Staff Assessment

AVENAL ENERGY PROJECT

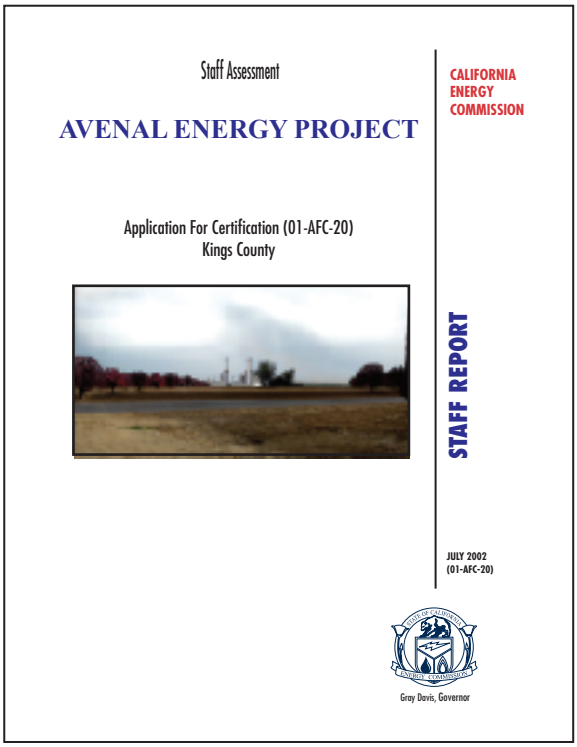
Application For Certification (01-AFC-20)
Kings County

CALIFORNIA
ENERGY
COMMISSION

STAFF REPORT

JULY 2002
(01-AFC-20)

Gray Davis, Governor



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EXECUTIVE SUMMARY

On October 9, 2001, Duke Energy Avenal, L.L.C. filed an Application for Certification (AFC) with the Energy Commission to construct and operate the Avenal Energy Project (AEP). The Energy Commission deemed the application complete at its December 19, 2001 business meeting. The analyses contained in this PSA are based upon information from: 1) the AFC; 2) responses to data requests, workshops, and site visits; 3) supplementary information from federal, state, and local agencies; 4) existing documents and publications; and 5) staff research.

This Preliminary Staff Assessment (PSA) contains the California Energy Commission staff's independent analysis and recommendations on the AEP. The AEP and related facilities such as the electric transmission lines, natural gas line, and water supply lines are under the Energy Commission's jurisdiction (Pub. Resources Code § 25500). When issuing a license, the Energy Commission is the lead state agency (Pub. Resource Code § 25519(c)) under the California Environmental Quality Act (Pub. Resource Code §§ 21000 et seq.). Its process has been certified by the Secretary for Resources, allowing the Commission's siting plan documentation to be used in lieu of an environmental impact report (Cal. Code Regs., tit. 14 § 15251(k)).

It is the responsibility of the Energy Commission staff to complete an independent assessment of the project's potential effects on the environment, the effects on the public's health and safety, and to determine whether the project conforms to all applicable laws, ordinances, regulations and standards (LORS). Staff also recommends measures to mitigate potential significant adverse environmental impacts and conditions for the construction, operation, and eventual closure of the project, if approved by the Energy Commission.

This PSA is not the decision document for the Energy Commission. It is preliminary in nature and represents preliminary conclusions at the staff level only. The final decision on the proposed project will be made by the Commissioners of the California Energy Commission only after submission of a Final Staff Assessment (FSA), testimony of the applicant and other parties, and evidentiary hearings. The Commissioners will consider the recommendations of all interested parties, including those of the Energy Commission staff; the applicant; intervenors; concerned citizens; and local, state, and federal agencies, before making a final decision on the application to construct and operate the AEP.

PROJECT LOCATION AND DESCRIPTION

The proposed site, within the City of Avenal, is located in an agricultural region along the western edge of the San Joaquin Valley, approximately 2 miles east of Interstate 5 in Kings County. This location is about 200 miles south of San Francisco and about 200 miles north of Los Angeles. Access to the site is via Avenal Cutoff Road. Site facilities, including the power block, switchyard, zero liquid discharge facility, cooling tower, and storm water retention basin, will occupy approximately 25 acres within the 148-acre site.

The residential and commercial districts of the City of Avenal are separated from the proposed site by about 6 miles and the intervening topography of the Kettlemen Hills. See **Project Description Figure 1.** (Duke 2001a, p. 1-7)

The 600-megawatt (MW) natural gas-fired combined cycle power plant is arranged with two trains of Combustion Turbine Generator (CTG)/ Heat Recovery Steam Generator (HRSG) to one Steam turbine generator (STG) a two-on-one configuration. (Note that this nominal power rating is based upon preliminary design information and generating equipment manufacturers' guarantees. The project's actual maximum generating capacity may differ from, and potentially exceed this figure of 600 MW.) The two advanced natural gas-fired model PG7241 7FA class CTGs supplied by General Electric are equipped with dry low NOx combustors designed for natural gas and inlet air mechanical chillers. The purpose of this chiller system is to enhance output during higher ambient temperatures.

As proposed, the project would interconnect to the PG&E transmission grid through a new, on-site 230-kV switchyard by constructing approximately 7000 feet of new, double circuit 230-kV line to loop the existing PG&E Gates-ARCO 230-kV line into the site.

The applicant has since informed staff that it will connect directly to the Gates substation approximately 6 miles northwest of the proposed project site. The applicant informed staff that it will supplement the AFC. The supplement will contain AFC level analysis of all of the required information for this project change.

PUBLIC AND AGENCY COORDINATION

The Informational Hearing and Site Visit was held in the community on January 28, 2002. A publicly noticed data response and issues resolution workshop was held on the following topics: air quality, biological and cultural resources, noise, soil and water resources, traffic and transportation, transmission system engineering, visual resources and waste management. The workshop was held at the City of Avenal Community Center on March 6, 2002.

In addition to the workshop, extensive coordination has occurred with the numerous local, state, and federal agencies that have an interest in the project.

Written comments on this PSA are encouraged and will be considered in staff's Final Staff Assessment (FSA).

STAFF'S ASSESSMENT

Each technical area section of the PSA contains a discussion of impacts, and where appropriate, mitigation measures and conditions of certification. The PSA includes staff's assessments of:

- the environmental setting of the proposal;
- impacts on public health and safety, and measures proposed to mitigate these impacts;

- environmental impacts, and measures proposed to mitigate these impacts;
- the engineering design of the proposed facility, and engineering measures proposed to ensure the project can be constructed and operated safely and reliably;
- project closure;
- project alternatives;
- compliance of the project with all applicable laws, ordinances, regulations and standards (LORS) during construction and operation; and
- proposed conditions of certification.

OVERVIEW OF STAFF'S CONCLUSIONS

All LORS have been met except for those in the categories listed as "Inconclusive" in the table below. No unmitigated significant adverse impacts have been identified except for those in the categories of air quality, biological resources, transmission system engineering, and visible plumes.

Technical Discipline	Environmental/ System Impact	Conforms with LORS
Air Quality	Inconclusive	Inconclusive
Biological Resources	Inconclusive	Inconclusive
Cultural Resources	Impacts mitigated	Yes
Power Plant Efficiency	None	N/A
Power Plant Reliability	None	N/A
Facility Design	N/A	Yes
Geology and Paleontology	Impacts mitigated	Yes
Hazardous Materials	Impacts mitigated	Yes
Land Use	Impacts mitigated	Inconclusive
Noise and Vibration	Impacts mitigated	Yes
Public Health	None	Yes
Socioeconomics	Impacts mitigated	Yes
Traffic and Transportation	None	Yes
Transmission Line Safety & Nuisance	None	Yes
Transmission System Engineering	Inconclusive	Inconclusive
Visual Resources	Impacts: mitigated (for structures)/ Inconclusive (for plumes)	Yes
Waste Management	Impacts mitigated	Yes
Water and Soil Resources	Impacts mitigated	Yes
Worker Safety	None	Yes

The following summarizes staff's position with respect to the areas listed as "Inconclusive." For a more complete discussion of conclusions, see the respective technical sections of the PSA.

Air Quality

- The San Joaquin Valley Air Pollution Control District's (SJVAPCD) recent determination of the Best Available Control Technology (BACT) appears to be inconsistent with recent comments from the U.S. Environmental Protection Agency (USEPA) on other power plant projects. The USEPA is expected to comment on the determination, and the applicant needs to certify that the control levels can be achieved. The USEPA's and the applicant's comments will be addressed in the SJVAPCD's Final Determination of Compliance (FDOC).
- Recent USEPA guidance has raised concerns about the use of pre-1990 offsets in the San Joaquin Valley. Because the applicant's offset package has not yet been reviewed in detail by the USEPA, staff is uncertain whether the USEPA considers the Avenal project offset package to be satisfactory.

Biological Resources

- The applicant is working with the U.S. Fish and Wildlife Service (USFWS), Energy Commission staff, and California Department of Fish and Game (CDFG) to identify the appropriate habitat compensation that is acceptable to all agencies. The applicant submitted a Biological Assessment and a request to the USEPA to initiate consultation with the USFWS on October 10, 2001. The USEPA then initiated formal consultation with USFWS on February 13, 2002. The USFWS sent a letter accepting the Biological Assessment and recommending the Kern Water Bank as the entity to receive funds for habitat compensation. If the Kern Water Bank is used to receive funds, then the USFWS would complete a certification letter under an existing Habitat Conservation Plan, and the Section 7 process would not be completed. CDFG has requested that the applicant submit habitat compensation alternatives that are closer to the impacts. Habitat compensation needs to be identified and approved prior to filing the FSA.
- A draft biological resources mitigation implementation and monitoring plan (BRMIMP) needs to be completed. This BRMIMP must include a discussion of the sensitive biological resources present at the site and along the linear facilities, designated biologist's duties, forms that would be used by the designated biologist, best management practices (BMP) used to avoid biological resources, and standard survey protocols for sensitive species.
- When the applicant identifies its final electrical transmission route, it must submit biological resources survey information that includes proposed mitigation measures.

Land Use

- The applicant has not provided staff with a tentative parcel map of the project site.

Transmission System Engineering

- The system impact study for the project initially indicated that about 33 circuit miles of transmission line might need to be reconductored. Staff requested that the applicant provide an environmental analysis of that potential reconductoring.

- The applicant has since notified staff that upon further review of the interconnection impacts from a reliability perspective, that it may interconnect the project directly to the Gates substation, some 6 miles to the north of the site. The decision to interconnect the project to the Gates substation would require the complete installation of new transmission towers and lines from the proposed power plant to the Gates substation.
- The applicant needs to supply staff with an interconnection study, which supports this decision to connect the plant's output directly to the Gates substation. (Staff will need to have the applicant file a supplement to its AFC. The AFC supplement must supply all appropriate survey materials at an AFC level of analysis.)
- This concerns staff since such survey requirements may have schedule impacts on the project. The applicant has not notified staff when it will file the AFC supplement.

Visible Resources (Plumes)

- Staff's preliminary modeling analysis of the operating conditions expected by the applicant determined that visible water vapor plume frequencies from the project's main cooling tower are substantially greater than staff's threshold for triggering a visual impact analysis of the plumes.
- Based upon the predicted dimensions (height, length, and width) of the visible plumes using only the Seasonal/Annual Cooling Tower Impact (SACTI) model, staff concludes that the main cooling tower plumes would cause significant visual impacts to nearby residences and travelers on Avenal Cutoff Road.
- However, the cooling tower plume frequency and plume dimension results will need to be remodeled using the Combustion Stack Visible Plume (CSVP) model after the applicant responds more appropriately to staff's data requests regarding apparent inconsistencies in the applicant's cooling exhaust temperature data by providing the requested heat balance information for the cooling tower.
- Staff has proposed condition of certification **VIS-6** for control of the main cooling tower plumes in the event that staff continues to find the visual impacts of the plumes to be significant once the CSVP analysis is complete. The condition would require the project to reduce the frequency of the plumes to acceptable levels through the use of a plume-abated, wet/dry cooling tower, or through other cooling tower design changes.

RECOMMENDATIONS

Due to the remaining issues outlined above, staff cannot make a recommendation on the project at this time, however, staff expects to receive additional information that will enable the completion of the project's impacts' analyses. With the additional information, staff will be able to make a recommendation in the FSA.

Through PSA workshops and issues resolution workshops, staff will attempt to resolve as many of these concerns and outstanding issues as possible prior to release of the FSA. Staff may need to issue additional data requests to clarify its information needs. Some of the information needed may require a significant amount of time to obtain,

such as the AFC supplement, SJVAPCD FDOC, a temporary parcel map of the project site, and an accepted Biological Assessment from the USFWS.

In addition to the estimated time required for the FDOC, a significant amount of time may be required for determinations from wildlife agencies regarding biological resources.

Staff cannot predict the amount of time that will be needed for parties to provide the needed information or for agencies to issue their determinations. For that reason, staff has proposed an FSA schedule that is linked to the receipt of the critical information identified above. Taking into consideration the amount of time necessary for analysis, review, revisions, and document preparation, staff needs a **minimum** of 30 days after all critical pieces of information and final determinations from the relevant agencies are received to complete its FSA.

AVENAL ENERGY CENTER
PRELIMINARY STAFF ASSESSMENT

EXECUTIVE SUMMARY 1

INTRODUCTION 2

PROJECT DESCRIPTION 3

ENVIRONMENTAL ASSESSMENT 4

- AIR QUALITY 4.1
- BIOLOGICAL RESOURCES 4.2
- CULTURAL RESOURCES 4.3
- HAZARDOUS MATERIALS MANAGEMENT 4.4
- LAND USE 4.5
- NOISE 4.6
- PUBLIC HEALTH 4.7
- SOCIOECONOMIC RESOURCES 4.8
- TRAFFIC AND TRANSPORTATION 4.9
- TRANSMISSION LINE SAFETY AND NUISANCE 4.10
- VISUAL RESOURCES 4.11
- WASTE MANAGEMENT 4.12
- WATER AND SOIL 4.13
- WORKER SAFETY AND FIRE PROTECTION 4.14

ENGINEERING ASSESSMENT 5

- FACILITY DESIGN 5.1
- GEOLOGY AND PALEONTOLOGY 5.2
- POWER PLANT EFFICIENCY 5.3
- POWER PLANT RELIABILITY 5.4
- TRANSMISSION SYSTEM ENGINEERING 5.5

ALTERNATIVES 6

GENERAL CONDITIONS 7

PREPARATION TEAM 8

INTRODUCTION

Lance Shaw

PURPOSE OF THIS REPORT

The Preliminary Staff Assessment (PSA) presents the California Energy Commission (Energy Commission) staffs' independent analysis of Duke Energy Avenal, Limited Liability Company's (LLC) (the applicant) Application for Certification (AFC). This report is prepared pursuant to sections 1742, 1742.5, 1743, and 1744 of Title 20, California Code of Regulations. The PSA is a staff document; it is not a Committee document nor is it a draft decision or proposed decision. The PSA describes the following:

1. the existing environment;
2. the proposed project;
3. whether the facilities can be constructed and operated safely and reliably in accordance with applicable laws, ordinances, regulations and standards (LORS);
4. the environmental consequences of the project including potential public health and safety impacts;
5. mitigation measures proposed by the applicant, staff, interested agencies and intervenors which may lessen or eliminate potential impacts;
6. the proposed conditions under which the project should be constructed and operated if it is certified; and
7. project alternatives.

The analyses contained in this PSA are based upon information from: 1) the AFC; 2) subsequent amendments; 3) responses to data requests; 4) supplementary information from local and state agencies; 5) publicly-existing workshops and meetings; 6) documents and publications; and 7) independent field studies and research.

The PSA presents conclusions and proposed conditions that apply to the design, construction, operation, and closure of the proposed facility. Each proposed condition of certification is followed by a "verification" to ensure compliance with the adopted conditions of certification.

The Energy Commission staff's analyses were prepared in accordance with Public Resources Code, section 25500 et seq., Title 20, California Code of Regulations, section 1701 et seq., and the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.) and its guidelines (Cal. Code Regs., Title 14, § 15000 et seq.).

ORGANIZATION OF THE PRELIMINARY STAFF ASSESSMENT

The **INTRODUCTION** section of this PSA explains the purpose of the PSA and its relationship to the Energy Commission's siting process. The **PROJECT DESCRIPTION** section of the PSA provides a brief overview of the project including its purpose, location, and major project components.

The environmental and engineering evaluations of the proposed project follow the **PROJECT DESCRIPTION**. This PSA will not contain a **NEED CONFORMANCE** section, since the legislature eliminated the requirement to conduct an integrated assessment of need in Senate Bill 110, effective January 1, 2000.

In the **environmental analyses**, the project's environmental setting is described, environmental impacts are identified and their significance assessed, and the project's compliance with applicable laws is reviewed. The mitigation measures proposed by the applicant are reviewed for adequacy and conformance with applicable LORS; any remaining unmitigated impacts are identified, and additional mitigation measures and project alternatives are proposed by staff when necessary. Staff's conclusions and recommendations are discussed, and proposed conditions of certification are included, if applicable.

In the **engineering analyses**, the project is evaluated in each technical area with respect to applicable LORS and performance objectives. Staff-proposed modifications to the facility, if applicable, are listed. Each technical section ends with a discussion of facility closure, conclusions and recommendations. Proposed conditions of certification are included, if applicable.

In cases where staff needed to gather or to receive additional information, or to further analyze information, or to request/receive comments from other agencies, comments to the effect that this will be clarified in the final staff assessment (FSA) appear.

ENERGY COMMISSION SITING PROCESS

The California Energy Commission has the exclusive authority to certify the construction and operation of thermal electric power plants 50 megawatts (MW) or larger. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law (Pub. Resources Code, section 25500). The Energy Commission must review power plant Applications for Certification (AFC) to assess potential environmental impacts including potential impacts to public health and safety, potential measures to mitigate those impacts (Pub. Resources Code, section 25519(c)), and compliance with applicable governmental LORS (Pub. Resources Code, section 25523 (d)).

The Energy Commission's siting regulations require staff to independently review the AFC and assess whether the list of environmental impacts contained is complete, and whether additional or more effective mitigation measures are necessary, feasible, and available (Cal. Code Regs., tit. 20, sections 1742 and 1742.5(a)). Staff's initial independent review is presented in a report, which we call a preliminary staff assessment (Cal. Code Regs., tit. 20, section 1742.5).

In addition, staff must assess the completeness and adequacy of the project's health and safety standards, and the reliability of power plant operations (Cal. Code Regs., tit. 20, section 1743(b)). Staff is required to develop a compliance plan (coordinated with other agencies) to ensure that applicable LORS are met (Cal. Code Regs., tit. 20, section 1744(b)).

Staff conducts its environmental analysis in accordance with the requirements of the California Environmental Quality Act (CEQA). No Environmental Impact Report (EIR) is required because the Energy Commission's site certification program has been certified by the Resources Agency (Public Resource Code, section 21080.5, Cal. Code Regs., tit. 14, section 15251(k)). The Energy Commission's certified process implements the subjective portions of CEQA.

The staff normally prepares both a preliminary and final staff assessment. The Preliminary Staff Assessment (PSA) presents for the applicant, intervenors, agencies, other interested parties, and members of the public the staff's preliminary analysis, conclusions, and recommendations. The final staff assessment (FSA) incorporates written comments on the PSA and comments on the PSA received at PSA workshops. The FSA serves as staff's testimony on a proposal for evidentiary hearings.

Staff uses the PSA to resolve issues between the parties and to narrow the scope of adjudicated issues in the evidentiary hearings. During the period between publishing the PSA and FSA, the staff conducts workshops to discuss findings, proposed mitigation, and proposed compliance monitoring requirements. Based on these workshops and written comments, staff will refine the analysis, correct errors, finalize conditions of certification to reflect areas where staff has reached agreement with the parties, and publish its final staff assessment.

The staff's assessment is only one piece of evidence that will be considered by the Committee in reaching a decision on whether or not to recommend that the full Energy Commission approve the proposed project. At the public hearings, all parties will be afforded an opportunity to present evidence and to rebut the testimony of other parties, thereby creating a hearing record on which a decision on the project can be based. The hearing before the Committee also allows all parties to argue their positions on disputed matters, if any, and it provides a forum for the Committee to receive comments from the public and other governmental agencies.
Following the hearings, the Committee's recommendation to the full Energy Commission on whether or not to approve the proposed project will be contained in a document entitled the Presiding Members' Proposed Decision (PMPD). Following publication, the PMPD is circulated for a minimum of 30 days in order to receive written public comments, and a public hearing may be held to take additional comments.

At the conclusion of the comment period, the Committee may prepare a revised PMPD. A revised PMPD is required to undergo a 15-day comment period. At the close of the comment period for the revised PMPD, the PMPD is submitted to the full Energy Commission for decision. Following Energy Commission adoption, any party may appeal the decision to the Energy Commission within 30 days.

A Compliance Monitoring Plan and General Conditions will be assembled from conditions contained in the FSA and other evidence presented at the hearings. The Compliance Monitoring Plan and General Conditions will be presented in the PMPD. The Energy Commission staff's implementation of the plan ensures that a certified facility is constructed, operated, and closed in compliance with the conditions adopted by the Energy Commission. The proposed Compliance Monitoring Plan and General Conditions are included at the end of the PSA.3

PROJECT DESCRIPTION

Lance Shaw

NATURE AND PURPOSE OF THE PROJECT

Duke Avenal, a Delaware Limited Liability Company and wholly owned subsidiary of Duke Energy North America, will be the owner of the generating plant and the site. The applicant proposes to construct and operate the Avenal Energy Project (AEP). The applicant's objectives are to:

- Provide environmentally sound, efficient, and reliable power generation for California's restructured energy market.
- Use a location that has existing nearby infrastructure (i.e., existing transmission lines, water supply, and gas supply) with available capacity and supply to support the project.
- Develop a site consistent with community planning and existing zoning, at a location that is supported by the local community.
- Minimize impacts to environmental resources. (Duke 2001a, pp.1-1-to 1-9)

PROJECT LOCATION

The proposed site, within the City of Avenal, is located in an agricultural region along the western edge of the San Joaquin Valley, approximately 2 miles east of Interstate 5. This location is about 200 miles south of San Francisco and about 200 miles north of Los Angeles. Access to the site is via Avenal Cutoff Road. Site facilities, including the power block, switchyard, zero liquid discharge facility, cooling tower, and storm water retention basin, will occupy approximately 25 acres within the 148-acre site.

The residential and commercial districts of the City of Avenal are separated from the proposed site by about 6 miles and the intervening topography of the Kettlemen Hills. See **Project Description Figure 1.** (Duke 2001a, p.)

POWER PLANT

The 600-megawatt (MW) natural gas-fired combined cycle power plant is arranged with two trains of Combustion Turbine Generator (CTG)/ Heat Recovery Steam Generator (HRSG) to one Steam turbine generator (STG) a two-on-one configuration. (Note that this nominal power rating is based upon preliminary design information and generating equipment manufacturers' guarantees. The project's actual maximum generating capacity will differ from, and likely exceed this figure of 600 MW.) The two advanced natural gas-fired model PG7241 7FA class CTGs supplied by General Electric are equipped with dry low NOx combustors designed for natural gas and inlet air mechanical chillers. The purpose of this chiller system is to enhance output during higher ambient temperatures.

Dry low NOx combustors in the CTGs are followed by selective catalytic reduction (SCR) in the HRSGs to control NOx stack emissions. An oxidation catalyst located in each HRSG reduces the concentration of carbon monoxide (CO) and volatile organic compounds (VOC) in the exhaust gases leaving the stack.

An aerial view of the plant layout **Project Description Figure 2** shows the site. The rendering in **Project Description Figure 3** provides a view of the plot plan and identifies major pieces of equipment. **Project Description Figure 4** shows elevations of some of the power plant facilities. **Project Description Figure 5** shows the proposed site linear facilities—primary water supply (from the aqueduct), backup ground water supply (wells), gas supply line, electric transmission line, and existing electrical lines in the vicinity.

TRANSMISSION LINE FACILITIES

The project proposes to deliver its electrical power to the PG&E transmission grid through a new, on-site 230-kV switchyard by constructing approximately 7,000 feet of new, double circuit 230-kV line to loop the existing PG&E Gates-ARCO 230-kV line into the site. This is shown on **Project Description Figure 5.**

NATURAL GAS PIPELINE

Natural gas will be supplied to the site from the Pacific Gas & Electric (PG&E) Kettleman compressor station which is located approximately 7000 feet southwest of the site. It is shown on **Project Description Figure 5.** The project will own the connecting natural gas pipeline. (Duke 2001a, p. 1-4)

WATER SUPPLY AND WASTE WATER TREATMENT

The primary source of raw water for the project will be a surface water supply from the Kern County Water Agency delivered via the State Water Project aqueduct. It will be delivered via a short pipeline from the City of Avenal water turnout to the project's power block. The source of the project's backup water supply will be ground water from nearby agricultural wells. Approximately 1.6 miles of new water pipelines will be needed to connect the site to the wells. The applicant proposes that the backup ground water supply will be used on a limited basis and will be offset by conservation measures to ensure no net increase in groundwater pumping.

This project will bring a new supply of municipal and industrial water to Kings County for its operation. The backup groundwater supply will be used under limited conditions, such as when there is an increase in power demand, interrupted canal flow, or events of elevated canal trubidity.

This is a zero liquid discharge facility (ZLDF). The ZLDF treats the water by separating the water from the dissolved solids, then recycles purified distilled water. The brine slurry continuously withdrawn by the ZLDF is reduced to dry solids. The resultant dewatered salt cake will be disposed of at a local non-hazardous landfill. Water recycling through the ZLDF will reduce project water consumption by approximately 10

percent. Sanitary water will be discharged by a septic system with leach fields. (DUKE 2001a p. 1-1 to 1-15)

The source of the project's surface water supply derives from the KWCA Kern River Restoration Project and Water Supply Program that allowed KCWA to acquire an additional 40,000 acre-feet of water for, in part, the marketing of 10,000 acre-feet of water within or outside of the KCWA service area by the Nickel Family, LLC. The restoration project resulted in a net gain to KCWA of an annual average of approximately 30,000 acre-feet of Lower Kern River water. The 10,000 annual acre-feet of firm water supply KCWA agreed to provide to the Nickel family, in order to obtain the rights to the annual average 40,000 acre-feet, is being marketed for municipal and industrial use, including power plant use. The project has secured a right to 2,250 annual acre-feet of the 10,000 acre-feet that has been placed on the water market. Water for the project will be delivered to a new turnout to be built upstream of the existing Avenal turnout. (Duke 2001a, p 1-1 to 2-46)

The City of Avenal operates a water turnout on the State Water Project canal that provides raw water for the City treatment plant located near the northeast corner of the Site. The treatment plant produces potable-quality water, which is piped over the Kettleman Hills to the developed area of the City and to the Avenal State Prison.

The total annual project water requirement is expected to be 2,250 acre-feet/ year (AFY). Approximately 3 AFY of this will be potable water used for sanitary purposes. The potable water will come from the City of Avenal water treatment plant. (Duke 2001a, p.1-8)

CONSTRUCTION AND OPERATION

Construction of the project is expected to begin early in the first quarter 2003 and be completed in the third quarter of 2004. It is expected to begin commercial operation in September 2004. (Duke 2001a, p. 1-2)

The project's estimated capital cost is about $325 million. Average construction employment during the 20-month construction schedule is approximately 240 persons. The operations work force is expected to be approximately 30 persons. (Duke 2001a, p. 1-22)

ENVIRONMENTAL ASSESSMENT

AIR QUALITY

Brewster Birdsall

INTRODUCTION

In this analysis, staff evaluated the expected air quality impacts of the emissions of criteria air pollutants due to the proposed Avenal Energy project. Criteria air pollutants are those for which a federal or state ambient air quality standard has been established to protect public health. They include ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), reactive organic gases (ROGs, including volatile organic compounds, or VOCs), and particulate matter less than 10 microns in diameter (PM_{10}).

The Energy Commission staff evaluated the following major points:

- whether the proposed Avenal Energy project is likely to conform with applicable Federal, State and San Joaquin Valley Air Pollution Control District (SJVAPCD, or District) air quality laws, ordinances, regulations and standards (Cal. Code Regs., tit. 20, § 1744(b)); and
- whether the proposed Avenal Energy project is likely to cause significant air quality impacts, including new violations of ambient air quality standards or contributions to existing violations of those standards and whether the mitigation proposed for the Avenal project is adequate to lessen the potential impacts to a level of insignificance (Cal. Code Regs., tit. 20, § 1742(b)).

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

The federal Clean Air Act requires that any new major stationary sources of air pollution and any major modifications to existing major stationary sources obtain a construction permit before commencing construction. This process is known as New Source Review (NSR). Its requirements differ depending on the attainment status of the area where the major facility is to be located. Prevention of Significant Deterioration (PSD) requirements apply in areas that are in attainment of the national ambient air quality standards. The Nonattainment NSR requirements apply to areas that have not been able to demonstrate compliance with national ambient air quality standards. The entire program, including both PSD and Nonattainment NSR permit reviews, is referred to as the federal NSR program.

Title V of the federal Clean Air Act requires states to implement and administer an operating permit program to ensure that large sources operate in compliance with the requirements included in the Code of Federal Regulations (CFR), Title 40, Part 70(40 CFR 70). A Title V permit contains all of the requirements specified in different air quality regulations that affect an individual project.

Title IV of the federal Clean Air Act requires implementation of an acid rain permit program (40 CFR 72). These regulations require subject facilities to obtain emission allowances for oxides of sulfur (SOx) emissions.

The U.S. Environmental Protection Agency (U.S. EPA) has reviewed and approved the San Joaquin Valley Air Pollution Control District's regulations for the Nonattainment NSR, Title V, and Title IV programs. These federal permitting programs have been delegated to the SJVAPCD for implementation. The SJVAPCD rules and regulations implementing the federal programs are as stringent as the federal regulations. The federal PSD program is implemented by the U.S. EPA, which means that an independent application must be filed with the U.S. EPA in order to secure this federal permit.

The Avenal Energy project is also subject to the federal New Source Performance Standards (NSPS of 40 CFR 60). Enforcement of NSPS has been delegated to the SJVAPCD (District Rule 4001). The proposed combined cycle power plant must comply with the requirements of NSPS Subparts Da and GG. SJVAPCD emission limitations or Best Available Control Technology (BACT) requirements are, however, more restrictive than the NSPS requirements, as will be discussed below. The federal NSPS allowable emissions concentration for NOx is 75 ppmvd (parts per million volume dry) @ 15% O_2, and the NSPS requirement for SO_2 emissions concentration is 150 ppm @ 15% O_2.

STATE

California State Health and Safety Code, Section 41700, requires that: "no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property."

LOCAL

As part of the Energy Commission's licensing process, in lieu of issuing a construction permit to the applicant for the Avenal Energy project, the SJVAPCD prepared a Preliminary Determination of Compliance (PDOC, SJVAPCD 2002a). The PDOC evaluates whether and under what conditions the proposed project will comply with the applicable rules and regulations, as described below. The review by the SJVAPCD for the PDOC is conducted in a manner that is equivalent to that for an authority to construct. The Commission staff coordinates its analysis with that for the PDOC. District Rule 2201-5.8 specifies the timelines under which the District is obligated to make its preliminary and final decisions. Provided successful completion of the Energy Commission's licensing process and incorporation of the District's conditions into the Decision granted by the Energy Commission, the Determination of Compliance serves as an equivalent to an Authority to Construct. A Permit to Operate would be issued by the District provided the construction is in compliance with the conditions of the Determination of Compliance and the Energy Commission Decision.

The project is subject to the specific SJVAPCD rules and regulations that are briefly described below:

Regulation II – Permits

Rule 2201 – New And Modified Stationary Source Review Rule

The main functions of the District's New Source Review Rule are to issue of Authorities to Construct and Permits to Operate, apply Best Available Control Technology (BACT) to new or modified permit sources, and to require the new permit source to secure emission offsets.

Section 2201-4.1 – Best Available Control Technology

Best Available Control Technology is defined as: a) what has been contained in any State Implementation Plan and approved by U.S. EPA; b) the most stringent emission limitation or control technique that has been achieved in practice for a class of source; or c) any other limitation or control technique which the District's Air Pollution Control Officer (APCO) finds is technologically feasible and is cost effective. BACT is required for NOx, VOC, PM_{10} and SO_2 emissions from any new or modified emission unit that exceed 2 lb/day, and CO emissions that exceed 550 lb/day. The Avenal Energy project would trigger BACT requirements for NOx, VOC, PM_{10}, SO_2, and CO.

Section 2201-4.5 – Offsets

Emissions offsets for new or modified sources are required when those sources exceed the following emission levels:

- Oxides of Nitrogen, NOx: 20,000 lb/year (10 tons per year, tpy)
- Volatile Organic Compounds, VOC: 20,000 lb/year (10 tpy)
- Carbon Monoxide, CO: 200,000 lb/year (100 tpy)
- Sulfur Oxides, SOx: 54,750 lb/year (150 lb/day)
- PM_{10}: 29,200 lb/year (80 lb/day)

Section 4.8 of the rule requires that the emission offsets provided by the applicant be adjusted according to the distance from the project to the location of the offset. Within 15 miles of the proposed source, the offsets must be provided at a 1.3-to-1 ratio, and beyond 15 miles of the proposed source, the offsets must be provided at a 1.5-to-1 ratio. The offsets must be provided for only the quantity of potential emissions that would be in excess of the trigger levels, at a time prior to operation of the new sources (Section 4.13.11).

Section 4.13.3.2 allows for the use of interpollutant offsets (including between VOC and NOx for ozone, and PM_{10} precursors [VOC, NOx and SOx) for PM_{10}) on a case-by-case basis, provided that the applicant demonstrates that the emissions increase will not cause a violation of any ambient air quality standard. The ratio for interpollutant trading shall be based on an air quality analysis and shall be equal to or greater than the minimum offsetting requirements (the distance ratios) of this rule. Section 4.6.1 exempts emergency equipment from all offset requirements and provides an exemption from CO offset requirements for any equipment that demonstrates compliance with CO ambient air quality standards.

The Avenal Energy project would trigger offset requirements for NOx, VOC, CO, and PM_{10}.

Section 2201-4.14 – Additional Source Requirements

This rule (Rule 4.14.2) requires that a new source not cause or make worse, the violation of an ambient air quality standard as demonstrated through analysis with air dispersion models.

Rule 2520 – Federally Mandated Operating Permits

Requires that a project owner obtain a Title V Operating Permit within 12 months of commencing operation. A project is subject to this requirement if any of the following apply: the project is a major stationary source (under Rule 2201 Major Source definition), it has the potential to emit greater than 100 tons per year of a criteria pollutant, any equipment permitted is subject to New Source Performance Standards, the project is subject to Title IV Acid Rain program, or the owner is required to obtain a PSD permit from U.S. EPA. The Title V Permit application requires that the owner submit information on the operation of the air polluting equipment, the emission control, the quantities of emissions, the monitoring of the equipment, as well as other information requirements.

Rule 2540 – Acid Rain Program

A project greater than 25 MW and installed after November 15, 1990, must submit an acid rain program permit application to the District. The acid rain requirements will become part of the Title V Operating Permit (Rule 2520).

Regulation IV – Prohibitions

Rule 4001 – New Source Performance Standards

Specifies that a project must meet the requirements of the Federal New Source Performance Standards (NSPS), according to Title 40, Code of Federal Regulations, Part 60, Chapter 1. This project is subject to Subpart GG, which pertains to Stationary Gas Turbines; and Subpart Da, which pertains to the steam generators (e.g., the duct burners). The pollutant emission limits of these regulations are less stringent than the Rule 2201 BACT requirements.

Rule 4101 – Visible Emissions

This rule contains general requirements limiting visible emissions to no darker than Ringelmann No. 1 (20 percent opacity) for periods greater than three minutes in any hour.

Rule 4102 – Nuisance

Prohibits any emissions “which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health, or safety of any such person or public or which cause or have a natural tendency to cause injury or damage to business or property.”

Rule 4201 – Particulate Matter Concentration

Limits particulates emissions from sources such as the gas turbine and cooling tower to less than 0.1 grain per dry standard cubic foot of exhaust gas.

Rule 4301 – Fuel Burning Equipment

Limits air contaminant emissions from fuel burning equipment. This rule is applicable to the auxiliary boiler. However, the combustion turbine is exempt from this rule because it produces power primarily through the mechanical turning of the turbine blades. The emissions of particulate matter are limited to 0.1 grain per dry standard cubic foot of exhaust gas or 10 pounds per hour. Additionally, the equipment must not emit more than 200 pounds of sulfur compounds or 140 pounds of NOx in any hour. The pollutant emission limits of these regulations are less stringent than the Rule 2201 BACT requirements.

Rule 4305 – Boilers, Steam Generators, and Process Heaters

Limits air contaminant emissions from fuel burning equipment. This rule is applicable to the auxiliary boiler. The HRSG is exempt from this rule because it is a waste heat recovery device. The pollutant emission limits of these regulations are less stringent than the Rule 2201 BACT requirements.

Rule 4351 – Boilers, Steam Generators, and Process Heaters, Reasonably Available Control Technology

Limits NOx and CO emissions from boilers rated greater than 9 million Btu per hour (MMBtu/hr). This requirement applies to the auxiliary boiler, but does not apply to the HRSG, which is a waste heat recovery device. The pollutant emission limits of these regulations are less stringent than the Rule 2201 BACT requirements.

Rule 4701 – Internal Combustion Engines

Establishes emission limitations and record-keeping requirements new or modified internal combustion engines rated at 50 hp or higher. Standby engines and engines used for fire-fighting purposes are exempt from the emission limitations of this rule, but are required to maintain certain administrative records.

Rule 4703 – Stationary Gas Turbines

Establishes requirements for monitoring and record-keeping for NOx and CO emissions from new or modified stationary gas turbines with a designed power of 0.3 MW or higher. According to this rule, at 15% O_2, NOx and CO concentrations must be less than 9 ppm and 200 ppm, respectively.

Rule 4801 – Sulfur Compounds

Limits the emissions of sulfur compounds to no greater than 0.2 percent calculated as SO_2 per dry standard cubic foot.

Regulation VIII – Fugitive PM_{10} Prohibitions

The SJVAPCD rules related to fugitive dust control were made more stringent in November 2001. The requirements are described below.

Rule 8011 – General Requirements

Rule 8011 defines the types of chemical stabilizing agents and dust suppressant materials that can (and cannot) be used to minimize fugitive dust and specifies test methods and recordkeeping requirements for the rules under Regulation VIII.

Rule 8021 – Construction, Demolition, Excavation, and Extraction and Other Earthmoving Activities

Rule 8021 requires that fugitive dust emissions during construction activities be limited to no greater than 20 percent opacity by means of water application or chemical dust suppressants. The rule also requires temporarily stabilizing areas of inactivity and encourages the use of paved access aprons, gravel strips, and wheel washers.

Rule 8031 – Bulk Materials

Rule 8031 limits the fugitive dust emissions from the handling and storage of materials. It specifies that bulk materials be transported using wetting agents, allow appropriate freeboard space in the vehicles, or be covered. It also requires that stored materials be covered or stabilized.

Rule 8041 – Carryout and Trackout

Rule 8041 requires use of measures to sweep paved areas and to limit mud or dirt carry-out onto paved public roads.

Rule 8061 – Paved and Unpaved Roads

Rule 8061 specifies the width of paved shoulders on paved roads and the use of dust suppressants on unpaved roadways, shoulders and medians.

Rule 8071 – Unpaved Vehicle/Equipment Areas

Rule 8071 is intended to limit fugitive dust from unpaved equipment areas larger than one-acre by means of dust suppressants or paving. It also requires restricting access and periodically stabilizing areas that are inactive for more than seven consecutive days.

SETTING

METEOROLOGICAL CONDITIONS

The general climate of California is typically dominated by the eastern Pacific high pressure system centered off the coast of California. In the summer, this system results in low inversion layers and clear skies inland and typically early morning fog by the coast. In winter, this system promotes wind and rainstorms originating in the Gulf of Alaska and striking Northern California.

The climate of the southern San Joaquin Valley is characterized by hot dry summers and mild winters with precipitation almost exclusively in the winter. Summers are usually very warm, with average daily maximum temperatures between 97 and 99°F for the two hottest months (July and August). Very little precipitation occurs during the

summer months because the strong high pressure blocks migrating storm systems. Beginning in the fall and continuing through the winter, the storm belt and zone of strong westerly winds begins to greatly influence California. Temperature, winds, and rainfall are variable during these months, and stagnant conditions occur more frequently than during summer.

Wind speeds are generally higher in summer than in winter and are typically north-northwesterly winds. During the spring, summer, and fall, the stronger winds are caused by a combination of offshore and thermal low pressure resulting from high temperatures in the Central Valley. During the winter months, winds are more variable and are predominantly northerly. Calm conditions occur more during winter, but are relatively infrequent throughout the year. Valley fog often occurs during these calm, stagnant atmospheric conditions, when temperature inversions trap a layer of cool, moist air near the surface. The annual rainfall at Kettleman Station is only about 7 inches and most precipitation (90%) occurs during October through April. During December and January, average daily minimum temperatures are between 38 and 40°F (WRCC 2001).

Along with the wind flow, atmospheric stability and mixing heights are important factors in the determination of pollutant dispersion. Atmospheric stability is an indicator of the air turbulence and mixing. During the daylight hours of the summer when the earth is heated and air rises, there is more turbulence, more mixing, and thus less stability. During these conditions there is more air pollutant dispersion and therefore usually reduced air quality impacts near any single air pollution source. During the winter months between storms, however, very stable atmospheric conditions occur, resulting in very little mixing. Under these conditions, minimal air pollutant dispersion occurs, and consequently higher air quality impacts may result near sources. Because lower mixing heights generally occur during the winter, along with lower mean wind speeds and less vertical mixing, dispersion occurs less rapidly.

EXISTING AIR QUALITY

The U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) both require the establishment of allowable maximum ambient concentrations of air pollutants, called ambient air quality standards (AAQS). The state standards (CAAQS), established by CARB, are typically more restrictive than the federal or national standards (NAAQS), which are established by the U.S. EPA. The state and federal air quality standards are listed in **AIR QUALITY Table 1**. As indicated in **Table 1**, the averaging times for the various air quality standards (the duration over which they are measured) range from hourly to annually. The standards are read as a concentration, in parts per million (ppm), or as a weighted mass of material per a volume of air, in milligrams or micrograms of pollutant per cubic meter of air (mg/m^3 and $\mu g/m^3$, respectively).

In general, an area or air basin is designated as attainment for a specific pollutant if the concentrations of that air contaminant do not exceed the standard. Likewise, an area is designated as nonattainment for an air contaminant if that standard is violated. Where not enough ambient data are available to support designation as either attainment or nonattainment, the area would be designated as unclassified. Unclassified areas are

normally treated the same as attainment areas for regulatory purposes. An area can be attainment for one air contaminant while nonattainment for another, or attainment for the federal standard and nonattainment for the state standard for the same contaminant. The entire area within the boundaries of an air district or air basin is usually evaluated to determine the district's attainment status. **AIR QUALITY Table 2** shows the area designation status of the San Joaquin Valley Air Basin for each criteria pollutant for both the federal and state ambient air quality standards. The federal classifications go from moderate to extreme.

Ozone, PM_{10}, and recent NO_2 data are recorded at the Hanford air monitoring station about 20 miles to the northeast of Avenal. Other sources of data for ozone, PM_{10}, NO_2, and CO include the Visalia station, and SO_2 data is from Fresno and Bakersfield. In the discussion that follows, data from the nearest stations are presented, where available and relevant.

Historic Air Quality Trends

In **AIR QUALITY Figure 1**, the normalized maximum short term concentrations of criteria pollutants in the project area are charted from 1980 to 2001. The availability of this data is shown in the tables that follow this chart. Normalized concentrations represent the ratio of the highest measured concentrations for a given averaging period in a given year to the most-stringent applicable national or state ambient air quality standard. Therefore, normalized concentrations lower than one indicate that the measured concentrations were lower than the most-stringent ambient air quality standard. Data in **Figure 1** are from a variety of stations: normalized concentrations of ozone and PM_{10} are from Hanford; NO_2 and CO are from Visalia; and SO_2 is from Fresno until 1997 and Bakersfield after 1997. **Figure 1** shows that maximum ozone and PM_{10} concentrations are well above the most-stringent state-level standard. The tables that follow provide more detail, showing that ozone and PM_{10} concentrations also frequently exceed the less restrictive federal standards.

AIR QUALITY Table 1
Federal and State Ambient Air Quality Standards

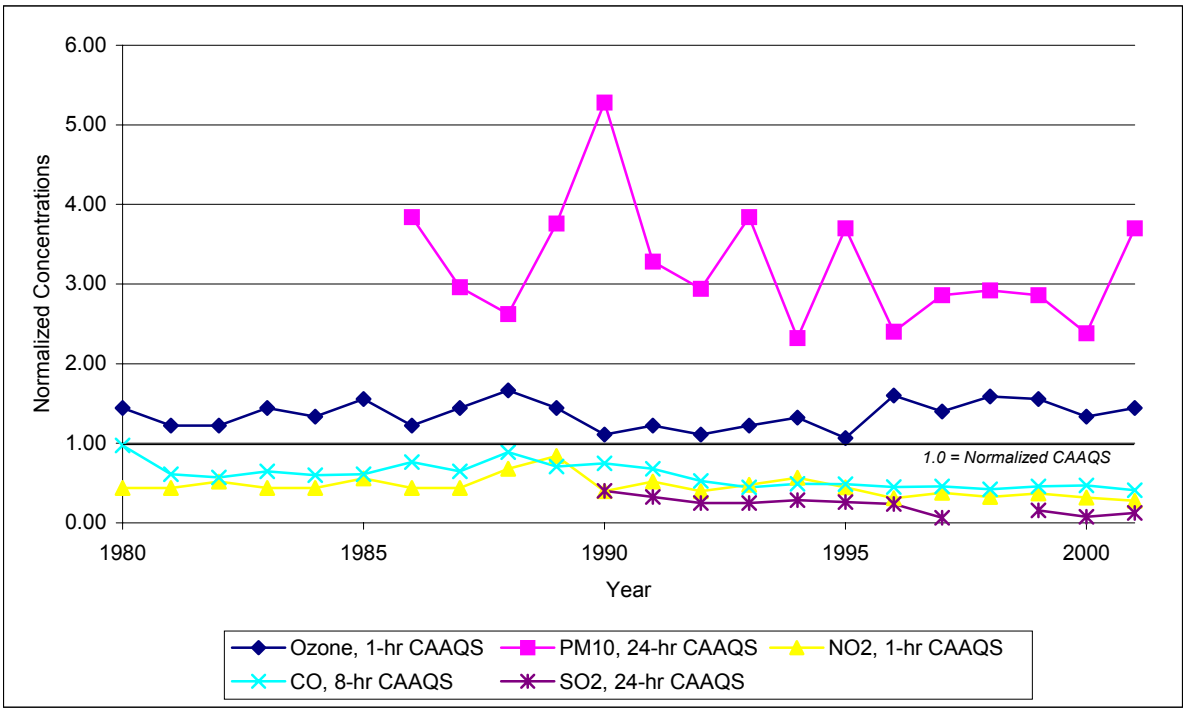
Pollutant	Averaging Time	National Standard (NAAQS)	California Standard (CAAQS)
Ozone (O_3)	1 Hour	0.12 ppm (235 µg/m^3)	0.09 ppm (180 µg/m^3)
	8 Hour	0.08 ppm (160 µg/m^3)	—
Respirable Particulate Matter (PM_{10})	Annual Geometric Mean	—	30 µg/m^3
	24 Hour	150 µg/m^3	50 µg/m^3
	Annual Arithmetic Mean	50 µg/m^3	—
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	65 µg/m^3	—
	Annual Arithmetic Mean	15 µg/m^3	—
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	—
	1 Hour	—	0.25 ppm (470 µg/m^3)
Carbon Monoxide (CO)	8 Hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Sulfur Dioxide (SO_2)	Annual Average	0.03 ppm (80 µg/m^3)	—
	24 Hour	0.14 ppm (365 µg/m^3)	0.04 ppm (105 µg/m^3)
	3 Hour	0.5 ppm (1300 µg/m^3)	—
	1 Hour	—	0.25 ppm (655 µg/m^3)
Sulfates (SO4(2-))	24 Hour	—	25 µg/m^3
Lead	30 Day Average	—	1.5 µg/m^3
	Calendar Quarter	1.5 µg/m^3	—
Hydrogen Sulfide (H_2S)	1 Hour	—	0.03 ppm (42 µg/m^3)
Vinyl Chloride (chloroethene)	24 Hour	—	0.010 ppm (26 µg/m^3)
Visibility Reducing Particulates	1 Observation	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.

AIR QUALITY Table 2
Federal and State Area Designations for the San Joaquin Valley Air Basin

Pollutants	Federal Classification	State Classification
Ozone	Severe Nonattainment	Severe Nonattainment
PM_{10}	Serious Nonattainment	Nonattainment
NO_2	Attainment	Attainment
CO	Attainment	Attainment
SO_2	Attainment	Attainment

Note: The federal ozone designation for the San Joaquin Valley was degraded from "serious" to "severe" in October 2001, and in June 2002, the SJVAPCD Staff recommended voluntary further degradation of the status from "severe" to "extreme." The SJVAPCD Governing Board is presently deliberating whether to request this designation from U.S. EPA.

AIR QUALITY Figure 1
Normalized Maximum Short-Term
Historical Air Pollutant Concentrations near Avenal



Note: A Normalized Concentration is the ratio of the highest measured concentration to the applicable most stringent air quality standard. For example, in 1998 the highest 1-hour average ozone concentration measured in Hanford was 0.143 ppm. Since the most stringent ambient air quality standard is the state standard of 0.09 ppm, the 1998 normalized concentration is 0.143/0.09 = 1.6.

Source: CARB 2002.

Ozone

In the presence of ultraviolet radiation, both NOx and VOC go through a number of complex chemical reactions to form ozone. **AIR QUALITY Table 3** summarizes the best representative ambient ozone data collected from three different monitoring stations close to the project site. The normalized 1-hour ozone data presented in **Figure 1** above shows that concentrations exceed the California Ambient Air Quality Standard (CAAQS) by 10 to 60 percent in each of the recent years.

AIR QUALITY Table 3 includes the maximum hourly concentration and the number of days above the state standards. Ozone formation is highest in the spring and summer, when abundant sunshine and high temperatures are available to trigger the necessary photochemical reactions, and lowest in the winter. In October 2001, the San Joaquin Valley Air Basin was downgraded to severe ozone nonattainment because of ongoing and persistent violations of the National Ambient Air Quality Standards (NAAQS). Although the NAAQS are less restrictive than the state-level standard, ozone violations occur at levels approximately 20 percent above that standard. In recent years, a minimum of approximately two dozen days per year registered concentrations above the less-stringent federal standard.

AIR QUALITY Table 3
Ozone Air Quality Summary, 1993-2001

Year	Hanford, South Irwin Street			Visalia, North Church Street			Bakersfield, California Avenue		
	Days Above 1-hr CAAQS	Max. 1-hr Level (ppm)	Max. 8-hr Level (ppm)	Days Above 1-hr CAAQS	Max. 1-hr Level (ppm)	Max. 8-hr Level (ppm)	Days Above 1-hr CAAQS	Max. 1-hr Level (ppm)	Max. 8-hr Level (ppm)
1993	2	0.11	0.093	60	0.15	0.125	---	---	---
1994	9	0.12	0.102	52	0.15	0.119	27	0.12	0.116
1995	2	0.10	0.085	48	0.13	0.112	59	0.13	0.113
1996	78	0.14	0.121	53	0.14	0.111	66	0.13	0.120
1997	23	0.13	0.106	24	0.13	0.104	14	0.12	0.109
1998	27	0.14	0.113	54	0.15	0.122	29	0.12	0.110
1999	28	0.14	0.111	52	0.13	0.106	44	0.12	0.101
2000	48	0.12	0.110	46	0.13	0.099	41	0.13	0.106
2001*	19	0.13	0.107	14	0.13	0.100	12	0.13	0.115

California Ambient Air Quality Standard (CAAQS): Hourly 0.09 ppm
National Ambient Air Quality Standard: 8-hour 0.08 ppm
Source: CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.
Note: *Available ozone data for 2001 only partially complete.

Inhalable Particulate Matter (PM_{10})

AIR QUALITY Table 4 shows that the project area also commonly experiences violations of the state 24-hour PM_{10} standard. The violations of the state 24-hour standard occur predominately between the months of October and February, with the highest number of violations occurring from October through January. As the trend shows in **AIR QUALITY Figure 1**, PM_{10} concentrations in the project area continue to dramatically exceed the state-level standard. **Table 4** shows that the less-stringent federal standards are also violated by ambient PM_{10} concentrations for both the daily- and annual-averaging periods.

PM_{10} can be emitted directly (for example by the combustion of any fossil fuel) or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere. Gaseous emissions of pollutants like NOx, SOx, and VOC from combustion sources, and ammonia from NOx control equipment and agriculture, given the right meteorological conditions, can form particulate matter in the form of nitrates (NO_3), sulfates (SO_4), and organic particles. These pollutants are

known as secondary particulates, because they are not directly emitted but are formed through complex chemical reactions in the atmosphere.

PM nitrate (mainly ammonium nitrate) is formed in the atmosphere from the reaction of nitric acid and ammonia. Nitric acid in turn originates from NOx emissions from combustion sources. The nitrate ion concentrations during the wintertime are a significant portion of the total PM_{10}, and may even be a higher contributor to particulate matter of less than 2.5 microns ($PM_{2.5}$). The nitrate ion is only a portion of the PM nitrate, which can be in the form of ammonium nitrate (ammonium plus nitrate ions) and some as sodium nitrate. If the ammonium and the sodium ions associated with the nitrate ion are taken into consideration, PM nitrate contributions to the total PM would be even more significant.

AIR QUALITY Table 4
PM_{10} Air Quality Summary, 1993-2001

Year	Hanford, South Irwin Street			Visalia, North Church Street			Corcoran, Patterson Avenue		
	Days Above CAAQS (calc)	Max. Daily Average (µg/m^3)	Annual Arith. Mean (µg/m^3)	Days Above CAAQS (calc)	Max. Daily Average (µg/m^3)	Annual Arith. Mean (µg/m^3)	Days Above CAAQS (calc)	Max. Daily Average (µg/m^3)	Annual Arith. Mean (µg/m^3)
1993	36	192	---	180	108	52.8	---	---	---
1994	156	116	50.1	138	104	48.2	---	---	---
1995	150	185	52.9	153	125	52.3	---	---	---
1996	105	120	40.8	150	115	44.6	36	141	52.0
1997	102	143	46.2	66	96	41.5	90	199	48.1
1998	90	146	39.2	102	160	39.9	66	128	41.9
1999	102	143	53.4	174	152	54.9	132	174	53.2
2000	99	119	49.0	180	130	52.7	120	128	46.7
2001	156	185	57.0	162	143	51.0	126	165	49.0

California Ambient Air Quality Standard (CAAQS): Daily 50 µg/m^3
National Ambient Air Quality Standard (NAAQS): Daily 150 µg/m^3; Annual Arithmetic Mean 50 µg/m^3
Source: CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.

Days above the state standard (calculated): Because PM_{10} is monitored approximately once every six days, the potential number of violation days is calculated by multiplying the number of days of monitored violations by six.

Fine Particulate Matter ($PM_{2.5}$)

The U.S. EPA first identified $PM_{2.5}$ ambient air quality standards in 1997. The air agencies in California are now deploying $PM_{2.5}$ ambient air quality monitors throughout the state. $PM_{2.5}$ ambient air quality attainment plans, if needed, are due to the U.S. EPA by 2005. The SJVAPCD would be responsible for developing an air quality management plan for $PM_{2.5}$, if the air basin is eventually designated as a nonattainment area.

Preliminary data is available for $PM_{2.5}$ from the Corcoran monitoring station starting in late-1999. At this location, the maximum 24-hour concentrations occurring in 1999, 2000, and 2001 were 53, 76, and 123 µg/m^3, respectively. Compared to the 1997 U.S. EPA standard (65 µg/m^3), about seven days over the two-to-three-year period exceeded the federal standard (CARB web site, July 2002). Because a data record of at least

three years would be necessary to determine attainment status, the $PM_{2.5}$ attainment status for the San Joaquin Valley will not be designated until after 2002.

The highest $PM_{2.5}$ concentrations in the San Joaquin Valley occur in the winter. During wintertime high PM episodes, the contribution of ground level releases to ambient PM concentrations is disproportionately high. The contribution of wood-smoke particles to the $PM_{2.5}$ concentrations may be even higher, considering that most of the wood-smoke particles are smaller than 2.5 microns. Managing $PM_{2.5}$ concentrations will require identifying controllable sources and developing feasible source management strategies. Because PM_{10} includes $PM_{2.5}$ as a subset and reactive precursors that lead to ozone can also lead to $PM_{2.5}$, the established strategies for controlling PM_{10} and ozone precursors (including existing programs for combustion sources) also presently help to reduce $PM_{2.5}$ concentrations.

Nitrogen Dioxide (NO_2)

As shown in **AIR QUALITY Table 5** the maximum one-hour and annual concentrations of NO_2 at the air monitoring stations in the region are lower than California Ambient Air Quality Standards. Approximately 90 percent of the NOx emitted from combustion sources is NO, while the balance is NO_2. NO is oxidized in the atmosphere to NO_2 but some level of photochemical activity is needed for this conversion. This is why the highest concentrations of NO_2 occur during the fall and not in the winter when atmospheric conditions favor the trapping of ground level releases but lack significant photochemical activity (less sunlight). In the summer the conversion rates of NO to NO_2 are high but the relatively high temperatures and windy conditions (atmospheric unstable conditions) disperse pollutants, preventing the accumulation of NO_2 to levels approaching the 1-hour ambient air quality standard. The formation of NO_2 in the summer with the help of the ozone is according to the following reaction.

$$NO + O_3 \rightarrow NO_2 + O_2$$

In urban areas, the daytime ozone concentration level is typically high. That level drops substantially at night as the above reaction takes place between ozone and NO. This “scavenging” reaction explains why in urban areas, ozone concentrations at ground level drop , while higher aloft or in downwind rural areas (without sources of fresh NOx emissions) ozone concentrations can remain relatively high.

AIR QUALITY Table 5
NO_2 Air Quality Summary, 1993-2001

Year	Hanford, South Irwin Street		Visalia, North Church Street		Bakersfield, California Avenue	
	Maximum 1-hr Average (ppm)	Annual Average (ppm)	Maximum 1-hr Average (ppm)	Annual Average (ppm)	Maximum 1-hr Average (ppm)	Annual Average (ppm)
1993	---	---	0.120	0.0226	---	---
1994	0.082	0.0152	0.142	0.0228	0.089	---
1995	0.094	0.0151	0.112	0.0233	0.109	0.0220
1996	0.066	0.0145	0.077	0.0182	0.099	0.0233
1997	0.080	0.0139	0.095	0.0188	0.081	0.0220
1998	0.086	0.0143	0.081	0.0166	0.084	0.0222
1999	0.086	0.0160	0.092	0.0206	0.107	0.0249
2000	0.072	0.0140	0.079	0.0180	0.089	0.0240
2001	0.096	---	0.069	---	0.115	---

California Ambient Air Quality Standard: Hourly 0.25 ppm
National Ambient Air Quality Standard: Annual 0.053 ppm
Source: CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.

Carbon Monoxide (CO)

As **AIR QUALITY Table 6** shows, the maximum one-hour and eight-hour CO concentrations are less than the California Ambient Air Quality Standards (CAAQS). CO is considered a local pollutant as it is inert and found in highest concentrations only near the source of emission. Automobiles and other mobile sources are the principal source of the CO emissions. High levels of CO emissions can also be generated from fireplaces and wood-burning stoves. According to the data recorded throughout the San Joaquin Valley, except for one 8-hour period in Fresno in 1995, there have been no violations of the standards in the air basin since 1993 (see also **AIR QUALITY Figure 1**).

The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground level in what is known as the stable boundary layer. These conditions occur frequently in the wintertime late in the afternoon, persist during the night and may extend one or two hours after sunrise. Since mobile sources (motor vehicles) are the main cause of CO, ambient concentrations of CO are highly dependent on motor vehicle activity. In fact, the peak CO concentrations occur during the rush hour traffic in the morning and afternoon. Carbon monoxide concentrations throughout the state have declined significantly due to two state-wide programs: 1) the 1992 wintertime oxygenated gasoline program, and 2) Phases I and II of the reformulated gasoline program. New vehicles with oxygen sensors and fuel injection systems have also contributed to the decline in CO levels in the state. Today, all the areas of California, with the sole exception of certain locations within the Los Angeles area, are in compliance with the CO ambient air quality standards.

AIR QUALITY Table 6
CO Air Quality Summary, 1993-2001

Year	Visalia, North Church Street			Bakersfield, California Avenue		
	Days Above 8-hr CAAQS/ NAAQS	Max. 1-hr Level (ppm)	Max. 8-hr Level (ppm)	Days Above 8-hr CAAQS/ NAAQS	Max. 1-hr Level (ppm)	Max. 8-hr Level (ppm)
1993	0	7.0	4.00	---	---	---
1994	0	8.7	4.41	0	6.3	4.25
1995	0	9.3	4.38	0	7.8	6.23
1996	0	5.3	4.04	0	8.7	7.67
1997	0	7.3	4.14	0	5.2	4.01
1998	0	7.4	3.79	0	5.7	3.90
1999	0	7.9	4.11	0	5.8	4.51
2000	---	---	4.23	---	---	4.89
2001*	---	---	3.68	---	---	3.41

California Ambient Air Quality Standard: 1-hr, 20 ppm; 8-hr, 9 ppm
National Ambient Air Quality Standard: 1-hr, 35 ppm; 8-hr, 9 ppm
Source: CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.
Note: *Available CO data for 2001 only partially complete.

Sulfur Dioxide (SO_2)

Sulfur dioxide is typically emitted as a result of the combustion of a fuel containing sulfur. Pipeline-quality natural gas contains very little sulfur and consequently causes very low SO_2 emissions when combusted. By contrast fuels high in sulfur content such as lignite (a type of coal) emit very large amounts of SO_2 when combusted. Sources of SO_2 emissions within the San Joaquin Valley come from every economic sector and include a wide variety of fuels, gaseous, liquid and solid. The entire state is designated attainment or unclassified for all SO_2 ambient air quality standards. **AIR QUALITY Table 7** shows the historic 1-hour, 24-hour and annual average SO_2 concentrations measured at the nearby monitoring stations. As **AIR QUALITY Table 7** and **AIR QUALITY Figure 1** show, concentrations of SO_2 are well below the state and federal SO_2 ambient air quality standards.

AIR QUALITY Table 7
SO_2 Air Quality Summary, 1993-2001

Year	Fresno, First Street			Bakersfield, California Avenue		
	Maximum 1-hr Average (ppm)	Maximum 24-hr Average (ppm)	Annual Average (ppm)	Maximum 1-hr Average (ppm)	Maximum 24-hr Average (ppm)	Annual Average (ppm)
1993	0.010	0.0100	0.0024	---	---	---
1994	0.017	0.0115	0.0039	0.020	0.0067	0.0027
1995	0.014	0.0105	0.0037	0.026	0.0149	0.0028
1996	0.015	0.0095	0.0021	0.059	0.0105	0.0022
1997	0.010	0.0026	0.0004	0.011	0.0040	0.0020
1998	---	---	---	---	---	---
1999	---	---	---	0.011	0.0063	0.0032
2000	---	---	---	---	0.0030	0.0030
2001	---	---	---	---	0.0050	0.0020

California Ambient Air Quality Standard: Hourly 0.250 ppm
California Ambient Air Quality Standard: 24-hr 0.040 ppm
National Ambient Air Quality Standard: Annual 0.030 ppm
Source: CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.

Summary of Background Conditions

AIR QUALITY Table 8 summarizes the recent air quality conditions for the project area. Staff recommends the background ambient concentrations of **AIR QUALITY Table 8** for use in the modeling and impacts analysis. These concentrations reflect the measurements from the nearest station and most-recent years of data (from 1998 to 2001). Background data for PM_{10} during all averaging times exceed the most-restrictive limiting standards. Daily PM_{10} also exceeds the less-stringent federal standard of 150 $\mu g/m^3$. The applicant's background data matches staff's findings for all pollutants except PM_{10} and NO_2 (AFC Table 6.2-28, DUKE 2001a). For PM_{10} and 1-hour NO_2 data, staff identified higher background concentrations occurring in 2001 during the time that the applicant was submitting the AFC.

PROJECT DESCRIPTION AND EMISSIONS

This section describes the project design, project emissions, and air pollutant control devices as described in the Avenal Energy AFC (DUKE 2001a).

CONSTRUCTION

Project Site

Project engineering and construction will require approximately 26 months, while the on-site construction schedule requires a total of approximately 20 months. This construction schedule is based on a 10.5 hour per day, 6 day work week. Additional construction shifts may be necessary to make up schedule deficiencies. Towards the end of the 20-month construction period, additional time, including 24-hour-per-day

work, would be necessary for start-up and commissioning of the equipment (AFC p. 2-81, DUKE 2001a).

AIR QUALITY Table 8
Staff Recommended Background Concentrations for Avenal Energy Project Area (ppm)

Pollutant	Averaging Time	Maximum Monitored Background (ppm)	Staff-Recommended Background ($\mu g/m^3$)	Limiting Standard (ppm)	Type of Standard
Ozone	1 hour	0.14	---	0.09	CAAQS
	8 hour	0.113	---	0.08	NAAQS
PM_{10}	24 hour	185 $\mu g/m^3$	185	50 $\mu g/m^3$	CAAQS
	Annual Geometric Mean	47 $\mu g/m^3$	47	30 $\mu g/m^3$	CAAQS
	Annual Arithmetic Mean	57 $\mu g/m^3$	57	50 $\mu g/m^3$	NAAQS
NO_2	1 hour	0.096	180	0.25	CAAQS
	Annual	0.016	30	0.053	NAAQS
CO	1 hour	7.9	9875	20	CAAQS
	8 hour	4.23	4600	9	NAAQS
SO_2	1 hour	0.011	49.4	0.25	CAAQS
	3 hour	---	44.2	0.5	NAAQS
	24 hour	0.0063	23.6	0.04	CAAQS
	Annual	0.0032	8.0	0.03	NAAQS

Notes: Data from Hanford station; except PM_{10} data is higher of Hanford or Corcoran (per AFC Table 6.2-28); CO data are from Visalia; and SO_2 data are from Bakersfield.

Staff-recommended background concentrations for PM_{10} and hourly NO_2 are from 2001 data, not available at the time of the AFC submittal. All other staff-recommended data match the background concentrations identified in the AFC Tables 6.2-28 and 6.2-29 (DUKE 2001a).

Sources: CARB Air Quality Data CD, 2001, and CARB web site, http://www.arb.ca.gov/adam/, Accessed May 2002.

A portion of the 148-acre parcel would be disturbed for temporary construction equipment laydown and offices. Approximately 36 acres would be disturbed on-site for support of construction activities for the power plant, the plant access road, and ancillary facilities. The parcel, which gently slopes to the northeast, would be partially graded to provide a level plant grade. Upon completion of the facility, the power plant and plant access road will occupy 22 acres of the parcel (AFC Table 2.3-7).

Linear Facilities

The ancillary facilities for the power plant include the connection to the natural gas pipeline, the transmission system interconnection, and the new water pipelines. Construction of the connection to the natural gas supply will require four months of disturbing approximately five acres over the distance of 2.5 to 2.8 miles, and construction of the transmission connections will require seven new towers installed on a total of about two acres of disturbed land over the 7,000 foot distance the new line must cover. Additionally, about 10 acres would be disturbed over three months to construct new connections to existing water wells for backup water supply (AFC Table 2.3-7).

Project Construction Emissions

During the construction period, air emissions will be generated from the exhaust of the heavy equipment and fugitive dust from earthwork and activity on unpaved surfaces. Heavy equipment would include loaders and haul trucks to deliver construction materials, excavators and backhoes for earthwork, graders, cranes, lifts, and smaller equipment such as welders, generators, and air compressors. Fugitive dust emissions will occur due to activity on the exposed surfaces at the site, especially those portions that are unpaved. Equipment emissions and fugitive dust emissions would also occur offsite on the corridors for the linear facilities (i.e., along the new fuel gas and water supply pipelines and transmission line).

AIR QUALITY Table 9 summarizes the different levels of criteria pollutants that are estimated to be generated from onsite and offsite construction activities due to the Avenal Energy project (AFC Appendix 6.2-4, DUKE 2001a; DUKE 2002l).

The construction equipment and fugitive dust emissions provided above were based on emission factors and load factors published by the U.S. EPA, AP-42 (U.S. EPA, 1991 and 2000). The equipment emission rates assume use of California-required low-sulfur diesel fuel and engines that comply with U.S. EPA off-road equipment emission standards from 1996. The applicant provided the estimated number of operational hours for each piece of equipment throughout project construction outlined in the AFC. The emissions account for measures the applicant proposes to implement that would minimize emissions from diesel equipment and fugitive dust. For equipment, the measures identified by the applicant include limiting engine idling time, shutting down equipment when not in use, conducting routine preventative maintenance to prevent engine problems, and use of low-emitting diesel engines, if available (AFC Appendix 6.2-4). For fugitive dust, emission reductions would be achieved with dust suppression measures specified by the applicant along with those specified in the Energy Commission's Conditions of Certification.

AIR QUALITY Table 9
Avenal Energy, Estimated Emissions from Construction
(Peak Daily Emissions and Annual Tons)

	Nox		PM10		C0		SOx		VOC	
Equipment	**lb/day**	**Tpy**	**lb/day**	**tpy**	**lb/day**	**tpy**	**lb/day**	**tpy**	**lb/day**	**tpy**
Onsite Equipment	691	32.3	34	1.6	891	59.5	20	1.0	86	5.0
Onsite Fugitive Dust	---	---	29	1.9	---	---	---	---	---	---
Worker Travel and Deliveries to Site	203	15.5	6	0.5	1,754	130.5	3	0.2	143	10.6
Total: Onsite and Workers (20 months)	895	47.8	69	4.1	2,645	190.0	23	1.2	229	15.6
Total: Natural Gas Pipeline (3-4 months)	63	---	7	---	26	---	2	---	5	---
Total: Water Pipelines (4-5 months)	77	---	10	---	36	---	3	---	6	---
Total: Transmission Line Interconnect (2-3 months)	107	---	7	---	42	---	4	---	8	---

Source: AFC Appendix 6.2-4 (DUKE 2001a).

OPERATIONAL PHASE

Equipment Description

The major equipment proposed in the application include the following (AFC Table 1.5-1, p. 1-8, DUKE 2001a):

- New combined cycle power plant with two combustion turbine generators (CTGs) each generating approximately 180 MW. Each CTG includes dry low-NOx combustors for NOx reduction. Each CTG would be coupled to heat recovery steam generator (HRSG) with supplemental duct burners and an integral selective catalytic reduction (SCR) and oxidation catalyst pollution control system to control NOx, CO and VOC emissions from the CTG. The combustion turbines will be supplied by General Electric Power Systems (GE Model 7FA).
- Each duct burner would have a firing capacity of approximately 453 MMBtu/hr (high heating value - HHV) and would be anticipated to operate approximately 4,000 hours per year.
- Three refrigeration modules to be operated as necessary to chill CTG inlet air to 45 degrees F with auxiliary cooling towers mounted on top. The auxiliary cooling towers for the inlet air chillers would be equipped with drift eliminators to minimize drift.
- One steam turbine generator (STG) would be installed with the two CTGs. The STG system would generate approximately 300 MW. Accounting for power consumption that would occur at the plant, the nominal output of the plant with the duct burners in service will be approximately 600 MW.Aqueous ammonia storage (two 27,000-gallon tanks), vaporization, and injection system for SCR.

- Cooling system for the steam generation system with a surface condenser that is cooled with circulating water from an evaporative cooling tower. The cooling tower would be a 7-cell conventional counter-flow mechanical draft design with high-efficiency drift eliminators to minimize drift.
- Auxiliary boiler with heat input capacity of approximately 37.4 MMBtu/hr, operating approximately 2,500 hours per year.
- Fire water pump engine (370 hp) and an emergency generator engine (500 kW), both diesel-fueled for emergency use only.
- A continuous emission monitoring (CEM) system.

Equipment Operation

The Avenal Energy combined cycle power plant will fire exclusively pipeline-quality natural gas. It is designed to provide a nominal electrical output of 600 MW. Natural gas would be delivered to the site from a new pipeline connecting to an existing gas compressor station that is between 2.5 and 2.8 miles in length, depending on routing. The plant switchyard will be connected to an existing 230-kV line by "looping" the existing line to the onsite switchyard, requiring approximately 7,000 feet of new line. New water pipelines would be used to provide backup water to the power plant if the primary source of water (the adjacent San Luis Canal) is interrupted. It is anticipated that annual availability of the power plant would be greater than 90 percent of 8,760 hours per year, including 4,000 hours per year with the duct burners operating (AFC p. 1-15, DUKE 2001a).

Emission Controls

Both of the CTGs will be equipped with dry low-NOx (DLN) combustors followed by SCR and oxidation catalysts in the HRSGs. With this design, the applicant proposes to limit NOx to 2.5 ppmvd @15% O_2 (based on a 1-hour average) and 2.0 ppmvd on an annual average basis. As a reagent, the SCR system relies on use of ammonia vapor injected to the exhaust stream. The applicant proposes to limit stack emissions of ammonia (known as ammonia slip) to 10 ppmvd (AFC p. 2-47, DUKE 2001a). The catalyst systems integral to the HRSG include oxidation catalysts that will also reduce CO and VOC emissions. The oxidation catalyst system will reduce VOC emissions to 2 ppm as methane, and good combustion practices along with the oxidation catalyst will reduce CO concentrations to no more than 4.0 ppmvd @15% O_2 (based on a 3-hour average) (DUKE 2002j).

Continuous emission monitors (CEMs) will be installed on the CTG/HRSG exhaust stacks to monitor NOx, CO, and oxygen concentrations to assure adherence with the proposed emission limits. The CEM system will generate reports of emissions data in accordance with permit requirements and will send alarm signals to the plant's control room when the level of emissions approaches or exceeds pre-selected limits.

The exclusive use of pipeline-quality natural gas, a relatively clean-burning fuel, will limit the formation of PM_{10} and SO_2 emissions. Natural gas contains very little noncombustible gas or solid residues and a small amount of reduced sulfur compounds including mercaptan, thus resulting in relatively low emissions of PM_{10} and SO_2. The

applicant anticipates that the supplied natural gas will contain less than 0.25 grains of sulfur per 100 scf (AFC p. 6.2-58).

Project Operating Emissions

Air emissions will be generated from operating the major project components. **AIR QUALITY Tables 10 through 12** summarize the maximum (reasonable worst-case) estimated levels of the different criteria pollutants associated with project operation. The assumptions used in calculating the emissions in the tables include (AFC Appendix 6.2-1, DUKE 2001a):

- manufacturer guaranteed emission factors;
- the facility operating in a baseload or peaking scenario with an availability of more than 90 percent or approximately 8,400 hours per year;
- a range of load conditions (50% to 100%, with or without duct firing) and ambient temperatures (36°F to 97°F);and
- operating scenarios generating maximum annual emissions, based on the following assumptions (AFC p. 6.2-30 and 31):

a. annually: roughly 35 cold startups and 200 hot startups, would occur for each combustion turbine, amounting to approximately 400 annual hours in a startup or shutdown mode for each CTG, with the remaining annual hours divided at 4,000 hours of full load operation with duct burners on and 4,000 hours at full load with duct burners off;

b. concurrent operation of the cooling tower and chillers;

c. operation of the auxiliary boiler for 2,500 hours annually; and

d. occasional operation of the diesel fire water pump and emergency generator engines for testing and emergency use not exceeding 100 hours and 200 hours annually, respectively.

The proposed project's hourly emissions of criteria air pollutants are shown in **AIR QUALITY Table 10**. As Table 10 shows, the highest NOx and CO emissions occur during startups, because the pollution control devices are not at optimal operating conditions. Startup emissions are shown in more detail in **AIR QUALITY Table 11**. The emission tables do not show direct $PM_{2.5}$ emissions because no established methodology exists for quantifying these emissions from the proposed sources. Although it is known that a substantial portion of the particulate matter formed during combustion likely qualifies within the $PM_{2.5}$ subset of PM_{10}, more specific estimates of $PM_{2.5}$ emission rates are not available for all sources.

AIR QUALITY Table 10
Avenal Energy, Hourly Operational Emissions (pounds per hour, lb/hr)

Operational Source/Profile	NOx (a)	PM_{10} (b)	CO	SOx (b)	VOC (b)
Each CTG/HRSG (average during startup or shutdown)	80.0	13.5	902.0	1.6	16.0
Each CTG/HRSG (@ 97ºF, 100% w/ duct burning)	20.3	13.5	19.8	1.6	5.7
Each CTG/HRSG (@ 63ºF, 100% w/ duct burning)	19.9	13.1	19.4	1.5	5.6
Each CTG/HRSG (@ 36ºF, 100% w/ duct burning)	19.7	12.7	19.2	1.5	5.5
Each CTG/HRSG (@ 36ºF, 100% w/o duct burning)	16.5	11.0	16.0	1.3	3.2
Each CTG/HRSG (@ 97ºF, 50% w/o duct burning)	9.3	11.0	9.1	0.7	1.8
Each CTG/HRSG (@ 36ºF, 50% w/o duct burning)	10.7	11.0	10.4	0.8	2.1
Each Cooling Tower Cell (7 cells)	---	0.47	---	---	---
Each Chiller Cooling Tower Cell (12 cells)	---	0.09	---	---	---
Auxiliary Boiler	0.41	0.19	1.38	0.03	0.16
Fire Pump Engine	7.40	0.10	1.75	0.14	0.18
Emergency Generator Engine	10.19	0.59	12.55	0.29	1.48

Source: AFC p. 6.2-30 to 32, Table 6.2-21. AFC Appendix p. 6.2-2.9 (DUKE 2001a). Response to Data Request No. 10 (DUKE 2002c). Revision to 4 ppm CO (DUKE 2002j).

(a) On a one-hour basis, the applicant proposed that each CTG/HRSG would achieve 2.5 ppm NOx. The annual average NOx concentration will be less than 2.0 ppm. AFC p. 6.2-29 (DUKE 2001a) and Response to Data Request No. 11 (DUKE 2002c).

(b) Emissions of PM_{10}, SOx, and VOC for CTG/HRSGs are a function of quantity of fuel burned, thus they will be highest when the combustors and duct burners operate at maximum fuel consumption.

The applicant assumed that startup scenarios could be represented by a reasonable worst-case, single-hour emission rate. Depending on how long a combustion turbine has been shut down, the turbine may operate in startup mode up to four hours before it is brought to normal conditions. The applicant has noted that only one turbine would be in a startup mode at any time (Response to Data Request No. 8, DUKE 2002c). The expected maximum emission rates during startup and shutdown events are summarized in **AIR QUALITY Table 11**.

AIR QUALITY Table 11
Avenal Energy, Maximum Startup or Shutdown Emissions
(Pounds per hour, lb/hr)

Operational Source/Profile	NOx	PM_{10}	CO	SOx	VOC
One CTG/HRSG (maximum during startup)	320.0	13.5	902.0	1.6	16.0
One CTG/HRSG (@ 97ºF, 100% w/ duct burning)	20.3	13.5	19.8	1.6	5.7

Source: AFC p. 6.2-42 and Table 6.2-24 (DUKE 2001a). Revision to 4 ppm CO (DUKE 2002j).

Note: Only one turbine will operate in a startup mode at any time, and the auxiliary boiler may operate simultaneously with the combustion turbines when one of the turbines is in startup mode. The cooling towers will also be in operation while a turbine is in startup (Response to Data Response Nos. 8 and 9, DUKE 2002c).

AIR QUALITY Table 12 summarizes the maximum annual criteria pollutants emissions from the project assuming the 8,400-hr/yr operating scenario identified by the applicant (AFC p. 6.2-31, DUKE 2001a). Annual emissions are estimated based on a projected number of startup/shutdown sequences (approximately 400 hours per year for each

turbine) and a projected range of full and partial load operation with and without duct firing, as described above.

AIR QUALITY Table 12
Avenal Energy, Estimated Annual Operational Emissions
(Tons per year, tpy)

Operational Source (a)	NOx (b)	PM_{10}	CO	SOx	VOC
CTG/HRSG Pair	149.6	102.5	504.0	11.9	41.9
Cooling Tower	---	14.4	---	---	---
Chiller Cooling Towers	---	4.8	---	---	---
Auxiliary Boiler	0.513	0.238	1.725	0.033	0.200
Fire Pump Engine	0.370	0.005	0.088	0.007	0.009
Emergency Generator Engine	1.019	0.059	1.255	0.029	0.148
TOTAL	**151.5**	**122.1**	**507.1**	**12.0**	**42.2**

Source: AFC p. 6.2-30 to 32, Table 6.2-21 (DUKE 2001a). Response to Data Request No. 12 (DUKE 2002c). Revision to 4 ppm CO (DUKE 2002j).

(a) Assumes annual assumption of CTG startups and shutdowns and auxiliary boiler operating levels identified above (approximately 400 hours per year for each turbine). Also includes full-time operation of the cooling tower and chillers. Operation of the fire pump engine and emergency standby generator engines are limited to 100 and 200 hours annually, respectively.

(b) Annual NOx emissions from each CTG/HRSG are based on an annual average emission concentration of 2.0 ppm. AFC p. 6.2-29 and Response to Data Request No. 11 (DUKE 2002c).

Ammonia Emissions

Due to the large combustion turbines used in this project and the need to control NOx emissions, significant amounts of ammonia will be injected into the flue gas stream as part of the SCR system. Not all of this ammonia will mix with the flue gases to reduce NOx; a portion of the ammonia will pass through the SCR and will be emitted unaltered, out the stacks. These ammonia emissions are known as ammonia slip. The applicant has proposed achieving an ammonia slip no greater than 10 ppm (AFC p. 6.2-33 and Appendix 6.2-1, DUKE 2001a; Response to Data Request No. 17, DUKE 2002c). Emissions associated with a 10 ppm slip would be equivalent to approximately 680 pounds of ammonia emitted into the atmosphere per day per CTG/HRSG. Staff anticipates that lower ammonia slip levels would occur with proper operation and well-maintained equipment, for example with fresh catalyst surfaces, and that levels below 5 ppm would be achievable on a routine basis.

INITIAL COMMISSIONING

The initial commissioning of a power plant refers to the time frame between the completion of the construction and the reliable production of electricity for sale on the market. Normally, during the initial testing during commissioning the post-combustion control systems (i.e., SCR system and oxidation catalyst) may not be fully installed or operational.

The applicant identifies the series of tests that would result in greater than routine emissions as each unit is commissioned. After first fire, the sequence of commissioning activities would be as follows: 1) full speed, no load tests (approximately 20% of maximum heat input), including synchronization; 2) partial load tests with combustor tuning, prior to installation of the post-combustion control systems; 3) full load tests without operation of the SCR; 4) full load tests for tuning of SCR; and 5) full load tests with full operation of the SCR. Combustor tuning would occur before SCR and oxidation

catalyst installation, and testing under partial load would also occur before control system installation and operation is complete (AFC p. 6.2-43 and p. 6.2-46 to 47, DUKE 2001a, and Response to Data Request No. 13, DUKE 2002c).

The applicant anticipates that commissioning activities would occur over approximately a three- to four-month period, and that one turbine could be in normal operation mode while the second undergoes commissioning. Similar to routine operations, a continuous emissions monitoring (CEMs) system would be used to monitor commissioning emissions (Response to Data Request No. 13, DUKE 2002c). The emissions anticipated by the applicant for the full commissioning period are summarized in **AIR QUALITY Table 13**.

Staff anticipates that commissioning emissions would be minimized by the applicant by limiting the time of each commissioning activity to the shortest duration feasible, consistent with manufacturer's recommendations, because emissions occurring during commissioning would accrue towards the annual limitations imposed by the SJVAPCD.

PROJECT IMPACTS

MODELING APPROACH

Air dispersion modeling provides a means of predicting the location and magnitude of the air contaminant impacts of a new emissions source at ground level. The models consist of several complex series of mathematical equations, which are repeatedly calculated by a computer for a range of ambient meteorological conditions. Model results are often described as a unit of mass per volume of air, such as micrograms per cubic meter ($\mu g/m^3$). They are an estimate of the concentration of the pollutant emitted by the project that will occur at ground level.

AIR QUALITY Table 13
Avenal Energy, Estimated Commissioning Emissions

Commisioning Activity	NOx (a)	PM_{10}	CO	SOx	VOC
Maximum Hourly Emissions (lb/hr), Per CTG/HRSG	320	11	902	1.3	16
Maximum Daily Emissions (lb/day, 12-hr tests), Per CTG/HRSG	1,500	132	4,620	15	42
Total Commissioning Emissions (lb), Per CTG/HRSG	25,594	4,488	90,715	429	1,805
Total Commissioning Emissions (lb), CTG/HRSG Pair	51,187	8,976	181,429	857	3,610

Source: AFC p. 6.2-46 to 47 (DUKE 2001a). Response to Data Request No. 13, Exhibit 13-1 (DUKE 2002c).

Notes: One turbine could be in normal operation mode while the second undergoes commissioning. The emission rates shown in this table are for commissioning activities only.

(a) Maximum hourly emissions of NOx are derived from maximum startup emissions. The applicant provided more detailed information with Response to Data Request Nos. 13 and 14 that indicates maximum emissions during commissioning would be 125 lb/hr NOx (DUKE 2002c). The rate of 320 lb/hr NOx are the maximum emissions during a startup (AFC p. 6.2-42, DUKE 2001a), which staff believes could also occur during commissioning.

Inputs for the modeling include stack information (exhaust flow rate, temperature, and stack dimensions), specific turbine emission data and meteorological data, such as wind speed, atmospheric conditions, and site elevation. For this project, the meteorological data used as inputs to the model included hourly wind speeds and directions measured in 1995 at the PG&E Kettleman City compressor station near the project site.

The applicant used a regulatory-guideline model approved by the U.S. EPA (Industrial Source Complex, Short-Term, ISCST3 Version 00101) to estimate the impacts of project-related NOx, PM_{10}, CO and SOx emissions. A description of the modeling analysis for construction activities is provided in Appendix 6.2-4, Section 6.2-4.5.2 of the AFC, and the analyses for commissioning and operation are described in AFC Section 6.2.5.1.2 (DUKE 2001a).

For the 1-hour impacts of NO_2, the applicant provided a refined modeling analysis of NOx using the ozone limiting method (ISC3_OLM, version 96113). This method calculates the maximum NO to NO_2 conversion using ozone concentration files (from Hanford) to determine maximum 1-hour NO_2 concentrations assuming that 10 percent of the exhaust NOx is NO_2 and that, over time, the available ozone allows a 100 percent conversion of the remaining NO to NO_2. This method somewhat overpredicts NO_2 concentrations in that it does not consider mixing or limiting quantities of ozone consumed in the reaction. The OLM is a method accepted by the U.S. EPA and CARB for 1-hour NO_2 modeling.

The applicant's modeled impacts were added to the available highest ambient background concentrations measured during 1997 to 2001 at the nearest monitoring stations (see **AIR QUALITY Table 8** above). Staff then compared the results with the ambient air quality standards for each respective air contaminant to determine whether the project's emission impacts would cause a new violation of the ambient air quality standards or contribute to an existing violation.

CONSTRUCTION IMPACTS

The applicant provided staff with a modeling analysis of the impacts caused by the emissions that would occur during construction. The modeling incorporates the mitigation measures the applicant has proposed for construction of the project. Staff reviewed the applicant's modeling analysis and supporting information and concludes that it is adequate.

The results of the construction impacts analyses are presented in **AIR QUALITY Table 14**. The modeling analyses included both the fugitive dust and vehicle exhaust emissions, which include PM_{10}, NOx, and CO. In **AIR QUALITY Table 14**, the first and second columns list the air contaminant, i.e., NO_2, PM_{10}, and CO, and the averaging time for each air contaminant analyzed. The third and fourth columns present the project emission impacts and the highest measured concentration of the criteria air contaminants in the ambient air (background), respectively. The fifth column presents the total impact, i.e., the sum of project emission impact and background measured concentration. The values in **bold** in the impacts and background columns represent values that equal or exceed the relevant air quality standard. The sixth column presents

the most restrictive ambient air quality standard for such air contaminant. The seventh column presents the percentage of the total impacts in relation to the most restrictive ambient air quality standards. Without any project-related impacts, existing background conditions for PM_{10} exceed the limiting standards as well as less-stringent daily federal standards.

As indicated in **AIR QUALITY Table 14**, the project construction activities would further exacerbate existing violations of the state and federal PM_{10} standards, and thus constitute a significant air quality impact for PM_{10}. Additionally, NOx and VOC emissions from construction equipment would cause secondary contributions to existing violations of the ozone standards and thus constitute a significant air quality impact for ozone via ozone precursors. The project's construction activities would not create a new violation of either NO_2, CO, or SO_2 air quality standards, thus direct impacts for NO_2, CO, and SO_2, are not considered significant.

The maximum modeled project construction impacts are predicted to occur at the fence line and they decrease substantially with increased distance. Additionally, residential receptors do not exist at the fence line so the maximum modeled PM_{10} concentration at the maximum exposed residence will be significantly lower than that shown above. There are no residences within one mile of the site, but there are farmhouses 1.3 miles to the northeast near Orange Avenue and the Avenal Cutoff Road, and one residence is near Interstate 5 and the Kettleman Compressor Station, approximately 1.8 miles southwest of the site (AFC p. 6.12-8, DUKE 2001a). At the residence to the southwest, PM_{10} concentrations caused by project construction would be less than 2.1 $\mu g/m^3$ on a maximum 24-hour basis and less than 0.02 $\mu g/m^3$ on an annual average. Impacts at the closer farmhouses to the northeast would be below these levels.

AIR QUALITY Table 14
Avenal Energy, Ambient Air Quality Impacts from Construction
(In $\mu g/m^3$)

Pollutant	Averaging Period	Project Impact	Back-ground	Total Impact	Limiting Standard	Type of Standard	Percent of Standard
PM_{10}	24-hour	14.8	**185**	**200**	50	CAAQS	**400**
	AGM (a)	0.5	**47**	**48**	30	CAAQS	**158**
	AAM (a)	0.5	**57**	**58**	50	NAAQS	**115**
NO_2	1-hour (b)	235.3	180	416	470	CAAQS	88
	Annual (b)	2.1	30.2	32	100	NAAQS	32
CO	1-hour	1414	9,875	11,289	23,000	CAAQS	49
	8-hour	451	4,600	5,051	10,000	NAAQS	51
SO_2	1-hour	32.1	49.4	82	650	CAAQS	12
	3-hour	16.4	44.2	61	1,300	NAAQS	5
	24-hour	3.4	23.6	27	109	CAAQS	26
	Annual	0.1	8.0	8	80	NAAQS	10

Notes: AFC Appendix Table 6.2-4.5 (DUKE 2001a); Response to Data Request Nos. 134 and 135 (DUKE 2002m); and independent staff assessment for 3-hour SO_2.

(a) Annual Geometric Mean – AGM, and Annual Arithmetic Mean – AAM.

(b) NO_2 (1-hour) impacts based on ISC3-OLM analysis and NO_2 (annual) impacts based on Ambient Ratio Method (ARM).

OPERATION IMPACTS

The following section discusses the ambient air quality impacts that could occur during routine operation throughout the life of the project, including initial commissioning.

Operational Modeling Analysis

A refined modeling analysis was performed to identify off-site criteria pollutant impacts from operational emissions of the proposed project. The impact modeling analysis included both maximum operating and startup/shutdown scenarios to determine maximum short-term and annual emission impacts. Hourly emission rates were calculated by the applicant for full-load and half-load conditions at a range of three ambient temperatures (36°F, 63°F, and 97°F). The annual emissions modeling assumed turbine operation at 100 percent load and a range of temperatures for 8,000 hours per year. Startup and shutdown modes account for an additional 400 hours. The remainder of time is turbine downtime. The operating profiles are explained in **AIR QUALITY Tables 10 through 12** above.

The applicant's predicted maximum hourly concentrations of the nonreactive pollutants are summarized in **AIR QUALITY Table 15**. The values in **bold** in the impacts and background columns represent values that equal or exceed the relevant air quality standard. Without any project-related impacts, existing background conditions for PM_{10} exceed the limiting standards as well as less-stringent daily federal standards.

AIR QUALITY Table 15
Avenal Energy, Ambient Air Quality Impacts from Routine Operation
(In µg/m^3)

Pollutant	Averaging Period	Project Impact	Back-ground	Total Impact	Limiting Standard	Type of Standard	Percent of Standard
PM_{10}	24-hour	4.5	**185**	**190**	50	CAAQS	**379**
	AGM	0.6	**47**	**48**	30	CAAQS	**159**
	AAM	0.6	**57**	**58**	50	NAAQS	**115**
NO_2	1-hour (a,b)	22.4	180	202	470	CAAQS	43
	Annual (a)	0.3	30.2	30	100	NAAQS	30
CO	1-hour	809	9,875	10,684	23,000	CAAQS	46
	8-hour	145	4,600	4,745	10,000	NAAQS	47
SO_2	1-hour	24.6	49.4	74	650	CAAQS	11
	3-hour	5.0	44.2	49	1,300	NAAQS	4
	24-hour	0.3	23.6	24	109	CAAQS	23
	Annual	0.01	8.0	8	80	NAAQS	10

Notes: AFC Table 6.2-26, p. 6.2-46, and Table 6.2-29, p. 6.2-48 (DUKE 2001a).

(a) NO_2 (1-hour) impacts based on ISC3-OLM analysis and NO_2 (annual) impacts based on Ambient Ratio Method (ARM).

(b) Short term NO_2 impacts do not reflect startup conditions or operation of the fire pump engine or emergency generator. Worst-case hourly NO_2 impacts occur during operation of the emergency engines, when the maximum impact would be: 274 µg/m^3 NO_2 (1-hour). During startup of the combustion turbines, the maximum impact would be: 121.6 µg/m^3 NO_2 (1-hour) (Response to Data Request No. 9, DUKE 2002c).

The modeling results indicate that the project's operational impacts would not create violations of NO_2, CO, or SO_2 standards, but could further exacerbate existing violations of the PM_{10} standards. In light of the existing PM_{10} non-attainment status for the region,

the impacts of direct PM_{10} emissions are considered to be significant and warrant additional mitigation. Secondary impacts caused by PM_{10} and ozone precursor emissions are discussed below.

There is also a potential for $PM_{2.5}$ impacts to occur because the project would also emit this contaminant directly; however, the magnitude of potential $PM_{2.5}$ impacts are not quantified because no established methodology exists for quantifying $PM_{2.5}$ emissions for all sources or characterizing the complex interaction of $PM_{2.5}$ precursors in the ambient air. $PM_{2.5}$ mitigation could be provided by mitigating combustion-related PM_{10}, which includes $PM_{2.5}$, and mitigating reactive precursor emissions that can lead to $PM_{2.5}$.

The highest modeled 1-hour NO_2 impact (274 µg/m^3) occurs during infrequent testing of the diesel engine fire pump and diesel-powered emergency generator. The location of this impact would be near the property line immediately east of the emergency sources, and would be substantially less at the more distant existing off-site residences and sensitive receptor locations. When the fire pump or emergency engines are not operating, elevated 1-hour NO_2 impacts would occur during CTG/HRSG startups. During these times, the 1-hour NO_2 impacts would not exceed 122 µg/m^3 in the hills four kilometers to the south-southwest of the site (Response to Data Request No. 9, DUKE 2002c). During all other routine operation of the plant, 1-hour NO_2 concentrations would be below 22.4 µg/m^3, and the location of the maximum hourly impact would be in the hills approximately 4 kilometers to the southwest of the site (AFC Table 6.2-26, DUKE 2001a). Under all scenarios, the maximum total NO_2 impact including background conditions would not exceed the relevant standard (470 µg/m^3).

The maximum 24-hour PM_{10} impacts (4.5 µg/m^3) occur near the southeast corner of the project site boundary, approximately 500 meters from the center of the project site. Maximum annual PM_{10} impacts occur at the southern project site boundary. Because of the high buoyancy of the CTG and HRSG exhaust, the combustion turbine sources contribute little to the maximum impacts near the project site boundary. The chillers and cooling tower contribute to the elevated PM_{10} concentrations at the edge of the site. Maximum CTG and HRSG 24-hour PM_{10} impacts (2.7 µg/m^3) occur in the hills approximately 2.6 miles (4.2 km) to the southwest. The 24-hour PM_{10} impacts from operation of all project sources at the nearest residences would be less than 1.1 µg/m^3.

Secondary Pollutant Impacts

The project's gaseous emissions of NOx, SO_2, VOC and ammonia are precursor pollutants that can contribute to the formation of secondary pollutants, such as ozone and PM_{10}. The process of gas-to-particulate conversion is complex and depends on many factors, including local humidity and the presence of other compounds. Currently, there are no agency-recommended models or procedures for estimating nitrate or sulfate formation. However, because of the known relationship of NOx and SO_2 emissions to secondary PM_{10} formation, it can be said that the emissions of NOx and SO_2 from the project do have the potential (if left unmitigated) to contribute to higher PM_{10} levels, and possibly $PM_{2.5}$, in the region, and NOx and VOC emissions do have the potential to contribute to higher ozone levels.

As identified above, PM_{10} impacts would be significant due to direct emissions of PM_{10}. Significant indirect impacts would also occur from secondary PM_{10} and ozone because routine operational emissions of precursor pollutants would contribute to existing violations of the PM_{10} and ozone standards. Along with mitigation that is appropriate to reduce significant, direct impacts of PM_{10}, additional mitigation for emissions of NOx, SO_2, and VOC is appropriate to reduce indirect impacts to PM_{10} and ozone. Mitigation for these pollutants would also help to reduce potential $PM_{2.5}$ impacts.

The ammonia emissions from the project are the result of unreacted ammonia, or "ammonia slip," that remains in the exhaust after passing through the SCR catalyst system. Ammonia reacts with SOx and NOx in the ambient air to form ammonium sulfate and ammonium nitrate, which are components of PM_{10} and $PM_{2.5}$. Cattle and other livestock generate the majority of the ammonia emissions in the San Joaquin Valley (CARB 1999b), in the range of tens-of-thousands of tons per year. The Avenal Energy project would contribute on the order of 200 tons per year, or less. Although the region is rich in ammonia without the project, increased ammonia emissions could under certain circumstances contribute to increased particulate matter concentrations. Staff does not anticipate substantial ambient particulate impacts from the project's ammonia emissions, but staff does expect that the applicant will control its ammonia slip emissions to the extent feasible, while maintaining the guaranteed NOx emission limit, to minimize potential particulate impacts and to reduce the operational costs of ammonia loss. Energy Commission staff experience, guidance from CARB, and vendor guarantees show that ammonia slip below 5 ppmvd at 15% O_2 should be achievable (CARB 1999). Because the project as proposed would only keep ammonia slip levels below 10 ppm, it would not be consistent with CARB recommendations.

Fumigation Impacts

There is the potential that higher short-term concentrations may occur during fumigation conditions. During the early morning hours before sunrise, the air is usually very stable. During such stable meteorological conditions, emissions from elevated stacks rise through this stable layer and are dispersed. When the sun first rises, the air at ground level is heated, resulting in a vertical (both rising and sinking air) mixing of air for a few hundred feet or so. Emissions from a stack that enter this vertically mixed layer of air will also be vertically mixed, bringing some of those emissions down to the ground level. Later in the day, as the sun continues to heat the ground, this vertical mixing layer becomes higher and higher, and the emissions plume becomes better dispersed. The early morning pollution event, called fumigation, usually lasts approximately 30 to 90 minutes.

Fumigation conditions are generally only compared to 1-hour standards. The applicant analyzed the air quality impacts under fumigation conditions from the project turbine using the SCREEN3 model (Version 96043). AFC Appendix 6.2-2, Table 6.2-2.6 illustrates that under fumigation conditions, the hourly project impacts would not exceed the impacts shown in **AIR QUALITY Table 15** above (DUKE 2001a).

Initial Commissioning Impacts

The applicant modeled the initial commissioning impacts based on the information provided in **AIR QUALITY Table 13**. The modeling analysis prepared by the applicant for commissioning considered that only one turbine would undergo commissioning

activities at any one time. This is in contrast to the applicant's claim that one turbine could be in normal operation mode while the second undergoes commissioning. In lieu of a complete commissioning analysis from the applicant, staff reviewed the analysis for startup conditions. Staff revisited the modeling to determine 3-hour, 8-hour, and 24-hour impacts under startup/commissioning conditions with the one turbine, the auxiliary boiler, and the cooling towers operating while commissioning the second turbine. Because startup conditions would cause the same maximum hourly emission rates from the combustion turbines at similar exhaust conditions, staff determined that the startup modeling, with additional analysis for all short-term averaging periods, adequately characterizes impacts from commissioning activities.

The commissioning modeling results are provided in **AIR QUALITY Table 16**.

AIR QUALITY Table 16
Avenal Energy, Ambient Air Quality Impacts
from Initial Commissioning (in µg/m^3)

Pollutant	Averaging Period	Project Impact	Back-ground	Total Impact	Limiting Standard	Type of Standard	Percent of Standard
PM_{10}	24-hour	4.5	**185**	**190**	50	CAAQS	**379**
NO_2	1-hour (a)	121.6	180	302	470	CAAQS	64
CO	1-hour (a)	579.1	9,875	10,454	23,000	CAAQS	45
	8-hour	223.0	4,600	4,823	10,000	NAAQS	48
SO_2	1-hour (a)	1.3	49.4	51	650	CAAQS	8
	3-hour	1.2	44.2	45	1,300	NAAQS	3
	24-hour	0.2	23.6	24	109	CAAQS	23

Source: AFC p. 6.2-46 and 47 (DUKE 2001a); Response to Data Requests Nos. 13 and 14, (DUKE 2002c); and independent staff assessment for 8-hour CO and 3-and 24-hour SO_2.

Notes:

(a) NO_2 (1-hour) impacts based on ISC3-OLM analysis. Because one turbine could be in normal operation mode while the second undergoes commissioning, maximum hourly air quality impacts would be similar to those that would occur during startup (Response to Data Request Nos. 9 and 13, DUKE 2002c).

Emission limits for operating design exhaust concentrations would not apply during the initial commissioning procedures. However, the applicant recognizes that emissions occurring during commissioning would be included in the annual emission limits subject to offset requirements (Response to Data Request No. 13, DUKE 2002c). This means there is an incentive for the applicant to limit the commissioning period to the shortest time possible. Direct and indirect impacts that would occur during initial commissioning would be similar to the impacts that would occur during routine plant operation; thus no additional mitigation is necessary to address commissioning impacts.

VISIBILITY IMPACTS

A visibility analysis of the project's gaseous emissions is required under the federal Prevention of Significant Deterioration (PSD) permitting program. The Avenal project is subject to PSD permitting through the U.S. EPA, because it exceeds the PSD major source emission limits for NO_2 and CO. For new PSD sources , a visibility analysis is required for the nearest Class I area. The nearest Class I area is Pinnacles National Monument in western San Benito County, more than 100 kilometers (62 miles) from the project site. Due to the distance to Class I areas, Energy Commission staff anticipates

that the project's visibility impacts on Class I areas would be considered insignificant by the U.S. EPA and Federal Land Managers. The PSD permit issued by the U.S. EPA would address these impacts.

MITIGATION

Applicant's Proposed Mitigation

Construction Mitigation

SJVAPCD Regulation VIII requires the applicant to limit fugitive dust during the construction phase of a project. To comply with these rules and reduce construction impacts, the applicant proposed a variety of mitigation measures for fugitive dust and equipment exhaust emissions (AFC Appendix 6.2-4, DUKE 2001a; Responses to Data Request No. 3, DUKE 2002c). The applicant's measures include dust suppression for unpaved travel surfaces and parking areas, covering haul trucks, limiting traffic speeds, replanting vegetation in disturbed areas, and minimizing wind erosion with dust suppressant or wind breaks. Also the emissions from equipment would be minimized by limiting the idling time of equipment, conducting preventative maintenance, and using low-emitting diesel engines if available. The PM_{10} emissions estimates and modeling results presented in this analysis assume the use of the fugitive dust emission control measures.

Operations Mitigation

The project proposal includes a combination of clean-fuel-firing equipment, emission control devices, and emission reduction credits (ERCs). The equipment description, equipment operation, and emission control devices are provided in the **AIR QUALITY Project Description**.

Combustion Turbine

The natural gas combustion turbines would limit NOx formed during combustion by using dry low-NOx combustors. Compared to steam or water-injection designs, combustors designed for low-NOx firing maintain low temperatures, thus minimizing NOx formation, while thermal efficiencies remain high.

Flue Gas Controls

To further reduce the emissions from the combustion turbines and duct burners before the gases are exhausted into the atmosphere, flue gas controls, primarily catalyst systems, will be installed in the HRSG. The applicant is proposing two catalyst systems: a selective catalytic reduction system to reduce NOx, and an oxidizing system to reduce CO and VOC.

Cooling Tower and Chillers' Cooling Tower

The proposed cooling system would use high-efficiency drift eliminators to minimize cooling tower drift and the accompanying PM_{10} emissions. The concentration of total dissolved solids will also be monitored and managed by adjusting the water cycles to ensure compliance with the anticipated emission rates.

Emission Offsets

In addition to emission control strategies included in the project design, SJVAPCD Rule 2201 requires the applicant to fully offset new emissions (i.e., the project's liability) of NOx, VOC, and PM_{10}. The project is exempt from offset requirements for CO because the applicant has demonstrated that CO emissions would not violate ambient air quality standards. The applicant proposes to use the emission reduction credits (ERCs) required by Rule 2201 to mitigate impacts for nonattainment pollutants (PM_{10} and ozone) and ozone precursor pollutants (NOx and VOC) (AFC Tables 6.2-35 and 36). The SJVAPCD does not require new emissions of SO_2 to be offset because project emissions would fall below the Rule 2201 thresholds. As an alternative mitigation approach for SOx, the applicant volunteered to offset SOx emissions, if necessary to mitigate indirect PM_{10} impacts (Response to Data Request No. 20, Duke 2002c).

AIR QUALITY Table 17 reviews the offset liabilities defined by the SJVAPCD. The applicant has sufficient ERCs to offset all emission increases of NOx, VOC, and PM_{10} via the SJVAPCD trading rules. Staff is in the process of gathering more-detailed information on the location of the original emission reductions because they are probably derived from sources throughout the San Joaquin Valley. The following lists summarize the acquired credits and how they apply to the requirements.

AIR QUALITY Table 17
Avenal Energy, Offset Liability and Proposed Offset Strategy

Pollutant	Offset Liability (a)	Proposed Offset Strategy (b)	SJVAPCD Offset Threshold	SJVAPCD ERCs Required
NO_x, lb/yr	300,995	NOx ERCs + VOC ERCs	20,000	280,229
VOC, lb/yr	84,199	VOC ERCs	20,000	64,134
CO, lb/yr	1,011,555	None Required	---	---
PM_{10}, lb/yr	244,137	PM_{10} ERCs + Sox ERCs	29,200	214,909
SO_x, lb/yr	23,897	None Required	54,750	---

Source: PDOC, p. 38. SJVAPCD 2002a.

Notes: a. Total offset liabilities are the project emissions before subtracting SJVAPCD offset thresholds and emissions from the emergency fire pump engine and generator, which are exempt from SJVAPCD requirements.

b. Emissions of SOx do not need to be offset per District rules because they are below the District threshold, but will need to be mitigated to satisfy CEQA requirements. Emissions of CO do not need to be offset or mitigated because they would not cause or contribute to violations of any ambient air quality standards.

NOx Emission Offsets

All of the following NOx ERCs would be used for the NOx offset requirements shown in **AIR QUALITY Table 17** above. The NOx ERCs would be discounted at a rate of 1.5-to-1 because of their distance from the project site. The NOx ERCs, by themselves, would not be sufficient to fully offset NOx.

NOx ERCs (lb)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
ERC No. C-400-2	2,243	2,243	2,243	2,243	8,972
ERC No. N-229-2	0	1,166	88,317	1,422	90,905
ERC No. N-231-2	0	9	1,255	437	1,701
ERC No. N-232-2	0	0	4,728	0	4,728
NOx ERC Total (lb)	**2,243**	**3,418**	**96,543**	**4,102**	**106,306**
	Discounted NOx ERCs for NOx Requirement (1.5:1)				**70,871**

VOC Emission Offsets

The following VOC ERCs would be used to offset the remainder of the NOx requirements and all of the VOC requirements shown in **AIR QUALITY Table 17** above. For interpollutant trading and the distance penalty, the VOC ERCs would be discounted at a rate of 2.5-to-1 when applied to the NOx requirement (DUKE 2002k). VOC ERCs would be discounted at a rate of 1.5-to-1 because of their distance if used for the VOC requirement. The VOC ERCs would sufficiently offset the remainder of the NOx requirement and all of VOC.

VOC ERCs (lb)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
ERC No. C-399-1	5,480	6,496	4,696	6,616	23,288
ERC No. C-400-1	45	45	45	45	180
ERC No. N-232-1	0	0	709	0	709
ERC No. N-233-1	0	0	241	0	241
ERC No. S-1700-1	87,500	87,500	87,500	87,500	350,000
ERC No. S-1797-1	31,432	31,424	31,417	31,417	125,690
ERC No. S-1805-1	31,431	31,424	31,417	31,417	125,689
VOC ERC Total (lb)	**155,888**	**156,889**	**156,025**	**156,995**	**625,797**
Discounted VOC ERCs for NOx Requirement (2.5:1)					**209,358**
Discounted VOC ERCs for VOC Requirement (1.5:1)					**68,268**

PM_{10} Emission Offsets

All of the following PM_{10} ERCs would be used for the PM_{10} offset requirements shown in **AIR QUALITY Table 17** above. The PM_{10} ERCs would be discounted at a rate of 1.5-to-1 because of their distance from the project site. The PM_{10} ERCs, by themselves, would not be sufficient to fully offset PM_{10}.

PM_{10} ERCs (lb)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
ERC No. C-400-4	80	80	80	80	320
ERC No. N-229-4	0	0	3,215	0	3,215
ERC No. N-232-4	0	0	985	0	985
PM_{10} ERC Total (lb)	**80**	**80**	**4,280**	**80**	**4,520**
Discounted PM_{10} ERCs for PM_{10} Requirement (1.5:1)					**3,013**

SOx Emission Offsets

The following SOx ERCs would be used to offset the remainder of the PM_{10} requirements shown in **AIR QUALITY Table 17** above. For interpollutant trading and the distance penalty, the SOx ERCs would be discounted at a rate of 1.9-to-1 when applied to the PM_{10} requirement. This includes the discount for their distance. The SOx ERCs would sufficiently offset the remainder of the PM_{10} requirement.

Sox ERCs (lb)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual
ERC No. N-310-5	25,000	25,000	25,000	25,000	100,000
ERC No. S-1808-5	92,179	23,666	69,157	96,288	281,290
ERC No. S-1809-5	12,862	491	0	8,499	21,852

ERC No. S-1810-5	6	14	12	8	40
ERC No. S-1811-5	2	4	3	6	15
Sox ERC Total (lb)	**130,049**	**49,175**	**94,172**	**129,801**	**403,197**
	Discounted SOx ERCs for PM_{10} Requirement (1.9:1)				**212,209**

Adequacy of Proposed Mitigation

Construction Mitigation

The effectiveness of the proposed construction mitigation can vary widely due to a number of influencing factors, including ambient conditions (temperature, wind & humidity), size & weight of construction vehicles, vehicle speed, number of vehicles and soil characteristics. If the mitigation measures for fugitive dust-generating activities are applied correctly and with sufficient frequency, the control efficiency can approach 100%. Much of the uncertainty, however, would be due to varying degrees of vigilance on the part of construction personnel. The impacts shown above present a reasonable worst-case analysis presuming average fugitive dust mitigation efficiency and an average level of efforts to operate equipment as prescribed.

As shown in **AIR QUALITY Table 14** above, direct impacts of NO_2, CO, and SO_2 during construction would not be significant. Direct PM_{10} impacts would be reduced by the proposed mitigation but would remain significant because any increase to ambient PM_{10} concentrations could contribute to continuing violations of the PM_{10} standards. Similarly, indirect impacts for PM_{10} and ozone would continue to be significant because of construction emissions of PM_{10} and ozone precursors. Additional mitigation is appropriate to reduce direct and indirect PM_{10} and ozone impacts.

Operations Mitigation

Emissions controls that would be inherent to the design of the combustion turbines, the cooling towers, and each of the post-combustion control systems (e.g. catalytic reduction devices) would be successful in substantially reducing emission levels. The impacts that would occur after implementing these strategies are identified in **AIR QUALITY Table 15** above. As discussed above, secondary pollutant impacts caused by emissions of PM_{10} and ozone precursors, along with direct impacts of PM_{10}, warrant mitigation beyond that provided by the proposed emission control systems. What follows is a discussion of the adequacy of the proposed controls and emission offsets to mitigate the remaining PM_{10} and ozone impacts. No additional mitigation is necessary for direct impacts of NO_2, CO, and SO_2.

Combustion Turbine/Flue Gas Controls

Staff is concerned that the applicant would need to modify the project proposal to meet the SJVAPCD BACT determination in the PDOC for gas turbine emissions of NOx (SJVAPCD 2002a). Staff is also concerned that the SJVAPCD BACT determination may not agree with current U.S. EPA recommendations for CO and achievable ammonia slip.

As illustrated in the **AIR QUALITY Project Description**, the proposed emissions with the controls in place would be 2.5 ppm NOx (1-hour basis) and 4.0 ppm CO with ammonia slip levels below 10 ppm. Recommendations from U.S. EPA on recent CEC

cases indicate that 2.0 ppm may actually be achievable for both NOx and CO on a 1-hour basis with ammonia slip levels below 5 ppm. Guidance from CARB also shows that 5 ppm ammonia slip should be achievable (CARB 1999). Energy Commission staff agrees with CARB that an ammonia slip level of 5 ppm is achievable.
The SJVAPCD PDOC requires NOx to be reduced to 2.0 ppm (1-hour basis), but it does not require reductions of CO or ammonia slip beyond those proposed by the applicant. If the U.S. EPA specifies that the lower emission limits for CO and ammonia slip are achievable and demonstrated in practice, the limits in the PDOC may need to be revised. Similarly, if the applicant determines that it cannot meet the 2.0 ppm NOx limit in the PDOC, then the project proposal would not be consistent with the SJVAPCD requirements. As such, the project proposal may ultimately need to be modified to satisfy LORS. The need for project modifications to meet the NOx limit or additional control for CO or ammonia slip cannot be determined until the applicant and U.S. EPA each participate in the public review of the PDOC and the Final Determination of Compliance (FDOC) is released.

Emission Offsets

The SJVAPCD, as the administrator of the ERC program, evaluated the status of Avenal Energy's participation in the Preliminary Determination of Compliance (SJVAPCD 2002a). The applicant holds numerous ERCs for NOx, VOC, PM_{10}, and SOx, and proposes to use interpollutant trading to satisfy the overall offset liability. The U.S. EPA, as an oversight agency, may comment on the validity of the ERCs. In a similar case, credits derived from source shut-downs in the San Joaquin Valley prior to 1990 were challenged by the U.S. EPA (U.S. EPA 2002a). Staff is not aware of any pre-1990 credits in the Avenal Energy proposal, but should the U.S. EPA challenge any credits, the offset strategy may require revision. The quantity of ERCs presently held is sufficient to meet the SJVAPCD requirements. The following discussion describes the adequacy of the offsets to provide the minimum level of CEQA mitigation.

Secondary Ozone Mitigation

The applicant proposes providing VOC and NOx ERCs to mitigate indirect ozone impacts. The SJVAPCD new source review program is designed to allow new source growth while providing gradual air quality benefits to eventually achieve attainment of the ozone standards. The interpollutant and distance trading ratios and trigger levels for offset requirements are part of the local strategy to improve air quality, or attain the ozone standards.

A minimum-level of CEQA mitigation can be achieved if emission reductions of ozone precursors are provided in quantities equaling at least the amount of the project emissions. Energy Commission staff normally seeks excess emission reductions if the reductions would be distant from the source or traded between pollutants because analyzing impacts from pollutant transport or interpollutant reactions usually involves some level of uncertainty. Excess emission reductions also are especially appropriate where historical trends of background concentrations show little evidence of gradual improvement, as in the case here (refer to **AIR QUALITY Figure 1**).

After implementing the requirements of the PDOC the total emissions, or minimum liability under CEQA, would be 385,194 lb/yr (300,995 lb/yr NOx + 84,199 lb/yr VOC).

This is shown in **AIR QUALITY Table 17**. Retiring the proposed ERCs of NOx and VOC would result in reductions of more than 732,100 lb/yr of ozone precursors (106,306 lb/yr NOx + 625,797 lb/yr VOC).

The VOC and NOx emission increases associated with the proposed project would be fully offset with excess reductions that address uncertainties associated with distance and interpollutant trading. The excess reductions also provide further assurance that the project would not obstruct the progress of eventually attaining the ozone standards, which means that the indirect ozone impacts would be reduced to a level of insignificance. No further ozone mitigation is necessary.

AIR QUALITY Table 18 summarizes the offset liability and offsets required versus the CEQA mitigation sought by staff.

AIR QUALITY Table 18
Avenal Energy, Offset Liability and Residual Impact

Pollutant	Minimum CEQA Liability	SJVAPCD ERCs Required	ERCs Acquired (a)	Discounted ERCs Value after Trade (b)	Residual Liability
NOx, lb/yr	300,995	280,229	106,306	70,871 to NOx	None
VOC, lb/yr	84,199	64,134	625,797	209,358 to NOx 68,268 to VOC	None
PM_{10}, lb/yr	244,137	214,909	4,520	3,013 to PM_{10}	None
SOx, lb/yr	23,897	---	403,197	212,209 to PM_{10}	---
CEQA Mitigation Plan					
Ozone Precursors, lb/yr (c)	385,194	---	732,103	---	None
PM_{10}/PM_{10} Precursors, lb/yr (d)	268,034	---	407,717	---	None

Source: PDOC, p. 38. SJVAPCD 2002a; with independent staff assessment

Notes: a. This summarizes the offsets (i.e., ERCs) the applicant has acquired to date, before discounting for interpollutant trading ratios or distance ratios.

b. This summarizes the offsets redistributed according to the applicant's strategy for interpollutant trading. It shows the value after the ERCs are discounted for interpollutant trading and distance.

c. Ozone precursors are total of NOx plus VOC.

d. PM10/PM10 precursors are total of PM10 plus SOx, with any surplus offsets of NOx and VOC.

Direct and Secondary PM_{10} Mitigation

The applicant proposes providing a combination of PM_{10} and SOx ERCs to mitigate direct PM_{10} impacts. The minimum PM_{10} liability for the project under CEQA, as shown in **AIR QUALITY Tables 17 and 18**, is 268,034 lb/yr of PM_{10} and PM_{10} precursors. Retiring the proposed ERCs of PM_{10} and the PM_{10} precursor SOx would result in reductions of more than 407,700 lb/yr of PM_{10}/PM_{10} precursors (4,520 lb/yr PM_{10} + 403,197 lb/yr SOx), as shown in **Table 18**.

As with the ozone mitigation strategy, Energy Commission staff seeks excess emission reductions for PM_{10} to address uncertainties due to distance from the source and trading between pollutants. Excess emission reductions are especially appropriate because historical trends of PM_{10} background concentrations show little evidence of gradual improvement (see **AIR QUALITY Figure 1**).

By retiring the proposed emission reduction credits, the PM_{10} emission increases associated with the proposed project would be fully offset with excess reductions. The excess reductions would provide assurance that the project would not obstruct the progress of eventually attaining the PM_{10} standards, which means that the PM_{10} impacts would be reduced to a level of insignificance. No further PM_{10} and PM_{10} precursor mitigation is necessary.

Staff Proposed Mitigation

Construction Mitigation

Staff proposes specific mitigation to reduce construction emissions of PM_{10}, VOC, and NOx to avoid PM_{10} and ozone impacts. Much of the uncertainty in the effectiveness of the applicant's proposed strategy for construction mitigation is due to varying degrees of vigilance on the part of construction personnel. Staff's proposed Conditions of Certification **AQ-SC3** and **AQ-SC4** would require the applicant to prepare and adhere to a Fugitive Dust Mitigation Plan and a Diesel Construction Equipment Mitigation Plan. Because SO_2 is also a precursor to PM_{10}, one aspect of the Diesel Construction Equipment Mitigation Plan would require consideration of ultra-low sulfur diesel fuel. In order to confirm implementation of these plans, staff proposes rigorous monitoring and recordkeeping (**AQ-SC2**) of certain environmental parameters that would be used to indicate whether a high degree of day-to-day vigilance is being maintained. Each of these responsibilities would be coordinated by personnel specifically approved by the Energy Commission to fill the roles of Construction Mitigation Manager (**AQ-SC1**).

With the implementation of the staff-recommended construction mitigation measures, the PM_{10} and ozone impacts from the construction of the Avenal Energy project can be reduced to a level of insignificance.

Operations Mitigation

The PDOC recommended level for NOx control is 2.0 ppm hourly, which is more stringent to the applicant's proposal of 2.5 ppm. This level of control has been consistently recommended by the U.S. EPA on other similar projects, but the applicant may not agree that it has been demonstrated in practice. Staff is not aware of any additional, commercially available and demonstrated controls or operating strategies that could be applied to further reduce NOx emissions. The Final Determination of Compliance will incorporate comments from agencies, interested parties, and the applicant to finalize the BACT findings and the required emissions levels.

CUMULATIVE IMPACTS

The cumulative impact analysis identifies any stationary sources within a 6-mile radius of the project that could interact with the project's emissions. These include those that will soon be or were in the permitting process at the time, or that had received a construction permit from the SJVAPCD but was not yet operational. Emissions from other existing stationary sources within the 6-mile radius are presumed to be included in the existing background air quality conditions. Sources beyond the 6-mile radius are presumed to cause minimal effects at the project site.

The applicant included a cumulative modeling protocol in AFC Appendix 6.2-7 (DUKE 2001a). The protocol outlined the results of a records review conducted by the SJVAPCD under the direction of the applicant. According to the correspondence in AFC Appendix 6.2-7, the SJVAPCD reviewed permitting records in August 2001 and identified only one other known project that fit these criteria. The only other source identified by the SJVAPCD within a 6-mile radius of the Avenal site is a diesel-fired internal combustion engine owned by the City of Avenal, to be operated only for emergency purposes and testing of the engine itself.

Because the emissions from the City of Avenal emergency generator engine were found by the applicant to be less than one ton per year of all pollutants, this source was not included in the applicant's cumulative assessment (AFC Appendix 6.2-7, p. 6.2-7.1). Staff has reviewed the applicant's approach and, because the City's engine would only be used for emergency purposes, staff has determined that cumulative impacts would be adequately characterized by the analysis of direct project impacts already presented above, and no significant cumulative effects would be likely.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is greater than fifty percent within a six-mile radius of the proposed Avenal Energy power plant (please refer to **Socioeconomics Figure 1** in this Staff Assessment), and Census 1990 information that shows the low-income population is less than fifty percent within the same radius. Since staff has concluded that there will be no significant direct or cumulative air quality-related impacts, there will also be no significant impact to any minority populations that have been identified. Therefore, there are no air quality-related environmental justice issues.

COMPLIANCE WITH LORS

FEDERAL

The U.S. EPA is responsible for completing the Federal Prevention of Significant Deterioration (PSD) review requirements. Review under the PSD program has not been completed by U.S. EPA. It is possible that changes to the project proposal may be necessary to meet federal requirements, and that these changes could occur after the Energy Commission siting process. To address the issue of the ongoing federal permitting process, and the potential for project revisions, staff recommends a condition for coordinating possible modifications (**AQ-SC5**).

Without U.S. EPA involvement, staff cannot make a final recommendation, at this time, as to whether the project is in compliance with PSD requirements.

STATE

Staff believes that if the project meets the District and U.S. EPA recommendations for BACT, the project would demonstrate compliance with California State Health and Safety Code, Section 41700.

LOCAL

The SJVAPCD completed a Preliminary Determination of Compliance (PDOC, SJVAPCD 2002a) for this project dated July 3, 2002, with a 30-day public comment period. Although the PDOC indicates that the Avenal Energy project would comply with all applicable District requirements, the U.S. EPA, other agencies, and the public have not yet had an opportunity to comment. Staff is concerned that the project proposal needs modification to meet District requirements for NOx BACT and that the U.S. EPA may recommend more stringent levels of control for CO and ammonia slip from the combustion turbines. Staff is also concerned that the offset package may need future modification depending again on U.S. EPA recommendations. The likelihood of the project to comply with these requirements is described below.

Rule 2201 – New And Modified Stationary Source Review Rule

Section 2201-4.1 – Best Available Control Technology

BACT is required for NOx, VOC, PM_{10}, SO_2, and CO. The applicant's proposal of 2.5 ppm NOx (1-hour basis) from the combustion turbines does not agree with the PDOC, which limits emissions to 2.0 ppm NOx (1-hour basis). Additionally, the proposed BACT determination for CO and ammonia slip may not be consistent with current U.S. EPA recommendations, which could identify a need for more stringent control. After U.S. EPA review of the PDOC and the public comment period, the SJVAPCD will prepare a Final Determination of Compliance. If the project proposal is modified to agree with District and U.S. EPA recommendations for BACT, then the project would demonstrate compliance with these requirements.

Section 2201-4.5 – Offsets

Emission reduction credits derived from source shut-downs in the San Joaquin Valley prior to 1990 were challenged by the U.S. EPA in a recent similar case (U.S. EPA 2002a). Although staff is not aware of any pre-1990 credits in the Avenal Energy proposal, if the U.S. EPA challenges any credits, the offset strategy may require revision. Sufficient credits exist in the San Joaquin Valley market to replace any invalid ERCs that could be in the proposal, and staff anticipates that the applicant would readily secure replacement emission reduction credits if necessary to address any U.S. EPA concerns. As such, the project is likely to comply with these requirements.

FACILITY CLOSURE

Eventually, the Avenal Energy power plant will close, either as a result of the end of its useful life, or through some unexpected situation, such as a natural disaster or catastrophic facility breakdown. When the facility closes, then all sources of air emissions will cease and thus all impacts associated with those emissions will no longer occur. The only other expected emissions will be construction/demolition emissions from the dismantling activities. These activities will be short term, nevertheless, staff recommends that a facility closure plan be submitted to the Energy Commission Compliance Project Manager to demonstrate compliance with applicable laws, ordinances, regulations, and standards during closure activities.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

No written comments concerning air quality have been received from either the public or from any public agency. The response to any written comments received upon publication of this Preliminary Staff Assessment will be incorporated in the Final Staff Assessment.

CONCLUSIONS AND RECOMMENDATIONS

Staff reviewed the Avenal Energy project and the District's Preliminary Determination of Compliance (SJVAPCD 2002a). The project and the proposed offsets would satisfy the LORS requirements of the District. However, the BACT determination in the PDOC for combustion turbine emissions of NOx appears to be inconsistent with the applicant's proposal. Additionally, recent U.S. EPA guidance has raised concerns about the use of pre-1990 offsets and identified more stringent CO and ammonia slip levels than those specified in the PDOC and the AFC. The U.S. EPA is expected to provide comments on the PDOC BACT determinations, ammonia slip, and the offset package. The Final Determination of Compliance will address comments from the applicant, the U.S. EPA, and interested parties regarding BACT, the offset package, and ammonia slip levels. Without an FDOC, Staff cannot recommend certification of the Avenal Energy project at this time.

The proposed offsets would mitigate the project's operational CEQA impacts to a level of insignificance. However, staff determined that additional mitigation (**AQ-SC1** through **AQ-SC6**) was necessary to reduce the potential construction impacts to levels of

insignificance. Upon release of the FDOC, staff would recommend the following Conditions of Certification to address the impacts and appropriate mitigation for the construction and operation of the Avenal Energy project.

CONDITIONS OF CERTIFICATION

STAFF CONDITIONS

STAFF CONDITIONS OF CERTIFICATION

AQ-SC1 The project owner/operator shall submit the resume(s) of each individual proposed to fill the Construction Mitigation Manager (CMM) position to the CEC Compliance Project Manager (CPM) for approval. One or more individuals may hold this position. The owner/operator shall be responsible for funding the costs of the CMM, however the CMM shall report directly to the CPM. The CMM shall preferably have a minimum of eight years experience as follows, however the CPM shall consider all resumes submitted regardless of experience:

- five years construction experience as a subcontractor or general contractor.
- An engineering degree or an additional five years construction experience.
- one year construction project management experience.
- two years air quality assessment experience.

The project owner/operator shall make available an onsite dedicated office for the CMM. The CMM shall be responsible for implementing all mitigation measures related to construction equipment combustion emissions, construction monitoring and enforcing the effectiveness of construction mitigation measures as outlined in Conditions of Certification **AQ-SC3** and **AQ-SC4**. The CMM shall be onsite during all construction activities, until no longer deemed necessary by the CPM. The CMM shall be granted access to all areas of the main and linear facility construction sites. The CMM shall have the authority to stop specific construction activities on either the main or the linear facility construction sites as specified in Condition **AQ-SC3** (3) below. The CMM may not be terminated prior to the cessation of construction activities unless approval is granted by the CPM.

Verification: The project owner/operator shall submit the CMM resume(s) to the CPM for approval at least 60days prior to site mobilization.

AQ-SC2 The project owner shall ensure that the CMM submits directly to the CPM for approval (and a copy to the project owner) a report of all compliance actions taken germane to Conditions of Certification **AQ-SC3** and **AQ-SC4**. The report shall include, at a minimum, the following elements:
Fugitive Dust Mitigation Monthly Report
(see Condition of Certification AQ-SC3)

- A summary of each of the operation(s) planned for the following two months which may result in the generation of fugitive dust. Each description shall

include a schedule, on-site location details and a list of proposed fugitive dust mitigation measures.

- A summary of all mitigation activities implemented for each fugitive dust generating operation identified in a previous report. This report should provide a summary description of the operation, the mitigation measures implemented and the estimated effectiveness of each mitigation measure.
- Details of all operation(s) requiring fugitive dust mitigation that are not identified in the previous report or the FDMP. Details shall include (at a minimum) a description of the operation, the date, duration, mitigation measures implemented, and an explanation for not reporting the operation in a previous report (or in the FDMP).
- Identification of any failures of mitigation measures and details of the actions taken to reduce the identified impacts and prevent future failures of those mitigation measures.
- Identification of any observation by the CMM of dust plumes beyond the property boundary of the main construction site or beyond an acceptable distance from the linear construction site and what actions (if any) were taken to abate the plume.

Diesel Construction Equipment Mitigation Monthly Report (see Condition of Certification AQ-SC4)

- Identification of any changes, as approved by the CPM, to the Diesel Construction Equipment Mitigation Plan from the initial report or the last monthly report including any new contractors and their diesel construction equipment.
- A Copy of all receipts or other documentation indicating types and amounts of fuel purchased, from whom, where delivered and on what date for the main and related linear construction sites.
- Identification and verification of all diesel engines required to meet EPA or CARB 1996 off-road diesel equipment emission standards.
- The suitability of the use of a catalyzed diesel particulate filter for a specific piece of construction equipment is to be determined by a qualified mechanic or engineer who must submit a report through the CMM to the CPM for approval. The identification of any suitability report initiated or pursued, or the completed report, should be included in the monthly report (in the month that it was completed) as should the verification of any subsequent installation of a catalyzed diesel particulate filter.
- Identification of any observation by the CMM of exhaust plumes emanating from diesel-fired construction equipment beyond the property boundary of the main construction site or beyond an acceptable distance from the linear construction site and what actions (if any) where taken to abate the plume or future expected plumes.

Verification: The project owner shall ensure that the CMM submits directly to the CPM for approval (and a copy to the project owner), a monthly report of all compliance

actions taken germane to Conditions of Certification **AQ-SC3** and **AQ-SC4**. The report is due within ten working days after the end of each reporting month.

AQ-SC3 The project owner shall ensure that the CMM prepares and submits to the CPM for approval, a Fugitive Dust Mitigation Plan (FDMP) that specifically identifies all fugitive dust mitigation measures that will be employed during the construction of the facility. The FDMP shall be administered on site by the full-time CMM.

The FDMP shall include a schedule of each operation planned for the first two months of the project that may result in the generation of fugitive dust, including location, source(s) of fugitive dust, and proposed mitigation measures specific to each operation/source.

The construction mitigation measures that shall be addressed in the FDMP include, but are not limited to, the following:

- Identification of the employee parking area(s) and surface composition of those parking area(s)
- The frequency of watering of unpaved roads and all disturbed areas
- Application of chemical dust suppressants
- Gravel in high traffic areas
- Paved access aprons
- Sandbags to prevent run off
- Posted speed limit signs
- Wheel washing areas prior to large trucks leaving the project site
- Methods that will be used to clean tracked-out mud and dirt from the project site onto public roads
- For any transportation of solid bulk material
    1. Vehicle covers
    2. Wetting of the transported material
    3. Appropriate freeboard
- Methods for the stabilization of storage piles and disturbed areas
- Windbreaks at appropriate locations
- Additional mitigation measures to be implemented at the direction of the CMM in the event that the standard measures fail to completely control dust from any activity and/or source
- The suspension of all earth moving activities under windy conditions
- On-site monitoring devices

In monitoring the effectiveness of all mitigation measures included in the FDMP, the CMM shall take into account the following, at a minimum:

a) Onsite spot checks of soil moisture content at locations where soil disturbance, movement and/or storage is occurring; and

b) Visual observations of all construction activities.

The CMM shall implement the following procedures for additional mitigation measures if the CMM determines that the existing mitigation measures are not resulting in effective mitigation:

1. The CMM shall direct more aggressive application of the existing mitigation methods within 15 minutes of making such a determination.
2. The CMM shall direct implementation of additional methods of dust suppression if step #1 specified above, fails to result in adequate mitigation within 30 minutes of the original determination.
3. The CMM shall direct a temporary shutdown of the source of the emissions if step #2 specified above fails to result in adequate mitigation within one) hour of the original determination. The activity shall not restart until one full hour after the shutdown. The owner/operator may appeal to the CPM any directive from the CMM to shutdown a source, provided that the shutdown shall go into effect within one hour of the original determination unless overruled by the CPM before that time.

Verification: At least 30 days prior to site mobilization, the project owner/operator shall provide the CPM with a copy of the FDMP for approval. Site mobilization shall not commence until the project owner/operator receives approval of the FDMP from the CPM.

AQ-SC4 The project owner shall ensure that the CMM prepares and submits to the CPM for approval, a Diesel Construction Equipment Mitigation Plan (DCEMP) that will specifically identify diesel engine mitigation measures that will be employed during the construction phase of the main and related linear construction sites. The project owner shall ensure that the CMM will be responsible for directing implementation of and compliance with all measures identified in the DCEMP. The DCEMP shall address, at a minimum, the following mitigation measures:

- Catalyzed diesel particulate filters (CDPF)
- CARB certified ultra low sulfur diesel fuel, containing 15ppm sulfur or less (ULSD)
- Diesel engines certified to meet EPA and/or CARB 1996 or better off-road equipment emission standards
- Restricting diesel engine idle time, to the extent practical, to no more than ten minutes

The DCEMP shall include the following:

1. A list of all diesel-fueled, off-road, stationary or portable construction-related equipment to be used either on the main or the related linear construction sites. This list will initially be estimated and then subsequently be updated as specific contractors become identified. Prior to a contractor gaining access to the main or related linear construction sites, the project owner shall ensure that the CMM submits to the CPM for approval, an update of this list including all of the new contractor's diesel construction equipment.

2. Each piece of construction equipment listed under item #1 of this condition must demonstrate compliance according to the following mitigation requirements, except as noted in items #3, #4 and #5 of this condition:

Engine Size (BHP)	1996 CARB or EPA Certified Engine	Required Mitigation
< 100	NA	ULSD
> or = 100	Yes	ULSD
> or = 100	No	ULSD and CDPF, if suitable as determined by the CMM

3. If the construction equipment is intended to be on-site for ten days or less, then none of the mitigation measures identified in item #2 of this condition are required.

4. The CPM may grant relief from the mitigation measures listed in item #2 of this condition for a specific piece of equipment if the CMM can demonstrate that they have made a good faith effort to comply with the mitigation measures and that compliance is not possible.

5. Any implemented mitigation measure in item #2 of this condition may be terminated immediately if one of the following conditions exists, however the CPM must be informed within ten working days of the termination:

   5.1 The measure is excessively reducing normal availability of the construction equipment due to increased downtime for maintenance, and/or reduced power output due to an excessive increase in back pressure.

   5.2 The measure is causing or is reasonably expected to cause significant engine damage.

   5.3 The measure is causing or is reasonably expected to cause a significant risk to workers or the public.

   5.4 Any other seriously detrimental cause which has approval by the CPM prior to the termination being implemented.

6. All contractors must agree to limit diesel engine idle time on all diesel-powered equipment to no more than ten minutes, to the extent practical.

Verification: The project owner shall ensure that the CMM submits a DCEMP to the CPM for approval at least 30 days prior to site mobilization. The CMM will update the initial DCEMP (if necessary), no less than ten days prior to a specific contractor gaining access to either the main or related linear construction sites. The project owner shall ensure that the CMM notifies the CPM of any emergency termination within ten working days of the termination.

CONSTRUCTION AND OPERATION CONDITION OF CERTIFICATION

AQ-SC5 The project owner shall submit to the CPM for review and approval any modification proposed by either the project owner or issuing agency to any project air permit.

Verification: The project owner shall submit any proposed air permit modification to the CPM within five working days of its submittal either by 1) the project owner to an agency, or 2) receipt of proposed modifications from an agency. The project owner shall submit all modified air permits to the CPM within 15 days of receipt.

AQ-SC6 The project owner shall submit to the CPM and APCO Quarterly Compliance Reports, no later than 30 days following the end of each calendar quarter, that include operational and emissions information as necessary to demonstrate compliance with Conditions **AQ-1** through **AQ-110**. The Quarterly Operational Report will specifically note or highlight incidences of noncompliance.

Verification: The project owner shall submit the Quarterly Operational Reports to the CPM and APCO no later than 30 days following the end of each calendar quarter.

DISTRICT PRELIMINARY DETERMINATION OF COMPLIANCE CONDITIONS

Conditions of Certification AQ-1 through AQ-14 are SJVAPCD General Facility Permit Conditions.

AQ-1 The project owner shall not begin actual onsite construction of the equipment authorized by this Authority to Construct until the lead agency satisfies the requirements of the California Environmental Quality Act (CEQA). [California Environmental Quality Act]

Verification: The project owner shall keep proof of the project's District air permit and CEC certification, including copies of all permit conditions and Conditions of Certification, onsite starting at the commencement of construction through the final decommissioning of the project. The project owner shall make the District's permit conditions and Conditions of Certification available at the project site to representatives of the District, California Air Resource Board (CARB) and the Energy Commission for inspection.

AQ-2 All equipment shall be maintained in good operating condition and shall be operated in a manner to minimize emissions of air contaminants into the atmosphere. [District NSR Rule]

Verification: The project owner shall make the site available for inspection by representatives of the District, CARB and the Commission.

AQ-3 No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

Verification: The project owner will document any complaints that it has received from the public in the Quarterly Operational Report (**AQ-SC6**). The project owner shall make the site available for inspection by representatives of the District, CARB and the Commission.

AQ-4 Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]

Verification: The project owner shall submit the results of the initial and annual source tests per Condition **AQ-55**.

AQ-5 No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]

Verification: The project owner shall document any known opacity violations in the Quarterly Operational Report (**AQ-SC6**). The project owner shall make the site available for inspection by representatives of the District, CARB and the Commission.

AQ-6 Project owner shall submit an application to comply with Rule 2520 - Federally Mandated Operating Permits within twelve months of commencing operation. [District Rule 2520]

Verification: The project owner shall submit a copy of their Title V – Federal Mandated Operating Permit Application to the CPM within 12 months of commencing operation.

AQ-7 Project owner shall submit an application to comply with Rule 2540 - Acid Rain Program. [District Rule 2540]

Verification: The project owner shall submit to the CPM copies of the Title IV permit and proof that necessary Title IV SO_2 emission allotments have been acquired at least 30 days prior to the initial firing of the turbine(s).

AQ-8 Upon implementation of C-3953-1-0, C-3953-2-0, C-3953-3-0, C-3953-4-0, C-3953-5-0, C-3953-6-0, and C-3953-7-0 emission offsets shall be provided to offset the following increases in: PM_{10} - Q1: 53,727 lb, Q2: 53,727 lb, Q3: 53,727 lb, and Q4: 53,727 lb; NO_x (as NO_2) - Q1: 70,057 lb, Q2: 70,057 lb, Q3: 70,057 lb, and Q4: 70,057 lb; VOC - Q1: 16,034 lb, Q2: 16,034 lb, Q3: 16,034 lb, and Q4: 16,034 lb. Offsets shall be provided at the appropriate distance ratio specified in Rule 2201. SO_x offsets provided to offset PM_{10} increases shall be at an interpollutant ratio of 1.4:1 and applicable distance ratio. VOC offsets provided to offset NO_x increases shall be at an interpollutant ratio of 2.0:1 and applicable distance ratio. [District Rule 2201]

Verification: The project owner shall submit copies of the surrendered ERC certificates to the CPM at least 30 days prior to the initial firing of the turbine(s).

AQ-9 Disturbances of soil related to any construction, demolition, excavation, extraction, and other earthmoving activities shall comply with the requirements for fugitive dust control in SJVAPCD District Rule 8021 (11/15/01) unless specifically exempted under section 4.0 of Rule 8021. [District Rule 8021]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8021 as part of the Monthly Compliance Report (MCR), while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

AQ-10 Outdoor handling, storage, and transport of any bulk material shall comply with the requirements of SJVAPCD District Rule 8031 (11/15/01), unless specifically exempted under section 4.0 of Rule 8031. [District Rule 8031]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8031 as part of the MCR, while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

AQ-11 All sites that are subject to SJVAPCD District Rule 8021, SJVAPCD District Rule 8031, and SJVAPCD District Rule 8071 shall comply with the requirements of SJVAPCD District Rule 8041 (11/15/01), unless specifically exempted under section 4.0 of Rule 8041. [District Rule 8041]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8041 as part of the MCR, while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

AQ-12 Any open area having 3.0 acres or more of disturbed surface area, that has remained undeveloped, unoccupied, unused or vacant for more than seven days shall comply with the requirements of SJVAPCD District Rule 8051 (11/15/01), unless specifically exempted under section 4.0 of Rule 8051. [District Rule 8051]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8051 as part of the MCR, while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

AQ-13 Any new or existing public or private paved or unpaved road, road construction project, or road modification project shall implement the control measures and design criteria of, and comply with the requirements of SJVAPCD District Rule 8061 (11/15/01) unless specifically exempted under section 4.0 of Rule 8061. [District Rule 8061]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8061 as part of the MCR, while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

AQ-14 Any unpaved vehicle/equipment traffic area of 1.0 acre or larger shall comply with the requirements of SJVAPCD District Rule 8071 (11/15/01), unless specifically exempted under section 4.0 of Rule 8071. [District Rule 8071]

Verification: The project owner shall provide documentation demonstrating compliance with Rule 8071 as part of the MCR, while construction is occurring at the main or related linear construction sites, and as necessary after construction is complete in the Quarterly Operational Report (**AQ-SC6**).

Conditions of Certification AQ-15 through AQ-71 apply per turbine/HRSG unit unless otherwise identified.

EQUIPMENT DESCRIPTION, UNIT C-3953-1-0:
180 MW COMBINED-CYCLE POWER GENERATING SYSTEM #1 CONSISTING OF A GENERAL ELECTRIC FRAME 7 MODEL PG7241FA NATURAL GAS-FIRED COMBUSTION TURBINE GENERATOR WITH DRY LOW NOX COMBUSTOR, A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AN OXIDATION CATALYST, HEAT RECOVERY STEAM GENERATOR #1 (HRSG) WITH A 480 MMBTU/HR DUCT BURNER AND A 300 MW NOMINALLY RATED STEAM TURBINE SHARED WITH S-3953-2

EQUIPMENT DESCRIPTION, UNIT C-3953-2-0:
180 MW COMBINED-CYCLE POWER GENERATING SYSTEM #2 CONSISTING OF A GENERAL ELECTRIC FRAME 7 MODEL PG7241FA NATURAL GAS-FIRED COMBUSTION TURBINE GENERATOR WITH DRY LOW NOX COMBUSTOR, A SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, AN OXIDATION CATALYST, HEAT RECOVERY STEAM GENERATOR #2 (HRSG) WITH A 480 MMBTU/HR DUCT BURNER AND A 300 MW NOMINALLY RATED STEAM TURBINE SHARED WITH S-3953-1

AQ-15 The owner of the Avenal Energy Project shall minimize the emissions from the gas turbine and heat recovery steam generator to the maximum extent possible during the commissioning period. Conditions **AQ-16** through **AQ-27** shall apply only during the commissioning period as defined below. Unless otherwise indicated, Conditions **AQ-28** through **AQ-71** shall apply after the commissioning period has ended. [District Rule 2201]

Verification: The project owner shall provide in the monthly commissioning status report (see the verification for Condition **AQ-21**) information regarding the types and effectiveness of methods used to minimize commissioning period emissions.

AQ-16 Commissioning activities are defined as, but not limited to, all testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the Avenal Energy Project construction contractor to insure safe and reliable steady state operation of the gas turbines, heat recovery steam generators, steam turbine, auxiliary boiler, and associated electrical delivery systems. [District Rule 2201]

Verification: The project owner shall provide in the monthly commissioning status report (see the verification for Condition **AQ-21**) information regarding the commissioning period activities.

AQ-17 Commissioning period shall commence when all mechanical, electrical, and control systems are install and individual system startup has been completed, or when a gas turbine is first fired, whichever occurs first. The commissioning

period shall terminate when the plant has completed initial performance testing and is available for commercial operation. [District Rule 2201]

Verification: The project owner shall provide in the monthly commissioning status report (see the verification for Condition **AQ-21**) information regarding the commissioning period activities.

AQ-18 At the earliest feasible opportunity, in accordance with the recommendations of the equipment manufacturer and the construction contractor, the combustors of this unit shall be tuned to minimize emissions. [District Rule 2201]

Verification: The project owner shall provide combustor tuning information to demonstrate compliance with this condition, and that information shall be submitted to the CEC CPM as part of the monthly commissioning status report noted in the verification of Condition **AQ-21**.

AQ-19 At the earliest feasible opportunity, in accordance with the recommendations of the equipment manufacturer and the construction contractor, the Selective Catalytic Reduction (SCR) system and the oxidation catalyst shall be installed, adjusted, and operated to minimize emissions from this unit. [District Rule 2201]

Verification: The project owner shall provide emission abatement system information (such as dates of catalyst installation and ammonia grid initial operation) to demonstrate compliance with this condition, and that information shall be submitted to the CEC CPM as part of the monthly commissioning status report noted in the verification of Condition **AQ-21**.

AQ-20 Coincident with the steady-state operation of the SCR system and the oxidation catalyst, NO_x and CO emissions from this unit shall comply with the limits specified in Conditions **AQ-45** and **AQ-46**. [District Rule 2201]

Verification: The project owner shall provide emissions data to demonstrate compliance with this condition, and that data shall be submitted to the CEC CPM as part of the monthly commissioning status report noted in the verification of Condition **AQ-21**.

AQ-21 The project owner shall submit a plan to the District at least four weeks prior to the first firing of this unit, describing the procedures to be followed during the commissioning period. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not limited to, the tuning of the combustors, the installation and operation of the SCR systems and the oxidation catalyst, the installation, calibration, and testing of the NO_x and CO continuous emissions monitors, and any activities requiring the firing of this unit without abatement by the SCR system or oxidation catalyst. [District Rule 2201]

Verification: The project owner shall submit a single commissioning plan to the District and the CPM at least four weeks prior to the first firing of any combustion turbine, describing in detail the procedures to be followed for each turbine. The project owner shall submit, commencing one month from the time of gas turbine first fire, a monthly commissioning status report throughout the duration of the commissioning phase that demonstrates compliance with the commissioning plan and demonstrates

compliance with all other substantive requirements listed in Conditions **AQ-16** through **AQ-27**. The monthly commissioning status report shall be submitted to the CPM monthly within 10 days of the numeric calendar day of turbine first fire date.

AQ-22 Emission rates from this unit, during the commissioning period, shall not exceed any of the following limits: NO_x (as NO_2) - 125 lb/hr or 1,500 lb/day; VOC (as methane) - 16 lb/hr or 192 lb/day; CO - 902 lb/hr or 4,620 lb/day; PM_{10} - 132 lb/day; or SO_x (as SO_2) - 15.2 lb/day. [District Rule 2201]

Verification: The project owner shall provide emissions data to demonstrate compliance with this condition, and that data shall be submitted to the CEC CPM as part of the monthly commissioning status report noted in the verification of Condition **AQ-21**.

AQ-23 Turbine units C-3953-1 and C-3953-2 shall not be commissioned simultaneously. Combined emission rates from units C-3953-1 and C-3953-2, during the commissioning period, shall not exceed any of the following limits: NO_x (as NO_2) - 141.24 lb/hr or 2,132.5 lb/day; VOC (as methane) - 32 lb/hr or 359.4 lb/day; CO - 2,706 lb/hr or 8,608.6 lb/day; PM_{10} - 436.5 lb/day; or SO_x (as SO_2) - 50.6 lb/day. [District Rule 2201]

Verification: The project owner shall provide emissions data to demonstrate compliance with this condition, and that data shall be submitted to the CEC CPM as part of the monthly commissioning status report noted in the verification of Condition **AQ-21**.

AQ-24 During the commissioning period, the project owner shall demonstrate compliance with Conditions **AQ-22** and **AQ-23** through the use of properly operated and maintained continuous emissions monitors and recorders as specified in Conditions **AQ-36** and **AQ-37**. The monitored parameters for this unit shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation). [District Rule 2201]

Verification: The project owner shall provide CEM data to demonstrate compliance with conditions **AQ-22** and **AQ-23**, and that data shall be submitted to the CEC CPM as part of the monthly commissioning phase status report noted in the verification of Condition **AQ-21**.

AQ-25 The continuous monitors specified in Conditions **AQ-36** and **AQ-37** shall be installed, calibrated, and operational prior to the first firing of this unit. After first firing, the detection range of the CEMS shall be adjusted as necessary to accurately measure the resulting range of NO_x and CO emission concentrations. [District Rule 2201]

Verification: The project owner shall provide notification to the District and the CPM of the anticipated dates for installation, calibration and testing for the CEMS at least ten (10) days prior to installation. The project owner shall provide a report to the District and CPM for approval demonstrating compliance with CEMS calibration requirements prior to turbine first fire. The project owner shall provide ongoing calibration data in the monthly commissioning status reports (see verification of Condition **AQ-21**).

AQ-26 The total number of firing hours of this unit without abatement of emissions by the SCR system and the oxidation catalyst shall not exceed 408 hours during the commissioning period. Such operation of this unit without abatement shall

be limited to discrete commissioning activities that can only be properly executed without the SCR system and the oxidation catalyst in place. Upon completion of these activities, the project owner shall provide written notice to the District and the unused balance of the 408 firing hours without abatement shall expire. [District Rule 2201]

Verification: The project owner shall provide to the District and the CPM a reporting of the unused balance of the 294 firing hours without abatement for each turbine in the monthly commissioning status reports (see verification of Condition **AQ-21**).

AQ-27 The total mass emissions of NO_x, CO, VOC, PM_{10}, and SO_x that are emitted during the commissioning period shall accrue towards the consecutive twelve month emission limits specified in Condition **AQ-49**. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-28 The project owner shall notify the District of the date of initiation of construction no later than 30 days after such date, the date of anticipated startup not more than 60 days nor less than 30 days prior to such date, and the date of actual startup within 15 days after such date. [District Rule 4001]

Verification: The project owner shall notify the CPM and the District of the date of initiation of construction no later than 30 days after such date, the date of anticipated startup, defined here as first turbine fire, not more than 60 days or less than 30 days prior to such date, and the date of actual startup within fifteen (15) days after such date.

AQ-29 Selective catalytic reduction (SCR) system and oxidation catalyst shall serve the gas turbine engine. Project owner shall submit SCR and oxidation catalyst design details to the District at least 30 days prior to commencement of construction. [District Rule 2201]

Verification: The project owner shall submit SCR and oxidation catalyst design details to the District and the CPM 30 days prior to commencement of construction of the SCR or oxidation catalyst systems.

AQ-30 Project owner shall submit continuous emission monitor design, installation, and operational details to the District at least 30 days prior to commencement of construction. [District Rule 2201]

Verification: The project owner shall provide copies of drawings of the continuous emissions monitor design, installation, and operations details to the District and the CPM at least 30 days prior to commencement of construction of the SCR or oxidation catalyst systems.

AQ-31 The project owner shall submit to the District information correlating the NO_x control system operating parameters to the associated measured NO_x output. The information must be sufficient to allow the District to determine compliance with the NO_x emission limits of this permit during times that the CEMS is not functioning properly. [District Rule 4703]

Verification: The project owner shall compile the required NO_x control system and emissions data and submit the information to the CPM and the APCO in the Quarterly Operational Reports (**AQ-SC6**).

AQ-32 Combustion turbine generator (CTG) and electrical generator lube oil vents shall be equipped with mist eliminators. Visible emissions from lube oil vents shall not exhibit opacity of 5% or greater, except for up to three minutes in any hour. [District Rules 2201 and 4101]

Verification: The project owner shall make the site available for inspection by representatives of the District, CARB and the Commission to verify the installation and proper operation of the lube oil vent mist eliminators.

AQ-33 Heat recovery steam generator design shall provide space for additional selective catalytic reduction catalyst and oxidation catalyst if required to meet NO_x and CO emission limits. [District Rule 2201]

Verification: The project owner shall submit SCR and oxidation catalyst design details that demonstrate compliance with this conditions to the APCO and the CPM 30 days prior to commencement of construction of the SCR or oxidation catalyst systems.

AQ-34 Ammonia injection grid shall be equipped with operational ammonia flowmeter and injection pressure indicator. [District Rules 2201 and 4703]

Verification: The project owner shall make the site available for inspection of the ammonia flow meter and injection pressure indicator by representatives of the District, CARB and the Commission.

AQ-35 Project owner shall monitor and record exhaust gas temperature at selective catalytic reduction and oxidation catalyst inlets. [District Rules 2201 and 4703]

Verification: The project owner shall make the site available for inspection of the exhaust gas temperature measuring equipment and temperature records by representatives of the District, CARB and the Commission.

AQ-36 The CTG shall be equipped with a continuous monitoring system to measure and record hours of operation and fuel consumption. [District Rules 2201, 4001, and 4703]

Verification: The project owner shall make the site available for inspection of the hourly operation and fuel consumption measuring equipment and records by representatives of the District, CARB and the Commission.

AQ-37 The CTG shall be equipped with a continuous emission monitor (CEM) for NO_x (before and after SCR system), CO, and O_2. Alternatively, a continuous ammonia monitor may be installed in lieu of the NO_x CEM before the SCR system. Continuous emissions monitor(s) shall meet the requirements of 40 CFR part 60, Appendices B and F, and 40 CFR part 75, and District-approved protocol, and shall be capable of monitoring emissions during normal operating conditions and during startups and shutdowns, provided the CEM(s) pass the relative accuracy requirement for startups and shutdowns specified herein. If relative accuracy of CEM(s) cannot be demonstrated during startup conditions, CEM results during startup and shutdown events shall be replaced with startup emission rates obtained from source testing to determine compliance with

emission limits contained in this document. [District Rules 2201, 4001, and 4703]

Verification: The project owner shall provide a Continuous Emission Monitoring System (CEMS) protocol for approval by the CPM and the APCO at least 60 days prior to installation of the CEMS. The project owner shall make the site available for inspection of the CEMS by representatives of the District, CARB and the Commission.

AQ-38 The facility shall install and maintain equipment, facilities, and systems compatible with the District's CEM data polling software system and shall make CEM data available to the District's automated polling system on a daily basis. [District Rule 1080]

Verification: The project owner shall include in the Continuous Emission Monitoring System (CEMS) protocol, as required in Condition **AQ-37**, the details on the systems proposed for enabling the District's CEM data polling system.

AQ-39 Upon notice by the District that the facility's CEM system is not providing polling data, the facility may continue to operate without providing automated data for a maximum of 30 days per calendar year provided the CEM data is sent to the District by a District-approved alternative method. [District Rule 1080]

Verification: The project owner shall identify dates when a District approved alternative emission polling method was used due to polling system malfunction as part of the Quarterly Operational Reports (**AQ-SC6**).

AQ-40 The exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and shall be equipped with safe permanent provisions to sample stack gases with a portable NO_x, CO, and O_2 analyzer during District inspections. The sampling ports shall be located in accordance with the CARB regulation titled California Air Resources Board Air Monitoring Quality Assurance Volume VI, Standard Operating Procedures for Stationary Emission Monitoring and Testing. [District Rule 1081]

Verification: Prior to construction of the turbine stacks the project owner shall provide to the CPM for approval detailed plan drawings of the turbine stacks that show the sampling ports and demonstrate compliance with the requirements of this condition. The project owner shall make the site available for inspection of the turbine stacks by representatives of the District, CARB and the Commission.

AQ-41 The CTG shall be fired exclusively on natural gas with a sulfur content of no greater than 0.25 grain of sulfur compounds (as S) per 100 dry scf of natural gas. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the fuel sulfur content data, as required to be compiled in Condition **AQ-56**, demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-42 During startup or shutdown, CTG exhaust emissions shall not exceed any of the following limits: NO_x (as NO_2) - 80 lb/hr, VOC - 16 lb/hr, or CO - 902 lb/hr, based on three hour averages. NO_x (as NO_2) - 320 lb/hr, based on one hour average. [District Rules 2201 and 4102]

Verification: The project owner shall submit to the CPM and APCO the turbine startup and shutdown emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-43 Combined emission rates from units C-3953-1 and C-3953-2, during startup or shutdown, shall not exceed any of the following limits: NO_x (as NO_2) - 96.24 lb/hr, VOC - 21.66 lb/hr, or CO - 921.78 lb/hr, based on three hour averages. NO_x (as NO_2) - 336.24 lb/hr, based on one hour average. [District Rules 2201 and 4102]

Verification: The project owner shall submit to the CPM and APCO the turbine startup and shutdown emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-44 Startup is defined as the period beginning with turbine initial firing until the unit meets the lb/hr and ppmvd emission limits in Condition **AQ-46**. Shutdown is defined as the period beginning with initiation of turbine shutdown sequence and ending with cessation of firing of the gas turbine. Startup and shutdown durations shall not exceed three hours and one hour, respectively, per occurrence. Startup and shutdown events shall not exceed 400 hours per calendar year. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the turbine startup and shutdown event duration data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-45 Emission rates from this unit (with duct burner firing), except during startup and shutdown periods, shall not exceed any of the following limits: NO_x (as NO_2) - 16.24 lb/hr and 2.0 ppmvd @ 15% O_2; VOC (as methane) - 5.66 lb/hr and 2.0 ppmvd @ 15% O_2; CO - 19.78 lb/hr and 4.0 ppmvd @ 15% O_2; PM_{10} - 13.53 lb/hr; or SO_x (as SO_2) - 1.58 lb/hr. NO_x (as NO_2) emission limits are one hour rolling averages. All other emission limits are three hour rolling averages. [District Rules 2201, 4001, and 4703]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-46 Emission rates from this unit (without duct burner firing), except during startup and shutdown periods, shall not exceed any of the following limits: NO_x (as NO_2) - 13.16 lb/hr and 2.0 ppmvd @ 15% O_2; VOC (as methane) - 3.21 lb/hr and 1.4 ppmvd @ 15% O_2; CO - 16.02 lb/hr and 4.0 ppmvd @ 15% O_2; PM_{10} - 11.0 lb/hr; or SO_x (as SO_2) - 1.27 lb/hr. NO_x (as NO_2) emission limits are one hour rolling averages. All other emission limits are three hour rolling averages. [District Rules 2201, 4001, and 4703]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-47 Emissions from this unit, on days when a startup and/or shutdown occurs, shall not exceed the following limits: NO_x (as NO_2) - 632.5 lb/day; VOC - 167.4

lb/day; CO - 3,988.6 lb/day; PM_{10} - 304.5 lb/day; or SO_x (as SO_2) - 35.4 lb/day. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-48 Ammonia (NH_3) emissions shall not exceed 10 ppmvd @ 15% O_2 over a 24 hour rolling average. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-49 Annual emissions from the CTG, calculated on a twelve consecutive month rolling basis, shall not exceed any of the following limits: NO_x (as NO_2) - 149,600 lb/year; CO - 504,000 lb/year; VOC - 41,880 lb/year; PM_{10} - 102,520 lb/year; or SO_x (as SO_2) - 11,908 lb/year. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO turbine emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-50 Each one hour period shall commence on the hour. Each one hour period in a three hour rolling average will commence on the hour. The three hour average will be compiled from the three most recent one hour periods. Each one hour period in a twenty-four hour average for ammonia slip will commence on the hour. The twenty-four hour average will be calculated starting and ending at twelve-midnight. [District Rule 2201]

Verification: None.

AQ-51 Daily emissions will be compiled for a twenty-four hour period starting and ending at twelve-midnight. Each month in the twelve consecutive month rolling average emissions shall commence at the beginning of the first day of the month. The twelve consecutive month rolling average emissions to determine compliance with annual emissions limitations shall be compiled from the twelve most recent calendar months. [District Rule 2201]

Verification: None.

AQ-52 Compliance with ammonia slip limit shall be demonstrated utilizing the following calculation procedure: ammonia slip ppmvd @ 15% O_2 = ((a - (b x c/1,000,000)) x (1,000,000 / b) x d), where a = ammonia injection rate (lb/hr) / (17 lb/lb mol), b = dry exhaust flow rate (lb/hr) / (29 lb/lb mol), c = change in measured NO_x concentration ppmvd @ 15% O_2 across the catalyst and d = correction factor. The correction factor shall be derived annually during compliance testing by comparing the measured and calculated ammonia slip. Alternatively, the project owner may utilize a continuous in-stack ammonia monitor, acceptable to the District to monitor compliance. At least 60 days prior to using a NH_3 CEM, the project owner shall submit a monitoring plan for District review and approval. [District Rule 4102]

Verification: If an ammonia in-stack monitor is proposed the project owner shall include the ammonia monitor in the Continuous Emission Monitoring System (CEMS) protocol that is required to be approved by the APCO and CPM under Condition **AQ-37**.

AQ-53 Source testing to measure startup NO_x, CO, and VOC mass emission rates shall be conducted for one of the gas turbines (C-3953-1 or C-3953-2) prior to the end of the commissioning period and at least once every seven years thereafter. CEM relative accuracy shall be determined during startup source testing in accordance with 40 CFR 60, Appendix B. [District Rule 1081]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-54 Source testing (with and without duct burner firing) to measure the NO_x, CO, and VOC emission rates (lb/hr and ppmvd @ 15% O2) shall be conducted within 60 days after the end of the commissioning period and at least once every twelve months thereafter. [District Rules 1081 and 4703]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-55 Source testing (with and without duct burner firing) to measure the PM_{10} emission rate (lb/hr) and the ammonia emission rate shall be conducted within 60 days after the end of the commissioning period and at least once every twelve months thereafter. [District Rule 1081]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-56 Compliance with natural gas sulfur content limit shall be demonstrated within 60 days after the end of the commissioning period and weekly thereafter. After demonstrating compliance with the fuel sulfur content limit for 8 consecutive weeks for a fuel source, then the testing frequency shall not be less than quarterly. If a test shows noncompliance with the sulfur content requirement, the source must return to weekly testing until eight consecutive weeks show compliance. [District Rules 1081, 2540, and 4001]

Verification: The project owner shall compile continuous fuel sulfur content monitoring data from the gas supplier, or if such data is not available, the project owner shall test the sulfur content of the natural gas fuel monthly using recognized ASTM method(s). The fuel sulfur content data shall be submitted to the CPM and the APCO in the Quarterly Operation Reports (**AQ-SC6**).

AQ-57 Source testing to determine the percent efficiency of the turbine shall be conducted within 60 days after the end of the commissioning period and at least once every twelve months thereafter. [District Rule 4703]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-58 Compliance demonstration (source testing) shall be District witnessed, or authorized and samples shall be collected by a California Air Resources Board certified testing laboratory. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified

30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081]

Verification: The project owner shall notify the CPM and the District 30 days prior to any compliance source test. The project owner shall provide a source test plan to the CPM and District for approval fifteen (15) days prior to testing. The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-59 The following test methods shall be used: PM_{10} - EPA Method 5 (front half and back half) or 201 and 202a, NO_x - EPA Method 7E or 20, CO - EPA Method 10 or 10B, O_2 - EPA Method 3, 3A, or 20, VOC - EPA Method 18 or 25, ammonia - BAAQMD ST-1B, and fuel gas sulfur content - ASTM D3246. EPA approved alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081, 4001, and 4703]

Verification: The project owner shall provide a source test plan demonstrating compliance with this condition to the CPM and APCO for approval fifteen (15) days prior to testing.

AQ-60 Source testing to determine the percent efficiency of the turbine shall be conducted utilizing the procedures in District Rule 4703 (Stationary Gas Turbines). [District Rule 4703]

Verification: The project owner shall provide a source test plan demonstrating compliance with this condition to the CPM and District for approval fifteen (15) days prior to testing.

AQ-61 The project owner shall maintain the following records: date and time, duration, and type of any startup, shutdown, or malfunction; performance testing, evaluations, calibrations, checks, adjustments, any period during which a continuous monitoring system or monitoring device was inoperative, and maintenance of any continuous emission monitor. [District Rules 2201 and 4703]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, CARB and the Commission.

AQ-62 The project owner shall maintain the following records: hours of operation, fuel consumption (scf/hr and scf/rolling twelve month period), continuous emission monitor measurements, calculated ammonia slip, and calculated NO_x mass emission rates (lb/hr and lb/twelve month rolling period). [District Rules 2201 and 4703]

Verification: The project owner shall make the records available for inspection of records by representatives of the District, CARB and the Commission.

AQ-63 Results of continuous emissions monitoring shall be reduced according to the procedure established in 40 CFR, Part 51, Appendix P, paragraphs 5.0 through 5.3.3, or by other methods deemed equivalent by mutual agreement with the District, the ARB, and the EPA. [District Rule 1080]

Verification: None.

AQ-64 Audits of continuous emission monitors shall be conducted quarterly, except during quarters in which relative accuracy and total accuracy testing is performed, in accordance with EPA guidelines. The District shall be notified prior to completion of the audits. Audit reports shall be submitted along with quarterly compliance reports to the District. [District Rule 1080]

Verification: The project owner shall submit to the CPM and APCO the CEMS audits demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-65 The project owner shall comply with the applicable requirements for quality assurance testing and maintenance of the continuous emission monitor equipment in accordance with the procedures and guidance specified in 40 CFR Part 60, Appendix F. [District Rule 1080]

Verification: The project owner shall submit to the CPM and APCO the CEMS audits demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-66 Project owner shall notify the District of any breakdown condition as soon as reasonably possible, but no later than one hour after its detection, unless the project owner demonstrates to the District's satisfaction that the longer reporting period was necessary. [District Rule 1100, 6.1]

Verification: The project owner shall comply with the notification requirements of the District and submit written copies of these notification reports to the CPM and the APCO as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-67 The District shall be notified in writing within ten days following the correction of any breakdown condition. The breakdown notification shall include a description of the equipment malfunction or failure, the date and cause of the initial failure, the estimated emissions in excess of those allowed, and the methods utilized to restore normal operations. [District Rule 1100, 7.0]

Verification: The project owner shall comply with the notification requirements of the District and submit written copies of these notification reports to the CPM as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-68 The project owner shall submit a written report to the APCO for each calendar quarter, within 30 days of the end of the quarter, including: time intervals, data and magnitude of excess emissions, nature and cause of excess (if known), corrective actions taken and preventive measures adopted; averaging period used for data reporting shall correspond to the averaging period for each respective emission standard; applicable time and date of each period during which the CEM was inoperative (except for zero and span checks) and the nature of system repairs and adjustments; and a negative declaration when no excess emissions occurred. [District Rule 1080]

Verification: The project owner shall submit to the CPM and APCO the excess emissions and other data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-69 Project owner shall provide notification and record keeping as required under 40 CFR, Part 60, Subpart A, 60.7. [District Rule 4001]

Verification: The project owner shall comply with the notification and record keeping requirements specified under 40 CFR, Part 60, Subpart A, 60.7. The project owner shall make records available for inspection by representatives of the District, CARB and the Commission upon request.

AQ-70 Project owner shall submit a semiannual report to the APCO listing any daily period during which the sulfur content of the fuel being fired in the gas turbine exceeded 0.8% by weight. [District Rule 4001]

Verification: The project owner shall submit to the CPM and APCO the sulfur content exceedance data as required in this condition semiannually as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-71 All records required to be maintained by this permit shall be maintained for a period of at least five years and shall be made readily available for District inspection upon request. [District Rule 2201]

Verification: The project owner shall make records available for inspection by representatives of the District, CARB and the Commission upon request.

Conditions of Certification AQ-72 through AQ-79 apply to each of the cooling towers unless otherwise noted.

EQUIPMENT DESCRIPTION, UNIT C-3953-3-0:
108,740 GPM MECHANICAL DRAFT PLANT COOLING TOWER WITH 7 CELLS AND HIGH EFFICIENCY DRIFT ELIMINATOR

EQUIPMENT DESCRIPTION, UNIT C-3953-4-0:
10,100 GPM MECHANICAL DRAFT CHILLER AUXILIARY COOLING TOWER #1 WITH 4 CELLS AND HIGH EFFICIENCY DRIFT ELIMINATOR

EQUIPMENT DESCRIPTION, UNIT C-3953-5-0:
10,100 GPM MECHANICAL DRAFT CHILLER AUXILIARY COOLING TOWER #2 WITH 4 CELLS AND HIGH EFFICIENCY DRIFT ELIMINATOR

EQUIPMENT DESCRIPTION, UNIT C-3953-6-0:
10,100 GPM MECHANICAL DRAFT CHILLER AUXILIARY COOLING TOWER #3 WITH 4 CELLS AND HIGH EFFICIENCY DRIFT ELIMINATOR

AQ-72 Project owner shall submit cooling tower design details including the cooling tower type, drift eliminator design details, and materials of construction to the District at least 90 days before the tower is operated. [District Rule 7012]

Verification: The project owner shall provide copies of cooling tower and drift eliminator design details to the CPM and the District for approval at least 30 days prior to construction of permanent foundations for the cooling tower.

AQ-73 No hexavalent chromium containing compounds shall be added to cooling tower circulating water. [District Rule 7012]

Verification: The project owner shall provide the list of cooling tower water additives (i.e. biocides, fungicides, anti-scaling compounds, etc.) demonstrating compliance with this condition to the CPM for approval at least 30 days prior to operation of the cooling tower and shall provide any revisions to the cooling tower water additives list to the CPM for approval prior using the new water additive.

AQ-74 For the Plant Cooling Tower the drift eliminator drift rate shall not exceed 0.0005%. [District Rule 2201]

Verification: The project owner shall provide copies of plant cooling tower and drift eliminator design details to the CPM and the District for approval at least 30 days prior to construction of permanent foundations for the plant cooling tower.

AQ-75 For the Plant Cooling Tower, Unit C-3953-0, the PM_{10} emission rate shall not exceed 79.3 lb/day. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the plant cooling tower emission data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-76 For the three Chiller Auxiliary Cooling Towers; Units C-3953-4, C-3953-5, and C-3953-6, the drift eliminator drift rate shall not exceed 0.0006%. [District Rule 2201]

Verification: The project owner shall provide copies of chiller auxiliary cooling tower and drift eliminator design details to the CPM and the District for approval at least 30 days prior to construction of permanent foundations for the chiller auxiliary cooling towers.

AQ-77 For the three Chiller Auxiliary Cooling Towers; Units C-3953-4, C-3953-5, and C-3953-6, the PM_{10} emission rate shall not exceed 8.8 lb/day each. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the chiller auxiliary cooling towers emission data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-78 Compliance with the PM_{10} daily emission limit shall demonstrated as follows: PM_{10} lb/day = circulating water recirculation rate * total dissolved solids concentration in the blowdown water * design drift rate. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the chiller auxiliary cooling towers emission data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-79 Compliance with PM_{10} emission limit shall be determined by blowdown water sample analysis by independent laboratory within 60 days of initial operation and quarterly thereafter. [District Rule 1081]

Verification: The results and field data collected from cooling tower blowdown water samples analysis shall be submitted to the CPM and the District as part of the Quarterly Operational Report (**AQ-SC6**).

Conditions of Certification AQ-80 through AQ-100 apply to the auxiliary boiler.

EQUIPMENT DESCRIPTION, UNIT C-3953-7-0:
37.4 MMBTU/HR CLEAVER BROOKS MODEL CBL-700-900-200#ST NATURAL GAS-FIRED BOILER WITH ALZETA MODEL CSB ULTRA LOW NOX BURNER

AQ-80 The exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and shall be equipped with safe permanent provisions to sample stack gases with a portable NO_x, CO, and O_2 analyzer during District inspections. The sampling ports shall be located in accordance with the CARB regulation titled California Air Resources Board Air Monitoring Quality Assurance Volume VI, Standard Operating Procedures for Stationary Emission Monitoring and Testing. [District Rule 1081]

Verification: Prior to construction of the auxiliary boiler stack the project owner shall provide to the CPM for approval detailed plan drawings of the auxiliary boiler stack that show the sampling ports and demonstrate compliance with the requirements of this condition. The project owner shall make the site available for inspection of the auxiliary boiler stack by representatives of the District, CARB and the Commission.

AQ-81 The boiler shall be equipped with an in-stack oxygen (O_2) monitoring system to measure and record excess O_2. [District Rules 2201 and 4351]

Verification: The project owner shall provide an in-stack O_2 monitoring system protocol for approval by the CPM and the APCO as part of the CEMS protocol required in Condition **AQ-37**. The project owner shall make the site available for inspection of the auxiliary boiler O_2 monitoring system by representatives of the District, CARB and the Commission.

AQ-82 The boiler shall be fired exclusively on natural gas with a sulfur content of no greater than 0.25 grain of sulfur compounds (as S) per 100 dry scf of natural gas. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the fuel sulfur content data, as required to be compiled in Condition **AQ-56**, demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-83 During startup or shutdown, boiler exhaust emissions shall not exceed either of the following limits: NO_x (as NO_2) - 2.3 lb/hr or CO - 2.9 lb/hr. [District Rules 2201 and 4102]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler startup and shutdown emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-84 Startup is defined as the period beginning with boiler initial firing until the unit meets the ppmvd emission limits in Condition **AQ-85**. Shutdown is defined as the period beginning with initiation of boiler shutdown sequence and ending with cessation of firing of the boiler. Startup and shutdown durations shall not exceed one hour, each, per occurrence. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler startup and shutdown event duration data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-85 Emission rates from this unit, except during startup and shutdown periods, shall not exceed any of the following limits: NO_x (as NO_2) - 9.0 ppmvd @ 3% O_2 or 0.0112 lb/MMBtu; VOC (as methane) - 10.0 ppmvd @ 3% O_2; CO - 50.0 ppmvd @ 3% O_2; PM_{10} - 0.005 lb/MMBtu; or SO_x (as SO_2) - 0.0007 lb/MMBtu. All emission limits are three hour rolling averages. [District Rules 2201, 4305, and 4351]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-86 Emissions from this unit, on days when a startup and/or shutdown occurs, shall not exceed the following limits: NO_x (as NO_2) - 9.9 lb/day; VOC - 3.6 lb/day; CO - 33.2 lb/day; PM_{10} - 4.5 lb/day; or SO_x (as SO_2) - 0.6 lb/day. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler emissions data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-87 Annual hours of operation shall not exceed 3,000 hours per calendar year. [District Rule 2201]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler operations data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-88 Source testing to measure startup NO_x and CO mass emission rates shall be conducted upon initial operation and at least once every seven years thereafter. [District Rule 1081]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-89 Source testing to measure the NO_x and CO emissions limits shall be conducted within 60 days of initial operation and not less than once every 12 months thereafter. After demonstrating compliance on two consecutive annual source tests, the unit shall be tested not less than once every thirty-six months. [District Rules 1081, 4305, and 4351]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-90 If the project owner fails any compliance demonstration for the NO_x and/or CO emission limits of this permit when testing not less than every 36 months, compliance with the NO_x and CO emission limits shall be demonstrated not less than once every 12 months. [District Rules 1081, 4305, and 4351]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-91 Source testing to measure the ammonia emission limit shall be conducted within 60 days of initial operation and at least once every twelve months thereafter. [District Rule 1081]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-92 The following test methods shall be used: NO_x (ppmv) - EPA Method 7E or ARB Method 100, NO_x (lb/MMBtu) - EPA Method 19, CO (ppmv) - EPA Method 10 or ARB Method 100, stack gas oxygen - EPA Method 3 or 3A or ARB Method 100, and fuel hhv - ASTM D 1826-88 or D 1945-81 in conjunction with ASTM D 3588-89 for gaseous fuels. EPA approved alternative test methods as approved by the District may also be used to address the source testing requirements of this permit. [District Rules 1081, 4305, and 4351]

Verification: The project owner shall provide a source test plan demonstrating compliance with this condition to the CPM and APCO for approval fifteen (15) days prior to testing.

AQ-93 The stack concentration of NO_x (as NO_2), CO, and O_2 shall be measured at least on a monthly basis using District approved portable analyzer. [District Rule 4305]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler portable analyzer concentration data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-94 The project owner shall maintain records of the date and time of NO_x, CO, and O_2 measurements, the measured NO_2 and CO concentrations corrected to 3% O_2, and the O_2 concentration. The records must also include a description of any corrective action taken to maintain the emissions within the acceptable range. These records shall be retained at the facility for a period of no less than 2 years and shall be made available for District inspection upon request. [District Rule 4305]

Verification: The project owner shall make the auxiliary portable analyzer concentration and corrective action records available for inspection by representatives of the District, CARB and the Commission upon request.

AQ-95 If the NO_x or CO concentrations, as measured by the portable analyzer, exceed the allowable emissions rate, the project owner shall notify the District and take corrective action within one (1) hour after detection. If the portable analyzer readings continue to exceed the allowable emissions rate, the project owner shall conduct an emissions test within 60 days, utilizing District-approved test methods, to demonstrate compliance with the applicable emissions limits. [District Rule 4305]

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-96 The portable analyzer shall be calibrated as recommended by the manufacturer. All instrument calibration data shall be kept on file including the date of calibration. The calibration date shall not exceed 6 months prior to the date the stack concentrations are measured and recorded. [District Rule 4305]

Verification: The project owner shall make portable analyzer manufacturer operating manuals and calibration records available for inspection by representatives of the District, CARB and the Commission upon request.

AQ-97 Concentration measurements shall not be taken until the sample acquisition probe has been exposed to the stack gas for at least 150% of the response time. Measurements shall be taken in triplicate. [District Rule 4305]

Verification: The project owner shall submit to the CPM and APCO the auxiliary boiler portable analyzer concentration data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-98 If water vapor is not removed prior to measurement, the absolute humidity in the gas stream must be determined so that the gas concentrations may be reported on a dry basis. [District Rule 4305]

Verification: None.

AQ-99 If water vapor creates an interference with the measurement of any component, then the water vapor must be removed from the gas stream prior to concentration measurements. [District Rule 4305]

Verification: None.

AQ-100 Records of monthly natural gas HHV, natural gas consumption, and hours of operation shall be maintained and retained on site for a period at least two years and made available for District inspection upon request. [District Rules 2201 and 4351]

Verification: The project owner shall make the records that demonstrate compliance with this condition available for inspection by representatives of the District, CARB and the Commission upon request.

Conditions of Certification AQ-101 to AQ-110 apply to each diesel-fired emergency engine unless otherwise noted.

EQUIPMENT DESCRIPTION, UNIT C-3953-8-0:
300 HP CLARKE MODEL JW6H-UF40 DIESEL-FIRED EMERGENCY IC ENGINE POWERING A FIRE PUMP

EQUIPMENT DESCRIPTION, UNIT C-3953-9-0:
660 HP CATERPILLAR MODEL 3456 DIESEL-FIRED EMERGENCY IC ENGINE POWERING A 500 KW ELECTRICAL GENERATOR

AQ-101 The exhaust stack shall not be fitted with a rain cap, or any other similar device which would impede vertical exhaust flow. [District Rule 4102]

Verification: The project owner shall make the site available for inspection of the emergency engines by representatives of the District, CARB and the Commission.

AQ-102 The sulfur content of the diesel fuel used shall not exceed 0.05% by weight. [District Rule 2201]

Verification: The project owner shall make fuel purchase, MSDS or other fuel supplier records containing diesel fuel sulfur content available for inspection by representatives of the District, CARB and the Commission upon request.

AQ-103 The emergency fire pump engine unit C-3953-8 NO_x emissions shall not exceed 5.2 g/hp-hr. [District Rule 2201]

Verification: The project owner shall provide to the CPM and APCO, 30 days prior to installation of the emergency fire pump IC engine, manufacturer emissions guarantee data or other information demonstrating compliance with this condition.

AQ-104 The emergency fire pump engine unit C-3953-8 PM_{10} emissions shall not exceed 0.09 g/hp-hr. [District Rules 2201 and 4102]

Verification: The project owner shall provide to the CPM and APCO, 30 days prior to installation of the emergency fire pump IC engine, manufacturer emissions guarantee data or other information demonstrating compliance with this condition.

AQ-105 The emergency fire pump engine unit C-3953-8 shall be operated only for maintenance, testing, and required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 100 hours per year. [District Rules 2201, 4201, and 4701]

Verification: The project owner shall submit to the CPM and APCO the emergency fire pump IC engine operations data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-106 The emergency generator engine unit C-3953-9 shall be equipped with either a positive crankcase ventilation (PCV) system that recirculates crankcase emissions into the air intake system for combustion, or a crankcase emissions control device of at least 90% control efficiency. [District Rule 2201]

Verification: The project owner shall provide to the CPM and APCO, 30 days prior to installation of the emergency generator IC engine, manufacturer data demonstrating compliance with this condition.

AQ-107 The emergency generator engine unit C-3953-9 NO_x emissions shall not exceed 6.9 g/hp-hr. [District Rule 2201]

Verification: The project owner shall provide to the CPM and APCO, 30 days prior to installation of the emergency generator IC engine, manufacturer emissions guarantee data or other information demonstrating compliance with this condition.

AQ-108 Emergency generator engine unit C-3953-9 PM_{10} emissions shall not exceed 0.4 g/hp-hr. [District Rule 2201]

Verification: The project owner shall provide to the CPM and APCO, 30 days prior to installation of the emergency generator IC engine, manufacturer emissions guarantee data or other information demonstrating compliance with this condition.

AQ-109 Emergency generator engine unit C-3953-9 shall be operated only for maintenance, testing, and required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 7 hours in any rolling 24-hour period or 38 hours per year. [District Rules 2201, 4102, and 4701]

Verification: The project owner shall submit to the CPM and APCO the emergency generator IC engine operations data demonstrating compliance with this condition as part of the Quarterly Operational Report (**AQ-SC6**).

AQ-110 The project owner shall maintain records of hours of emergency and non-emergency operation. Records shall include the date, the number of hours of operation, the purpose of the operation (e.g., load testing, weekly testing, rolling blackout, general area power outage, etc.), and the sulfur content of the diesel fuel used. Such records shall be retained on site for a period of at least two years and made available for District inspection upon request. [District Rule 4701]

Verification: The project owner shall make the emergency engine(s) records available for inspection by representatives of the District, CARB and the Commission upon request.

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BIOLOGICAL RESOURCES

Melinda Dorin

INTRODUCTION

This section provides the California Energy Commission staff's analysis of potential impacts to biological resources from the Duke Energy North America/Cochran's (DUKE's) proposal for the construction and operation of the Avenal Energy Project (AEP). This analysis is primarily directed toward impacts to state and federally listed species, species of special concern, and other areas of critical biological concern. This document presents information regarding the affected biotic community, the potential environmental impacts associated with the construction and operation of the proposed project, and where necessary, specifies mitigation planning and compensation measures to reduce potential impacts to non-significant levels. This document also determines compliance with applicable laws, ordinances, regulations, and standards (LORS), and specifies conditions of certification.

This analysis is based, in part, on information provided on October 10, 2001, from Duke's Application For Certification (DUKE 2001a), data request responses (DUKE 2002o), a site visit on March 6, 2002, the March 6, 2002 data request workshop, and discussions with and letters from the U. S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (CDFG), and the Kern Water Bank Authority (KWBA).

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

DUKE will need to abide by the following LORS during project construction, operation, and maintenance.

FEDERAL

- **Endangered Species Act of 1973**
  Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq., designate and provide protection of threatened and endangered plant and animal species, and their critical habitat.
- **Migratory Bird Treaty Act**
  Title 16, United States Code, sections 703 through 712, prohibit the take of migratory birds.

STATE

- **California Endangered Species Act of 1984**
  Fish and Game Code sections 2050 et seq. protect California's rare, threatened, and endangered species.
- **Nest or Eggs-Take, Possess, or Destroy**
  Fish and Game Code section 3503 protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird.

- **Birds of Prey or Eggs-Take, Possess, or Destroy**
  Fish and Game Code section 3503.5 protects California's birds of prey and their eggs by making it unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird.
- **Migratory Birds-Take or Possession**
  Fish and Game Code section 3513 protects California's migratory birds by making it unlawful to take or possess any migratory non-game bird as designated in the Migratory Bird Treaty Act or any part of such migratory non-game bird.
- **Fully Protected Species**
  Fish and Game Code sections 3511, 4700, 5050, and 5515 prohibit take of animals that are classified as Fully Protected in California.
- **Non-game Birds**
  Fish and Game Code sections 3800 et. seq. protect all non-game birds by making it unlawful to take non-game birds or parts of a bird unless otherwise provided in the codes section.
- **Significant Natural Areas**
  Fish and Game Code section 1930 et seq. designate certain areas such as refuges, natural sloughs, riparian areas, and vernal pools as significant wildlife habitat.
- **Native Plant Protection Act of 1977**
  Fish and Game Code section 1900 et seq. designate state rare, threatened, and endangered plants.
- **California Code of Regulations**
  Title 14, sections 670.2 and 670.5 list animals of California designated as threatened or endangered.
- **Regional Water Quality Control Board**
  To verify that the federal Clean Water Act permitted actions comply with state regulations, the project owner will need to get a Section 401 certification from the Regional Water Quality Control Board (RWQCB).

LOCAL

No local biological-related LORS have been identified for the AEP.

SETTING

REGIONAL DESCRIPTION

The proposed project site is located in the southwest San Joaquin Valley, California in western Kings County, just south of the Fresno County line. Regional vegetation historically consisted of native grassland and scrub communities, however most of these habitats have been replaced over the past 50 years by agriculture. The project site occurs within this intensive agricultural setting, which includes agricultural lands consisting of croplands, orchards, and vineyards.

In contrast, the southwest half of the project region includes the Guijarral Hills, Kettleman Hills, Kreyenhagen Hills, and Kettleman Plain. These areas are characterized by agriculture in the Kettleman Plain, open space and petroleum production in the Guijarral Hills and Kettleman Hills, and open space in the Kreyenhagen Hills.

Cropland vegetation communities typically consist of row crops, orchards, and grain crops. Most croplands support annuals that are planted in spring and harvested during summer or fall. In many areas, second crops are planted after harvesting the first.

Orchards in the region are typically open, single-species, tree-dominated habitats. Trees range in height from 15 to 30 feet. The understory is usually composed of low-growing grasses and other herbaceous plants, but are managed to totally or partially prevent understory growth. Vineyards are composed of single species planted in rows, usually supported on wood and wire trellises. Between rows of vines, grasses and other herbaceous plants may be planted or allowed to grow as a ground cover to control erosion (DUKE 2001a, Technical Report p. 6.6-2).

A United States Bureau of Reclamation (USBR) right-of-way dissects the agricultural lands in this region and contains the concrete-lined San Luis Canal and adjacent maintained grassland swaths that occur between the canal and the edge of the right-of-way. The Department of Water Resources (DWR) manages the San Luis Canal as part of the California Aqueduct system and conducts routine maintenance in these grasslands such as mowing and occasional pesticide applications (DUKE 2001a, p. 6.6-26).

The Kettleman Hills, Guijarral Hills, and Kreyenhagen Hills west of Interstate 5 support the dominant natural habitat community. The Kettleman Hills and other areas farther to the north and west support large expanses of annual grasslands mostly composed of non-native annual grasses. These non-native species form a vegetation community that is successful at rapidly colonizing soils that have been disturbed. The closest natural habitat communities are located within the Kettleman Hills west of Interstate 5, approximately 2 miles west and southwest of the project site.

Many native and non-native fish and wildlife species are known to inhabit the project region. Bird species include wading birds, shorebirds, gulls, terns, songbirds, and raptors. The most common bird species found within the region include western meadowlark (*Sturnella neglecta*), mourning dove (*Zenaida macroura*), northern mockingbird (*Mimus polyglottos*), and Brewer's blackbird (*Euphagus cyanocephalus*). Other common wildlife species include small and large mammals such as the California ground squirrel (*Citellus beecheyi*) and coyote (*Canis latrans*). Reptiles such as the gopher snake (*Pituophis melanoleucus catenifer*) and side-blotched lizard (*Uta stansburiana hesperis*), and amphibians such as the bullfrog (*Rana catesbeiana*) and the pacific tree frog (*Hyla regilla*) are also common species found in the project region.

Recovery Plans

Although the loss and fragmentation of habitat in the valley has resulted in the elimination and reduction of many species and populations of plants and wildlife, there are several animal species listed under state and/or federal Endangered Species Acts

that inhabit the project region. Most of these special-status species occur in the natural communities west of Interstate 5. Some of these special-status wildlife species include the San Joaquin kit fox (*Vulpes macrotis mutica*) (kit fox), blunt-nosed leopard lizard (*Gambelia silia*), and short-nosed kangaroo rat (*Dipodomys nitratoides*). The Kettleman and Kreyenhagen Hills provide habitat for special-status plants such as San Joaquin woollythreads (*Monolopia congdonii*) and California jewel-flower (*Caulanthus californicus*). The USFWS has designated the natural habitats west of Interstate 5 and the lands that interconnect them as important areas to protect for their contributions to meeting the overall objectives of the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (The Plan) (USFWS 1998, p. 25).

Connecting large blocks of isolated natural land will help reduce the harmful effects of habitat loss and fragmentation. There are three kit fox core populations listed in The Plan, which include the natural lands of western Kern County, approximately 2 miles west of the project site. Kettleman Hills (in western Kings County) provides linkages between core populations, and also probably with smaller, more isolated populations in adjacent valleys (USFWS 1998, p. 132). For kit fox habitat protection and population interchange, it is important to maintain and enhance connecting corridors so kit fox can move between the Kettleman Hills and the San Joaquin Valley's edge through the farmed gap between Kettleman and Guijarral Hills, and between the Guijarral Hills and Anticline Ridge (USFWS 1998, p. 135).

SITE VICINITY

The proposed project would occupy a 148-acre site in the City of Avenal, Kings County, California. The proposed project, except for the water supply and natural gas supply pipelines, is located within an existing agricultural field approximately 200 feet from the San Luis Canal.

The entire project site and adjacent lands have been cleared of native vegetation and have been highly disturbed from agricultural operations such as plowing, disking, irrigating, planting, and harvesting. Approximately 96.8 percent of the project vicinity, which includes everything within one mile of the project site and 1,000 feet out from the project linears, consist of agricultural land with cropland, orchard, and vineyard vegetation communities. The remaining project vicinity includes the San Luis Canal and adjacent grasslands, and existing roads and structures (DUKE 2001a, p. 6.6-17). Adjacent lands to the north, west, and south are newly planted (2001) orchards, and adjacent lands to the east are occupied by row crops and the City of Avenal water treatment plant.

Although the San Luis Canal is a man-made waterway, it supports a variety of fish and aquatic insects and thus provides foraging habitat for several birds. One sensitive bird, the double-crested cormorant (*Phalacrocorax auritus*), was observed using the canal during the March 27-28, 2002 surveys (DUKE 2001a, p. 6.6-12).

There are maintained grasslands alongside the San Luis Canal which comprise approximately 1 percent of the project vicinity. The grassland swaths vary in width from 20 to 400 feet, averaging 80 feet in most places. The March 27-28, 2002 surveys of the grasslands noted several mammal burrows that could be used by special-status

mammals, as well as two western burrowing owl (*Athene cunicularia hypugea*) burrows (DUKE 2001a, p. 6.6-12). The two burrowing owl burrows are located approximately 0.3 and 0.4 mile from the project site, on the opposite side of the canal from the proposed project site. The grasslands also provide foraging opportunities for other special-status birds such as loggerhead shrike (*Lanius ludovicianus*). Two loggerhead shrikes were observed perching on a fence adjacent to the grasslands, approximately 1 mile north of the project site, and a Cooper's hawk (*Accipiter cooperi*) was observed soaring over the grasslands (DUKE 2001a, p. 6.6-12). Willow trees (*Salix sp*.) observed growing in some of the aquatic features in the project vicinity could provide nesting habitat for loggerhead shrike and other bird species. There were no sensitive plant species observed on the proposed project site (DUKE 2001a, p 6.6-25).

For special-status species potentially occurring in the site vicinity and observed on the AEP project site and in the vicinity, refer to **Biological Resources Table 1** and **Table 2**, respectively. For a complete list of species observed at the project site during March 2002 surveys by DUKE biologists, see Table 6.6-2 in the AFC (DUKE 2001a, p.6.6-22).

Table 1 BIOLOGICAL RESOURCES
Special-Status Species Potentially Occurring[1] in the Project Site Vicinity[2]
(DUKE 2001a)

Common Name	Scientific Name	Status[3] Federal/State/Other
PLANTS		
Pale-yellow layia	*Layia heterotricha*	FSC/--/1B
San Joaquin woollythreads	*Monolopia congdonii*	FE/--/1B
California jewel-flower	*Caulanthus californicus*	FE/SE/1B
WILDLIFE		
Invertebrates:		
San Joaquin dune beetle	*Coelus gracilis*	FSC/--/--
Reptiles:		
Blunt-nosed leopard lizard	*Gambelia silia*	FE/SE,CFP/--
Birds:		
Western burrowing owl	*Athene cunicularia hypugea*	FSC/CSC/--
Double-crested cormorant	*Phalacrocorax auritus*	--/CSC/--
Loggerhead shrike	*Lanius ludovicianus*	FSC/CSC/--
Cooper's hawk	*Accipiter cooperi*	--/CSC/--
Mammals:		
San Joaquin antelope squirrel	*Ammospermophilus nelsoni*	FSC/ST/--
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	FSC/--/--
Short-nosed kangaroo rat	*Dipodomys nitratoides*	FSC/CSC/--
San Joaquin kit fox	*Vulpes macrotis mutica*	FE/ST/--

1 Occurrence sources: CDFG California Diversity Database (CNDDB), Recovery Plan for Upland Species in the San Joaquin Valley (SJVRP), Department of Water Resources (DWR).

2 Site vicinity: Site vicinity includes the site, lands within 1 mile of the site, project linear corridors, and lands within 1,000 feet of project linear corridors. It does not include species potentially occurring along the transmission line reconductoring route.

3 Status:
Federal: FE =Federally listed as Endangered; FSC=USFWS designated "Species of Concern"
State: SE=State listed as Endangered; ST=State listed as Threatened; CFP=CDFG designated as "Fully Protected"; CSC=CDFG designated "Species of Special Concern"
Other: 1B =List 1B is defined as plants that are rare, threatened or endangered in California and elsewhere. California Native Plant Society (CNPS) Inventory of Rare & Endangered Plants of California (2001).

Table 2 BIOLOGICAL RESOURCES
Special-Status Species Observed in the Project Site Vicinity[1] During the March 2001 Surveys
(DUKE 2001a)

Common Name	Scientific Name	Status[2] Federal/State/	Habitat
Wildlife			
Birds:			
Double-crested cormorant	*Phalacrocorax auritus*	--/CSC/	San Luis Canal
Western burrowing owl (burrows)	*Athene cunicularia hypugea*	FSC/CSC/	Annual Grassland
Loggerhead shrike	*Lanius ludovicianus*	FSC/CSC/	Annual Grassland
Cooper's hawk	*Accipiter cooperi*	--/CSC/	Cropland (soaring overhead)

1 Site vicinity: Includes all areas within 1 mile of the site and 1,000 feet of the water lines, electric transmission lines, and natural gas pipelines. It does not include species potentially occurring along the transmission line reconductoring route.

2 Status:
Federal:
FSC=USFWS designated "Species of Concern"
State:
CSC=CDFG designated "Species of Special Concern"

Power Plant Site and Laydown Area

The entire proposed power plant permanent structures (power block, switchyard, zero liquid discharge facility (ZLDF), cooling tower, and storm water retention basin) and temporary sites (laydown area, topsoil borrow area, parking areas, and construction office) will occur within the 148-acre agricultural site described in the Site Vicinity. As currently proposed the storm water detention basin is located approximately 200 feet from the San Luis Canal. The USFWS will require a minimum of a 300-foot buffer zone between the edge of the project and the San Luis Canal to prevent potential restrictions to kit fox movements along the San Luis Canal corridor (USFWS 2002b). Staff supports the USFWS requirement for a 300-foot buffer.

DUKE submitted a revised Conceptual Landscaping Plan that has removed large trees from within the 300-foot buffer. The project fence line and non-irrigated landscaping still occur within 200 feet of the San Luis Canal. The revised plan depicts the entire 148-acre site being fenced, with landscaping placed at the fence line in certain areas (DUKE 2002o, p. 4 and Exhibit 138-1). A barbed wire fence will be used around the 148-acre site. A security fence will be used along the perimeter of the power plant facilities. This will allow kit fox to still utilize the agricultural area within the 148-acre site.

The tallest structures on the project site are the proposed power plant's two emission stacks, which will each be 145 feet tall. No evaporation ponds will be required since the facility is designed as a ZLDF. Water trucks and sprinklers will be used to control dust at the site during construction.

Plant Access Road

The proposed 2,610-foot power plant access road (including the construction laydown area road) begins at Avenal Cutoff Road and will occur entirely within the 148-acre agricultural site described in the Site Vicinity.

Natural Gas Pipeline

The proposed 4,000-foot natural gas pipeline interconnection will connect to the existing Kettleman compressor station, southwest of the proposed project site, and run to the northwest portion of the proposed power plant site. The pipeline will be buried along the existing paved Avenal Cutoff Road and Plymouth Avenue. The roads have dirt shoulders that contain no cover vegetation, and border a newly planted orchard adjacent to the project site.

Water Supply

Operation of the AEP will require an average of 2,250 acre-feet of water per year. Daily use is expected to vary between 1,328 to 3,146 gallons per minute, depending on plant operations and cooling efficiencies. According to the AFC, DUKE has secured 2,250 acre-feet per year of guaranteed water supply from the Nickel Family, LLC from their 10,000 acre-feet per year of banked Lower Kern River water (DUKE 2001a, p. 6.5-25). This water will be supplied by the Kern County Water Agency (KCWA) via a new turnout on the San Luis Canal that will be operated by the City of Avenal and through an exchange of local water to its member units for State Water Project supplies. The City of Avenal will provide access to the San Luis Canal turnout for interconnection with the surface water source. The existing City of Avenal turnout structure will remain in place after the new turnout structure is constructed. Please refer to the **Water Resources** section for more information regarding the project water supply.

DUKE proposes to use a backup water supply from nearby agricultural wells. A total of 1.8 miles of underground water supply pipeline is proposed to connect the project to the three wells. The water pipeline corridor just north of the project site runs north and parallel to the San Luis Canal along the edge of a newly planted orchard. The other water pipeline would run from the northwest part of the project site, southwest along Avenal Cutoff Road along the edge of a newly planted orchard.

Anglers use the canal for fishing near the AEP site, upstream of the City of Avenal turnout structure. This area is outside the fence line of the project, and access to this area would not be restricted as a result of the project (DUKE 2002o, Data Response 144).

Construction of the water supply pipelines and the new turnout structure would result in construction activities taking place in the grassland swaths, and within the 300-foot buffer to be established for kit fox. Activities related to the water pipelines would be temporary since the pipelines will be buried, but construction of the new turnout would result in a new permanent structure along the San Luis Canal.

Transmission Line

The proposed 7,000-foot (1.33-mile) above-ground double-circuit 230-kV transmission line interconnection will stretch through row crops from the southeast part of the site at the proposed switchyard, south and then west to the existing PG&E Gates-ARCO line. The transmission line will require seven new 120-foot steel lattice towers. In the AFC, DUKE stated that bird flight diverters will be installed on the transmission line interconnection if required by the USFWS. The USFWS has since indicated that bird flight diverters will be required (DUKE 2001a, p.6.6-38 and USFWS 2002a).

Staff has been informed that reconductoring of approximately 25 miles of existing transmission lines may be required along Path 15 due to anticipated insertion of AEP's power to the grid. Refer to the **Transmission System Engineering** section for background information.

IMPACTS

PROJECT SPECIFIC DIRECT AND INDIRECT IMPACTS

Potential impacts to biological resources from the construction, operation, and maintenance activities (excluding impacts due to potential transmission line reconductoring) of the proposed project include:

- permanent and temporary loss of agricultural habitat from the project footprint and linears;
- potential restriction of kit fox that use the San Luis Canal area as a movement, resting and foraging corridor;
- potential mortality and/or injury to wildlife due to the project's transmission line(s), transmission line reconductoring, and emission stacks;
- potential impacts from electrocution, lighting, noise and air emissions; and
- potential impacts to biological resources from surface water use.

Permanent and Temporary Loss of Habitat

The proposed project will result in temporary and permanent habitat loss as a result of the construction of the project components. Although agricultural land does not provide ideal habitat for special-status species, it does provide limited foraging and nesting opportunities for some birds and mammals.

A summary of project-related permanent and temporary acreage impacts is provided in **BIOLOGICAL RESOURCES Table 3**, below.

Table 3 BIOLOGICAL RESOURCES
Permanent and Temporary Impacts (Acres)[1]
(DUKE 2001a)

Project Component	Permanent (Operations)	Temporary (Construction Only)
Power Plant:		
Power Plant Structures, Laydown, Parking	22	28
Linear Facilities:		
Access Road	2	6
Transmission Line Interconnection	<1	2
Natural Gas Pipeline Interconnection	0	5
Water Supply Pipelines	0	10
Totals:	**25 acres**	**51 acres**

[1]Impacts from potential transmission line reconductoring are not included.

Loss of habitat is the primary cause of population declines of special-status species in the southern San Joaquin Valley (USFWS 1998, p. ix). An estimated minimum of 25 acres of permanent habitat loss and 51 acres of temporary habitat loss are expected to occur from the construction of facilities at the proposed AEP (DUKE 2001a, p. 1-8). The amount of habitat compensation that would be required may change depending on the fence used to enclose the site. Habitat loss would result in a significant impact to the San Joaquin kit fox.

In addition, the project, particularly the water pipeline, will occur adjacent to the San Luis Canal, a kit fox migration corridor, and foraging habitat for blunt-nosed leopard lizard and the short-nosed kangaroo rat. The USFWS and staff are concerned that the construction of the proposed AEP would adversely impact kit fox and other sensitive species that use the grassland swaths that border the San Luis Canal (DUKE 2001a; USFWS 2002a).

Species Mortality and Injury

Sensitive Plants

The 148-acre agricultural site does not currently contain any of the sensitive plants listed in **Biological Resources Table 1**. These plant species are also unlikely to occur within the maintained grassland swaths surrounding the San Luis Canal due to the historical disturbance of this area and the lack of nearby populations. The Department of Water Resources performs various weed control strategies, including mowing, along the San Luis Canal. The closest populations of San Joaquin woollythreads occurs 3 miles southwest in the Kettleman Hills and the closest populations of the pale-yellow layia occurs approximately 8 miles southwest of the project site in the Kettleman Plain and Kreyenhagen Hills. The closest historic population of the California jewel-flower is located approximately 8.5 miles southwest of the proposed project site on the east slope of the Diablo Range. Staff does not anticipate that these sensitive plant species will be affected by the proposed project (excluding potential transmission line reconductoring), since they are currently found miles from the proposed power plant site and ancillary facilities.

Sensitive Wildlife

Some special-status wildlife species, listed in **Biological Resources Table 1**, have the potential to occur in the project vicinity. Development of the project will reduce habitat potentially used by some of these species. Construction activities could result in adverse impacts to individuals either by injury or mortality. These potential impacts can be reduced to less than significant levels using impact avoidance and minimization measures, and habitat compensation.

Invertebrates

The San Joaquin dune beetle historically inhabits inland sand dunes from Antioch, Contra Costa County to the Kettleman Hills, Kings County. The San Joaquin dune beetle requires dune or dune-like habitat and is restricted to small isolated areas along the western edge of the San Joaquin Valley (USFWS 1998, p. 138). The 148-acre agricultural site and project vicinity does not contain this type of habitat. The San

Joaquin dune beetle is unlikely to occur at the project site, and therefore impacts to this species are unlikely to occur.

Reptiles

The blunt-nosed leopard lizard, which is state- and federally-listed endangered and a California Fully Protected species, is endemic to the San Joaquin Valley. Historically, this species is typically associated with sparsely vegetated alkali and desert scrub habitat. Non-native grasslands also provide suitable habitat, since most of the historic habitat has been converted to agriculture (USFWS 1998). The 148-acre agricultural site does not contain habitat for the blunt-nosed leopard lizard, however this species could potentially occur in the maintained grasslands adjacent to the San Luis Canal, where it may use small mammal burrows for cover. Since the species is fully protected the CDFG does not issue Incidental Take Permits (CDFG Code Section 2081), and no take is allowed. Construction activities within or next to the grassland swath could have a significant impact upon this species unless impact avoidance measures are implemented.

Birds

Construction disturbance (e.g. nighttime lighting and increased noise) during the breeding season of several sensitive bird species, particularly the burrowing owl, could result in potentially significant impacts. Burrowing owl nesting and foraging habitat exists within the grasslands adjacent to the San Luis Canal (within one mile of the site). Significant impacts to burrowing owls could occur if construction activities occurred near (within 250 feet of) active nests or if foraging habitat next to nesting sites is permanently removed.

The grasslands surrounding the San Luis Canal could provide seasonal and opportunistic foraging opportunities for the Cooper's hawk and year-round foraging opportunities for the loggerhead shrike. Loggerhead shrike nesting habitat exists within the nearby orchards and within willow trees growing in artificial water storage ponds. Nesting birds using the site would be significantly impacted by construction activities that resulted in a direct impact to the nest.

Mammals

The San Joaquin antelope squirrel, San Joaquin pocket mouse, and the short-nosed kangaroo rat (all state and/or federally listed species) could potentially be found in small mammal burrows and suitable loose-textured soils in the maintained grasslands along the San Luis Canal. The closest known occurrences of these species are found in the Kettleman Hills, west of the project site. If these small mammals are found in the grassland swath along the San Luis Canal, there is the potential for significant impacts during project construction.

San Joaquin kit fox may survive along or adjacent to aqueducts, road networks, transmission line corridors and industrial projects given adequate prey base and den sites (USFWS 1998, p. 130). The USFWS and staff are concerned that the AEP, as proposed, will significantly impact kit fox foraging, breeding and resting behavior along the San Luis Canal (USFWS 2002b).

Avian Electrocution

The AEP transmission lines, if not constructed according to current guidelines, have the potential to electrocute birds. Installation of transmission lines and construction of the transmission line towers according to the guidelines suggested by the Avian Powerline Interaction Committee (APLIC 1996), would greatly reduce the likelihood that birds will be electrocuted.

Avian Collision

Bird collisions with electric transmission lines, transmission line ground wires, and exhaust stacks can result in significant bird losses when these structures are located in areas where suitable habitat attracts bird populations. Most bird collisions occur during migration in inclement weather. The site and immediate surrounding areas currently do not contain ideal bird habitat (i.e. freshwater marshes or ponds) for low-flying flocking bird species that could increase the chances of collision with power plant-related facilities.

An almond orchard located underneath the proposed transmission lines was planted in 2001. The life expectancy of an orchard can be 20-30 years. Row crops are also planted in the area. Flood irrigation is not common in the area, and is not likely to be used (DUKE 2002o, p.7). The proposed location of the transmission line is unlikely to result in a significant amount of avian collisions.

Lighting

An increase in nighttime light at the proposed project site is expected to occur as a result of the construction and operation of the proposed AEP facilities. This is expected since the facility will operate continuously and lighting is needed to address worker and public safety concerns. Under certain circumstances, lights can disorient migratory birds flying at night and attract wildlife such as insects and insect-eaters. Although day-time surveys conducted by DUKE's biologists did not detect any sensitive wildlife species flying in the area that might be threatened by an increase of lighting at the site, staff assumes that bats and birds do forage in the area at night.

Duke proposes to light the 145-foot tall exhaust stacks with Federal Aviation Administration (FAA) type red flashing or non-flashing warning lights although the FAA would not require lighting for this project. Outdoor lighting will be of a light to medium level and will be controlled by photocells to switch on at dusk and off at day light each day (DUKE 2002o, Data Response 143). Flashing and solid red lights have been shown to cause significant bird kills and if feasible, should not be used. The USFWS recommends that unless required by the FAA for towers over 199 feet tall, only white (preferred) or red strobe lights should be used (USFWS 2000).

Lighting and activity associated with construction and operation could result in significant impacts to sensitive wildlife species listed in **Biological Resources Table 1** and **Table 2**. The kit fox could be disturbed by the additional light in the project area during construction and operation, resulting in an adverse impact. Sensitive bird species, such as the burrowing owl, could also be disturbed (particularly during nesting season) by lighting during the construction phase.

Noise

Daytime noise sources in the site vicinity consist of noise from vehicular traffic on Avenal Cutoff Road, farm operations, the water treatment facility on the San Luis Canal, distant traffic on Interstate 5, occasional aircraft operations, and natural sounds such as birds and insects. At night, noise from local intermittent traffic on the Avenal Cutoff Road is predominant. Construction noise will result in a temporary (20 months) increase in the ambient noise level from the use of construction equipment (trucks, cranes, rollers, bulldozers, pickup trucks, backhoes, jack hammers, rock drills, and pneumatic tools). The increases in noise will be primarily experienced closest to the noise source. Pile installation activities are associated with the highest sound levels, 95 decibels (dBA) at 50 feet and a series of short steam blows (lasting 2 or 3 minutes each) will be performed several times daily over a 2 or 3 week period. Steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. Although noise levels can be as high as 98 dBA near the equipment, noise levels diminish due to distance and other environmental factors at locations away from noise-producing equipment. Once construction is complete, noise levels will stabilize and operation noise levels will range from 51 dBA to 65 dBA at the site property lines (DUKE 2001a, p. 6.12-32).

Noise and activity associated with construction and operation could result in significant impacts to some sensitive wildlife species, in particular the San Joaquin kit fox, which could be disturbed by noise in the project area during construction and operation.

Sensitive bird species, such as the burrowing owl, could also be disturbed (particularly during nesting season) by noise during the construction phase.

Power Plant Emissions

The project will control emissions of criteria pollutants including oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), sulfur dioxide (SO_2), and particulates less than or equal to 10 microns in diameter (PM_{10}).

DUKE will provide emission reductions from other regional emission sources that exceed the emissions from the project, thus the project is expected to create a net reduction of regional emissions. The facility will incorporate air pollution controls that reflect Best Available Control Technology to reduce emissions. Short-term air quality impacts associated with construction activities will be reduced by compliance with the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) requirements.

National Park Wilderness Areas, designated as Class I areas, are protected in the Clean Air Act from any additional significant air quality deterioration from outside sources including power plants. The closest Class I area is more than 62 miles from the proposed project site (DUKE 2001a, p. 6.2-52). Additionally, there are no sensitive habitats (i.e. serpentine soil habitats) or rare plants within the area that would be impacted by nitrogen deposition. Therefore, impacts to biological resources from power plant emissions are considered to be less than significant.

Water Supply

A new turnout is proposed at the San Luis Canal to divert water to the AEP and the City of Avenal. The San Luis Canal is screened at the intake, and although fish survive in the Canal and there is recreational fishing where there is public access to it, the CDFG does not have screening requirements. The AEP will not impact access to the San Luis Canal by recreational anglers that fish near the site. The AEP will have a less than significant impact on fisheries in the San Luis Canal. CDFG does require notification of construction of the proposed turnout, and a Streambed Alteration Agreement Application would have to be filed with that agency for the new turnout structure (CDFG 2002b, p. 3). The City of Avenal would be constructing the new turnout structure as part of their water treatment facility.

CDFG (CDFG 2002b, p. 4) and staff are concerned that there would be potentially significant impacts to biological resources that use the Lower Kern River flood flows from the transfer of water to the AEP. The Kern County Water Agency (KCWA) certified a Negative Declaration for the *Kern River Restoration and Water Supply Program* in September 2000. A component of the water supply program was the acquisition of the Lower Kern River Water Rights from the Nickel Family, LLC and storage to existing or newly proposed KCWA water banking facilities. Although the water rights are cited as pre-1914 rights, the Negative Declaration also states that currently not all of the water can be captured (DUKE 2001e, Kern River Restoration and Supply Project Negative Declaration p. 6). KCWA estimates that on average the Lower Kern River flood flows provide about 40,000 acre feet per year of water. Historically, the Kern along with the Kings, Kaweah and Tule rivers flooded the Tulare Lake Basin and the Buena Vista Lake Basin in high flow years.

The KCWA developed a purchase agreement in 2001 with the California Department of Water Resources for the delivery of 30,000 acre feet per year to the Environmental Water Account. KCWA has also filed a Negative Declaration and Notice of Determination for the *Transfer of 10,000 acre feet per year of Banked Lower Kern River Water* out of Kern County (DUKE 2001e). No significant impacts to biological resources were identified by the KCWA for either the transfer of 40,000 acre feet per year of water to the water banking project or the transfer of 10,000 acre feet per year out of Kern County. However, the Negative Declarations did not provide background information on the biological resources that may potentially use the flooded basin such as wintering waterfowl. Since environmental documentation has been filed by the KCWA and potential impacts to biological resources from the water supply should have been addressed in those environmental documents, staff has not completed an additional analysis addressing potential impacts to biological resources from the proposed water use.

CUMULATIVE IMPACTS

The California Environmental Quality Act defines cumulative impacts as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.”

Air Emissions

There are two existing power plants in the region, GWF Hanford Peaker, which is approximately 15 miles southeast of the proposed AEP and Henrietta Peaker Project approximately 12 miles away. There are no additional power plants expected in the near future. As previously mentioned, there are no sensitive habitats (i.e. serpentine soil habitats) within the area that would be impacted from nitrogen deposition and other air pollution emissions from the two facilities. Therefore, staff does not believe that cumulative power plant emission impacts to biological resources from the GWF Hanford Peaker, Henrietta Peaker Project, and the AEP are likely to occur.

Water Supply

Water is an important resource in California that is allocated to many beneficial uses including, but not limited to agriculture, industrial, municipal, environmental, and recreational. As water is allocated to agriculture and the growing population, less water remains in rivers to be utilized by fish and wildlife. The water supply for the AEP is available through a water transfer, but originates from a pre-1914 water right on the Lower Kern River. As flood flows are captured and diverted to storage there is less surface water available for waterfowl and shorebirds wintering in the southern portion of the Central Valley to utilize.

The areas available currently in the Tulare Basin that provide habitat for wintering waterfowl are usually private duck hunt clubs, or preserves. Diversion of surface flow contributes to the cumulative loss of natural habitat available for use. The continual increase in demand for municipal and industrial uses, and storage of surface water has an adverse cumulative impact on biological resources.

Power plants can decrease the cumulative impacts to biological resources by using the least amount of fresh water, and using the best available technology to reduce the amount of water that is required for cooling. The proposed AEP project is designed as a ZLDF. This decreases the amount of water required to cool the power plant, and helps decrease the cumulative impact to the biological resources that use the water. Efficient use also makes water available for transfer to the California Department of Water Resources' Environmental Water Account and is used to enhance flows for fisheries resources in the San Francisco Bay/Sacramento-San Joaquin Delta. Efficient water use reduces cumulative impacts to biological resources to less than significant.

Habitat Loss/Disturbance

The greatest known threat to the survival of the San Joaquin kit fox has been, and will continue to be, the loss and degradation of habitat by agricultural and industrial development and urbanization in the San Joaquin Valley (USFWS 1998, p. 129). Suitable habitat compensation will address any cumulative habitat loss concerns.

MITIGATION

DUKE has proposed mitigation measures to avoid or reduce impacts to biological resources (DUKE 2001a, p. 6.6-38). The project owner will develop a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) that will provide details for implementing all mitigation measures proposed by the applicant, staff, and

other agencies. As of this staff assessment, staff has requested that a draft BRMIMP be submitted by the applicant to staff, prior to the Final Staff Assessment. A Final BRMIMP will be provided to and approved by staff and other agencies, prior to the start of any construction activities. See Biological Resources Condition of Certification **BIO-5** for more information. Staff supports the measures proposed by DUKE and has incorporated them into staff's proposed Conditions of Certification. Additional mitigation measures may be recommended due to the potential transmission line reconductoring.

SUMMARY OF AEP'S PROPOSED MITIGATION MEASURES

The applicant proposes to:

- implement a Worker Environmental Awareness Program;
- design transmission lines to reduce risk of avian collision;
- install emission control measures to minimize air pollution and impacts to biological resources;
- direct project lighting downward to minimize effects on wildlife;
- assure that weedy species are not introduced to the surrounding areas;
- conduct pre-construction biological resources surveys; and
- acquire compensation lands or credits for habitat disturbance (DUKE 2001A, P.6.6-38).

SUMMARY OF STAFF'S PROPOSED MITIGATION MEASURES

Staff supports AEP's mitigation measures and recommends that the project owner implement the following additional mitigation measures:

- provide a Designated Biologist on site to monitor all construction activities;
- develop and abide by the California Energy Commission Compliance Project Manager (CPM) and agency approved BRMIMP;
- establish a 300-foot buffer/avoidance zone along the San Luis Canal to minimize potential impacts to the San Joaquin kit fox and other sensitive species;
- comply with mitigation measures specified in the USFWS Biological Opinion and CDFG Incidental Take Permit;
- incorporate feasible impact avoidance measures into the project design;
- minimize impacts from construction to avoid wildlife harassment or harm;
- provide a landscaping plan consistent with biological resources requirements;
- conduct pre-construction surveys; and
- use white lights on power plant structures.

HABITAT COMPENSATION

To determine the amount of habitat necessary to compensate for temporary and permanent habitat impacts, the following USFWS-recommended habitat compensation ratios were used (DUKE 2001a, p. 6.6-38):

- 1 acre of habitat protected for every 1 acre of permanently disturbed agricultural land and;
- 0.2 acre of habitat protected for every 1 acre of temporarily disturbed agricultural land (DUKE 2001d).

Information provided by DUKE indicates that a minimum of 35.2 acres of habitat will need to be secured prior to construction of the AEP. Although the entire 148 acres will be fenced, fencing material would be used that does not restrict kit fox movement through the area that would remain in agriculture. The amount of acreage impacted is based on the acres used for project and related facilities, and what would be used for construction laydown and parking. Please refer to **BIOLOGICAL RESOURCES Table 4** below for impacts, compensation ratios, and the minimum acres required to be purchased.

Table 4
BIOLOGICAL RESOURCES Habitat Compensation Acreage Required for the Project[1]

	Total Impacts (acres)	Compensation Ratio	Compensation Acres Required
Permanent	25	1:1	25
Temporary[2]	51	0.2:1	10.2
TOTAL	**76**	**--**	**35.2**

1 Impacts due to potential reconductoring not included.
2 Temporary impacts last for no more than two years.

A Biological Assessment was submitted to the USFWS and the U.S. Environmental Protection Agency (USEPA) initiated Section 7 consultation on February 13, 2002 (USEPA 2002a). The USFWS has recently suggested that the compensation funds be provided to the KWB conservation bank through the Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan (KWBA 1997). CDFG would be unlikely to support using the KWB conservation bank since the AEP is outside the area covered in the Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan. The CDFG has issued a letter to the Commission and the applicant containing comments on the AFC and recommendations (CDFG 2002b). Duke and the resources agencies have been researching alternative sites for habitat compensation mitigation. Staff will continue to work with the USFWS, the CDFG and the Applicant to adequately reduce impacts to kit fox habitat to less than significant levels with mitigation. Lands needed to off-set habitat loss will need to be purchased and protected in perpetuity prior to any surface disturbance to mitigate impacts to levels less than significant (See Biological Resources Condition of Certification **BIO-15**).

MITIGATION FOR MORTALITY OR INJURY

Prior to construction of the proposed AEP, a Designated Biologist will be hired. The Designated Biologist will be responsible for preconstruction surveys, monitoring activities during construction, and taking preventative measures to reduce the potential mortality or injury to species occurring at the project site. The hiring of a Designated Biologist with proper qualifications (see Condition of Certification **BIO-1)** and duties (see Condition of Certification **BIO-2**) and with the authority outlined in Condition of

Certification **BIO-3** will help ensure that potential impacts to sensitive species will be addressed.

A Worker Environmental Awareness Program (WEAP) will also be developed and implemented to educate workers about the biological resources at the site, compliance with LORS that protect species, and measures the workers shall take if sensitive species are seen in the project vicinity (see Condition of Certification **BIO-4**).

A BRMIMP would be developed in consultation with the Designated Biologist, for approval by the Energy Commission Compliance Project Manager (CPM) and would include items such as survey requirements, mitigation measures, permit requirements, contact information, and forms for logs and for reporting non-compliance actions **(BIO-5**).

Sensitive Wildlife

The applicant will be required to do pre-construction surveys for sensitive species as well as for nesting birds, or species that could be directly impacted by project construction (see Conditions of Certification **BIO-12, BIO-13,** and **BIO-14**). If sensitive species or nesting birds are found, then impact avoidance and impact minimization measures will be employed to avoid impacts or reduce them to a less than significant level.

Reptiles

To prevent injury or mortality to the state and federally listed and California Fully Protected blunt-nosed leopard lizards, seasonal pre-construction surveys will be required along the San Luis Canal in the location of the proposed water pipeline. Above ground blunt-nosed leopard lizard activity is closely related to air temperatures as well as other weather conditions. The survey protocol will be included in the BRMIMP. If surveys detect active burrows or individuals, or evidence of individuals, avoidance measures to prevent take of this California Fully Protected species will need to be employed (see Condition of Certification **BIO-12**).

Birds

Direct and indirect impacts to burrowing owls from construction activities will be mitigated by impact avoidance and the establishment of a buffer zone, consistent with the requirements in the *Burrowing Owl Survey Protocol and Guidelines* (CBOC 1993). If an owl relocation is required, then impacts will be mitigated by acquiring (either by direct purchase or conservation easement) suitable burrowing owl habitat. Surveys will be performed to verify the presence or absence of this species prior to site mobilization, and the survey results will be sent to the Compliance Project Manager (CPM), CDFG, and USFWS. If burrowing owls are found on or near the site and mitigation measures are implemented, impacts should be reduced to less than significant levels (see Condition of Certification **BIO-14**).

If other nesting bird species are present at the site prior to the start of construction, then avoidance measures shall be taken to reduce direct impacts to less than significant. Buffer zones will be set up around active nests until young birds can forage on their own, or they fledge the nest. Measures to avoid direct impacts to nesting birds

protected by the Migratory Bird Treaty Act and/or Fish and Game Code will be placed in the BRMIMP and implemented. Implementation of mitigation measures should reduce impacts to less than significant levels (see Conditions of Certification **BIO-5** and **BIO-12**).

Mammals

The USFWS has indicated that they will require the establishment of a 300-foot buffer zone between the San Luis Canal and the project site in order to mitigate potentially significant impacts to kit fox that may use the canal for foraging, denning and as a movement corridor. Establishment of the buffer would reduce direct and indirect impacts from construction activity, noise and lights as well as permanent restrictions to kit fox movement, foraging and resting behavior (see Condition of Certification **BIO-10**). Landscaping for the site would be implemented in accordance with **Visual Resources** Condition of Certification **VIS-5**. In addition, pre-construction surveys for kit fox will need to be conducted prior to site mobilization. If active dens containing pups are found, seasonal avoidance will be required and additional habitat compensation may need to be provided as recommended by USFWS (USFWS 1999) (see Condition of Certification **BIO-13**).

Establishment of a buffer zone along the San Luis Canal would reduce impacts, to less than significant levels, to other small mammal species identified in **Biological Resources Table 1** that could potentially occur in the grasslands along the San Luis Canal. Pre-construction surveys will be required in areas where the water pipeline or other construction activities will cross the grassland swath. If pre-construction surveys detect individuals, or evidence of individuals, seasonal avoidance and additional habitat compensation as recommended by CDFG and USFWS, and approved by the CPM, may be required. For more information, see Condition of Certification **BIO-12**).

Avian Electrocution

Transmission lines will be built following Avian Powerline Interaction Committee Guidelines (APLIC 1996), so the potential for electrocution of large perching birds is very low and potential impacts would be reduced to a less than significant level (see Condition of Certification **BIO-9**).

Avian Collision

Avian collisions with transmission line ground wires will be reduced to a less than significant level if bird flight diverters are properly installed on the ground wires. Staff and the USFWS believe that implementation of this mitigation measure will reduce any avian collisions with transmission line ground wires to a less than significant level (see Condition of Certification **BIO-10**).

If transmission line reconductoring is also required as part of this project, bird flight diverters may also be required on the ground wires of those transmission lines, depending on the location of the lines, in order to mitigate potentially significant impacts.

FACILITY CLOSURE

Sometime in the future, the AEP will experience either a planned closure, or be unexpectedly (either temporarily or permanently) closed. When facility closure occurs, it must be done in such a way as to protect the environment and public health and safety. To address facility closure, an "on-site contingency plan" will be developed by the project owner, and approved by the Energy Commission Compliance Project Manager (CPM). Facility Closure mitigation measures will also be included in the BRMIMP prepared by DUKE (see Condition of Certification **BIO-6**).

PLANNED OR UNEXPECTED PERMANENT FACILITY CLOSURE

The area required for the power plant, parking, gas pipeline, and water disposal line are in disturbed habitats. The facility closure plan needs to address habitat restoration measures to be implemented along the water supply and transmission line routes in the event of a planned or an unexpected permanent closure. Planned or unexpected permanent facility closure may also trigger the removal of the transmission conductors, and the entire transmission line, since birds are known to collide with transmission line ground wires.

UNEXPECTED TEMPORARY CLOSURE

In the event that the Energy Commission CPM decides that the facility is permanently closed, the facility closure measures provided in the on-site contingency plan and BRMIMP would need to be implemented.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

There are several outstanding issues that need to be resolved prior to the Final Staff Assessment. A summary of the outstanding issues is below:

- a draft BRMIMP; and
- a proposed habitat compensation strategy;

The final BRMIMP must be approved by the CPM in consultation with CDFG and USFWS prior to the start of project construction. DUKE must identify the location and mechanism for acquiring compensation lands prior to the commission approval and implement this Condition of Certification prior to construction. DUKE has been working towards resolving this issue, but a final compensation package has not been identified and agreed upon.

In addition, DUKE must conduct pre-construction surveys and report all sensitive resources and nesting bird species located within the construction corridor to the CPM, USFWS, and CDFG. The applicant noted two owl burrows on the opposite side of the San Luis Canal from the project site during the March 27-28, 2002 field survey (DUKE 2001a). Staff recognizes that burrowing owls could move into the burrows at any time,

but pre-construction surveys will be required and the appropriate measures taken to reduce impacts.

COMPLIANCE WITH LORS

DUKE would be required to enter into an Federal Endangered Species Act Section 7 or Section 10 consultation with the USFWS (see Condition of Certification **BIO-9**). In addition, CDFG has recommended that DUKE acquire a California Endangered Species Act Section 2081 Incidental Take Permit for the life of the project (CDFG 2002b) (see Condition of Certification **BIO-7**) and file a Streambed Alteration Agreement Application (Condition of Certification **BIO-8**).

The USEPA initiated consultation with the USFWS under Section 7 of the Federal Endangered Species Act on February 13, 2002. Due to the changes in the habitat compensation package, the USFWS may be able to issue a letter through the existing Kern County Water Agency Habitat Compensation Plan. DUKE is in the process of completing an Incidental Take Permit application for submittal to CDFG.

RECOMMENDATIONS

At this time, Biological Resources staff cannot make a recommendation to certify the proposed AEP. Staff expects to incorporate all outstanding information into the Final Staff Assessment. The bulleted items above, when provided, should allow staff to make a final conclusion regarding the project's potential impacts and recommend suitable mitigation. Staff recommends the Energy Commission adopt the following Conditions of Certification.

CONDITIONS OF CERTIFICATION

BIOLOGICAL RESOURCES CONDITIONS

Designated Biologist Selection

BIO-1 The project owner shall submit the resume, including contact information, of the proposed Designated Biologist to the CPM for approval.

Verification: The project owner shall submit the specified information at least 60 days prior to the start of any site (or related facilities) mobilization. Site and related facility activities shall not commence until an approved Designated Biologist is available to be on site.

Protocol: The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's Degree in biological sciences, zoology, botany, ecology, or a closely related field;
2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;

3. At least one year of field experience with biological resources found in or near the project area;

If a Designated Biologist needs to be replaced, then the specified information of the proposed replacement must be submitted to the CPM at least ten working days prior to the termination or release of the preceding Designated Biologist.

Designated Biologist Duties

BIO-2 The Designated Biologist shall perform the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities:

1. Advise the project owner's Construction/Operation Managers, Supervising Construction Engineer, and Operations Engineer on the implementation of the biological resources' Conditions of Certification;
2. Be available to supervise or conduct mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as the grassland swaths surrounding the San Luis Canal and special status species or their habitat;
3. Clearly mark sensitive biological resource areas and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;
4. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (parking lots) for animals in harms way;
5. Notify the project owner and the CPM of any non-compliance with any biological resources Condition of Certification; and
6. Respond directly to inquiries of the CPM regarding biological resource issues.

Verification: The Designated Biologist shall maintain written records of the tasks described above, and summaries of these records shall be submitted in the Monthly Compliance Reports.

During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report.

Designated Biologist Authority

BIO-3 The project owner's Construction/Operation Manager shall act on the advice of the Designated Biologist to ensure conformance with the biological resources' Conditions of Certification.

Protocol: If required by the Designated Biologist, the project owner's Construction/ Operation Manager shall halt all site mobilization, ground

disturbance, grading, construction, and operation activities in areas specified by the Designated Biologist.

The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be an adverse impact to biological resources if the activities are continued;
2. Inform the project owner and the Construction/Operation Manager when to resume activities; and
3. Notify the CPM if there is a halt of any activities, and advise the CPM of any corrective actions that have been taken, or will be instituted, as a result of the halt.

Verification: The Designated Biologist must notify the CPM immediately (and no later than the following morning of the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, and operation activities. The project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the project owner, a determination of success or failure will be made by the CPM within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

Worker Environmental Awareness Program

BIO-4 The project owner shall develop and implement a CPM approved Worker Environmental Awareness Program (WEAP) in which each of its employees, as well as employees of contractors and subcontractors who work on the project site or any related facilities during site mobilization, ground disturbance, grading, construction, operation and closure are informed about sensitive biological resources associated with the project.

Protocol: The WEAP must:

1. Be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material is made available to all participants;
2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas;
3. Present the reasons for protecting these resources;
4. Present the meaning of various temporary and permanent habitat protection measures;

5. Identify whom to contact if there are further comments and questions about the material discussed in the program; and
6. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist.

Verification: At least 60 days prior to the start of any site (or related facilities) mobilization, the project owner shall provide to the CPM two copies of the WEAP and all supporting written materials prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date.

The signed training acknowledgement forms shall be kept on file by the project owner for a period of at least six months after the start of commercial operation.

During project operation, signed statements for active project operational personnel shall be kept on file for six months following the termination of an individual's employment.

Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP)

BIO-5 The project owner shall submit two copies of the proposed BRMIMP to the CPM (for review and approval) and to CDFG and USFWS (for review and comment) and shall implement the measures identified in the approved BRMIMP.

Protocol: The final BRMIMP shall identify;

1. All biological resources mitigation, monitoring, and compliance measures proposed and agreed to by the project owner;
2. All biological resources Conditions of Certification identified in the Commission's Final Decision;
3. All biological resource mitigation, monitoring and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS Biological Opinion;
4. All biological resources mitigation, monitoring and compliance measures required in other state agency terms and conditions, such as those provided in the CDFG Incidental Take Permit and Streambed Alteration Agreement and Regional Water Quality Control Board permits;

5. All biological resources mitigation, monitoring and compliance measures required in local agency permits, such as site grading and landscaping requirements;
6. All sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation and closure;
7. All required mitigation measures for each sensitive biological resource;
8. Required habitat compensation strategy, including provisions for acquisition, enhancement, and management for any temporary and permanent loss of sensitive biological resources;
9. A detailed description of measures that will be taken to avoid or mitigate temporary disturbances from construction activities;
10. All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction;
11. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities - one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Include planned timing of aerial photography and a description of why times were chosen;
12. Duration for each type of monitoring and a description of monitoring methodologies and frequency;
13. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;
14. All performance standards and remedial measures to be implemented if performance standards are not met;
15. A discussion of biological resources related facility closure measures;
16. A process for proposing plan modifications to the CPM and appropriate agencies for review and approval;
17. A copy of all biological resources permits obtained; and
18. Survey protocols for sensitive species.

Verification: The project owner shall provide the specified document at least 60 days prior to start of any site (or related facilities) mobilization.

The CPM, in consultation with the CDFG, the USFWS and any other appropriate agencies, will determine the BRMIMP's acceptability within 45 days of receipt.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP to obtain CPM approval.

Any changes to the approved BRMIMP must also be approved by the CPM in consultation with CDFG, the USFWS and appropriate agencies to ensure no conflicts exist.

Within thirty days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

Closure Plan Measures

BIO-6 The project owner will incorporate into the permanent or unexpected permanent closure plan, and the BRMIMP, measures that address the local biological resources.

Protocol: The planned or unexpected permanent closure plan shall address the following biological resources related mitigation measures:

1. Removal of transmission conductors when they are no longer used and useful;
2. Removal of all power plant site facilities and related facilities;
3. Measures to restore wildlife habitat to promote the re-establishment of native plant and wildlife species; and
4. Revegetation of the plant site and other disturbed areas utilizing appropriate seed mixture.

Verification: At least twelve months prior to commencement of closure activities, the project owner shall address all biological resources related issues associated with facility closure, which were incorporated into the BRMIMP, in a Biological Resources Element. The Biological Resources Element will be incorporated into the Facility Closure Plan and include a complete discussion of the local biological resources and proposed facility closure mitigation measures.

Incidental Take Permit

BIO-7 The project owner shall acquire an Incidental Take Permit from the California Department of Fish and Game (CDFG) (per Section 2081(b) of the Fish and Game Code; California Endangered Species Act) and incorporate the terms and conditions into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the final CDFG Incidental Take Permit.

Streambed Alteration Agreement

BIO-8 The project owner shall acquire a Streambed Alteration Agreement from the CDFG (per Section 1600 of the Fish and Game Code), and incorporate the biological resource related terms and conditions into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the final CDFG Streambed Alteration Agreement.

Federal Biological Opinion

BIO-9 The project owner shall provide final copies of the Biological Opinion per Section 10 of the federal Endangered Species Act obtained from the U. S. Fish and Wildlife Service. The terms and conditions contained in the Biological Opinion shall be incorporated into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the U. S. Fish and Wildlife Service's Biological Opinion.

Preventative Design Mitigation Features

BIO-10 The project owner shall modify the project design to incorporate all feasible measures that avoid or minimize impacts to the local biological resources.

1. Design transmission line poles, access roads, pulling sites, and storage and parking areas to avoid identified sensitive resources;
2. Establish a 300-foot minimum buffer/avoidance zone measured from the San Luis Canal to any project related buildings, other structures, impervious surfaces, outdoor activity areas and ornamental landscaped areas to minimize potential disturbance to the San Joaquin kit fox and other sensitive species;
3. Design and construct transmission lines and all electrical components to reduce the likelihood of electrocutions of large birds; and
4. Use white lights on the project facilities and face lights downward and away from the San Luis Canal.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP.

Construction Mitigation Management to Avoid Harassment or Harm

BIO-11 The project owner shall manage the construction site, and related facilities, in a manner to avoid or minimize impacts to the local biological resources.

The project owner shall:

1. Temporarily fence and provide wildlife escape ramps for construction areas that contain steep walled holes or trenches if outside of an approved, permanent exclusionary fence. The temporary fence shall be hardware cloth or similar materials that are approved by USFWS and CDFG;
2. Make certain all food-related trash will be disposed of in closed containers and removed at least once a week. Feeding of wildlife shall be prohibited;
3. Prohibit non-security related firearms or weapons from being brought to the site;
4. Prohibit pets from being brought to the site;
5. Report all inadvertent deaths of sensitive species to the appropriate project representative. Injured animals shall be reported to CDFG and the project owner shall follow instructions that are provided by CDFG.
6. Restrict project-related vehicle traffic to established roads, designated temporary access roads, and parking areas;
7. Confine parking and equipment storage to laydown areas, cap pipes 4 inches or greater in diameter that are not in use, and visually inspect pipes for wildlife before use; and
8. Obey speed limits.

Verification: All mitigation measures and their implementation methods will be included in the BRMIMP.

Pre-construction Surveys

BIO-12 The Designated Biologist shall survey for the presence of sensitive and nesting species on the 148-acre proposed project site, within one mile of the site perimeter and 1,000 feet of the project linear facilities thirty days, or in a timeframe approved by the CPM, prior to site mobilization.

Verification: At least 20 days prior to the expected start of any project-related site or related facilities mobilization, the project owner shall provide the CPM, USFWS, and CDFG with the survey results and identify any mitigation measures to be employed in consultation with the CPM, USFWS and CDFG.

San Joaquin Kit Fox Surveys

BIO-13 The Designated Biologist shall survey for San Joaquin kit fox on the 148-acre proposed project site and within one mile of the site and 1,000 feet on either side of the linear corridors, thirty days, or in a timeframe approved by the CPM, prior to site or related facilities mobilization to assess sensitive species presence. If any San Joaquin kit fox are observed, construction will be performed in conformance with the *June 1999 USFWS Standardized Recommendations for Protection of the San Joaquin Kit Fox* (USFWS 1999) prior to and/or during ground disturbance.

Verification: At least 20 days prior to the expected start of any project-related site or related facilities mobilization, the project owner shall provide the CPM, USFWS, and CDFG with the survey results and proposed mitigation strategy to be employed in consultation with the CPM, USFWS and CDFG.

Burrowing Owl Surveys

BIO-14 The Designated Biologist shall survey for burrowing owl activities on the 148-acre parcel and within one mile of the site and 1,000 feet on either side of the linear corridors, twenty days, or in a timeframe approved by the CPM, prior to site mobilization to assess western burrowing owl presence and the need for further mitigation. If any burrowing owls are observed, construction shall be performed in conformance with the *1993 Burrowing Owl Survey Protocol and Mitigation Guidelines* (CBOC 1993) prior to and/or during ground disturbance.

Verification: At least Fifteen days prior to the expected start of any project-related site or related facilities mobilization, the project owner shall provide the CPM, USFWS, and CDFG with the burrowing owl field survey results. If additional habitat compensation is required, the project owner will recommend a habitat compensation strategy for review and approval by the CPM, USFWS and CDFG.

San Joaquin Kit Fox Habitat Compensation

BIO-15 The project owner shall compensate for impacts to San Joaquin kit fox by providing a minimum of 35.2 acres of land to a habitat compensation bank. The compensation bank, or other habitat compensation strategy, shall be approved by the CPM, CDFG, and USFWS for the acquisition of San Joaquin kit fox habitat in the San Joaquin Valley area. The total compensation funds required must be sufficient to cover all land acquisition costs and the establishment of a suitable endowment to cover all administrative, management, maintenance, monitoring, operation, and research costs.

Verification: No less than thirty days prior to the start of any project-related ground disturbance activities, the project owner and the entity approved to receive the funds shall provide written verification to the CPM that the required habitat compensation funds have been provided to and received by the approved habitat compensation bank or other suitable entity.

REFERENCES

APLIC (Avian Powerline Interaction Committee). 1996. Suggested practices for raptor protection on power lines: The state of the art in 1996.

CBOC (California Burrowing Owl Consortium). 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. 15 pp.

CEC (California Energy Commission/McKinney). 2002b. Second Data Requests. Docketed March 25, 2002.

CDFG (California Department of Fish and Game). 2002a. Annette Tenneboe phone conversation with Julie Colyer, Aspen Environmental Group, on April 10, 2002.

CDFG (California Department of Fish and Game) 2002b. Review letter for the Avenal Energy Project, Application for Certification (01-AFC-20). July 10, 2002.

DUKE (Duke Energy North America/Cochran). 2001a. Application for Certification, Avenal Energy Project (01-AFC-20). 2 Volumes. Submitted to the California Energy Commission on October 9, 2001.

DUKE (Duke Energy North America/Seedall). 2001d. Request for Early Consulation Under Section 7 of the Endangered Species Act. Submitted to the California Energy Commission, October 17, 2001.

DUKE (Downey Brand Seymour & Rohwer/Gottwals). 2001e. Copies of CEQA Documents Referenced in Footnote 1 at Page 6.5-3 relating to water transfers: the Department of Water Resources Negative Declaration and the Kern County Water Agency Negative Declaration. Submitted to the California Energy Commission, October 18, 2001.

DUKE (Downey Brand Seymour & Rohwer/Gottwals). 2002a. Duke Energy's Proposed Schedule. Submitted to the California Energy Commission, January 23, 2002.

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DUKE (TRC/ Stenger). 2002o. Responses to Data Requests dated March 25, 2002, May 10, 2002.

KCWA (Kern County Water Agency). 2001a. California Environmental Quality Act Compliance for the Transfer of 10,000 acre-feet per year of Banked Lower Kern River Water Project. Submitted to the California Energy Commission, December 5, 2001.

KWBA (Kern Water Bank Authority). October 2,1997. Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan.

KWBA (Kern Water Bank Authority). 2002. Letter to Julie Colyer, Aspen Environmental Group from Cheryl Harding, on April 8, 2002.

USEPA (U.S. Environmental Protection Agency/Rios). 2002a. Designation of non-federal representative and request to initiate formal consultation under Section 7 of the ESA. Submitted to the California Energy Commission, February 20, 2002.

USFWS (U. S. Fish and Wildlife Service). 1998. Recovery plan for upland species of the San Joaquin Valley, California (The Plan). Region 1, Portland, OR. 319 pp.

USFWS (U.S. Fish and Wildlife Service). 1999. Standardized Recommendations for Protection of the San Joaquin Kit Fox.

USFWS (U.S. Fish and Wildlife Service). 2000. Service Guidance on the Siting, Construction, Operation and Decommissioning of Communications Towers. September 14, 2000

USFWS. 2002a. Brian Peterson phone conversation with Julie Colyer, Aspen Environmental Group, on March 28, 2002.

USFWS. 2002b. Letter to Mark Sims from Jan Knight. March 21, 2002.

USFWS (U.S. Fish and Wildlife Service/Knight). 2002c. Letter acknowledges the US Fish & Wildlife Services February 21, 2002 receipt of February 13, 2002 letter request initiation of formal Section 7 consultation under the Endangered Species Act of 1973. Submitted to the California Energy Commission, April 2, 2002.

CULTURAL RESOURCES

Judy McKeehan and Gary Reinoehl

INTRODUCTION

In this analysis, staff discusses cultural resources, which are defined as the structural and cultural evidence of the history of human development and life on earth. Evidence of California's early occupation is becoming increasingly vulnerable due to the ongoing development and urbanization of the state.

Cultural resource materials may be found nearly anywhere in California: along the ocean coastline and on coastal islands, along rivers and streams, in coastal and inland valleys and lowlands, throughout the coastal and inland mountain ranges, and throughout the interior deserts. Cultural resources may be buildings or structures built on the landscape, or ruins found on the ground or at varying depths beneath the surface.

The cultural resources section discusses potential impacts of the proposed Avenal Power Plant, in the city of Avenal, regarding cultural resources, which are defined under state law in the Laws Ordinances Regulations and Standards (LORS) section of this staff assessment. A brief cultural overview of the project is provided. If cultural resources are identified, staff determines whether there may be a project related impact to identified resources and if the resource is eligible for the California Register of Historic Resources (CRHR), staff then recommends mitigation that will reduce the impact to the historical resource.

There is also a potential that a project may impact a previously unidentified resource or impact an historical resource in an unanticipated manner. Staff also recommends procedures in the conditions of certification that mitigate these potential impacts.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

FEDERAL

- Code of Federal Regulations, 36 CFR Part 61. Federal Guidelines for Historic Preservation Projects: The U.S. Secretary of the Interior has published a set of Standards and Guidelines for Archaeology and Historic Preservation. These are considered to be the appropriate professional methods and techniques for the preservation of archaeological and historic properties. The Secretary's standards and guidelines are used by federal agencies, such as the Forest Service, the Bureau of Land Management, and the National Park Service. The State Historic Preservation Office refers to these standards in its requirements for mitigation of impacts to cultural resources on public lands in California.
- National Historic Preservation Act, 16 U.S.C. Section 470, commonly referred to as Section 106, requires federal agencies to take into account the effects of their undertakings on historic properties through consultations beginning at the early

stages of project planning. Regulations revised in 2000 (36 CFR Part 800 et. Seq.) set forth procedures to be followed for determining eligibility of cultural resources, determining the effect of the undertaking on the historic properties, and how the effect will be taken into account. The eligibility criteria and the process are used by federal agencies. Very similar criteria and procedures are used by the state in identifying cultural resources eligible for listing in the California Register of Historical Resources.

STATE

- California Code of Regulations, Title 14, section 4852 defines the term "cultural resource" to include buildings, sites, structures, objects, and historic districts.
- Public Resources Code, Section 5000 establishes a California Register of Historic Places; determines significance of and defines eligible resources. It identifies any unauthorized removal or destruction of historic resources on sites located on public land as a misdemeanor. It also prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn and establishes the penalty for possession of such artifacts with intent to sell or vandalize them as a felony. This section defines procedures for the notification of discovery of Native American artifacts or remains, and; states that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated.
- The California Environmental Quality Act (CEQA) (Public Resources Code, section 21000 et seq.; Title 14, California Code of Regulations, section 15000 et seq.) requires analysis of potential environmental impacts of proposed projects and requires application of feasible mitigation measures.
- Public Resources Code section 21083.2 states that the lead agency determines whether a project may have a significant effect on “unique” archaeological resources; if so, an EIR shall address these resources. If a potential for damage to unique archaeological resources can be demonstrated, the lead agency may require reasonable steps to preserve the resource in place. Otherwise, mitigation measures shall be required as prescribed in this section. The section discusses excavation as mitigation; limits the Applicant’s cost of mitigation; sets time frames for excavation; defines “unique and non-unique archaeological resources;” and provides for mitigation of unexpected resources.
- Public Resources Code section 21084.1 indicates that a project may have a significant effect on the environment if it causes a substantial adverse change in the significance of a historic resource; the section further defines a “historic resource” and describes what constitutes a “significant” historic resource.
- CEQA Guidelines, Title 14, California Code of Regulations, section 15126.4(b), prescribes the manner of maintenance, repair, stabilization, restoration, conservation, or reconstruction as mitigation of a project’s impact on a historical resource; discusses documentation as a mitigation measure; and discusses mitigation through avoidance of damaging effects on any historical resource of an archaeological nature, preferably by preservation in place, or by data recovery through excavation if avoidance or preservation in place is not feasible. Data recovery must be conducted in accordance with an adopted data recovery plan.

- CEQA Guidelines, section 15064.5 defines the term “historical resources,” explains when a project may have a significant effect on historic resources, describes CEQA’s applicability to archaeological sites, and specifies the relationship between “historical resources” and “unique archaeological resources.”
- Penal Code, section 622 1/2 states that anyone who willfully damages an object or thing of archaeological or historic interest is guilty of a misdemeanor.
- California Health and Safety Code, section 7050.5 states that if human remains are discovered during construction, the project owner is required to contact the county coroner.

LOCAL

County Of Kings

The Kings County General Plan contains goals, objectives and policies for the preservation and protection of historical and cultural resources throughout the county. Goal 26 calls for the preservation of significant historical and archaeological sites and structures which represent ethnic, cultural, and economic groups that have lived and worked in Kings County. Three objectives are listed to accomplish the goal: 1) to list historic sites and structures designated or proposed for designation as County landmarks in specific or area plans or local area development guidelines; 2) to designate the existing Kings County Museum Advisory Committee, a subcommittee of the County Parks and Recreation Advisory Commission, or its successor to review proposed development that may affect proposed or designated historic sites or landmarks in the County: and 3) to refer applications that involve the removal, destruction, or alteration of proposed or designated historic sites or landmarks to the Kings County Museum Advisory Committee or its successor for recommended mitigation measures.

The general plan includes a map of the King’s County Historical Sites. This map shows the Avenal Ranch (Adobe Barn & House), an Indian Cemetery, and the Site of Lemoore, all about 15 miles from the project area.

County of Fresno

The Fresno County General Plan contains goals and policies for the preservation and protection of historical and cultural resources throughout the county. Goal OS-J calls for the identification, protection, and enhancement of important historical, archeological, paleontological, geological, and cultural sites and their contributing environment throughout the county. The general plan lists thirteen policies to accomplish this goal. One policy requires the county to maintain an inventory of all sites and structures determined to be historically significant (Index of Historical Properties in Fresno County).

ENVIRONMENTAL SETTING

REGIONAL DESCRIPTION

The project area is located in an agricultural region along the western edge of the San Joaquin Valley, in northwestern Kings County, approximately 2 miles east of Interstate 5, about 200 miles south of San Francisco and 200 miles north of Los Angeles, on alluvial fan deposits between the Kettleman Hills and the Tulare Lake basin. The Diablo Range is to the west and the bed of the former Tulare Lake and expanse of the San Joaquin Valley extend eastward to the Sierra Nevada foothills. A small portion of the project extends into Fresno County.

PROJECT VICINITY DESCRIPTION

The proposed power plant, associated fuel, water, and electrical transmission lines, and construction staging areas will be located in the northeastern quarter of Section 19, Township 21 South, Range 18 East, Mt. Diablo Base and Meridian in the City of Avenal. The residential and commercial districts of the City of Avenal are located about 6 miles to the southwest, the City of Huron lies 8 miles north, and the City of Coalinga is 16 miles to the west. The Avenal Energy Project site is adjacent to an existing Pacific Gas and Electric Company (PG&E) compressor station. Interstate 5 is about 2 miles to the west and is accessed by Avenal Cutoff Road at the junction of Plymouth Avenue. The area reflects intensive agricultural activity characteristic of the western San Joaquin Valley. The San Luis Canal is adjacent to the proposed Avenal Energy Project site to the northeast. The marshlands around Tulare Lake have been mostly drained for agricultural use and there are presently no perennial surface waters.

Refer to the **PROJECT DESCRIPTION** section of this Preliminary Staff Assessment for additional information and maps of the project development region and the project area.

PREHISTORIC SETTING

Human occupation in the San Joaquin Valley region began in the early Holocene (11,000 to 7,000 Before Present). The Western Stemmed Complex of hunter/gatherer adaptation is known archaeologically along the southwestern and southern shores of Tulare Lake. In the Tulare Basin, mound sites found in association with agricultural development contained flexed and extended burials, cremations and associated artifacts, such as shell beads and ornaments, flaked and ground stone tools, and pottery and steatite (soapstone) items. Archaeological sites recorded in 1941 were reported as having similarities with sequences from the Santa Barbara Channel region. Changes in burial mode from sites known in the Sunflower Valley have been used to define a cultural chronology in the Tulare Basin. Recent excavations indicate a late Holocene occupation site near the mouth of the Tulare River, a buried middle Holocene site along Los Gatos Creek, remains along the northern shore of Tulare Lake and two rock shelter sites and midden deposits in nearby Fresno County (Duke 2001a, p. 6.7-6).

ETHNOGRAPHIC BACKGROUND

The project area was inhabited by the Tache Yokuts, who practiced a seasonal subsistence and settlement round, residing in the low foothills of the Diablo Range

during the winter months and along the northern shore of Tulare Lake and its tributaries from spring through fall. The Yokuts were a linguistically defined group whose territory ranged the San Joaquin Valley from the area south of Stockton and included the foothills of the Sierra Nevada south of Fresno and portions of the Coast Range and included about 40 triblets. Some ethnographic accounts identify the core of Tache territory as the northern and western shoreline of Tulare Lake, with the nearest village in the Coalinga area. The Tache Yokuts lived in small seasonal villages and traded their local products such as salt, baskets, steatite, and large mammal skins with coastal groups to the west for marine commodities, and with Sierra Nevada groups to the east for obsidian and stone milling tools (Duke 2001a, p. 6.7-4).

HISTORIC SETTING

The Spanish began to establish missions in *Alta California* in 1769, starting with Mission San Diego de Alcalá and ending with Mission San Francisco Solano in Sonoma, the mission closest to the project area, in 1823. Mission San Francisco de Asís and the San Francisco Presidio (military post) were established in 1776. After Mexico became independent from Spain in 1821, the missions were secularized (removed from Church control) by the Mexican government during the early 1830s. Former mission lands were granted to soldiers, prominent Mexican citizens, and other individuals for use as cattle ranches.

The first documented American presence in the Tulare Basin was the Jedediah Smith party in 1826. Several American explorers passed through the area in the 1840s, including John C. Fremont. The first permanent Euroamerican settlement was established in the basin in 1850, the same year California became a state, following the end of the Mexican war in 1848 and the Treaty of Guadeloupe Hidalgo that ceded the territory of California to the United States.

The first land patent issued in central California by the United States was granted to David Kettleman in 1852. Kettleman, along with two other men who arrived in the area at the same time, Jim McClure and John Fisher, intended to raise cattle to supply gold miners with beef. Cattle and sheep, augmented with grain grown to supplement the livestock operations remained the economic backbone of the area through the 19th century. Basque sheepmen arrived in the area at the end of the 19th century. The community of Esperanza was established near Avenal in 1888, but drought and hardship caused it to fail after only a few years.

The presence of coal and oil was long known in the Kettleman Hills area by oil slicks on the surface. The Pacific Oil Company established the first well in 1862 near the Avenal Ranch. However, the difficulty of transporting goods and services to the remote area made large-scale exploitation difficult. The nearest source of equipment was Stockton, and required travel over difficult wagon roads. Nonetheless, by 1928, after 45 oil wells had been drilled to greater and greater depths, the Milham Oil Company hit the first big “gusher” in the Kettleman Hills at a depth of over 7,000 feet. The Standard Oil Company already owned alternating sections of land, and in 1929 laid out the town of Avenal. Water lines were laid, and a sewer plant, post office, fire department and hospital were added to the community. The oil boom lasted through the 1950s, when the oil began to decline. Agriculture again assumed importance to the area as the oil

economy subsided. Construction of the California Aqueduct in the 1970s allowed dry farming to be replaced by irrigation (Duke 2001a, p. 6.7-7, -9).

RESOURCES INVENTORY

Literature and Records Search

Prior to preparation of the AFC, the applicant conducted a literature search and reviewed site records and maps at the Southern San Joaquin Valley Archaeological Information Center of the California Historic Resources Information System (CHRIS) (Duke 2001a). The record searches did not identify any previously recorded prehistoric or historic archaeological resources within one-half mile of the proposed project (the power plant and associated linear routes).

The applicant also carried out research to identify historical resources more than 45 years old in the vicinity of the project (Duke 2001a, p. 13). Research was conducted at the Avenal Museum, the King's County Library, the Tulare Lake Archaeological Research Group (TULARG) (Duke 2002d, p. 6) and Internet sources. The Avenal Museum provided a letter indicating that there is nothing of historic value in the area of the proposed plant.

Field Surveys

The applicant carried out an archaeological field survey of the areas that could be directly impacted by construction of the Avenal project and linear features such as transmission lines, water supply pipeline, natural gas pipeline, and water well sites (AFC 2001a). The survey was conducted in April and August of 2001 by walking parallel transects at 15-meter intervals. Soils within the area of potential effect have largely been used historically for agriculture. Ground visibility was characterized as very good except along the transmission line route, which was obscured by dense cotton. No archaeological resources were identified as a result of the survey (Duke 2001a, p. 14). A supplemental archaeological survey was completed on March 20, 2002, along the portion of the electrical transmission line that was previously obscured. Transects were walked at 15 meters apart and no cultural resources were found (Duke 2002d, p. 6).

Thomas Nave, the historian, performed an historic resources survey for the applicant in April 2001 (Duke 2001a, p. 14).

As a result of the reconnaissance survey for historic architectural resources, no resources were identified that appeared to be more than 45 years old (Duke 2001a, p. 15). The San Luis Canal is the primary water source for the project, but was constructed in the 1970s (Duke 2001a, p. 12). It is less than 50 years old. The historian indicates that he does not believe the canal qualifies as an historical resource.

The plant would be connected to PG&E's Gates-ARCO 230-kV transmission line. The applicant provided information about this transmission line, indicating that the power line was originally built in 1948 connecting the Tesla Substation to the Midway substation. This line has been modified on several occasions, the most notable are the additions of the Panoche substation in the early 1950s, and the ARCO substation in the 1970s. Some or all of the conductors have been replaced. These changes have altered the

design, materials, and workmanship to some degree. Two 500 kV lines have been built within the same right of way, altering the setting of the original Tesla-Midway transmission line.

The Avenal Cut-Off Road provides access to the project site and will be crossed by the connection to the PG&E Kettleman compressor station. Kings County declared the road a public right-of-way in 1936, and land deeds for the right-of-way were secured between 1938 and 1939. The first known road surface was graded at this time. The roadway was subsequently improved between 1962 and 1969 and is now a paved surface.

The water wells were not identified in the surveys and have not yet been considered as to whether they could qualify as historical resources.

Native American Contacts

The applicant contacted the Native American Heritage Commission (NAHC) to obtain a list of Native Americans that may have concerns about projects in the Kings and Fresno counties area (AFC, p. 6.7-9). The applicant sent letters to the Native Americans on the list describing the project and asking about concerns. Ten letters were sent (Duke 2001a, Appendix 6.7-1, Appendix A). No responses had been received by May 10, 2002 (Duke 2002d, p. 6).

Response rates tend to increase when follow up phone calls are made or meetings are held with Native American groups and individuals. Please provide copies of comments and responses from Native American groups and individuals.

CATEGORIZATION OF IDENTIFIED CULTURAL RESOURCES

As described previously, various laws apply to the treatment of cultural resources. These laws require the Energy Commission to categorize resources by determining whether they meet several sets of specified criteria. These categories then in turn influence the analysis of potential impacts to the resources and the mitigation that may be required to ameliorate any such impacts.

The record and literature search and the walking surveys of the proposed project were conducted to identify the presence of any cultural resource sites or materials. Where resources were identified, additional evaluation was conducted to determine whether the resources are already listed on, or are potentially eligible for listing on, either the National Register of Historic Places (NRHP) or the CRHR. The determination of eligibility is made in compliance with the criteria for the CRHR (Titile 14, Cal. Code Regs. Section 4852).

Pursuant to CEQA, staff makes a recommendation of whether a proposed project will affect “historical resources.” The guidelines provide a definition for historical resources and set forth a listing of criteria for making this determination. These criteria are the eligibility criteria for the CRHR and are essentially the same as the eligibility criteria for the NRHP. In addition, as with the NRHP, historical resources must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Resources eligible for the CRHR may have less integrity than the resources eligible for

the NRHP. If the criteria are met and the resource is determined eligible for the CRHR, the Energy Commission must evaluate whether the project will cause a "substantial adverse change in the significance of the historical resource," which the regulation defines as a significant effect on the environment.

The electrical transmission line into which Avenal Energy would connect is more than 50 years old (Duke 2002c, p. 31-32). Although the applicant has identified aspects of integrity that have been changed since the power transmission line was built, it does not provide sufficient analysis of the aspect of integrity to clearly state that the transmission line is not eligible for the CRHR because of a loss of integrity. Neither has there been a discussion of the significance of the transmission line to understand if it could be eligible for the CRHR.

The applicant stated that it has reviewed information available for the 230 kV transmission lines, including inquiries with Western Area Power Administration concerning their environmental review for the Path 15 project, but has not been able to access the necessary PG&E archives to complete a DPR 523 evaluation form. Duke has recommended that it is not necessary to perform additional evaluation of the transmission line (Duke 2002e, p. 1).

The public-right-of-way for the Avenal Cutoff Road was declared in 1936. It was presumably built to connect Avenal with other communities in the San Joaquin Valley. The road surface has been improved and the surface has been periodically replaced. The roadway presently lacks any semblance of its original construction. The applicant has evaluated the Avenal Cutoff Road and recommends that it is not eligible for the CRHR because of periodic road improvements (Duke 2002d, DPR 523). Staff agrees that the Avenal Cutoff Road does not meet the eligibility criteria for the CRHR. However, there may be subsurface remains of the original Avenal Cutoff Road that are exposed as a result of the construction of the linear facilities.

IMPACTS

Since project development and construction usually entail surface and subsurface disturbance of the ground, the proposed Avenal project has the potential to adversely affect both known and previously unknown cultural resources. Direct impacts are those which may result from the immediate disturbance of resources, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition. Indirect impacts are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource materials due to improved accessibility. Cumulative impacts to cultural resources may occur if increasing amounts of land are cleared and disturbed for the development of multiple projects in the same vicinity as the proposed project.

The potential for the project to cause impacts to cultural resources is related to the likelihood that such resources are present and whether they are actually encountered during project development and construction activities. Although the existence of known cultural resources increases the potential for additional resources, the absence of known resources does not necessarily mean that unknown resources will not be

encountered and that impacts will therefore not occur. In addition, the potential for discovery does not measure the significance of individual artifacts or other cultural resources present, since it is impossible to accurately predict what specific materials could be encountered. Furthermore, sometimes the full significance of discovered cultural resources can only be determined after they have been collected, prepared, and studied by professional archaeologists, historians, and/or architectural historians.

POTENTIAL FOR PROJECT IMPACTS

Because project-related site development and construction would entail subsurface disturbance of the ground, the proposed project has the potential to adversely affect previously unknown subsurface cultural resources.

Although no archaeological sites have been recorded within one-quarter mile of the proposed project, the relatively undisturbed landforms and the historical presence of the marshy margins of Tulare Lake Basin, which were ethnographically utilized, indicate a potential for discovering previously unidentified archaeological resources during construction. Not all of the project area was subjected to intensive archeological survey and archeological resources could exist in the unsurveyed area. Impacts could occur if archeological resources are discovered prior to or during construction unless mitigation measures are adopted for this circumstance.

The gas pipeline and the waterline will impact the Avenal Cutoff Road, which is over 50 years of age. The proposed gas line will be located within the Right of Way (ROW) and the waterline will cross Avenal Cutoff Road. This road was originally graded between 1936 and 1940. The road surface has been periodically replaced and lacks integrity. It is possible that intact portions of the original Avenal Cut-off road remain beneath the present road bed. Impacts could occur if portions of the old roadbed exist in the impact area of the project.

The project would connect to PG&E's Gates-ARCO 230-kV transmission line. The transmission line has not been evaluated for the CRHR. Until the resource is evaluated, the impact to the resource can not be determined. If this resource is found to meet the eligibility criteria for the California Register of Historical Resources and the alteration would result in a significant impact, then mitigation measures would have to be incorporated in the conditions of certification.

CUMULATIVE IMPACTS

Because impacts have not yet been determined, it is not possible to assess cumulative impacts. If above ground cultural resources in the project vicinity would be impacted and the impact is significant, then there may be cumulative impacts.

Impacts to subsurface archaeological resources from the proposed project and other projects in the vicinity could occur. However, project proponents for this and future projects in the area can mitigate impacts to as yet undiscovered subsurface archaeological sites to less than significant by implementing mitigation measures requiring construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for resources evaluated as significant (eligible for the CRHR or NRHP).

FACILITY CLOSURE

At the time of planned closure, all then-applicable LORS will be identified and the Energy Commission-required closure plan will address compliance with these LORS. Generally, if no additional ground disturbance occurs during closure activities and all conditions of certification have been met, no impacts to cultural resources would be expected. However, actual potential impacts are likely to depend upon the final location of project structures in relation to existing resources, and upon the procedures used for the removal of project structures. Since the Energy Commission has approval authority over the closure plan, the commission can ensure there will be no impacts.

COMPLIANCE WITH APPLICABLE LORS

Implementation of the Conditions of Certification in this document will ensure that this project complies with all applicable state laws with respect to cultural resources. The County of Kings and the County of Fresno have no specific LORS that apply to cultural resources apart from conducting an archaeological survey and compliance with CEQA.

MITIGATION

For cultural resources, the preferred method of mitigation is for project construction to avoid areas where cultural resources are known to exist, wherever possible. Often, however, avoidance cannot be achieved, and other measures such as surface collection, subsurface testing, and data recovery must be implemented for archaeological resources and documentation must be implemented for historical structures. Mitigation measures are developed to attempt to reduce the potential for adverse project impacts on cultural resources to a less than significant level.

APPLICANT'S PROPOSED MITIGATION

Archaeological Resources

The applicant believes that no mitigation measures are required (Duke 2001a, p. 6.7-12). However, the applicant also lists contingency measures for mitigation of potential impacts in the event that unknown cultural resources are found (Duke 2001, p. 6.7-10, 11, Duke 2002d, p. 7). The measures include providing instruction to construction workers to 1) watch for archaeological resources, 2) follow prescribed procedures to report such discoveries, and 3) carry out other appropriate protocols to ensure that construction activities avoid or minimize impacts to potentially significant cultural resources. These contingency measures will be compiled in a "Cultural Resources Discovery Response Plan". The cultural resources inventory (Duke 2001a, Appendix 6.7-1, p. 15) recommends the measures listed above and a pre-construction survey of the preferred electrical transmission line route before project-related ground disturbance occurs along the line.

STAFF'S PROPOSED MITIGATION MEASURES

Staff does not believe that the applicant's mitigation measures by themselves, reduce the impacts to less than significant. Staff has adapted the applicant's proposed

mitigation measures into a series of conditions of certification, sometimes rewording for clarification, adding time frames, and/or adding other requirements.

The mitigation measures for a significant impact to the transmission line, if it is found to meet the eligibility criteria for the CRHR, would include recordation of the resource to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) standards, distribution of the HABS/HAER record to the California Historical Society and the California State Library. Production of a history of the resource for the general public and distribution of the history document to local libraries and historical societies would serve as mitigation measures.

The proposed mitigation measures would apply to any potential for impacts to sensitive cultural resources in all areas affected by the project. Mitigation measures are derived from good professional practice and they are based on the U.S. Secretary of the Interior's guidelines. The mitigation measures set forth in the conditions have been applied to previous projects before the Energy Commission and they have proven successful in protecting sensitive cultural resources from construction-related impacts while allowing the timely completion of many projects throughout California. Adoption of staff's proposed conditions of certification is expected to reduce the potential for adverse project impacts on cultural resources to a less than significant level.

CONCLUSIONS AND RECOMMENDATION

No archaeological resources were identified in the project area as a result of a records search and field survey. However, there is the potential for encountering as yet unidentified subsurface cultural resources during project construction and in the areas not previously surveyed. If eligible resources are identified as a result of the field survey for the electric transmission interconnection corridor, impacts on cultural resources are possible. If such impacts are identified, conditions of certification will be provided in the Final Staff Assessment to reduce impacts to these resources.

Eligibility of PG&E's Gates-ARCO 230-kV transmission line has not been determined. The applicant continues to try to get information about the transmission line from PG&E to determine if the line meets the eligibility requirements for the CRHR. If an impact is identified, conditions of certification will be provided in the Final Staff Assessment to reduce impacts to these resources. The mitigation measures for impacts to the transmission line if the transmission line is found to meet the eligibility criteria for the CRHR and the impact is significant would include recordation of the resource to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) standards, distribution of the HABS/HAER record to the California Historical Society and the California State Library, production of a history of the resource for the general public, and distribution of the history document to local libraries, historical societies.

If the following conditions of certification are adopted, the project will comply with applicable laws, ordinances, regulations, and standards, reducing the impact of the proposed project to less than significant.

Staff recommends that the Energy Commission adopt the following proposed conditions of certification, which incorporate the mitigation measures discussed above.

PROPOSED CONDITIONS OF CERTIFICATION

CUL-1 Prior to the start of ground disturbance, the project owner shall submit the resume of the proposed Cultural Resources Specialist (CRS), and one alternate CRS, if an alternate is proposed, to the CPM for review and approval. The CRS shall be responsible for implementation of all cultural resources conditions of certification and may obtain qualified cultural resource monitors (CRMs) to monitor as necessary on the project.

Protocol: The resume for the CRS and alternate, shall include information that demonstrates that the minimum qualifications specified in the U.S. Secretary of Interior Guidelines, as published by the CFR 36, CFR Part 61 are met. In addition, the CRS shall have the following qualifications:

a. a technical specialty appropriate to the needs of the project and a background in anthropology, archaeology, history, architectural history or a related field; and

b. at least three years of archaeological or historic, as appropriate, resource mitigation and field experience in California.

The resume shall include the names and phone numbers of contacts familiar with the work of the CRS on referenced projects and demonstrate that the CRS has the appropriate education and experience to accomplish the cultural resource tasks that must be addressed during ground disturbance, grading, construction and operation. In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the CPM, that the proposed CRS or alternate has the appropriate training and background to effectively implement the conditions of certification.

CRMs shall meet the following qualifications:

a. A BS or BA degree in anthropology, archaeology, historic archaeology or a related field and one year experience monitoring in California; or

b. An AS or AA in anthropology, archaeology, historic archaeology or a related field and four years experience monitoring in California; or

c. Enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historic archaeology or a related field and two years of monitoring experience in California.

The project owner shall ensure that the CRS completes any monitoring, mitigation and curation activities necessary; fulfills all the requirements of these conditions of certification; ensures that the CRS obtains technical specialists, and CRMs, if needed; and that the CRS evaluates any cultural resources that are newly discovered or that may be affected in an unanticipated manner for eligibility to the California Register of Historic Resources (CRHR).

Verification: The project owner shall submit the resume for the CRS at least 45 days prior to the start of ground disturbance to the CPM for review and approval.

At least 10 days prior to a termination or release of the CRS, the project owner shall submit the resume of the proposed new CRS to the CPM for review and approval.

At least 20 days prior to ground disturbance, the CRS shall submit written notification to the CPM identifying anticipated CRMs for the project stating they meet the minimum qualifications required by this condition. If additional CRMs are needed later, the CRS shall submit written notice one week prior to any new CRMs beginning work.

At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources conditions of certification.

CUL-2 1. Prior to the start of ground disturbance, the project owner shall provide the CRS and the CPM with maps and drawings showing the footprint of the power plant and all linear facilities. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:2000 or 1" = 200') for plotting individual artifacts. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM.

2. If the footprint of the power plant or linear facilities changes, the project owner shall provide maps and drawings reflecting these changes, to the CRS and the CPM for approval. Maps shall identify all areas of the project where ground disturbance is anticipated.

3. If construction of the project would proceed in phases, maps and drawings, not previously provided, shall be submitted prior to the start of each phase. Written notification identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

4. At a minimum, the CRS shall consult weekly with the project construction manager to confirm area(s) to be worked during the next week, until ground disturbance is completed.

5. The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

Verification: The project owner shall submit the subject maps and drawings at least 40 days prior to the start of ground disturbance.

If there are changes to any project related footprint, revised maps and drawings shall be provided at least 15 days prior to start of ground disturbance for those changes.

If project construction is phased, if not previously provided, the project owner shall submit the subject maps and drawings 15 days prior to each phase.
A current schedule of anticipated project activity shall be provided to the CRS on a weekly basis during ground disturbance and also provided in each Monthly Compliance Report (MCR).

The project owner shall provide written notice of any changes to scheduling of construction phases within 5 days of identifying the changes.

CUL-3 Cultural resource monitoring shall be conducted during the initial groundbreaking at the plant site. The potential for encountering buried deposits shall be assessed by the CRS based on the initial groundbreaking observations. The initial assessment shall prescribe the type (intermittent to full time) and duration for monitoring of ground disturbance within the plant site.

1. Cultural resource monitoring shall be conducted during construction activities in all areas within the Avenal Cutoff Road right of way.

2. The cultural resource monitoring shall continue until the CRS determines that no cultural resources will be impacted by continued construction.

3. Monitors shall keep a daily log of any monitoring or cultural resource activities and the CRS shall prepare a weekly summary report on the progress or status of cultural resources-related activities. The CRS may informally discuss cultural resource monitoring and mitigation activities with Energy Commission technical staff.

4. The CRS shall notify the project owner and the CPM, by telephone or e-mail, of any incidents of non-compliance with any cultural resources conditions of certification within 24hours of becoming aware of the situation. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the conditions of certification.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these conditions of certification

5. A Native American monitor shall be obtained, at a minimum on an on call basis, to monitor ground disturbance in areas where Native American artifacts are discovered. Informational lists prepared by the Native American Heritage Commission of concerned Native Americans shall be obtained. Preference in selecting a monitor shall be given to Native Americans with traditional ties to the area that will be monitored.

Verification: Within five (5) days after the initial groundbreaking, the CRS or alternate CRS will provide a letter (electronic or paper) to the CPM and the project owner of the assessment of the initial groundbreaking observations, including the type (intermittent to full time) and duration of cultural resources monitoring for review and approval. Monitoring shall not be completed, until the CRS has determined that continued construction will not result in an impact to cultural resources and has provided a letter stating so to the CPM and the project owner.

During the ground disturbance phases of the project, the project owner shall include in the MCR to the CPM copies of the weekly summary reports prepared by the CRS regarding project-related cultural resources monitoring. Copies of daily logs shall be retained and made available for audit by the CPM as needed.

Within 24 hours of recognition of a non-compliance issue, the CRS shall notify the CPM by telephone of the problem and of steps being taken to resolve the problem. The telephone call shall be followed by an e-mail or fax detailing the non-compliance issue and the measures necessary to achieve resolution of the issue. Daily logs shall include forms detailing any instances of non-compliance with conditions of certification. In the event of a non-compliance issue, a report written no sooner than two weeks after resolution of the issue that describes the issue, resolution of the issue and the effectiveness or the resolution measures, shall be provided in the next MCR.

When Native American artifacts are found, the project owner shall send notification to the CPM identifying the person(s) retained at a minimum, on an on-call basis to conduct Native American monitoring. If efforts to obtain the services of a qualified Native American monitor are unsuccessful, the project owner shall immediately inform the CPM who will initiate a resolution process.

CUL-4 The project owner shall submit the Cultural Resources Report (CRR) to the CPM for approval. The CRR shall be written by the CRS and shall be provided in the ARMR format. The CRR shall report on all field activities including dates, times and locations, findings, samplings and analysis. All survey reports, DPR 523 forms and additional research reports not previously submitted to the California Historic Resource Information System (CHRIS) shall be included as an appendix to the CRR.

Verification: The project owner shall submit the CRR within 90 days after completion of ground disturbance (including landscaping). Within 10 days after CPM approval, the project owner shall provide documentation to the CPM that copies of the CRR have been provided to the State Historic Preservation Officer (SHPO), the CHRIS and the curating institution (if archaeological materials were collected).

CUL-5 The project owner shall provide, a Worker Environmental Awareness Program (WEAP) training, on a weekly basis, to all new employees starting prior to and for the duration of, ground disturbance. The training may be presented in the form of a video. The training shall include:

1. a discussion of applicable laws and penalties under the law;
2. samples or visuals of artifacts that might be found in the project vicinity;
3. information that the CRS, alternate CRS, and CRMs have the authority to halt construction to the degree necessary, as determined by the CRS, in the event of a discovery or unanticipated impact to a cultural resource;
4. instruction that employees are to halt work on their own in the vicinity of a potential cultural resources find, and shall contact their supervisor and the CRS or CRM; redirection of work would be determined by the construction supervisor and the CRS;

5. an informational brochure that identifies reporting procedures in the event of a discovery;
6. an acknowledgement form signed by each worker indicating that they have received the training; and
7. a sticker that shall be placed on each employee's hard hat indicating that that employee has completed environmental training.

Verification: The project owner shall provide in the Monthly Compliance Report the WEAP Certification of Completion form of persons who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-6 The project owner shall grant authority to halt construction to the CRS, alternate CRS and the CRMs in the event previously unknown cultural resource sites or materials are encountered, or if known resources may be impacted in a previously unanticipated manner. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in consultation with the CRS.

In the event cultural resources are found or impacts can be anticipated, the halting or redirection of construction shall remain in effect until all of the following have occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the find description and the work stoppage;
2. The CRS, the project owner, and the CPM have conferred and determined what, if any, data recovery or other mitigation is needed; and
3. Any necessary data recovery and mitigation has been completed.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM with a letter confirming that the CRS, alternate CRS and CRMs have the authority to halt construction activities in the vicinity of a cultural resource find, and that the CRS or project owner shall notify the CPM immediately (no later than the following morning of the incident or Monday morning in the case of a weekend) of any halt of construction activities, including the circumstance and proposed mitigation measures. The project owner shall provide the CRS with a copy of the letter granting the authority to halt construction.

CUL-7 Following the filing of the CPM-approved CRR with the appropriate entities, the project owner shall ensure that all cultural resource materials, maps, and data collected during data recovery and mitigation for the project are delivered to a public repository that meets the U.S. Secretary of Interior requirements for the curation of cultural resources. The project owner shall pay any fees for curation required by the repository.

Verification: The project owner shall ensure that all recovered cultural resource materials are delivered for curation within thirty days after providing the CPM-approved CRR.

For the life of the project, the project owner shall maintain in its compliance files copies of signed contracts or agreements with the public repository to which the project owner

has delivered for curation all cultural resource materials collected during data recovery and mitigation for the project.

REFERENCES

DUKE (TRC/Stenger). 2001a. Application for Certification for the Duke Energy Avenal Project. Submitted to the California Energy Commission, October 9, 2001.

DUKE (Duke Energy North America/Cochran). 2002c. Response to CEC January 24, 2002 Data Request to the Avenal Energy Project. Submitted to the California Energy Commission, February 25, 2002.

DUKE (TRC/Stenger). 2002d. Addendum to Responses to March 25, 2002 Data Requests and Other Data Requests for Avenal Energy (01-AFC-20), Attachment 2. Submitted to the California Energy Commission, May 10, 2002,

DUKE (Duke Energy North America/Cochran). 2002e. Response to CEC March 6, 2002 Workshop and subsequent discussions with CEC staff. Submitted to the California Energy Commission, July 22, 2002.

HAZARDOUS MATERIALS MANAGEMENT

Alvin J. Greenberg, Ph.D. and Rick Tyler

INTRODUCTION

The purpose of this Staff Analysis is to determine if the proposed Avenal Energy Project has the potential to cause significant impact on the public as a result of the use, handling or storage of hazardous materials at the proposed facility. If significant adverse impacts on the public are identified, Energy Commission staff must also evaluate the potential for facility design alternatives and additional mitigation measures to reduce impacts to the extent feasible.

This analysis does not address potential exposure of workers to hazardous materials used at the proposed facility. Employers must inform employees of hazards associated with their work and thus employees accept a higher level of risk than the general public as a condition of employment. Workers are thus not afforded the same level of protection normally provided to the public. Further, workers can be provided with special protective equipment and training to reduce the potential for health impacts associated with the handling of hazardous materials. Staff's **Worker Safety and Fire Protection** analysis also describes the requirements applicable to the protection of workers from such risks.

There are two acutely hazardous materials stored at the Avenal Energy Project in quantities exceeding the reportable amounts defined in California Health and Safety Code, section 25532 (j), aqueous ammonia (19 percent ammonia in aqueous solution) and sulfuric acid (93% and 29.5% solutions). (See Table 6.15-1 of the Application for Certification, Duke 2001a). It is staff's opinion that aqueous ammonia presents the greatest potential for off-site consequences. The use of aqueous ammonia significantly reduces the risk that would otherwise be associated with use of the more economical anhydrous form of ammonia. Use of the aqueous form eliminates the high internal energy associated with the more hazardous anhydrous form, which is stored as a liquefied gas at elevated pressure. The high internal energy associated with the anhydrous form of ammonia can act as a driving force in an accidental release, which can rapidly introduce large quantities of the material to the ambient air and result in high down-wind concentrations. Spills associated with the aqueous form are much easier to contain and emissions are limited by the slow mass transfer from the surface of the spilled material.

Sulfuric acid poses little threat of off-site impact in 93% or 29.5% solutions as a result of its very low vapor pressure. It is staff's conclusion that impacts from a spill of sulfuric acid would be confined to the facility.

Other hazardous materials stored in smaller quantities, such as mineral and lubricating oils, corrosion inhibitors and water conditioners, will be present at the proposed facility. Hazardous materials used during the construction phase include gasoline, diesel fuel, and oil, welding gases, lubricants, solvents and paint. No acutely toxic hazardous materials will be used onsite during construction. None of these materials pose a significant potential for off-site impacts as a result of the quantities on-site, their relative

toxicity, and/or their environmental mobility. Although no natural gas is stored, the project will also involve the construction and operation of a natural gas pipeline and handling of large amounts of natural gas. Natural gas poses some risk of both fire and explosion. This pipeline will be approximately 2 miles in length including on and off-site segments.

The Avenal Energy Project will also require the transportation of aqueous ammonia to the facility. Analysis of the potential for impacts associated with such deliveries is addressed below.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local laws and policies apply to the protection of public health and hazardous materials management. Staff's analysis examines the project's compliance with these requirements.

FEDERAL

The Superfund Amendments and Reauthorization Act of 1986 (42 USC §9601 et seq.), contains the Emergency Planning and Community Right To Know Act (also known as SARA Title III). The Clean Air Act (CAA) of 1990 (42 USC §7401 et seq. as amended) established a nationwide emergency planning and response program and imposed reporting requirements for businesses which store, handle, or produce significant quantities of extremely hazardous materials. The CAA section on Risk Management Plans - codified in 40 CFR Part 68 - requires the states to implement a comprehensive system to inform local agencies and the public when a significant quantity of such materials is stored or handled at a facility. The requirements of both SARA Title III and the CAA are reflected in California Health and Safety Code, section 25531 et seq. Due to the petroleum-containing hazardous materials that will be used on this site, a Spill Prevention Control and Countermeasure Plan (SPCC) is required by Federal Regulations (Hazardous Waste Contingency Plan Title 40, C.F.R. Part 112.7).

STATE

California Health and Safety Code, section 25534, directs facility owners, storing or handling acutely hazardous materials in reportable quantities, to develop a Risk Management Plan (RMP) and submit it to appropriate local authorities, the United States Environmental Protection Agency (EPA), and the designated local Administering Agency for review and approval. The plan must include an evaluation of the potential impacts associated with an accidental release, the likelihood of an accidental release occurring, the magnitude of potential human exposure, any preexisting evaluations or studies of the material, the likelihood of the substance being handled in the manner indicated, and the accident history of the material. This new, recently developed program supersedes the California Risk Management and Prevention Plan (RMPP).

Title 8, California Code of Regulations, Section 5189, requires facility owners to develop and implement effective safety management plans to insure that large quantities of hazardous materials are handled safely. While such requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the RMP process.

Title 8, California Code of Regulations, Section 458 and Sections 500 - 515, set forth requirements for design, construction and operation of vessels and equipment used to store and transfer aqueous ammonia. These sections generally codify the requirements of several industry codes, including the ASME Pressure Vessel Code, ANSI K61.1 and the National Boiler and Pressure Vessel Inspection Code. These codes apply to aqueous ammonia and they may also be used to design storage facilities for aqueous ammonia.

California Health and Safety Code, section 41700, requires that "No person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."

Gas Pipeline

The safety requirements for pipeline construction vary according to the population density and land use, which characterize the surrounding land. The pipeline classes are defined as follows (Title 49, Code of Federal Regulations, Part 192):

- Class 1: Pipelines in locations with ten or fewer buildings intended for human occupancy.
- Class 2: Pipelines in locations with more than ten but fewer than 46 buildings intended for human occupancy. This class also includes drainage ditches of public roads and railroad crossings.
- Class 3: Pipelines in locations with more than 46 buildings intended for human occupancy, or where the pipeline is within 100 yards of any building or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12 month period (The days and weeks need not be consecutive).

The natural gas pipeline will be designed for Class 3 service and will meet California Public Utilities Commission General Order 112-E and 58-A standards as well as various PG&E standards. The natural gas pipeline must be constructed and operated in accordance with the Federal Department of Transportation (DOT) regulations, Title 49, Code of Federal Regulations (CFR), Parts 190, 191, and 192:

- Title 49, Code of Federal Regulations, Part 190 outlines the pipeline safety program procedures.
- Title 49, Code of Federal Regulations, Part 191, Transportation of Natural and Other Gas by Pipeline; Annual Reports, Incident Reports, and Safety-Related Condition Reports, requires operators of pipeline systems to notify the U.S. Department of Transportation of any reportable incident by telephone and then submit a written report within 30 days.
- Title 49, Code of Federal Regulations, Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, specifies minimum safety requirements for pipelines and includes material selection, design requirements, and corrosion protection. The safety requirements for pipeline construction vary according to the population density and land use which characterize the surrounding

land. This part contains regulations governing pipeline construction, which must be followed for Class 2 and Class 3 pipelines.

LOCAL AND REGIONAL

The Uniform Fire Code (UFC) contains provisions regarding the storage and handling of hazardous materials in Articles 79 and 80. The latest revision to Article 80 was in 1997 (Uniform Fire Code, 1997) and includes minimum setback requirements for outdoor storage of ammonia.

The California Building Code contains requirements regarding the storage and handling of hazardous materials. The Chief Building Official must inspect and verify compliance with these requirements prior to issuance of an occupancy permit. A further discussion of these requirements is provided in the **Seismic** portion of this document.

The Certified Unified Program Authority (CUPA) with responsibility to review RMPs and Hazardous Materials Business Plans is the Kings County Department of Health, Division of Environmental Health Services.

SETTING

The proposed site is located on a portion of a 148-acre parcel in the northeast corner of the City of Avenal in Kings County, at the western edge of the San Joaquin Valley. The project site is accessible via Avenal Cutoff Road, and is located about 2 miles east of I-5. The site is currently used for production of row crops and has been farmed for about 50 years. The site topography is gently sloping, with an elevation about 340 feet above sea level. The locale overall has a low population density. There are 9 residences within 3 miles of the site. The nearest residence is located more than 1 mile away. The nearest local communities are the City of Avenal, which is located about 6 miles southwest of the project and separated from the project by the Kettleman Hills, and the City of Huron, located about 8 miles to the north of the project.

Several factors associated with the area in which a project is to be located affect its potential to cause public health impacts from an accidental release of a hazardous material. These include:

- local meteorology;
- terrain characteristics; and
- location of population centers and sensitive receptors relative to the project.

METEOROLOGICAL CONDITIONS

Meteorological conditions, including wind speed, wind direction and air temperature, affect the extent to which accidentally released hazardous materials would be dispersed into the air and the direction in which they would be transported. This affects the potential magnitude and extent of public exposure to such materials as well as the associated health risks. When wind speeds are low and the atmosphere is stable, dispersion is severely reduced and can lead to increased localized public exposure.

Recorded wind speeds and ambient air temperatures are described in the Air Quality section (6.2) of the AFC. Staff agrees with the applicant that use of F stability (stagnated air, very little mixing) and 1.5 meter per second wind speed is appropriate for conducting the Offsite Consequence Analysis. Staff believes these represent a reasonably conservative scenario and thus reflects worst case atmospheric conditions.

TERRAIN CHARACTERISTICS

The location of elevated terrain (terrain above the power plant stack height) is often an important factor to be considered in assessing potential exposure. An emission plume resulting from an accidental release may impact high elevations before impacting lower elevations. The terrain is relatively featureless on all sides, with the Kettleman Hills lying approximately three miles southwest of the Site.

LOCATION OF EXPOSED POPULATIONS AND SENSITIVE RECEPTORS

The general population includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. Figures 6.16-1 and 6.16-2 (AFC) show the location of sensitive receptors and residents in the project vicinity. There are no sensitive receptors within 6 miles of the project site. There are residences located within 3 miles of the proposed project.

IMPACTS AND ANALYSIS

Staff thoroughly reviewed and assessed the potential for the transportation, handling, and use of hazardous materials to impact the surrounding community. All chemicals and natural gas were evaluated.

METHODOLOGY

In order to assess the potential for released hazardous materials to travel off-site, and impact on the public, staff analyzed several aspects of the proposed use of these materials at the facility. Staff recognizes that some hazardous chemicals must be used at power plants. Therefore, staff conducted its analysis by examining the need for hazardous materials, the choice of chemical to be used and its amount, the manner in which the applicant will use the chemical, the manner it will be transported to the facility and transferred to facility storage tanks, and the way the applicant chooses to store the material on-site. Staff reviewed the applicant's proposed engineering controls and administrative controls concerning hazardous materials usage. Engineering controls are those physical or mechanical systems (such as storage tanks or automatic shut-off valves) which can prevent a spill of hazardous material from occurring or which can limit the spill to a small amount or confine it to a small area. Administrative controls are those rules and procedures that workers at the facility must follow that will help to prevent accidents or keep them small if they do occur. Both engineering and administrative controls can act as methods of prevention or as methods of response and minimization. In both cases, the goal is to prevent a spill from moving off-site and causing harm to people.

Staff conducted a thorough review and evaluation of the applicant's proposed use of hazardous materials as described by the applicant in the AFC (Section 6.15). Staff's assessment followed the five steps listed below:

- Step 1: Staff reviewed the chemicals and the amounts proposed for on-site use as listed in Tables 6.15-1 of the AFC and determined the need and appropriateness of their use.
- Step 2: Those chemicals, proposed for use in small amounts or whose physical state is such that there is virtually no chance that a spill would migrate off the site and impact the public, will likely be removed from further assessment.
- Step 3: Measures proposed by the applicant to prevent spills were reviewed and evaluated. These included engineering controls such as automatic shut-off valves and different size transfer-hose couplings and administrative controls such as worker training and safety management programs.
- Step 4: Measures proposed by the applicant to respond to accidents were reviewed and evaluated. These measures also included engineering controls such as catchment basins and methods to keep vapors from spreading and administrative controls such as training emergency response crews.
- Step 5: Staff analyzed the theoretical impacts on the public worst-case spill of hazardous materials even with the mitigation measures proposed by the applicant. When mitigation methods proposed by the applicant are sufficient, no further mitigation is recommended. If the proposed mitigation is not sufficient to reduce the potential for adverse impacts to an insignificant level, staff will propose additional prevention and response controls until the potential for causing harm to the public is reduced to an insignificant level. It is only at this point that staff can recommend that the facility be allowed to use hazardous materials.

PROJECT IMPACTS

Small Quantity Hazardous Materials

In conducting the analysis, staff determined in Steps 1 and 2 that some materials, although present at the proposed facility, pose a minimal potential for off-site impacts as they will be stored in a solid form or in smaller quantities, have low mobility, or have low levels of toxicity. These hazardous materials were eliminated from further consideration.

During the construction phase of the project, the only hazardous materials proposed for use include paint, paint thinner, cleaners, solvents, sealants, gasoline, diesel fuel, motor oil, hydraulic fluid, welding flux and gases, lubricants and emergency refueling containers. Any impact of spills or other releases of these materials will be limited to the site due to the small quantities involved. Fuels such as fuel oil #6, mineral oil, lube oil, and diesel fuel are all of very low volatility and represent limited off-site hazard even in larger quantities.

The use of hydrogen gas poses a risk of explosion. However, the moderate quantity present and the results of previous modeling of the blast effects of a hydrogen tank explosion demonstrate that any blast effect will be confined to the site and not have

significant impacts off-site. The Applicant will be required by Condition of Certification **HAZ- 9** to store the hydrogen cylinders in an area isolated from combustion sources. The tanks and piping that are near potential traffic hazards will be protected from vehicle impact by traffic barriers.

After removing from consideration those chemicals that pose no risk of off-site impact in Steps 1 and 2, staff continued with Steps 3, 4 and 5 to review the only remaining hazardous materials: sulfuric acid, hydrochloric acid, sodium hypochlorite, natural gas, and aqueous ammonia.

Large Quantity Hazardous Materials

Sulfuric Acid will be present in excess of the Reportable Quantity (RQ) and therefore must be included in the Hazardous Materials Business Plan (HMBP) and the Risk Management Plan (RMP). The amount of hydrochloric acid and sodium hypochlorite stored on site will be below the RQ. These materials do not pose a risk of off-site impacts, because they have relatively low vapor pressures and thus spills would be confined to the site, or, as is the case with hydrochloric acid, they will be used infrequently. Because of public concern at another proposed energy facility in 1995, staff conducted a quantitative assessment of the potential for impact associated with sulfuric acid use, storage, and transportation. Staff found no hazard would be posed to the public. However, in order to protect against risk of fire, an additional Condition of Certification will require that the project owner shall ensure that no combustible or flammable material is stored within 100 feet of the sulfuric acid tank.

Natural Gas

Natural gas poses a fire and/or explosion risk as a result of its flammability. Natural gas is composed of mostly methane but also contains ethane, propane, nitrogen, butane, isobutane and isopentane. It is colorless, odorless, and tasteless and is lighter than air. Natural gas can cause asphyxiation when methane is ninety percent in concentration. Methane is flammable when mixed in air at concentrations of 5 to 14 percent, which is also the detonation range. Natural gas, therefore, poses a risk of fire and/or explosions if a release were to occur. However, it should be noted that, due to its tendency to disperse rapidly (Lees 1983), natural gas is less likely to cause explosions than many other fuel gases, such as propane or liquefied petroleum gas. While natural gas will be used in significant quantities, it will not be stored on-site. The risk of a fire and/or explosion on-site can be reduced to insignificant levels through adherence to applicable codes and development and implementation of effective safety management practices. In particular, gas explosions can occur in the Heat Recovery Steam Generator (HRSG) and during start-up. The National Fire Protection Association (NFPA 85A) requires 1) the use of double block and bleed valves for gas shut-off; 2) automated combustion controls; and 3) burner management systems. These measures will significantly reduce the likelihood of an explosion in gas-fired equipment. Additionally, start-up procedures will require air purging of the gas turbines prior to start-up, thus precluding the presence of an explosive mixture. The safety management plan proposed by the applicant will address the handling and use of natural gas and significantly reduce the potential for equipment failure due to improper maintenance or human error. Since the proposed facility will require the installation of a new gas pipeline off-site, impacts from this pipeline need to be evaluated.

The design of the natural gas pipeline is governed by laws and regulations discussed here. These LORS require use of high quality arc welding techniques by certified welders and inspection of welds. Many failures of older natural gas lines have been associated with poor quality gas welds. Many failures in older pipelines have also resulted from corrosion. Current codes address this failure mode by requiring use of corrosion resistant coatings and cathodic corrosion protection. Another major cause of pipeline failure is damage resulting from excavation activities near pipelines. Current codes address this mode of failure by requiring clear marking of the pipeline route. An additional mode of failure particularly relevant to the project area is damage caused by earthquake. Existing codes also address seismic hazard in design criteria (see discussion below). Evaluation of pipeline performance in recent earthquakes indicates that pipelines designed to modern codes perform well in seismic events while older lines frequently fail. Staff believes that existing regulatory requirements are sufficient to reduce the risk of accidental release from the pipeline to insignificant levels.

Failures of gas pipelines, according to data from the U.S. Department of Transportation (the National Transportation Safety Board) from the period 1984 - 1991, occur as a result of pipeline corrosion, pipeline construction or materials defects, rupture by heavy equipment excavating in the area such as bulldozers and backhoes, weather effects, and earthquakes. Given the gas line failures which occurred in the Marina District of San Francisco during the 1989 Loma Prieta earthquake, the January 1994 Northridge earthquake in Southern California, and the January 1995 gas pipeline failures in Kobe, Japan, as well as the January 19, 1995 gas explosion in San Francisco, the safety of the gas pipeline is of paramount importance. However, it must be noted that those pipelines, which failed, were older and not manufactured nor installed to modern code requirements.

The natural gas pipeline for the proposed facility will be installed, owned, and operated by the applicant. If loss of containment occurs as a result of pipe, valve, or other mechanical failure or external forces, significant quantities of compressed natural gas could be released rapidly. Such a release can result in a significant fire and/or explosion hazard, which could cause loss of life and/or significant property damage in the vicinity of the pipeline route. However, the probability of such an event is extremely low if the pipeline is constructed according to present standards.

According to DOT statistics, the frequency of reportable incidents is about 0.25 for all pipeline incidents per 1,000 miles per year or 2.5×10^{-4} incidents per mile per year (SERA 1993). DOT has also evaluated and categorized the major causes of pipeline failure. To summarize, the four major causes of accidental releases from natural gas pipelines are: Outside Forces-43 percent, Corrosion-18 percent, Construction/Material Defects-13 percent, and Other-26 percent.

Outside forces are the primary causes of incidents. Damage from outside forces includes damage caused by use of heavy mechanical equipment near pipelines (e.g., bulldozers and backhoes used in excavation activities), weather effects, vandalism, and earthquake-caused rupture as seen in the Marina District of San Francisco during the 1989 Loma Prieta Quake and in Kobe, Japan in January 1995. The fourth category, “Other” includes equipment component failure, compressor station failures, operator

errors and sabotage. The average annual service incident frequency for natural gas transmission systems varies with age, the diameter of the pipeline, and the amount of corrosion.

Older pipelines have a significantly higher frequency of incidents. This results from the lack of corrosion protection and use of less corrosion resistant materials compared to modern pipelines, limited use of modern inspection techniques, and higher frequency of incidents involving outside forces. The increased incident rate due to outside forces is the result of the use of a larger number of smaller diameter pipelines in older systems, which are generally more easily damaged and the uncertainty regarding the locations of older pipelines.

In the United States, extensive federal and state pipeline codes and safety enforcement minimize the risk of severe accidents related to natural gas pipelines. Recently in November 2000, the DOT Office of Pipeline Safety proposed a program requiring the preparation of risk management plans for gas pipelines throughout the United States. These risk management plans will include the use of diagnostic techniques to detect internal and external corrosion or cracks in pipelines and to perform preventive maintenance. The project owner would be required to develop and implement these plans if the proposal is promulgated as a regulation.

Staff believes the worst case scenario for off-site natural gas hazard is a large rupture of the pipeline caused by improper use of heavy equipment near the pipeline. [The applicant would provide an analysis of the likelihood - which is thought to be very low - of explosion and fire resulting from sparks generated from heavy equipment rupture of the pipeline if the DOT proposal for a pipeline risk management plan becomes regulation.] This worst case scenario would not result in significant asphyxiation hazard since natural gas disperses to the atmosphere rapidly when released. The worst case scenario is primarily a safety hazard to construction workers and nearby residences. The project owner will mark the pipeline in conformance with State and Federal regulations to lower the probability of occurrence of the above scenario. The gas pipeline will be buried at a depth that would ensure that a farm tractor disking the soil would not reach the pipeline.

The following safety features will be incorporated into the design and operation of the natural gas pipeline (as required by current federal and state codes): (1) while the pipeline will be designed, constructed, and tested to carry natural gas at a certain pressure, the working pressure will be less than the design pressure; (2) butt welds will be X-rayed and the pipeline will be tested with water prior to the introduction of natural gas into the line; (3) the pipeline will be surveyed for leakage annually (4) the pipeline will be marked to prevent rupture by heavy equipment excavating in the area; and (5) valves at the meter will be installed to isolate the line if a leak occurs. (See Conditions of Certification **HAZ-6** & **7**)

Aqueous Ammonia

Based on the discussion above, aqueous ammonia and natural gas are the only hazardous materials that may pose a risk of off-site impacts. Aqueous ammonia will be used in controlling the emission of oxides of nitrogen (NOx) from the combustion of natural gas in the facility. The accidental release of aqueous ammonia without proper

mitigation can result in very large down-wind concentrations of ammonia gas. One storage tank will be used to store the 19% aqueous ammonia with a maximum capacity of 24,000 gallons.

Aqueous ammonia is one of the hazardous materials that may pose a risk of off-site impacts. The use of aqueous ammonia can result in the formation and release of toxic gases in the event of a spill even without interaction with other chemicals. This is a result of its moderate vapor pressure and the large amounts of aqueous ammonia, which will be used and stored on-site. However, as with aqueous hypochlorite, the use of aqueous ammonia instead of the much more hazardous anhydrous ammonia (i.e. ammonia that is not diluted with water) poses far less risk.
To assess the potential impacts associated with an accidental release of ammonia, staff typically evaluates where four “bench mark” exposure levels of ammonia gas occur off-site. These include: 1) the lowest concentration posing a risk of lethality, 2,000 ppm; 2) the Immediately Dangerous to Life and Health (IDLH) level of 300 ppm; 3) the Emergency Response Planning Guideline (ERPG) level 2 of 150 ppm (recently changed from the 200 ppm value), which is also the RMP level 1 criterion used by EPA and California; and 4) the level considered by the Energy Commission staff to be without serious adverse effects on the public for a one-time exposure of 75 ppm. (A detailed discussion of the exposure criteria considered by staff and their applicability to different populations and exposure-specific conditions is provided in Appendix A of this analysis.) If the exposure associated with a potential release exceeds 75 ppm at any public receptor, staff will presume that the potential release poses a risk of significant impact. However, staff will also assess the probability of occurrence of the release and/or the nature of the potentially exposed population in determining whether the likelihood and extent of potential exposure are sufficient to support a finding of potentially significant impact.

Appendix 6.15-1 describes the modeling parameters used for the worst case and alternative case accidental releases of aqueous ammonia. The worst-case release in the AFC is associated with a failure of the ammonia storage tank releasing all of its content, and the alternative scenario is a failure of a supply truck loading hose spilling 8,000 gallons of aqueous ammonia. In conducting these two scenario analyses, it can be assumed that spilled material would be contained in the basin below the storage tank and below the tanker truck pad.

The storage tank would be surrounded by a secondary containment area filled with plastic balls that would reduce the surface area to about one tenth of the total surface area, and partially block the wind. Another mitigation design feature is the 24-inch diameter manhole-sized drain in the bottom of the containment area, which drains into an underground tertiary containment vault (Duke 2001a, Section 6.15.2.2.4 and Figure 6.15-1). The basin below the loading area will have a 10-inch diameter drain that connects as well to the underground vault.

In addition, winds of 1.5 meter per second and category F stability would exist at the time of the accidental release. The US EPA-approved DEGADIS air dispersion model was used to estimate airborne concentrations of ammonia. This model is designed to predict the maximum possible impacts based on distance from the storage tank without regard to specific direction of transport.

The results of the applicant's modeling showed that off-site airborne concentrations of ammonia would not exceed the level the CEC uses to establish insignificance (75 ppm) at the nearest public receptor. For the worst-case scenario, the concentration of 75 ppm was present at 839 feet from the aqueous ammonia storage tank. For the alternative scenario, the concentration of 75 ppm was present at 859 feet from the loading area, which is just a few feet outside the facility fence line (Duke 2001a, Figures 6.15-4 and 6.15-5). Staff reviewed the applicants' modeling calculations, and concludes that the results are accurate. Therefore, the release of aqueous ammonia used for the project will not cause a significant off-site impact. Staff continues, however, to assess the proposed location of the softball and soccer fields as depicted in Figure 6.13-18 to determine the appropriateness of locating these fields near the power plant.

Transportation of Hazardous Materials

Hazardous materials including aqueous ammonia, sulfuric acid, and sodium hypochlorite will be transported to the facility via tanker truck. While many types of hazardous materials will be transported to the site, it is staff's belief that transport of aqueous ammonia would pose the predominance of risk associated with such transport.

Staff reviewed the Applicant's transportation analysis and the proposed transportation routes for hazardous materials delivery (Duke 2001a, Appendix 6.11-1 and Section 6.11). Staff believes that it is appropriate to rely on the extensive regulatory program that applies to shipment of hazardous materials on California Highways to ensure safe handling in general transportation (see the Federal Hazardous Materials Transportation Law [49 U.S.C. §5101 et seq], the US Department of Transportation Regulations [49 C.F.R. Subpart H, §172-700], and California DMV Regulations on Hazardous Cargo). These regulations also address the issue of driver competence.

To address the issue of tank truck safety, the Applicant stated that aqueous ammonia would be delivered to the proposed facility only in Department of Transportation (DOT)-certified vehicles with a design capacity of 8,000 gallons. These vehicles will be designed to DOT Code MC-330 or MC-331. These are high integrity vehicles designed for hauling caustic materials under pressure such as aqueous ammonia. Staff has proposed Condition **HAZ-8** requiring use of a DOT vehicle appropriate for hauling an aqueous ammonia solution.

The transportation of similar volumes of hazardous materials on the nation's highways is not unique nor an infrequent occurrence. Based on the environmental mobility, toxicity, quantities present at the site, and frequency of delivery, it is staff's opinion that ammonia poses the predominate risk associated with hazardous materials transportation and use at the proposed facility. Based on this, staff concludes that the risk associated with transportation of other hazardous materials to the proposed facility does not significantly increase the risk of impact beyond that associated with existing transportation of aqueous ammonia.

Seismic Issues

The possibility exists that an earthquake would cause the failure of a hazardous materials storage tank and rupture of the natural gas pipeline. The quake could also cause the failure of the secondary containment system (berms and dikes) as well as electrically controlled valves, pumps, neutralization systems and the foam vapor

suppression system. The failure of all these preventive control measures might then result in a vapor cloud of hazardous materials moving off-site and impacting the residents and workers in the surrounding community. The effects of the Loma Prieta earthquake of 1989, the Northridge earthquake of 1994, and the earthquake in Kobe, Japan heighten the concern regarding earthquake safety in January 1995.

Information obtained after the January 1994 Northridge earthquake showed that some damage was caused to several large storage tanks and smaller tanks associated with the water treatment system of a cogeneration facility. Those tanks with the greatest damage - including seam leakage - were older tanks while the newer tanks sustained displacements and failures of attached lines. Therefore, staff conducted an analysis of the codes and standards, which should be followed in adequately designing and building storage tanks and containment areas as well as the natural gas pipeline to withstand a large earthquake. Staff recommends that the proposed facility be designed and constructed to the applicable standards of the Uniform Building Code for Seismic Zone 4, CPUC General Order 112E, and the CFR Title 49 Part 192. If these standards are followed, staff concludes that the likelihood of accidental releases of hazardous materials during seismic events would be insignificant.

CUMULATIVE IMPACTS

Staff reviewed the potential for the construction and operation of the Avenal Energy Project combined with any existing facilities in the project area to result in cumulative impacts on the population within the area. Projects that could potentially contribute to cumulative impacts are identified in Section 6.1.4 and Table 6.1-1 of the AFC (Duke Avenal 2001a). Staff evaluated the impacts from construction of the City of Avenal Water Turnout Relocation, Coalinga Mental Health Facility, Hanford Hospital and City of Mendota Prison. Since construction and operation of these type of projects does not involve the handling of significant amounts of hazardous materials, staff concludes that there would be no hazardous materials related cumulative impacts. Staff finds that the facility, as proposed by the Applicant and with the additional mitigation measures proposed by the Staff, poses a minimal risk of accidental release, which could result in off-site impacts. It is further extremely unlikely that an accidental release that has very low probability of occurrence (about one in a million per year) would independently occur simultaneously at the Avenal Energy Project and another facility at the same time. Therefore, staff concludes that the facility would not contribute to a cumulative impact.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is greater than fifty percent within a six-mile radius of the proposed Avenal Energy Project (please refer to **Socioeconomics Figure 1** in this Staff Assessment), and Census 1990 information that shows the low-income population is less than fifty percent within the same radius. Although the minority population within the six-mile radius is greater than 50 percent, the actual number of people living within the six-mile radius (331) is very small and widely dispersed. Since staff has concluded that there will be no significant direct or cumulative hazardous materials-related impacts, there will also be no significant impact to any minority or low-income populations. Therefore there are no environmental justice issues.

APPLICANT'S PROPOSED MITIGATION

The potential for accidents resulting in the release of hazardous materials is greatly reduced by the implementation of a safety management program, which includes the use of both engineering and administrative controls. Administrative controls include the development and implementation of a Safety Management Plan. Elements of facility controls and the safety management plan are summarized below.

ENGINEERING CONTROLS

Engineering controls help to prevent accidents and releases (spills) from moving off-site and impacting the community by incorporating engineering safety design criteria into the design of the facility. The engineered safety features proposed by the applicant for use at this facility include:

- Construction of secondary containment structures that surround each aqueous ammonia storage tank and the tank truck unloading facility, limiting the area of potential spread of an accidental release.
- Underground containment vault that would collect the accidental release from the secondary containment structures, reducing the ability of the ammonia to vaporize into the atmosphere.
- Large, 24-inch drain at the bottom center of the sloped secondary containment beneath each storage tank, and 10-inch drain at the bottom center of the truck-unloading ramp, directly draining into the vault.
- Use of industrial quality high-density polyethylene (HDPE) balls to reduce ammonia evaporation, either from an exposed liquid surface or from the underground containment vault.
- Physical separation of stored chemicals in separate containment areas in order to prevent accidental mixing of incompatible materials which may result in the evolution and release of toxic gases or fumes.

ADMINISTRATIVE CONTROLS

Administrative controls also help to prevent accidents and releases (spills) from moving off-site and impacting the community by establishing worker training programs, process safety management programs and by complying with all applicable health and safety laws, ordinances and standards.

The worker health and safety program proposed by the applicant for use at this facility will include (but is not limited to) the following elements:

- worker training regarding chemical hazards, health and safety issues, and hazard communication;
- the proper use of personal protective equipment;
- safety operating procedures for operation and maintenance of systems utilizing hazardous materials; and

- fire safety and prevention; and emergency response actions including facility evacuation, hazardous material spill cleanup, and fire prevention.

At the facility, the project owner will be required to designate an individual who has the responsibility and authority to ensure a safe and healthful workplace. The project health and safety professional oversees the health and safety program and has the authority to halt any action or modify any work practice in order to protect the workers, facility, and the surrounding community or in the event that the health and safety program is violated.

A facility Process Safety Management Program is required for the facility. This is a program for the regular inspection and maintenance of equipment, valves, piping, and appurtenances. Additionally, the process safety management program requires that only trained facility personnel are assigned to the transfer and handling of hazardous chemicals.

ON-SITE SPILL RESPONSE

In order to address the issue of spill response, the facility will prepare and implement an Emergency Response Plan which includes information on: hazardous materials contingency and emergency response procedures, spill containment and prevention systems, personnel training, spill notification, on-site spill containment, prevention equipment and capabilities, etc. Emergency procedures will be established which include evacuation; spill cleanup, hazard prevention, and emergency response. The facility emergency coordinator will notify the plant emergency response team and other key personnel. The Kings County Fire Department, the Kings County Department of Health, Division of Environmental Health Services and the California Office of Emergency Services will also be immediately contacted.

Kings County does not have a Hazmat team. However, it has an agreement with the City of Visalia Fire Department, which has a Hazmat team to provide response to spills. Additionally, the City of Hanford Fire Department and the Lemoore Naval Air Station have Hazmat teams and can also be called upon in the event of a spill (Fillmore 2002). While there are no estimated response times from these locations, the Lemoore NAS is the closest (~17 miles distant), Hanford is ~26 miles distant, and Visalia is ~41 miles away. Thus, hazmat response time could vary between 15 and 40 minutes. Staff finds that these response times are consistent for power plants located within California. Please refer to the **Worker Safety/Fire Protection** section for additional information regarding hazardous materials response.

STAFF'S PROPOSED MITIGATION

Staff proposes nine Conditions of Certification mentioned throughout the text (above) and listed below. **HAZ-1** ensures that no hazardous material would be used at the facility except those listed in the AFC unless there is prior approval by the County and the CEC CPM. **HAZ-2** requires that a RMP be prepared and submitted prior to the delivery of aqueous ammonia.

The worst-case accidental release scenario evaluated in the AFC assumed that accidental spills of aqueous ammonia would occur from the storage tank into the catchment system. Staff believes that the most likely event resulting in a spill would be during transfer from the delivery tanker to the storage tank. Staff therefore proposes a condition (**HAZ-3**) requiring development of a safety management plan for the delivery of aqueous ammonia. The development of a Safety Management Plan addressing delivery of ammonia will further reduce the risk of any accidental release not addressed by the proposed spill prevention mitigation measures and the required Risk Management Plan (RMP). **HAZ-4** requires that the aqueous ammonia storage tank be designed to certain rigid specifications, **HAZ-5** addresses the storage of sulfuric acid, and **HAZ-6** & **7** address the safety of the gas pipeline. The transportation of hazardous materials is addressed in **HAZ-8,** hydrogen storage is addressed in **HAZ-9**.

FACILITY CLOSURE

The requirements for handling of hazardous materials remain in effect until such materials are removed from the site regardless of the reasons for facility closure. Therefore, the facility owners are responsible for continuing to handle such materials in a safe manner, as required by applicable laws. An approved on-site contingency plan is also required to protect public health and safety in the case of unexpected permanent closure. As above, the plan must provide for the removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment.

For planned permanent closure, Duke Avenal will develop a facility closure plan at least twelve months prior to commencement of closure and is committed to complying with LORS which are applicable at the time of closure. Duke Avenal will also be require to comply with the CEC's General Conditions for Facility Closure (COM-12 and 13).

In the event that the facility owner abandons the facility in a manner which poses a risk to surrounding populations, staff will coordinate with the California Office of Emergency Services, Kings County Environmental Health Department, and the California Department of Toxic Substances Control (DTSC) to ensure that any unacceptable risk to the public is eliminated.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

None received.

CONCLUSIONS AND RECOMMENDATIONS

Staff's evaluation of the proposed project (with staff's proposed mitigation measures) indicates that hazardous materials use will pose little potential for significant impacts on the public. With adoption of the proposed conditions of certification, the proposed project will comply with all applicable laws, ordinances, regulations and standards (LORS). In response to Health and Safety Code, section 25531 et seq., the applicant will be required to develop an RMP. To insure adequacy of the RMP, staff's proposed conditions of certification require that the RMP be submitted for concurrent review by

EPA, Kings County, and staff. In addition, staff's proposed conditions of certification require Kings County's review, and staff's review and approval of the RMP prior to delivery of any hazardous materials to the facility. Other proposed conditions of certification address the issue of the transportation, storage, and use of aqueous ammonia.

Staff recommends the Energy Commission adopt the proposed conditions of certification, presented herein, to ensure that the project is designed, constructed and operated to comply with applicable LORS and to protect the public from significant risk of exposure to an accidental ammonia release.

PROPOSED CONDITIONS OF CERTIFICATION

HAZ-1 The project owner shall not use any hazardous materials not listed in Appendix C, below, and the owner shall not use any hazardous substances in greater quantities than those identified by chemical name in Appendix C, below, unless approved in advance by Kings County and the CPM.

Verification: The project owner shall provide to the Compliance Project Manager (CPM), in the Annual Compliance Report, a list of hazardous materials contained at the facility in reportable quantities.

HAZ-2 The project owner shall provide a Risk Management Plan to the Kings County Environmental Health Department and the to CPM for review at the time the plans are first submitted to the U.S. Environmental Protection Agency (EPA). The project owner shall include all recommendations of Kings County and the CPM in the final document. A copy of the final plans, including all comments, shall be provided to Kings County and the CPM once approved by EPA.

Verification: At least sixty (60) days prior to the delivery of aqueous ammonia the project owner shall provide the final plans listed above and accepted by Kings County to the CPM for approval.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for delivery of aqueous ammonia. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of aqueous ammonia with incompatible hazardous materials.

Verification: At least sixty (60) days prior to the delivery of aqueous ammonia to the facility, the project owner shall provide a safety management plan as described above to the CPM for review and approval.

HAZ-4 The aqueous ammonia storage facility shall be designed to either the ASME Pressure Vessel Code and ANSI K61.6 or to API 620. In either case, a secondary containment basin capable of holding 125% of the storage volume shall protect the storage tank plus the volume associated with 24 hours of rain assuming the 25-year storm as specified in the AFC (Page 6.15-13).

Verification: At least sixty (60) days prior to delivery of aqueous ammonia to the facility, the project owner shall submit final design drawings and specifications for the

ammonia storage tank and secondary containment basin to the CPM for review and approval.

HAZ-5 The project owner shall ensure that no combustible or flammable material is stored within 100 feet of the sulfuric acid tank.

Verification: At least sixty (60) days prior to receipt of sulfuric acid on-site, the Project Owner shall provide copies of the facility design drawings showing the location of the sulfuric acid storage tank and the location of any tanks, drums, or piping containing any combustible or flammable materials

HAZ-6 The project owner is required to perform design review and detailed inspections of the natural gas pipeline that connects to PG&E's mainline 30 years after initial plant startup and every five (5) years thereafter in accordance with applicable LORS.

Verification: At least thirty (30) days prior to the initial flow of gas in the pipeline, the project owner shall provide an outline of a natural gas pipeline long-range design review plan to the CMP for review and approval. Twenty-nine (29) years after initial startup, the full plan shall be submitted to the CPM for review and approval. The project owner shall provide a summary of the results of the pipeline inspections in the first annual compliance report following the first year of implementation of the plan, and every fifth annual compliance report thereafter.

HAZ-7 After any significant seismic event in the area where surface rupture occurs within one mile of the pipeline, the gas pipeline shall be inspected by the project owner.

Verification: At least thirty (30) days prior to the initial flow of gas in the pipeline, the project owner shall provide a detailed plan to accomplish a full and comprehensive pipeline inspection in the event of an earthquake to the CMP for review and approval. This plan shall be revised, as appropriate, and submitted to the CPM for review and approval, at least every five years.

HAZ-8 The project owner shall direct all vendors delivering aqueous ammonia to the site to use only tanker truck transport vehicles which meet or exceed the specifications of DOT Code MC-307.

Verification: At least sixty (60) days prior to receipt of aqueous ammonia on site, the project owner shall submit copies of the notification letter to supply vendors indicating the transport vehicle specifications, to the CPM for review and approval.

HAZ-9 The project owner shall ensure that the hydrogen gas storage cylinders are stored in an area out of the plane of the turbines and that no combustible or flammable material is stored within 100 feet of the hydrogen cylinders.

Verification: At least sixty (60) days prior to receipt of hydrogen gas on-site, the project owner shall provide a copy of the site plan showing the location of the hydrogen gas cylinders and the location of any tanks, drums, or piping containing any combustible or flammable material and the route by which such materials will be transported through the facility.

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APPENDIX A

HAZARDOUS MATERIAL MANAGEMENT

BASIS FOR STAFF'S USE OF 75 PPM AMMONIA EXPOSURE CRITERIA

Staff uses a health-based airborne concentration of 75 PPM to evaluate the significance of impacts associated with potential accidental releases of ammonia. While this level is not consistent with the 200-ppm level used by EPA and Cal/EPA in evaluating such releases pursuant the Federal Risk Management Program and State Accidental Release Program, it is appropriate for use in staff's CEQA analysis. The Federal Risk Management Program and the State Accidental Release Program are administrative programs designed to address emergency planning and ensure that appropriate safety management practices and actions are implemented in response to accidental releases. However, the regulations implementing these programs do not provide clear authority to require design changes or other major changes to a proposed facility. The preface to the Emergency Response Planning Guidelines (ERPGs) states that "these values have been derived as planning and emergency response guidelines, **not** exposure guidelines, they do not contain the safety factors normally incorporated into exposure guidelines. Instead they are estimates, by the committee, of the thresholds above which there would be an unacceptable likelihood of observing the defined effects." It is staff's contention that these values apply to healthy adult individuals and are levels that should not be used to evaluate the acceptability of avoidable exposures for the entire population. While these guidelines are useful in decision making in the event that a release has already occurred (for example, prioritizing evacuations), they are not appropriate for and are not binding on discretionary decisions involving proposed facilities where many options for mitigation are feasible. CEQA requires permitting agencies making discretionary decisions to identify and mitigate potentially significant impacts through changes to the proposed project.

Staff has chosen to use the National Research Council's 30 minute Short Term Public Emergency Limit (STPEL) for ammonia to determine the potential for significant impact. This limit is designed to apply to accidental unanticipated releases and subsequent public exposure. Exposure at this level should not result in serious effects but would result in "strong odor, lacrimation, and irritation of the upper respiratory tract (nose and throat), but no incapacitation or prevention of self-rescue." It is staff's opinion that exposures to concentrations above these levels pose significant risk of adverse health impacts on sensitive members of the general public. It is also staff's position that these exposure limits are the best available criteria to use in gauging the significance of public exposures associated with potential accidental releases. It is, further, staff's opinion that these limits constitute an appropriate balance between public protection and mitigation of unlikely events, and are useful in focusing mitigation efforts on those release scenarios that pose real potential for serious impacts on the public. Table 1 provides a comparison of the intended use and limitations associated with each of the various criteria that staff considered in arriving at the decision to use the 75-ppm STPEL. Appendix B provides a summary of adverse effects, which might be expected to occur at various airborne concentrations of ammonia.

HAZARDOUS MATERIAL MANAGEMENT
APPENDIX A TABLE 1

Acute Ammonia Exposure Guidelines

Guideline	Responsible Authority	Applicable Exposed Group	Allowable Exposure Level	Allowable* Duration of Exposures	Potential Toxicity at Guideline Level/Intended Purpose of Guideline
IDLH[2]	NIOSH	Workplace standard used to identify appropriate respiratory protection.	300 ppm	30 min.	Exposure above this level requires the use of "highly reliable" respiratory protection and poses the risk of death, serious irreversible injury or impairment of the ability to escape.
IDLH/10[1]	EPA, NIOSH	Work place standard adjusted for general population factor of 10 for variation in sensitivity	30 ppm	30 min.	Protects nearly all segments of general population from irreversible effects
STEL[2]	NIOSH	Adult healthy male workers	35 ppm	15 min. 4 times per 8 hr day	No toxicity, including avoidance of irritation
EEGL[3]	NRC	Adult healthy workers, military personnel	100 ppm	Generally less than 60 min.	Significant irritation but no impact on personnel in performance of emergency work; no irreversible health effects in healthy adults. Emergency conditions one time exposure
STPEL[4]	NRC	Most members of general population	50 ppm 75 ppm 100 ppm	60 min. 30 min. 10 min.	Significant irritation but protects nearly all segments of general population from irreversible acute or late effects. One time accidental exposure
TWA[2]	NIOSH	Adult healthy male workers	25 ppm	8 hr.	No toxicity or irritation on continuous exposure for repeated 8 hr. Work shifts
ERPG-2[5]	AIHA	Applicable only to emergency response planning for the general population (evacuation) (not intended as exposure criteria) (see preface attached)	200 ppm	60 min.	Exposures above this level entail** unacceptable risk of irreversible effects in healthy adult members of the general population (no safety margin)

1) (EPA 1987) 2) (NIOSH 1994) 3) (NRC 1985) 4) (NRC 1972) 5) (AIHA 1989)

* The (NRC 1979), (WHO 1986), and (Henderson and Haggard 1943) all conclude that available data confirm the direct relationship to increases in effect with both increased exposure and increased exposure duration.

** The (NRC 1979) describes a study involving young animals, which suggests greater sensitivity to acute exposure in young animals. The (WHO 1986) warns that the young, elderly, asthmatics, those with bronchitis and those that exercise should also be considered at increased risk based on their demonstrated greater susceptibility to other non-specific irritants

References for Appendix A, Table 1

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Abbreviations for Appendix A, Table 1

ACGIH, American Conference of Governmental and Industrial Hygienists
AIHA, American Industrial Hygienists Association
EEGL, Emergency Exposure Guidance Level
EPA, Environmental Protection Agency
ERPG, Emergency Response Planning Guidelines
IDLH, Immediately Dangerous to Life and Health Level
NIOSH, National Institute of Occupational Safety and Health
NRC, National Research Council
STEL, Short Term Exposure Limit
STPEL, Short Term Public Emergency Limit
TLV, Threshold Limit Value
WHO, World Health Organization

Appendix B

SUMMARY OF ADVERSE HEALTH EFFECTS OF AMMONIA

638 PPM

WITHIN SECONDS:

- Significant adverse health effects;
- Might interfere with capability to self rescue;
- Reversible effects such as severe eye, nose and throat irritation.

AFTER 30 MINUTES:

- Persistent nose and throat irritation even after exposure stopped;
- irreversible or long-lasting effects possible: lung injury;
- Sensitive people such as the elderly, infants, and those with breathing problems (asthma) experience difficulty in breathing;
- asthmatics will experience a worsening of their condition and a decrease in breathing ability, which might impair their ability to move out of area.

266 PPM

WITHIN SECONDS:

- Adverse health effects;
- Very strong odor of ammonia;
- Reversible moderate eye, nose and throat irritation.

AFTER 30 MINUTES:

- Some decrease in breathing ability but doubtful that any effect would persist after exposure stopped;
- Sensitive persons: experience difficulty in breathing;
- asthmatics: may have a worsening condition and decreased breathing ability, which might impair their ability to move out of the area.

64 PPM

WITHIN SECONDS:

- Most people would notice a strong odor;
- Tearing of the eyes would occur;
- Odor would be very noticeable and uncomfortable.

- Sensitive people could experience more irritation but it would be unlikely that breathing would be impaired to the point of interfering with capability of self rescue
- Mild eye, nose, or throat irritation
- Eye, ear, & throat irritation in sensitive people
- asthmatics might have breathing difficulties but would not impair capability of self rescue

22 OR 27 PPM

WITHIN SECONDS:

- Most people would notice an odor;
- No tearing of the eyes would occur;
- Odor might be uncomfortable for some;
- sensitive people may experience some irritation but ability to leave area would not be impaired;
- Slight irritation after 10 minutes in some people.

4.0, 2.2, OR 1.6 PPM

- No adverse effects would be expected to occur;
- doubtful that anyone would notice any ammonia (odor threshold 5 - 20 PPM);
- Some people might experience irritation after 1 hr.

APPENDIX C

[Attach AFC Table 6.15-1 here.]

LAND USE

Tamblyn Borton and Amanda Stennick

INTRODUCTION

This land use analysis of the Duke Avenal Energy Project (AEP) focuses on two main issues: the project's consistency with local land use plans, ordinances and policies; and the project's compatibility with existing and planned land uses. In general, an electric generation project and its related facilities will be incompatible with existing and planned land uses if it creates unmitigated noise, dust, health hazard traffic, or visual impacts or when it unduly restricts existing or planned future uses.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

This section describes federal, state, regional, and local land use LORS applicable to the proposed project.

FEDERAL

While the AEP is subject in general to federal LORS, there are no specific federal laws, regulations or standards associated with land use that apply to the project.

STATE

Subdivision Map Act (Pub. Resources Code § 66410-66499.58)

The Subdivision Map Act provides procedures and requirements regulating land divisions (subdivisions) and determines parcel legality. Regulation and control of the design and improvement of subdivisions, by this Act, have been vested in the legislative bodies of local agencies. Each local agency by ordinance regulates and controls the initial design and improvement of developments and subdivisions for which the Map Act requires a tentative and final map.

LOCAL

Avenal General Plan

State law requires that each city and/or county prepare and adopt a comprehensive General Plan for the physical development of the city or county. County jurisdictions cover rural and unincorporated areas of the state. The General Plan must be internally consistent, and it must contain implementation measures to ensure its compliance.

There are seven mandated elements that must, by state law, be included in the General Plan: land use, circulation, housing, conservation, open space, noise and safety. The state also permits jurisdictions to adopt other elements, including but not limited to recreation, public services, scenic highways and historic preservation. The California Government Code section 65302a mandates a land use element designating the proposed general distribution, general location and extent of uses of the land. These state requirements are implemented through the Avenal General Plan and Avenal

Municipal Zoning Ordinance. The AEP site is designated Industrial by the General Plan.

Avenal Zoning Ordinance

The proposed 148-acre parcel is zoned Industrial by the Avenal Municipal Code (AMC). Zoning Ordinance Section 11.03 specifies uses permitted in an industrial district, subject to the approval of a conditional use permit (CUP). A Site Plan Review is required of all CUP applications, following Zoning Ordinance Chapter 27 procedures. The Project would require a CUP and Site Plan Review under the Zoning Ordinance, except that state law provides for certification of power plant sites by the Energy Commission in lieu of any local requirements. However, in June 2001, the Planning Commission and City Council approved a CUP and a variance under Zoning Ordinance Section 28 that allows the Project to be constructed with structures up to 200 feet in height.

City of Avenal property development standards are defined in Chapter 17 of the Zoning Ordinance. Standards for street improvements, off-street parking, trash enclosures, utilities, landscaping, fencing, and sign standards for industrial areas are identified in Zoning Ordinance Sections 17.02 through 17.09.

Kings County Land Use Policies

The Kings County General Plan policies, guidelines and standards apply only to land use and development within the unincorporated territory of the County. They do not apply to development within the City of Avenal. The City and the County work together to develop complementary planning documents. However, the County does not have land use authority in the City.

The only project land use that will occur on unincorporated lands is the 1.6-mile water pipeline from the existing ground water wells located north of the site along the San Luis canal.

Fresno County Land Use Policies

The Fresno County General Plan policies, guidelines and standards apply to land use development within unincorporated areas of Fresno County. The Project will include approximately 200 feet of water pipeline in Fresno County that will connect an existing well to the site for standby water supply. Under the Fresno County General Plan, non-agricultural uses in areas zoned for agricultural uses are permitted so long as those uses do not diminish agricultural production capacity, economic viability, or detrimentally impact surrounding agricultural operations to the extent that further losses in production may occur. (Fresno County General Plan, 1988, Sec. 204-02.).

SETTING

SITE AND VICINITY DESCRIPTION

The site is located within the city limits of Avenal, on the west side of the San Joaquin Valley, approximately two miles east of Interstate 5. Avenal is located in Kings County, just southwest of the Fresno County line. The region is predominantly rural. East of Interstate 5, agriculture is the primary land use. West of Interstate 5, the Kettleman Hills

and other uplands are primarily open space with grazing and oil/gas development. The region overall has a low population density. Lands throughout the region have been extensively disturbed by agriculture east of Interstate 5, and by oil exploration/production, grazing and other activities west of Interstate 5.

The AEP site is located on industrially zoned lands that are physically separated from the residential and business districts of the City of Avenal by a distance of approximately six miles, and the intervening topography of the Kettleman Hills. The Industrial zone extends from the Kettleman compressor station near Interstate 5 to the City's water treatment plant at the northeast corner of the City limits. The City zoned these lands Industrial, in part to take advantage of the bulk natural gas supply available from the compressor station and the access from Interstate 5. In addition, the City's industrial area is also beneficially located from the perspective of proximity to an electrical transmission corridor to the west of the site, and ready transportation to San Francisco or Los Angeles. Development of the industrial area provides the City with a tax and employment base that is remote from the City residential and business districts. While the site is designated and zoned Industrial, it is currently in use for production of row crops. It has been farmed for approximately 50 years.

Duke energy has negotiated an option to purchase 148 acres of a 608-acre parcel with the landowner (Mike J. Kochergen, Fresno, CA), which would be exercised once the AEP is approved. This will require the recordation of a parcel split, pursuant to the Subdivision Map Act. The AEP would be built on 25 acres located near the center of a proposed 148-acre parcel. An additional 26 acres would be temporarily used for construction laydown. Once completed, the remainder of the parcel would be improved pursuant to the conceptual landscape plan (see the **VISUAL RESOURCES** section of this PSA). An orange orchard is planned for the northwest portion of the site. The retention basin to the northeast of the power plant would be used as a soccer field during the dry season. To the south of that, a softball field is planned. The recreation fields are proposed by AEP and are for employee use. Ornamental trees would be planted along the east property line, and along the northwest boundary of the power plant. Additional ornamental trees are planned along the south and west property lines.

LINEAR FACILITIES

The Avenal Energy project includes a new 1.3-mile electrical connection to be located on undeveloped (agricultural) land to the south of the site, a new 2.5-mile underground natural gas interconnection to be located primarily in the Avenal Cutoff Road right-of-way, and water from the City’s turnout located adjacent to the site. Backup water will be provided via a new 1.6 pipeline connection to existing wells located in the San Luis Canal right-of-way. The electrical transmission interconnection and natural gas pipeline interconnection are also located within the City's industrial zoned lands. A short segment of water pipeline is located partially on unincorporated lands of Kings County and Fresno County. These unincorporated lands are designated agricultural.

SURROUNDING LAND USE

Existing land uses in the region are predominantly agriculture, consisting of row crops, orchards and vineyards. The closest population center is the residential and business districts of Avenal, approximately six miles southwest of the site on the other side of the

Kettleman Hills, and west of Interstate 5. The Avenal State Prison is located about one mile south of the Avenal business district. The community of Huron is located approximately eight miles north of the site. Kettleman City is located approximately 10 miles southeast of the site. The community of Coalinga is located approximately 16 miles to the west.

In the site area, Interstate 5 and the San Luis Canal are the predominant land uses. The San Luis Canal is that portion of the California Aqueduct that is jointly owned by the US Bureau of Reclamation and Department of Water Resources (DWR). The San Luis Canal stretches from San Luis Reservoir to approximately Kettleman City and is operated by DWR although both the State Water Project and the Central Valley Project make agricultural deliveries from this portion of the canal.

There are no residences within one mile of the site. One residence is adjacent to Interstate 5 and the Kettleman natural gas compressor station. That residence is within one-quarter mile of the gas pipeline interconnection. Existing nearby industrial uses include the approximately 80-acre Kettleman compressor station, a regional electrical transmission line corridor and the City potable water treatment plant. The Kettleman compressor station compresses natural gas in transport along a major north-south pipeline route just east of Interstate 5. The regional transmission line corridor runs generally parallel to and east of Interstate 5 in the site area and includes three parallel sets of towers lines: two are 500 kV and one is 230 kV. The City's water treatment plant processes raw water from the San Luis Canal for potable uses, and then pumps the treated water through a pipeline over the Kettleman Hills to the residential and business districts of the City and to the Avenal State Prison.

The site and adjacent lands to the south and west are in the City of Avenal and are designated and zoned industrial. The adjacent lands to the north and east are unincorporated lands of Kings County and are designated for General Agriculture. The northernmost project standby water supply well is located just outside Kings County in Fresno County on lands also designated for General Agriculture. No known unique geologic or physical features are located on or near the site.

There are no known or planned scenic, natural resource protection, natural resource extraction, educational, religious, cultural, historic areas or other unique land uses within one mile of the site or within one-quarter mile of linear facilities. Figure 6.13-18 in the Application for Certification (AFC) shows a soccer and a softball field as part of the conceptual landscape plan. The San Luis Canal is located east of the site and is used for recreational fishing.

The closest airport is the Avenal Airport, located more than seven miles southwest of the site and on the opposite side of the Kettleman Hills. There are no other airport facilities within 10 miles of the site. The U.S. Geological Survey (USGS) 7.5 min. topographic map shows a landing strip just to the east of the AEP site. That landing strip has been abandoned, and the area is now used for agricultural production. Aerial spraying is occasionally used on agricultural crops throughout the area, and the low-flying aircraft operate between area features such as high voltage transmission lines, communications towers and irrigation water standpipes.

PLANNED LAND USES

The AEP site is located far from large population centers and the pressures of urbanization. Based on consultations with the City, there are no notable trends in recent general plan or zoning changes (City of Avenal, 2001, 2002). No residential areas or schools are planned in the site vicinity. The site and surrounding lands in the City of Avenal have been zoned Industrial since at least 1992 when the General Plan was adopted.

According to the City of Avenal's Planning Department, a water turnout (i.e. a valve and pipe connected to the San Luis Canal) facility and an industrial park are proposed in the vicinity of the AEP. Please refer to the PSA section on **SOIL AND WATER RESOURCES** for a discussion on the water turnout facility. The Oasis Industrial Park is a planned industrial park situated on 100-140 acres approximately one mile to the northwest of the AEP. The Oasis Industrial Park is currently in the Federal Economic Development Agency's pre-application phase for funding and infrastructure, which is expected to be approved in July 2002. The park is a concept in the 1993 General Plan and the 2000 General Plan Update. It would have a wide variety of industrial uses including light manufacturing, real estate speculation, and staging and distribution centers. This project has not yet been submitted to the City. Therefore construction associated with this project is not expected to run concurrently with the proposed construction schedule of the AEP.

IMPACTS AND ANALYSIS

Significance criteria are based on the CEQA Guidelines, the CEQA Environmental Checklist Form (adopted January 1, 1999) and on performance standards or thresholds adopted by responsible agencies. An impact may be considered significant if the project results in any of the following.

- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect;
- Disruption or division of the physical arrangement of the established community;
- Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural uses.

A project may also have a significant impact on land use, in terms of environmental justice, if it would create disproportionate unmitigated impacts in an area with a population comprised of at least 50 percent minority or low-income populations.

CONSISTENCY WITH LAWS, ORDINANCES, REGULATIONS AND STANDARDS

Public Resources Code section 25525 states that the Energy Commission shall not certify any facility when it finds "that the facility does not conform with any applicable state, local, or regional standards, ordinances, or laws, unless the Energy Commission determines that such a facility is required for public convenience and necessity and that

there are not more prudent and feasible means of achieving such public convenience and necessity. In no event shall the Energy Commission make any finding in conflict with applicable federal law or regulation."

When determining if a project is in conformance with federal, state, local or regional laws, ordinances, regulations, and standards, the Energy Commission typically meets and consults with applicable agencies to determine conformity and, when necessary, "to attempt to correct or eliminate any noncompliance" (Pub. Resources Code Section 25523(d)(1)). The laws, ordinances, regulations, standards (LORS) and policies applicable to the project have been analyzed below to determine the extent to which the AEP is consistent or at variance with each requirement or standard.

Subdivision Map Act

The applicant has not yet complied with the Subdivision Map Act with regard to the property division. Since creating the parcel requires only a parcel split, a parcel map would be the proper subdividing vehicle, pursuant to the Subdivision Map Act. An approved parcel map would be necessary for the applicant to obtain site control for development. It would also, pursuant to the Act, verify proper grading and erosion control to the City. An approved map is also required by Energy Commission staff prior to certification to verify parcel size, property boundaries, erosion control, and access to linear facilities. This requirement is reflected in Condition of Certification LAND-2.

Avenal General Plan

Staff has reviewed the relevant goals, objectives and policies of the Avenal General Plan, and has concluded that the Avenal Energy project is consistent with the General Plan. Specifically regarding Goal 5 – "Protect Natural Resources in Avenal, including Prime Agricultural Land, Biotic and Cultural Resources, and Water Quality, development of the project would permanently remove prime agricultural land from active production." However, the site is in an area that is designated Industrial by the City's General Plan, which was adopted in 1992. As part of that process, an Environmental Impact Report (EIR) was prepared to identify impacts associated with implementation of the new General Plan. Loss of prime agricultural land within the City was identified as significant and unavoidable. As a result of this significant and unavoidable impact, a Statement of Overriding Consideration was adopted by the City of Avenal in conjunction with certification of the EIR, and the designation of the site to Industrial by the General Plan.

Avenal Zoning Ordinance

Staff has reviewed the relevant sections of the Zoning Ordinance. Because the developed area would be located toward the center of the site, the setback would be more than adequate to accommodate the relevant site development standards, such as landscaping, fencing, parking and signage, as required in Condition of Certification LAND-3. These features have been identified only conceptually in the AFC.

As noted previously in the PSA, the Planning Commission and City Council have approved a variance for the site to allow construction up to 200 feet in height. As proposed, the AEP would remain below the 200-foot height limit and is therefore consistent with the variance.

According to Avenal Municipal Code (AMC) Section 11.03U, “A Conditional Use Permit (CUP) is required for any industrial site with a developed area over 10 acres”. The developed area as proposed would total 25 acres, and an additional 26 acres would be used temporarily for construction. Although the CUP requirement is superceded by Commission certification, pursuant to Public Resources code 25500, the project is required to be consistent with this section of the AMC. As noted above, the Planning Commission and City Council have approved a CUP for the site.

Kings County Land Use Policies

The only project land use identified as of this writing that will occur on unincorporated lands is the water pipe from the existing ground water wells located north of the site. This use is consistent with the Kings County General Agriculture land use designation and with the existing agricultural land uses surrounding the site, as this use will not harm long-term agricultural use as directed by the Land Use Element of the Kings County General Plan. (Kings Co. General Plan, 1993, LU-10.)

Kings County has implemented a good neighbor policy between agricultural and nonagricultural property owners. Essentially, this principle allows for nonagricultural industrial types of uses, which are not inconsistent with the continued viability of the farmland conducted on land zoned as General Agricultural. Because the proposed pipeline will not interfere with the surrounding farming activity, that pipeline is consistent with the General Agricultural designation.

Fresno County Land Use Policies

The AEP will include approximately 200 feet of water pipeline in Fresno County that will connect an existing well to the site for standby water supply. The short segment of subsurface water pipe will not detrimentally affect the agricultural uses surrounding the site, and therefore, the pipeline is permitted in Fresno County. The pipeline may be subject to additional regulations with regard to its proximity to the San Luis Canal. These are discussed in detail in the **WATER RESOURCES** section of this Preliminary Staff Assessment (PSA).

COMPATIBILITY WITH EXISTING AND PLANNED LAND USES

Construction Impacts

Construction impacts of the Project will be temporary and are expected to last approximately 20 months. The major construction activities will be focused on-site and will not disrupt or divide surrounding land uses. Natural gas pipeline construction between the compressor facility and the site will be primarily along the alignment of Avenal Cutoff Road and Plymouth Avenue. Disturbance due to pipeline construction will be short-term. The water pipeline and electrical interconnection routes are located entirely within Kochergen Farms property and have been designed in consultation with the landowner to minimize impact on farming operations. Based on these considerations, construction of the AEP would not result in significant impacts on adopted environmental plans or goals of the community, or disruption or division of the physical arrangement of the community. In addition, the project will be compatible with the existing and planned agricultural uses in the area.

Project construction will not result in substantial growth and will not displace people. The site is located in a rural area that is primarily in agricultural use. As identified in the AFC, approximately 80 percent of construction worker jobs are expected to be filled from the existing available regional work force. The remaining 20 percent of the work force may take up temporary residence in the region during the construction period. Because of the short-term nature of Project construction, it is not expected that the construction work force would contribute to substantial urban growth.

Except for existing recreational fishing in the San Luis Canal, and the proposed soccer and softball fields, there are no established or planned recreational, educational, religious or scientific uses in the area. The impact to fishing would be limited to a 200-foot section of the canal, and would only be apparent during construction of this portion of the project.

The site is highly disturbed, but may provide habitat for endangered species in the area. These species could be disturbed during construction. In terms of land use, the City's habitat conservation and natural community conservation goals are integrated in the General Plan. The construction of the project on lands designated and zoned for industrial use has been determined to be consistent with habitat conservation and natural community conservation goals. (Biological resources and impacts are described in detail in the **BIOLOGICAL RESOURCES** section of this PSA.)

The site and surrounding City lands are zoned for industrial development. The industrial designation of the site vicinity is intended, in part, to identify areas appropriate for industrial development that will not cause land use conflicts with surrounding uses (City of Avenal, 1992). The area surrounding the industrial zone is farmland. Construction activities could disturb livestock. However, such animals were not observed during a site visit in early 2002, nor was the requisite fencing present on or near the site. The farmhouse nearest to the site is located approximately 1.3 miles away from the site, which would allow ample distance for noise attenuation. Gas pipeline construction will occur near a residence located approximately 1.8 miles southwest of the site, near Interstate 5 and the Kettleman compressor station, but noise and other effects on that residence will be short-term.

Project construction would occur in accordance with traffic management procedures (see the **TRAFFIC AND TRANSPORTATION** section of this PSA) to minimize the effect of construction-related transportation on local traffic. The procedures will be designed, in part, to assure safe access to existing land uses during construction so that surrounding land uses are not adversely affected. Construction impacts of traffic disruption will be short-term, and no adverse effect to land uses is expected.

Conversion of Prime Farmland

The proposed AEP site is classified as prime agricultural land by the California Department of Conservation. The site is currently in use for cotton production, with tomatoes also grown in a rotational cycle. As stated in the AFC, 25 acres of the proposed148-acre site would be permanently cleared, graded and paved for the power generation facility. An additional 51 acres (approximate) would be temporarily used for laydown, parking, and miscellaneous construction activities, and returned to agricultural use following plant construction. The Applicant has stated in Section 6.4.2.2 of the AFC

that once the AEP is in operation, a portion of the proposed 148-acre site will returned to agricultural use as part of the project landscaping plan. Orchards will be planted and maintained in the northwest quarter of the site between the AEP plant and Avenal Cutoff Road. The applicant's site development plan is currently in the conceptual stage with the exact amount of agricultural land that will be permanently converted unclear. Staff is assuming that 25 acres will be permanently converted for the plant site, however, this amount may not include acreage converted for the soccer and softball fields, and any other peripheral facilities on the applicant's conceptual plan.

The City of Avenal considered the conversion of prime agricultural land from the CEQA perspective of impact significance, when it adopted its 1992 General Plan and Environmental Impact Report (EIR), and acted on a related rezoning from an agricultural to an industrial designation. The City's 1992 EIR addressed the planned conversion of approximately 471 acres of prime agricultural land, and approximately 295 acres of non-prime agricultural lands being used for grazing, which it expected to be converted between 1992 and 2010.

In the Residual Impact section of the EIR, the City found that "Conversion of prime agricultural land must be considered a significant unavoidable impact. The only means of avoiding this impact would be to prohibit the conversion of agricultural land". This option was discussed in the EIR's Alternatives to the Proposed Action section, which concluded that this prohibition was infeasible, due to the preponderance of agricultural land in the region east of I-5, which is one of the City's two major areas slated for new industrial development and economic growth. The EIR concluded "Therefore the General Plan will have an adverse irreversible impact on agricultural resources in the Avenal planning area" (City of Avenal, 1992). The City adopted a CEQA Statement of Overriding Consideration, in response to its conclusions on the conversion of prime farmland as a significant impact.

The proposed AEP is within the incorporated area of the City and is consistent with the City General Plan and Zoning Ordinance. However, staff has evaluated the permanent loss of 25 acres of prime agricultural land in a countywide cumulative context, and from the statewide perspective of a cumulative loss of productive farmland. We are currently recommending mitigation for the permanent loss of 25 acres. If the final site development plan indicates that more than 25 acres will be converted, we will recommend mitigation on a 1:1 basis.

Staff agrees with the City's conclusion regarding a significant, unavoidable impact. However, staff believes that mitigation for the conversion of prime farmland resulting from the AEP project is appropriate and available. Proposed Condition of Certification **LAND-1** would require the project owner to provide appropriate compensation for the loss of this land through the purchase of comparable land or agricultural conservation easements in perpetuity**,** either through its own management; or through the American Farmland Trust, or some other entity acceptable to the Commission. The American Farmland Trust is a private non-profit organization that promotes conservation of agricultural lands through land purchases and/or easements, and working with local, state, and federal agencies to create legislation that protects farmlands.

Linear facilities will be located on existing roads, or on the AEP site. Construction of on-site linear facilities will have a temporary, insignificant impact on prime farmlands, in addition to the temporary, insignificant conversion of farmland for laydown, parking, and other construction activities. Staff concludes that the conversion of prime agricultural land required for the AEP, together with the proposed mitigation measure, and the temporary disturbance of cultivated land for on-site linears and construction activity will have a less than significant impact on the County's agricultural resources.

Operational Impacts

The AEP site is surrounded by agricultural uses, but would not disrupt or divide the agricultural activities that occur in the area. The closest community is Avenal, located six miles from the site on the west side of Interstate 5, and on the opposite side of the Kettleman Hills. The natural gas pipeline will be underground and located primarily along the alignment of Avenal Cutoff Road and Plymouth Avenue and will be underground. Therefore, it would not divide the physical arrangement of established land uses. The water pipeline and electrical interconnection routes have been designed to minimize impact on farming operations, in consultation with the land owner and operator of farming operations on the site and surrounding lands.

Project operations would not result in substantial growth and will not displace people. The site is located in a rural area that is primarily in agricultural use. The City of Avenal General Plan considered the growth impacts of industrial development when the area was designated for industrial uses; therefore the siting of the project is consistent with the General Plan. The industrial designation of the site vicinity is intended, in part, to identify areas appropriate for industrial development that will not cause land use conflicts with surrounding uses (City of Avenal, 1992).

The area surrounding the industrial zone is farmland. The farmhouse nearest to the site is located approximately 1.3 miles away. Operational noise would be attenuated over this distance (see the **NOISE** section of this AFC). Operation of a power plant would not be inconsistent with the farming activities that are occurring in the vicinity of the site.

The height of taller project structures could pose a short-term safety hazard, as agricultural operations in the region occasionally employ aerial spraying. However, the height would be consistent with other tall structures in the area, which include high voltage electric lines, communication towers, and water standpipes. To minimize any impact, the project is proposed to include lighting and visibility features on higher structures, such as the stacks. In addition, prior to construction, Duke Avenal will coordinate with the agricultural commissioners for Kings and Fresno Counties to provide notice of the structures to aerial spraying companies.

Project operations will provide approximately 30 full-time positions, for 24 hours per day, seven days per week. The largest operations shift typically would consist of approximately 15 to 20 persons. The traffic generated by a shift-change of this size can easily be accommodated by existing roadways without a change in level of service, and the one-acre designated for parking would accommodate the 10-plus parking space zoning requirement.

Because of the height and lighting of the AEP, the site would be visible from all approaches. A detailed visual analysis of the project is provided in the **VISUAL RESOURCES** section of this PSA.

Cumulative Impacts

As stated above, the City of Avenal water turnout facility is proposed within one mile of the AEP. The Oasis Industrial Park is a planned industrial park situated on 100-140 acres approximately one mile to the northwest of the AEP. The Oasis Industrial Park is currently in the Federal Economic Development Agency's pre-application phase. This project has not yet been approved; therefore construction associated with this project is not expected to run concurrently with the proposed construction schedule of the AEP. Because of the industrial nature of the proposed Oasis project, staff finds it compatible with a power plant.

The Fresno County Planning Department identified two small commercial projects under development in Fresno County. The commercial projects include a cheese factory expansion, located west of Highway 41 in Lemoore, and a small (i.e. 20 employees maximum) food processing plant. Both are under construction, and scheduled for completion in early to mid 2002, located near Highway 41 and state Route 198 in Lemoore. Kings County did not identify any projects within 15 miles of the AEP project.

With the exception of the proposed industrial park and water turnout facility, area projects are located at enough of a distance from the project as to not have cumulative land use impacts. The site is located in the western San Joaquin Valley, and is not subject to the pressures of urbanization. There have been no recent trends in zoning changes (City of Avenal, 2001). The site and surrounding lands in the City of Avenal have been zoned industrial since at least 1992 when the General Plan was adopted.

The proposed project is not expected to make a significant contribution to regional impacts related to new development and growth, such as population in-migration, the resultant increased demand for public services, and expansion of public infrastructure such as water pipelines to serve residential development.

Growth Inducing Impacts

As part of the environmental review process, staff has considered whether the project would directly or indirectly cause an increase in population above what has been anticipated by the above-referenced general plans. If electricity generated from the AEP is delivered locally, the project has the potential to serve planned industrial growth in the immediate area, and planned growth in the region. Also, it could provide farmers with the power they need to pump water for irrigation. Staff has therefore concluded that if the power from the AEP is delivered locally and regionally, the AEP has the potential to support planned growth, but would not induce unplanned growth. However, staff notes that power generated from AEP could be delivered anywhere in or out of the state.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows that the minority population in a six-mile radius of the site is nearly 86 percent non-white. As shown in **SOCIOECONOMICS Figure 1**, this is primarily because of the concentration of 50 percent to 74.9 percent non-white populations located to the north of the San Luis Canal, and pockets of 75 percent to 100 percent non-white residents located throughout the six-mile radius. However, this distribution of a non-white population is typical in regions where the primary industry is agricultural.

Based on the land use analysis, staff has not identified significant direct, indirect, or cumulative land use impacts resulting from the construction or operation of the project, and therefore there are no land use environmental justice issues related to this project.

FACILITY CLOSURE

At some point in the future, the proposed facility would cease operation and close down. At that time, it would be necessary to ensure that closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.
The planned lifetime of the AEP is estimated at 30 years. At least twelve months prior to the initiation of decommissioning, the Applicant would prepare a Facility Closure Plan for Energy Commission review and approval. This review and approval process would be public and allow participation by interested parties and other regulatory agencies. At the time of closure, all applicable LORS would be identified and the closure plan would discuss conformance of decommissioning, restoration, and remediation activities with these LORS. All of these activities would fall under the authority of the Energy Commission.

There are at least two other circumstances under which a facility closure can occur, unexpected temporary closure and unexpected permanent closure. Staff has not identified any LORS from a land use perspective that the applicant would have to comply with in the event of unexpected temporary closure or unexpected permanent closure of the AEP.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

Staff has reviewed the docket of project-related files, and has contacted the City of Avenal and the Counties of Fresno and Kings. No written or verbal comments have been received from these agencies. In fact, evidence to date suggests that the public and agencies are entirely supportive of the project.

CONCLUSIONS

Staff concludes that construction and operation of the AEP would be consistent with the applicable LORS of the City of Avenal and the Counties of Fresno and Kings, and cites the following in support of this conclusion.

1. The project would not disrupt or divide the physical arrangement of an established community. The closest community is located approximately six miles from the site and is buffered by the Kettleman Hills.

2. The project would not preclude or unduly restrict existing or planned land uses.

3. The project would not preclude or unduly restrict the conducting of agricultural land uses on neighboring properties.

4. Staff has concluded that the project is compatible with existing and planned land uses in the vicinity of the site.

Staff notes that the Statement of Overriding Consideration adopted in conjunction with the certification of the 1992 Avenal General Plan EIR does not adequately address the significant and unavoidable impact of the loss of agricultural land associated with the AEP. Therefore, staff recommends that the Commission adopt the proposed Condition of Certification **LAND-1**. Staff also notes that the AEP site is not yet a legal parcel, and the applicant has not prepared a Tentative Parcel Map for the City of Avenal's review and approval. The applicant also has not identified landscaping, fencing, lighting, parking, or signage beyond the conceptual stage. Therefore, staff recommends that the Commission adopt proposed Conditions of Certification **LAND-2 and LAND-3.**

PROPOSED CONDITIONS OF CERTIFICATION

LAND-1 The project owner shall submit an agricultural mitigation plan to the CPM for approval. The agricultural mitigation plan shall describe restoration or compensation methods for the permanent conversion of twenty-five acres of agricultural land to a nonagricultural use for the construction of the power generation facility. The plan shall describe any on- and off-site mitigation including one or both of the following:

1. The purchase of comparable lands or agricultural conservation easements near existing agricultural lands in King's County at a one-to-one ratio, with a long-term management arrangement ncluding funding, endowment, maintenance, and monitoring.

2. Payment to the American Farmland Trust for the purpose of purchasing agricultural mitigation land or easements.

Verification: Sixty (60) days prior to site mobilization, the project owner shall provide the CPM with the finalized agricultural mitigation plan with a copy of any final agreement signed between the project owner and the American Farmland Trust or other agency or non-profit organization that is publicly recognized and authorized to hold agricultural conservation easements for approval by the CPM.

The project owner shall provide the CPM with a copy of the executed agricultural conservation easements and/or receipt for the payment of monies to an agricultural land mitigation trust account to demonstrate fulfillment of the mitigation requirement.

LAND-2 The project owner shall provide to the CPM the recorded Certificates of Compliance which state that the described property complies with the applicable provisions of the State Subdivision Map Act and the land division ordinance and regulations of the City of Avenal.

Verification: The applicant shall provide the CPM with the recorded Certificates of Compliance on the proposed 148-acre AEP parcel.

LAND-3 The project owner shall prepare a site development plan that complies with Chapter 17 of the City of Avenal Zoning Ordinance, and includes fencing, signage, parking, setbacks, and landscaping.

Verification: At least 60 days prior to site mobilization, the project owner shall submit to the CPM a copy of the development plan, and a copy of the letter of comment from the City of Avenal Planning Director. If the CPM notifies the project owner that revisions of the plan are needed before the CPM will approve the plan, the project owner shall prepare and submit to the CPM a revised plan.

REFERENCES

City of Avenal. General Plan and Draft Environmental Impact Report, Final Environmental Impact Report. 1992.

City of Avenal Municipal Code. 1998.

City of Avenal. Personal communications with Melissa Whitten, City Manager. April 2002.

City of Avenal. Personal communications with Jim Doughty, Planning and Community Development Director. 2002.

City of Avenal. Municipal Zoning Ordinance. 1992.

City of Avenal. City Council Resolution. March 22, 2001.

City of Avenal. Initial Study/Proposed Negative Declaration for a Variance in the Maximum Height in an Industrial Zone (Duke Energy). April 18, 2001.

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NOISE AND VIBRATION

Bill Thiessen

INTRODUCTION

This section evaluates the potential noise and vibration effects associated with the construction and operation of the Avenal Energy Project (AEP), which would be located in the northeast corner of the City of Avenal, approximately 6 miles northeast of the City's residential and business districts. As described in the Application for Certification (AFC), the proposed project would be to construct a natural gas-fired combined-cycle power plant within a 148-acre parcel owned by Duke Avenal, LLC. The plant would have a nominal 600 megawatt (MW) rating. The proposed project would interconnect to a nearby transmission line, natural gas supply, and water supply line.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations (29 C.F.R. § 1910.95) designed to protect workers against the effects of occupational noise exposure. **Noise: Table 1** lists permissible noise level exposure as a function of the amount of time during which the worker is exposed. The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed; assuring that workers are made aware of overexposure to noise; and periodically testing the workers' hearing to detect any degradation. It should be noted that there are no federal laws governing offsite (community) noise.

NOISE: Table 1
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: OSHA Regulation

The Federal Transit Administration (FTA) has published guidelines for assessing the impacts of ground-borne vibration associated with construction of rail projects, which have been applied by other jurisdictions to other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," (VdB)

which is calculated from the peak particle velocity measured from ground-borne vibration. The FTA measure of the threshold of perception is 65 VdB, which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). This is the level of vibration that a person could barely feel. The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec. Vibration levels greater than this could cause damage (e.g., cracking in walls) to buildings and other structures.

STATE

California Government Code section 65302(f) encourages each local government entity to perform noise studies and implement a noise element as part of its General Plan. In addition, the California Office of Planning and Research has published guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure.

The State of California, Office of Noise Control, prepared a Model Community Noise Control Ordinance, which provides guidance for acceptable noise levels in the absence of local noise standards. The Model also contains a definition of a “pure tone” which can be used to determine whether a noise source contains significant annoying tonal components. The Model Community Noise Control Ordinance further recommends that, when a pure tone is present, the applicable noise standard should be lowered (made more stringent) by 5 dBA. (For an explanation of this and other noise terms, please see **Noise: Appendix A** following this section.)

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified, and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (Cal. Code Regs., tit. 14, App. G) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

a) exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies;

b) exposure of persons to, or generation of, excessive ground borne vibration or ground borne noise levels;

c) a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

d) a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Energy Commission staff, in applying Item c) above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA L_{90} or more at the nearest sensitive receptor.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

1. the construction activity is temporary;
2. use of heavy equipment and noisy activities is limited to daytime hours; and
3. all feasible noise abatement measures are implemented for noise-producing equipment.

California Occupational Safety and Health Administration (Cal-OSHA)

Cal-OSHA has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095-5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards described above.

LOCAL

The Avenal General Plan Noise Element establishes environmental noise limits for noise sensitive land uses receiving the noise. According to the Noise Element, the allowable noise exposure at the receiving noise sensitive property line is 50 dBA L_{eq} during the daytime (7:00 a.m. to 10:00 p.m.) and 45 dBA L_{eq} during the nighttime (10:00 p.m. to 7:00 a.m.). In addition, the Noise Element limits maximum (L_{max}) noise levels to 70 dBA in the daytime hours and 65 dBA during the nighttime hours. These noise limits would apply during the operational phase of the plant.

Although the project is in the City of Avenal, Kings County is adjacent to the site's northern and eastern boundaries. The Kings County Noise Element establishes land use compatibility with noise as "acceptable," "conditionally acceptable," and "unacceptable." For rural residential uses, noise levels less than 65 dB L_{dn} are acceptable, 65-75 L_{dn} is conditionally acceptable, and levels over 70 dB L_{dn} are unacceptable.

SETTING

The AEP site would be located southeast of Avenal Road and west of the California Aqueduct. The uses directly adjacent to the site are agricultural. A natural gas pipeline approximately 7,000 feet in length will supply fuel to the project, while water for cooling would be supplied from the adjacent San Luis Canal. Well water for backup would come from nearby groundwater wells. Electrical interconnection consists of a line approximately 3,000 feet long.

SENSITIVE RECEPTORS

The nearest residential land use to the project site (Receptor 4) is approximately 1.3 miles northeast of the site, at the intersection of Avenal Cutoff Road and Orange Avenue. See **Noise: Figure 1** and below for a description of site locations. Another residence is located southwest of the site, about 1.8 miles distant (Receptor 5).

AMBIENT NOISE LEVELS

The Energy Commission's power plant certification regulations require that noise measurements be made at noise-sensitive locations where there is a potential for an increase of 5 dBA or more over existing background noise levels during operation of a power plant.

Noise: Figure 1

{INSERT FIGURE 6.12-3 FROM AFC HERE}

The applicant conducted 25-hour continuous ambient noise level measurements at the east, south and west boundaries of the project site. Short-term ambient noise measurements were conducted at the two residences nearest to the project site. In response to a data request, a supplemental 25-hour continuous ambient noise measurement was made at Receptor 4, which represents the nearest residence to the project site. Since Receptor 4 is the nearest residence, ambient noise levels at this site are critical for evaluating whether potential noise impacts could result from the project**.** **Noise: Figure 2** graphically shows hourly noise levels measured at Receptor 4 from November 12 thru November 14, 2001. **Noise: Table 2** is a summary of nighttime noise levels and the L_{dn} value for November 13, 2001 at Receptor 4.

Noise: Table 2
Long-Term Noise Measurement Summary
(8-Hour Average From 10 p.m to 6 a.m.)

Monitoring Location	L_{dn}, dB	L_{90} 8-Hour, dBA	L_{50} 8-Hour, Dba	L_{eq} 8-Hour, dBA
Receptor 4	53	37	39	42

Source: Derived from Duke, Nov. 20, 2001, Responses to Data Adequacy Requests.

ANALYSIS AND IMPACTS

PROJECT SPECIFIC IMPACTS

Construction

Community Noise Impacts

Power Plant

Construction noise is a temporary phenomenon; the construction period for the AEP facility is scheduled to last approximately 20 months (DEA 2001). Hours of construction are proposed to be "…on a single shift, between the hours of 7 a.m. and 5:30 p.m., Monday through Saturday. Additional hours and/or a second shift may be necessary to make up schedule deficiencies or to complete critical construction activities."

Construction of an industrial facility such as a power plant may be noisier than what is usually permissible under noise ordinances for the operation phase. In order to allow the construction of new facilities, construction noise during certain hours is commonly exempt from enforcement by local ordinances. The City of Avenal does not have any noise limits for construction. The nearest residence is located approximately 1.3 miles northeast of the project site. To avoid complaints about construction noise, staff proposes that construction be limited to the hours of 7:00 a.m. through 7:00 p.m., Monday through Saturday (see proposed Condition of Certification **NOISE-2**).

Noise: Figure 2

{INSERT FIGURE ON P. 10 OF THE 11/20/01 RESPONSES TO DATA REQESTS}

Noise levels were predicted by the applicant for the construction of the AEP facility using information from a standard reference (Bolt, Beranek, and Newman, Inc., 1977). Due to its intermittent nature, construction noise is best compared to the existing average (L_{eq}) noise level (see **Noise: Table 2** above). The predicted worst-case construction noise level at the nearest sensitive receptor is 40 dBA due to pile driving. Noise levels due to other construction activities are predicted to range from 22-34 dBA. These noise levels would be within the range of existing ambient noise levels at the receptors. As a result, construction noise would be considered a less than significant impact. Staff recommends the implementation of the measures described in proposed Conditions of Certification **NOISE-1, NOISE-2 and NOISE-3** to further reduce any potential for noise impacts to the local community associated with construction activities.

Steam Blows

Typically, the loudest noise encountered during construction, inherent in building any project incorporating a steam turbine, is created by the steam blows. After erection and assembly of the feed water and steam systems, the piping and tubing that comprises the steam path has accumulated dirt, rust, scale and construction debris such as weld spatter, dropped welding rods and the like. If the plant were started up without thoroughly cleaning out these systems, all this debris would find its way into the steam turbine, quickly destroying the machine.

In order to prevent this, before the steam system is connected to the turbine, the steam line is temporarily routed to the atmosphere. High pressure steam is then raised in the heat recovery steam generator (HRSG) or a temporary boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a steam blow, is quite effective at cleaning out the steam system. A series of short steam blows, lasting two or three minutes each, is performed several times daily over a period of two or three weeks. At the end of this procedure, the steam line is connected to the steam turbine, which is then ready for operation.

These high-pressure steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. In order to reduce disturbance from steam blows, the steam blow piping will be equipped with a silencer that would reduce noise levels by 20 to 30 dBA. The resulting noise levels with this proposed mitigation will range from 30 to 40 dBA at the critical receptor (Receptor 4). This range of noise levels is not expected to result in a significant noise impact.

Linear Facilities

The plant will connect to existing gas, water, and electrical transmission lines. Since no sensitive receptors are located in close proximity to any of these linear corridors, construction noise impacts will be nonexistent.

Worker Noise Impacts

Construction workers will be subjected to occasional noise levels above 85 dBA. Where the noise exposure exceeds 85 dBA, Cal-OSHA standards require that warning signs be posted, and that a Hearing Conservation Program be implemented. With proper execution of the Hearing Conservation Program, as well as with the implementation of

the measures described in proposed Condition of Certification **NOISE-4**, no occupational noise impacts are anticipated from construction activities.

Operation

Community Noise Impacts

Power Plant

During its operating life, the AEP represents essentially a steady, continuous noise source day and night. Occasional brief increases in noise levels would occur as steam relief valves open to vent pressure, or during startup or shutdown as the plant transitions to and from steady-state operation. At other times, such as when the plant is shut down for lack of dispatch or for maintenance, noise levels would decrease.

The primary noise sources anticipated from the facility include the combustion turbines, heat recovery steam generators (HRSG), cooling towers, air inlet chillers, pumps, motors, main transformers and an instrument air compressor. The noise emitted by power plants during normal operations is generally broadband, steady state in nature. The resulting hourly average noise levels are typically dominated by the steady-state noise sources.

The applicant performed acoustical calculations to determine the facility noise emissions, and to develop noise mitigation measures. The calculations were based on typical manufacturer noise data for the major equipment planned for the facility. The modeling assumed that the units would be operated at full load. This is quite conservative, as actual power generation requirements vary with the time of day and electrical demands.

NOISE: Table 3 lists the predicted project noise levels at the nearest receptors. The predicted plant noise level at each location is lower than the City of Avenal's hourly L_{eq} daytime and nighttime criteria of 50 and 45 dBA, respectively. Also, the predicted plant noise levels are lower than the Kings County rural residential and agricultural criterion of 65 dB $L_{dn.}$

NOISE: Table 3
Summary of Predicted Operational Noise Levels

Receptor Sites	Hourly L_{eq}, dBA	L_{dn}, dB
4 – Nearest Residence to Northeast	32	38
5 – Nearest Residence to Southwest	29	35

CEQA requires that noise levels from a project should not substantially increase the existing ambient noise environment. In determining if a significant impact will likely occur, Energy Commission staff has traditionally followed the noise industry custom of assuming that a project that increases the existing noise level at a sensitive receptor by 5 dBA or more holds the potential to produce a significant adverse impact, and that further study is warranted in such situations. (Five dBA is considered to represent an increase in noise that is noticeable, but not necessarily annoying, to a majority of receptors.)

A power plant operates as essentially a steady, continuous noise source, unlike the relatively random intermittent sounds that normally comprise a noise environment. As such, power plant noise contributes to, and becomes part of, the background noise level, or the sound heard when most intermittent noises cease. When no traffic is driving by, no airplanes are flying overhead, no dogs are barking, no frogs are croaking, and no strong wind is blowing, what remains is background noise. This "background noise level" is commonly described by the L_{90} value, which is the noise level exceeded 90 percent of the time. In most cases, a power plant will operate around the clock, for most of the year. The plant will thus contribute to, and often define, the background noise level.

In noisy urban/industrial environments, staff has traditionally utilized the lowest hourly L_{90} value as a basis of determining the threshold of noise impacts. In a quiet rural environment, this is not necessarily the most reliable measure. Under certain circumstances, it is common in the noise industry to average noise descriptors over some relevant period of time.

Nighttime ambient noise levels in rural areas are typically lower than the daytime levels; differences in background noise levels of 5 to 10 dBA are common. Exceptions may occur when insects and frogs are active at night, and when winds blow far into the night. With this assumption, staff usually believes it both prudent and conservative to employ the lowest nighttime background noise level values as the relevant noise regime. To reflect the fact that noise levels vary naturally over the quietest periods, staff does not assume that the single quietest hourly background noise level is the standard of potential impact. Rather, it is usual to calculate the average L_{90} value for the quietest period of the night, typically a period of four hours or more.

Staff also considers the potential for annoyance by plant noise at night when residents are sleeping. It is common in rural areas to find that ambient noise levels are lower in winter months than in summer months. In summer, residents are more likely to sleep with windows open, exposing them to higher plant noise levels inside the house than in the winter months, when windows are typically closed.

Noise: Table 4 lists ambient noise levels at critical Receptor 4, predicted operational noise levels from the plant, cumulative ambient noise levels, and the change in ambient noise levels attributable to the plant.

Noise: Table 4
Contribution of Plant Noise to Ambient Noise Levels

Receptor Site	8-Hour Average Nighttime L_{90}, dBA			
	Ambient	Plant	Cumulative Ambient (Ambient + Plant)	Change
4 – Nearest Residence to Northeast	37	32	38	+1

Table 4 shows that the plant will increase ambient noise levels at Receptor 4 by one decibel. This represents an increase in noise levels that is not substantial. The increase in noise levels at the more distant Receptor 5 would also be not substantial.

Therefore the change in ambient noise levels due to plant operation is a less than significant impact.

Linear Facilities

The electrical transmission line will emit a corona or hum that, under some atmospheric conditions, may be audible up to 100 feet on either side of the line. Since there are no noise-sensitive receptors near the line, this will not be a significant impact. The buried natural gas and water pipelines will be inaudible.

Worker Noise Impacts

The Applicant recognizes the need to protect plant operating and maintenance personnel from noise hazards, and commits to comply with applicable laws, ordinances, regulations and standards (LORS). A measure to be implemented for noise-related impacts includes a Hearing Conservation Program. With proper execution of the Hearing Conservation Program, as well as the implementation of the measures described in proposed Condition of Certification **NOISE-6**, no occupational safety impacts are anticipated from operational noise.

VIBRATION IMPACTS

The primary source of vibration noise associated with a power plant is the operation of the turbines. It is normal operating procedure to maintain the plant's turbines in optimal balance to minimize excessive vibration that can cause damage or long term wear. Consequently, no excessive vibration would be experienced by adjacent land uses.

Another potential source of significant vibration is pile driving during construction. Given the relatively great distances to the nearest sensitive receptors, no vibration effects would be likely if pile driving were to be required.

CUMULATIVE IMPACTS

No other major new or proposed industrial sources of noise were identified that might cause cumulative effects that could exceed the noise standards or criteria for this project. Staff concludes there are no cumulative noise impacts.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information, which shows that the minority population is greater than fifty percent within a six-mile radius of the AEP (please refer to **Figure 1** in the **Socioeconomics** section of this document). Staff has identified no significant direct or cumulative noise impacts resulting from construction or operation of the project. Therefore, there are no noise-related environmental justice issues due to this project.

PUBLIC AND AGENCY COMMENTS

No public or agency comments were received regarding noise issues for the AEP.

CONCLUSIONS AND RECOMMENDATIONS

Staff concludes that noise from the construction and operation of the proposed AEP would comply with all applicable LORS, and would not significantly impact the public or environment, if the proposed Conditions of Certification are implemented.

PROPOSED CONDITIONS OF CERTIFICATION

NOISE-1 At least 15 days prior to the start of ground disturbance, the project owner shall notify all residents within one-half mile of the site and the linear facilities, by mail or other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

Verification: The project owner shall transmit to the California Energy Commission Compliance Project Manager (CPM) in the first Monthly Construction Report following the start of ground disturbance, a statement, signed by the AEP project manager, stating that the above notification has been performed, and describing the method of that notification, verifying that the telephone number has been established and posted at the site, and giving that telephone number.

NOISE-2 Hours of construction shall be limited to 7:00 a.m. through 7:00 p.m., Monday through Saturday.

Verification: The project owner shall transmit to the Compliance Project Manager (CPM) in the first Monthly Construction Report a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

NOISE-3: Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

a) use the Noise Complaint Resolution Form (below), or functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
b) attempt to contact the person(s) making the noise complaint within 24 hours;
c) conduct an investigation to determine the source of noise related to the complaint;
d) if the noise is project related, take all feasible measures to reduce the noise at its source; and
e) submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise

reduction efforts; and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within 5 days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form, or similar instrument approved by the CPM, with the local jurisdiction, and with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a 3-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is finally implemented.

NOISE-4 Prior to the start of ground disturbance, the project owner shall submit to the CPM for review a construction noise control program consistent with Cal-OSHA regulations (Title 8, Group 15, Article 105, Section 5096). The noise control program shall be used to reduce employee exposure to high noise levels during construction and also to comply with applicable OSHA and Cal-OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, or a lesser period of time mutually agreed to by the CPM and the project owner, the project owner shall submit to the CPM the above referenced program. The project owner shall make the program available to OSHA upon request.

NOISE-5 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that noise due to operation of the project will not exceed 32 dBA l_{eq} at the nearest sensitive receptor, and will otherwise comply with the noise standards of the City of Avenal and Kings County Noise Elements.

No new pure tone components may be produced by operation of the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints.

Protocol: Within 30 days of the project first achieving an output of 80 percent or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at Receptor Sites 4 and 5 used for the ambient noise survey. The survey shall also include the one-third octave band pressure levels to ensure that no new pure-tone noise components have been introduced. If the results from the survey indicate that the project noise level at the residential location exceeds the standards and requirements cited above, the project owner shall implement additional mitigation measures to reduce noise to a level of compliance with these limits.

Verification: Within 15 days after completing the post-construction survey, the project owner shall submit a summary report of the survey to the local jurisdiction, and to the CPM. Included in the post-construction survey report shall be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limits, and a schedule, subject to CPM approval, for implementing these measures. Within 15 days of implementation of the mitigation measures, the project owner shall submit to the CPM a summary report of a new noise survey, performed as described above and showing compliance with this condition.

NOISE-6 Within 30 days of the project first achieving an output of 80 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility. The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations, section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure. The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal-OSHA upon request.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Avenal Energy Project
(01-AFC-20)

NOISE COMPLAINT LOG NUMBER _____

Complainant's name and address:

Phone number: _____

Date complaint received: _____
Time complaint received: _____

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: _____

Initial noise levels at 3 feet from noise source _____ dBA Date: _____

Initial noise levels at complainant's property: _____ dBA Date: _____

Final noise levels at 3 feet from noise source: _____ dBA Date: _____

Final noise levels at complainant's property: _____ dBA Date: _____

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

Approximate installed cost of corrective measures: $ _____
Date installation completed: _____
Date first letter sent to complainant: _____ (copy attached)
Date final letter sent to complainant: _____ (copy attached)

This information is certified to be correct:

Plant Manager's Signature: _____

(Attach additional pages and supporting documentation, as required).

REFERENCES

Bolt, Beranek, and Newman, Inc., *Power Plant Construction Noise Guide,* May 1977.

City of Avenal, Noise Element, 1992.

Federal Transit Administration (FTA). *Transit Noise and Vibration Impact Assessment,* PB96-172135, April 1995.

Kings County, Noise Element, 1993.

Duke Energy Avenal. LLC (DEA). Application for Certification for the Avenal Energy Project (01-AFC-20). Dated and docketed October 11, 2001.

Duke Energy Avenal,LLC. Draft Responses to Data Adequacy Comments, November 20, 2001.

Office of Planning and Research. State of California General Plan Guidelines. June 1990.

NOISE: APPENDIX A
FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

Noise levels can be measured in a number of ways. One common measurement, the equivalent sound level (L_{eq}), is the long-term A-weighted sound level that is equal to the level of a steady-state condition having the same energy as the time-varying noise, for a given situation and time period. (See NOISE: Table A1, below.) A day-night (L_{dn}) sound level measurement is similar to L_{eq}, but has a 10 dB weighting added to the night portion of the noise because noise during night time hours is considered more annoying than the same noise during the day.

NOISE: Table A1
Definition of Some Technical Terms Related to Noise

Terms	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dB	The sound pressure level in decibels as measured on a Sound Level Meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the Noise Level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.77 decibels to levels in the evening from 7 p.m. to 10 p.m. and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Average Sound Level, DNL or L_{dn}	The Average A-Weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Source: California Department of Health Services 1976.	

In order to help the reader understand the concept of noise in decibels (dBA), NOISE: Table A2 has been provided to illustrate common noises and their associated dBA levels.

NOISE: Table A2
Typical Environmental and Industry Sound Levels

Source and Given Distance from that Source	A-Weighted Sound Level in Decibels (dBA)	Environmental Noise	Subjectivity/ Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		
Very Loud Music	110	Rock Music Concert	Very Loud
Pile Driver (50')	100		Very Loud
Ambulance Siren (100')	90	Boiler Room	Very Loud
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	Quiet
Large Transformer (200')	40		
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing
Source: Peterson and Gross 1974			

Subjective Response to Noise

The adverse effects of noise on people can be classified into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise. One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new

noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships (Kryter 1970) can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of one dB cannot be perceived.
2. Outside of the laboratory, a 3-dB change is considered a barely noticeable difference.
3. A change in level of at least five dB is required before any noticeable change in community response would be expected.
4. A 10-dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

Combination of Sound Levels

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a three dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus three dB). The rules for decibel addition used in community noise prediction are:

NOISE: Table A3
Addition of Decibel Values

When two decibel Values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0
Figures in this table are accurate to ± 1 dB.	

Source: Thumann, Table 2.3

OSHA noise regulations are designed to protect workers against the effects of noise exposure, and list permissible noise level exposure as a function of the amount of time to which the worker is exposed:

NOISE: Table A4
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: OSHA Regulation

Relationships

$L_{dn} = 10 \log (1/24)[15x10^{(Ld/10)} + 9x10^{(Ln+10)/10}]$

Note: the 10-dB weighting added to the nighttime noise level. Daytime and nighttime are 15 hours (0700~2200 hrs) and 9 hours (2200~0700 hrs) respectively. L_d and L_n are the L_{eq} values over the 15 and 9 hours respectively. L_{dn} does not contain any consideration for tonal sounds, since it is derived from L_{eq} measurements.

CNEL is essentially the same as L_{dn}, except that different time segments are used in computation. The 24-hour period is divided into three segments instead of two. The day period (0700~1900 hours), evening (1900~2200 hours) and night (2200~0700 hours). The evening period is assigned 5-dB weighting and the nighttime is assigned 10-dB weighting. The extra 5 dB weighting during the evening results in higher values for CNEL that L_{dn}, but the difference is not statistically significant.

Noise Attenuation

$[L_p]$ (at x = r) = $[L_p]$(at r = y) – 20log(x/y).

Where: x = distance to point where noise level is to be determined.
y = reference point.

$\Delta_{Loss} = 20\log (x/y)$.

Special case where x = 2y
$\Delta_{Loss} = 20\log (2y/y) = 20\log (2) = 6$

$\therefore$ As we double the distance, from a point source in free space, the noise level decreases by 6 dB.

PUBLIC HEALTH

Alvin J. Greenberg, Ph.D.

INTRODUCTION

The purpose of staff's public health analysis is to determine if toxic emissions from the proposed Avenal Energy Project will have the potential to cause significant adverse public health impacts or to violate standards for public health protection. If potentially significant health impacts are identified, staff will evaluate mitigation measures to reduce such impacts to insignificant levels.

Staff addresses potential impacts of regulated or criteria air pollutants in the **Air Quality** section . Impacts on public and worker health from accidental releases of hazardous materials are examined in the **Hazardous Materials Management** section. Health effects from electromagnetic fields are discussed in the **Transmission Line Safety and Nuisance** section. Pollutants released from the project in wastewater streams to the public sewer system are discussed in the **Soils and Water Resources** section. Plant releases in the form of hazardous and nonhazardous wastes are described in the **Waste Management** section.

The following sections describe staff's method of analyzing potential health impacts and the criteria used to determine their significance.

METHOD OF ANALYSIS

Staff is concerned about toxic emissions to which the public could be exposed during project construction and routine operation. Following the release of toxic contaminants into the air or water, people may come into contact with them through inhalation, dermal contact, or ingestion via contaminated food or water.

Air pollutants for which no air quality standards have been set are called noncriteria pollutants. Unlike criteria pollutants such as ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide, noncriteria pollutants have no ambient (outdoor) air quality standards that specify levels considered safe for everyone.

Since noncriteria pollutants do not have such standards, a process known as health risk assessment is used to determine if people might be exposed to those types of pollutants at unhealthy levels. The risk assessment procedure consists of the following steps:

1. identify the types and amounts of hazardous substances that the Avenal Energy Project could emit to the environment;

2. estimate worst-case concentrations of project emissions in the environment using dispersion modeling;

3. estimate amounts of pollutants to which people could be exposed through inhalation, ingestion, and dermal contact; and

4. characterize potential health risks by comparing worst-case exposure to safe standards based on known health effects.

Initially, a screening level risk assessment is performed using simplified assumptions that are intentionally biased toward protection of public health. That is, an analysis is designed that overestimates public health impacts from exposure to project emissions. In reality, it is likely that the actual risks from the power plant will be much lower than the risks which are estimated by the screening level assessment. This is accomplished by examining conditions that would lead to the highest, or worst-case risks, and then using those in the study. Such conditions include:

- using the highest levels of pollutants that could be emitted from the plant;
- assuming weather conditions that would lead to the maximum ambient concentration of pollutants;
- using the type of air quality computer model which predicts the greatest plausible impacts;
- calculating health risks at the location where the pollutant concentrations are calculated to be the highest;
- using health-based standards designed to protect the most sensitive members of the population (i.e., the young, elderly, and those with respiratory illnesses); and
- assuming that an individual's exposure to cancer-causing agents occurs for 70 years.

A screening level risk assessment will, at a minimum, include the potential health effects from inhaling hazardous substances. Some facilities may also emit certain substances which could present a health hazard from noninhalation pathways of exposure (see California Air Pollution Control Officers Association [CAPCOA 1993], Table III-5). When these substances are present in facility emissions, the screening level analysis includes the following additional exposure pathways: soil ingestion, dermal exposure, and mother's milk (CAPCOA 1993, p. III-19).

The risk assessment process addresses three categories of health impacts: acute (short-term) health effects, chronic (long-term) noncancer effects, and cancer risk (also long-term). Acute health effects result from short-term (1-hour) exposure to relatively high concentrations of pollutants. Acute effects are temporary in nature, and include symptoms such as irritation of the eyes, skin, and respiratory tract.

Chronic health effects are those which arise as a result of long-term exposure to lower concentrations of pollutants. The exposure period is considered to be approximately from ten to one hundred percent of a lifetime (from seven to seventy years). Chronic health effects include diseases such as reduced lung function and heart disease.

The analysis for noncancer health effects compares the maximum project contaminant levels to safe levels called "reference exposure levels" or RELs. These are amounts of toxic substances to which even sensitive people can be exposed and suffer no adverse health effects (CAPCOA 1993, p. III-36). These exposure levels are designed to protect the most sensitive individuals in the population, such as infants, the aged, and people

suffering from illness or disease which makes them more sensitive to the effects of toxic substance exposure. The RELs are based on the most sensitive adverse health effect reported in the medical and toxicological literature, and include margins of safety. The margin of safety addresses uncertainties associated with inconclusive scientific and technical information available at the time of standard setting and is meant to provide a reasonable degree of protection against hazards that research has not yet identified. The margin of safety is designed to prevent pollution levels that have been demonstrated to be harmful, as well as to prevent lower pollutant levels that may pose an unacceptable risk of harm, even if the risk is not precisely identified as to nature or degree. Health protection is achieved if the estimated worst-case exposure is below the relevant reference exposure level. In such a case, an adequate margin of safety exists between the predicted exposure and the estimated threshold dose for toxicity.

Exposure to multiple toxic substances may result in health effects that are equal to, less than, or greater than effects resulting from exposure to the individual chemicals. Only a small fraction of the thousands of potential combinations of chemicals have been tested for the health effects of combined exposures. In conformance with CAPCOA guidelines, the health risk assessment assumes that the effects of each substance are additive for a given organ system (CAPCOA 1993, p. III-37). In those cases where the actions may be synergistic (where the effects are greater than the sum), this approach may underestimate the health impact.

For carcinogenic substances, the health assessment considers the risk of developing cancer and assumes that continuous exposure to the cancer-causing substance occurs over a 70-year lifetime. The risk that is calculated is not meant to project the actual expected incidence of cancer, but rather a theoretical upper-bound number based on worst-case assumptions. In reality, the risk is generally too small to actually be measured. For example, the one in one million risk level represents a one in one million increase in the normal risk of developing cancer over a lifetime, at whatever location is estimated to have the worst-case risk.

Cancer risk is expressed in chances per million, and is a function of the maximum expected pollutant concentration, the probability that a particular pollutant will cause cancer (called “potency factors”, and established by the California Office of Environmental Health Hazard Assessment), and the length of the exposure period. Cancer risks for each carcinogen are added to yield total cancer risk. The conservative nature of the screening assumptions used means that actual cancer risks are likely to be lower or even considerably lower than those estimated.

The screening analysis is performed to assess worst-case risks to public health associated with the proposed project. If the screening analysis predicts no significant risks, then no further analysis is required. However, if risks are above the significance level, then further analysis, using more realistic site-specific assumptions would be performed to obtain a more accurate assessment of potential public health risks.

SIGNIFICANCE CRITERIA

Commission staff determines the health effects of exposure to toxic emissions based on impacts to the maximum exposed individual. This is a person hypothetically exposed to

project emissions at a location where the highest ambient impacts were calculated using worst-case assumptions, as described above.

As described earlier, non-criteria pollutants are evaluated for short-term (acute) and long-term (chronic) noncancer health effects, as well as cancer (long-term) health effects. Significance of project health impacts is determined separately for each of the three categories.

Acute and Chronic Noncancer Health Effects

Staff assesses the significance of non-cancer health effects by calculating a "hazard index." A hazard index is a ratio comparing exposure from facility emissions to the reference (safe) exposure level. A ratio of less than one signifies that the worst-case exposure is below the safe level. The hazard index for every toxic substance which has the same type of health effect is added to yield a total hazard index. The total hazard index is calculated separately for acute and chronic effects. A total hazard index of less than one indicates that cumulative worst-case exposures are less than the reference exposure levels (safe levels). Under these conditions, health protection is likely to be achieved, even for sensitive members of the population. In such a case, staff presumes that there would be no significant non-cancer project-related public health impacts.

Cancer Risk

Staff relied upon regulations implementing the provisions of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health & Safety Code, §§ 25249.5 et seq.) for guidance to determine a cancer risk significance level. Title 22, California Code of Regulations, section 12703(b) states that "the risk level which represents no significant risk shall be one which is calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure." This level of risk is equivalent to a cancer risk of ten in one million, or 10×10^{-6}. An important distinction is that the Proposition 65 significance level applies separately to each cancer-causing substance, whereas staff determines significance based on the total risk from all cancer-causing chemicals. Thus, the manner in which the significance level is applied by staff is more conservative (health-protective) than that which applies to Proposition 65.

The significant risk level of ten in one million is consistent with the level of significance adopted by the various Air Boards in California pursuant to Health and Safety Code section 44362(b), which requires notification of nearby residents when an air district determines that there is a significant health risk from a facility. In addition, San Joaquin Valley Unified Air Pollution Control District's Risk Management Policy states that a project with an incremental cancer risk of between one and ten in a million is acceptable if best available control technology has been applied to reduce risk. In general, the San Joaquin Valley Unified Air Pollution Control District would not approve a project with a cancer risk exceeding ten in one million.

As noted earlier, the initial risk analysis for a project is typically performed at a screening level, which is designed to overstate actual risks, so that health protection can be ensured. When a screening analysis shows cancer risks to be above the significance level, refined assumptions would likely result in a lower, more realistic risk estimate. If facility risk, based on refined assumptions, exceeds the significance level of

ten in one million, staff would require appropriate measures to reduce risk to less than significant. If, after all risk reduction measures had been considered, a refined analysis identifies a cancer risk greater than ten in one million, staff would deem such risk to be significant, and would not recommend project approval.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

FEDERAL

Clean Air Act section 112 (42 U.S. Code section 7412)

Section 112 requires new sources which emit more than ten tons per year of any specified hazardous air pollutant (HAP) or more than 25 tons per year of any combination of HAPs to apply Maximum Achievable Control Technology (MACT) to reduce hazardous emissions to the maximum extent possible.

STATE

California Health and Safety Code sections 39650 et seq.

These sections mandate the California Air Resources Board (CARB) and the Department of Health Services to establish safe exposure limits for toxic air pollutants and identify pertinent best available control technologies. They also require that the new source review rule for each air pollution control district include regulations that require new or modified procedures for controlling the emission of toxic air contaminants.

California Health and Safety Code section 41700

This section states that “no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property.”

LOCAL

San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) Rule 2201 requires safe exposure limits for Toxic Air Contaminants (TACs), use of Best Available Control Technology (BACT), and New Source Review (NSR).

SETTING

This section describes the environment in the vicinity of the proposed project site from the public health perspective. Features of the natural environment, such as meteorology and terrain, affect the project’s potential for causing impacts on public health. An emissions plume from a facility may affect elevated areas before lower terrain areas, due to a reduced opportunity for atmospheric mixing. Consequently, areas of elevated terrain can often be subjected to increased pollutant impacts. Also,

the types of land use near a site influence the surrounding population distribution and density, which, in turn, affects public exposure to project emissions. Additional factors affecting potential public health impacts include existing air quality and environmental site contamination.

SITE AND VICINITY DESCRIPTION

The proposed site is located on a portion of a 148 acre parcel in the northeast corner of the City of Avenal in Kings County, at the western edge of the San Joaquin Valley. The project site is accessible via Avenal Cutoff Road, and is located about 2 miles east of I-5. The site is currently used for production of row crops and has been farmed for about 50 years. The locale overall has a low population density. The site topography is gently sloping, with an elevation about 340 feet above sea level.

Kings County is located within the San Joaquin Valley. The Kettleman Hills lie approximately three miles southwest of the Site. Hot summers, mild winters and little precipitation characterize the climate of the San Joaquin Valley. Currently, land at the proposed site is zoned industrial. Located near the property are existing gas, water and electrical transmission infrastructure facilities. Surrounding land is generally open farmland.

There are 9 residences within 3 miles of the site. The nearest residence is located more than 1 mile away. The nearest local communities are the City of Avenal, which is located about 6 miles southwest of the project and separated from the project by the Kettleman Hills, and the City of Huron, located about 8 miles to the north of the project. As mentioned above, the location of sensitive receptors near the proposed site is an important factor in considering potential public health impacts.

METEOROLOGY

Meteorological conditions, including wind speed, wind direction, and atmospheric stability, affect the extent to which pollutants are dispersed into ambient air as well as the direction of pollutant transport. This, in turn, affects the level of public exposure to emitted pollutants and associated health risks. When wind speeds are low and the atmosphere is stable, for example, dispersion is reduced and localized exposure may be increased.

The climate at the project site is dominated by the influence of the Pacific Ocean and the Pacific high-pressure system, which is a semi-permanent, subtropical high-pressure system located off the coast. The size and strength of the Pacific high is at a maximum during the summer, when it is at its northernmost position, and results in strong northwesterly air flow and negligible precipitation. During this period, inversions become strong, winds are light, and the pollution potential is high. The Pacific high's influence weakens during the fall and winter when it moves southwestward, which allows storms from the Gulf of Alaska to reach northern California. About 70 percent of the region's annual rainfall occurs between December and March. During the winter, inversions are weak, winds often moderate, and the potential for air pollution is low.

Atmospheric stability is a measure related to turbulence, or the ability of the atmosphere to disperse pollutants due to convective air movement. Mixing heights (the height

above ground level through which the air is well mixed and in which pollutants can be dispersed) are lower during mornings due to temperature inversions and increase during the warmer afternoons. Staff's **Air Quality** section presents more detailed meteorological data.

EXISTING AIR QUALITY

The proposed site is within the jurisdiction of San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD). By examining average toxic concentration levels from representative air monitoring sites in California with cancer risk factors specific to each contaminant, lifetime cancer risk can be calculated to provide a background risk level for inhalation of ambient air. For comparison purposes, it should be noted that the overall lifetime cancer risk for the average individual is about 1 in 4, or 250,000 in one million.

The toxic air monitoring station closest to the Avenal Energy Project is on First Street in Fresno, approximately 48 miles from the project site. Based on levels of toxic air contaminants measured at this monitoring station in 2000, the background cancer risk calculated for this location is 225 in one million (CARB 2001). The pollutants 1,3-butadiene and benzene, emitted primarily from mobile sources, were the two highest contributors to risk and together accounted for over half of the total. The risk from 1,3-butadiene was about 73 in one million, while the risk from benzene was about 68 in one million. Formaldehyde accounts for about 12 percent of the ambient cancer risk determined for Fresno, with a risk of about 26 in one million. Formaldehyde is emitted directly from vehicles and other combustion sources, such as the proposed Avenal Energy Project.

The use of reformulated gasoline, beginning in the second quarter of 1996, as well as other toxics reduction measures, have led to a decrease of ambient levels of toxics and associated cancer risk during the past few years. For example, at the Fresno monitoring station, cancer risk was 497 in one million based on 1991 data and 314 in one million based on 1995 data.

SITE CONTAMINATION

Site disturbances will occur during facility construction from excavation, grading, and earth moving. Such activities have the potential to adversely affect public health through various mechanisms, such as the creation of airborne dust, material being carried off-site through soil erosion, and uncovering buried hazardous substances.

On behalf of Avenal Energy, a Phase I Environmental Site Assessment (ESA) was conducted by TRC in accordance with American Society for Testing and Materials Standard E 1527-00, Standard Practice for Environmental Site Assessments (Duke Avenal 2001, Appendix 6.14-1). The purpose of an ESA is to determine the potential for the presence or likely presence of any hazardous substances or petroleum products under conditions that may indicate a release or threat of a release from present or past activities. The results of the ESA are summarized in staff's **Waste Management** section. In addition, a database search was performed for potentially contaminated sites which may be encountered during construction of the linear facilities. These results are also summarized in the **Waste Management** section.

IMPACTS

Construction

Potential risks to public health during construction may be associated with exposure to toxic substances in contaminated soil disturbed during site preparation, as well as from heavy equipment operation. Criteria pollutant impacts from the operation of heavy equipment and particulate matter from earth moving are examined in staff's **Air Quality** analysis.

As described in the **Waste Management** section, a Phase I Environmental Site Assessment (ESA) has been performed. The ESA shows no evidence of significant site contamination.

The **Waste Management** section also discusses potentially contaminated sites which may be encountered during construction of the linear facilities. As noted in the **Waste Management** section, Avenal Energy Project has proposed procedures to assure proper management of soil that might be contaminated when construction occurs in areas near suspected contamination.

The operation of construction equipment will result in air emissions from diesel-fueled engines. Although diesel exhaust contains criteria pollutants such as nitrogen oxides, carbon monoxide, and sulfur oxides, it also includes a complex mixture of thousands of gases and fine particles. These particles are primarily composed of aggregates of spherical carbon particles coated with organic and inorganic substances. Diesel exhaust contains over 40 substances that are listed by the U.S. EPA as hazardous air pollutants and by the Air Resources Board (ARB) as toxic air contaminants.

Exposure to diesel exhaust causes both short- and long-term adverse health effects. Short-term effects can include increased cough, labored breathing, chest tightness, wheezing, and eye and nasal irritation. Long-term effects can include increased coughing, chronic bronchitis, reductions in lung function, and inflammation of the lung. Epidemiological studies also strongly suggest a causal relationship between occupational diesel exhaust exposure and lung cancer.

Based on a number of health effects studies, the Scientific Review Panel on Toxic Air Contaminants (SRP) recommended a chronic REL (see REL discussion in Method of Analysis section above) for diesel exhaust particulate matter of 5 micrograms per cubic meter ($\mu g/m^3$) and a cancer unit risk factor of $3x10^{-4}$ $(\mu g/m^3)^{-1}$ (SRP 1998, p. 6). The SRP did not recommend a value for an acute REL, since available data in support of a value was deemed insufficient. On August 27, 1998, the ARB listed particulate emissions from diesel-fueled engines as a toxic air contaminant and approved SRP's recommendations regarding health effect levels.

Construction of the Avenal Energy Project is anticipated to take place over a period of twenty months. As noted earlier, assessment of chronic (long-term) health effects assumes continuous exposure to toxic substances over a significantly longer time period, typically from seven to seventy years.

AFC Appendix 6.2-4 presents diesel exhaust emissions from engines and fugitive dust from construction activities. Worst-case daily dust emissions of 69.2 lb/day PM10 (particulate matter less than 10 microns in diameter) are expected to occur in month ten. Diesel emissions are generated from sources such as trucks, graders, cranes, welding machines, electric generators, air compressors, and water pumps. Modeling construction activities gives a 24-hour maximum total predicted concentration of 188.8 $\mu g/m^3$ (14.8 $\mu g/m^3$ calculated added to a background of 174 $\mu g/m^3$) (Duke Avenal 2001, Table 6.2-4.5). Mitigation measures are proposed to reduce the maximum calculated PM_{10} concentrations. These include the use of extensive fugitive dust control measures (stipulated by SJVUAPCD rule 8020). The fugitive dust control measures are assumed to result in 90% reductions of emissions.

In order to mitigate potential impacts from particulate emissions during the operation of diesel-powered construction equipment, staff recommends the use of ultra low sulfur diesel fuel or the installation of soot filters on stationary diesel equipment. The catalyzed diesel particulate filters are passive, self-regenerating filters that reduce particulate matter, carbon monoxide, and hydrocarbon emissions through catalytic oxidation and filtration. The degree of particulate matter reduction is comparable for both mitigation measures in the range of approximately 85-92 percent. Such filters will reduce diesel emissions during construction and reduce any potential for significant health impacts.

Operation

Emissions Sources

The emissions sources at the proposed Avenal Energy Project include two gas turbines with heat recovery steam generators, a fire pump diesel engine, an emergency diesel generator and an auxiliary boiler. During operation, potential public health risks are related to natural gas combustion emissions from the gas turbines and duct burners, diesel exhaust emissions from testing the diesel engine-driven fire pump, and combustion emissions from the auxiliary boiler.

As noted earlier, the first step in a health risk assessment is to identify potentially toxic compounds that may be emitted from the facility.

Diesel exhaust emissions contain a number of toxic compounds. However, a chronic REL and cancer risk factor have been established for diesel particulate matter which may be used to characterize emissions from diesel engines (please see the above discussion under **Construction Impacts**). The diesel engine used for the fire pump must be tested on a weekly basis in accordance with safety requirements, resulting in diesel particulate emissions that must be analyzed for health effects. The SJVUAPCD Risk Management Policy for Diesel Engines lists criteria for permitting stationary diesel engines, and states that if the annual emissions would result in an incremental cancer risk equal to, or less than, one in one million (measured at the point of maximum residential or off-site worker exposure) over an exposure period of 70 years, the project is acceptable without further risk management considerations.

Table 6.16-3 of the AFC lists non-criteria pollutants that might be emitted from Avenal Energy Project turbines as combustion byproducts, along with their anticipated amounts (emission factors). Emission factors are from EPA AP-42, from the California Air Toxics Emission Factors (CATEF II) database (CARB 2001) and from source tests on a similar turbine. Noncriteria emissions from the auxiliary boiler were taken from data compiled by the Ventura County Air Pollution Control District. Table 6.16-6 of the AFC lists toxicity values used to characterize cancer and noncancer health impacts from project pollutants. The toxicity values include reference exposure levels, which are used to calculate short-term and long-term noncancer health effects, and cancer unit risks, which are used to calculate the lifetime risk of developing cancer, as published in the CAPCOA Guidelines (CAPCOA 1993). **Public Health** Table 1 lists combustion-related toxic emissions and shows how each contributes to the health risk analysis. For example, the first row shows that oral exposure to acetaldehyde is not of concern, but if inhaled, may have cancer and chronic (long-term) noncancer health effects, but not acute (short-term) effects.

Public Health Table 1
Types of Health Impacts and Exposure Routes Attributed to Combustion-Related Toxic Emissions

Substance	Oral Cancer	Oral Noncancer	Inhalation Cancer	Noncancer (Chronic)	Noncancer (Acute)
Acetaldehyde			✔	✔	
Acrolein*				✔	✔
Ammonia				✔	✔
Benzene			✔	✔	✔
1,3-Butadiene			✔	✔	
Diesel Exhaust			✔	✔	
Ethylbenzene				✔	
Formaldehyde			✔	✔	✔
Napthalene		✔		✔	
Polynuclear Aromatic Hydrocarbons (PAHs)	✔		✔		
Propylene				✔	
Propylene oxide			✔	✔	✔
Toluene				✔	✔
Xylene				✔	✔

*Note that since there is now no ARB approved test method for acrolein, it was not quantified in the AFC and not included in the hazard index calculations.

Source: AFC Table 6.16-6 using reference exposure levels and cancer unit risks from CAPCOA Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines, October 1993 and SRP 1998.

Emissions Levels

Once potential emissions are identified, the next step is to quantify them by conducting a “worst case” analysis. Maximum hourly emissions are required to calculate acute (one hour) noncancer health effects, while estimates of maximum emissions on an annual basis are required to calculate cancer and chronic (long-term) noncancer health effects.

The emergency fire pump engine’s PM10 emission rate is 0.1 lb/hr (Duke Avenal 2001, Table 6.2-21). Annual emissions are based on 100 hours of operation.

AFC Table 6.16-3 shows maximum hourly and annual emissions for the gas turbines, auxiliary boiler and cooling towers. The maximum fuel use is combined with the emission factor for each toxic air contaminant to estimate hourly and maximum annual emissions for the operational conditions of Tables 6.2-1.2 through 6.2-1.6. Emission factors are estimates of the amounts of toxic substances released per unit of fuel burned and are from data compiled by the Ventura County Air Pollution Control District and the California Air Toxic Emission Factors (CATEF II) database maintained by the California Air Resources Board.

The next step in the health risk assessment process is to estimate the ambient concentrations of toxic substances. This is accomplished by using a screening air dispersion model and assuming conditions that result in maximum impacts. The screening analysis was performed using the U.S. EPA approved Industrial Source Complex Short Term 3 (ISCST3) dispersion modeling program (please see staff’s Air Quality section for a detailed discussion of the modeling methodology). Finally, ambient concentrations were used in conjunction with RELs and cancer unit risk factors to estimate health effects which might occur from exposure to facility emissions. Exposure pathways, or ways in which people might come into contact with toxic substances, include inhalation, dermal (through the skin) absorption, soil ingestion, consumption of locally grown plant foods, and mother’s milk.

The above method of assessing health effects is consistent with the California Air Pollution Control Officers Association (CAPCOA) Air Toxics “Hot Spot” Program Revised 1992 Risk Assessment Guidelines (October 1993) referred to earlier, and results in the following health risk estimates.

Impacts

Dispersion modeling for diesel emissions from diesel-fueled emergency equipment testing resulted in a maximum modeled annual impact at the location of the nearest residence of 0.15 in one million, which is less than staff’s ten in one million significance level. The area has a very low population density and an appropriate receptor will have lower risks than the modeled maximum. Since the health risk screening showed that the resulting risks are insignificant, the fire pump engine is exempt from SJVUAPCD permit requirements.

The screening health risk assessment for the project, including combustion and non-combustion emissions, resulted in a maximum acute hazard index of 0.06 about 2.4 miles southwest of the proposed site. The chronic hazard index at the point of

maximum impact is 0.01. The location of the maximum chronic hazard is about 2 miles south of the proposed site (Duke Avenal 2001, Figure 6.2-3.1). As **Public Health Table 2** shows, both acute and chronic hazard indices are under the REL of 1.0, indicating that no short- or long-term adverse health effects are expected.

As noted by the footnote in **Table 1** above, there is currently no approved method for determining the amount of acrolein emitted from the facility. One source of uncertainty that should be noted in this health hazard analysis is the consideration of acrolein impacts in a qualitative rather than quantitative manner. This stems from the California Air Resources Board's April, 2000 advisory to limit the use of the previously used standard method (M430) for the determination of acrolein levels, and that any data or results based on that method are suspect and should be flagged as non-quantitative when they appear. Until such a method is approved by ARB, only a qualitative assessment can be made to assess the impacts of potential significance (eye irritation), which at the levels from the Avenal Energy Project and similar sources would be relatively insignificant for two reasons: (1) the nature of the health endpoint at issue (minor, reversible irritation) and (2) recent data showing relatively low levels of acrolein, based on revised test methods, at a similar natural gas-fired combined cycle plant. Further, after reviewing such data in the Metcalf Energy Center Power Project (99-AFC-3) case, the Energy Commission required the use of an oxidation catalyst to mitigate any potential impacts from acrolein. An oxidation catalyst is included in the design of the proposed Avenal Energy Project. This means that any impact contribution from acrolein would be unlikely to alter staff's finding of a less than significant impact with respect to non-cancer effects.

Public Health Table 2
Operation Hazard/Risk

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
ACUTE NONCANCER	0.06	1.0	No
CHRONIC NONCANCER	0.01	1.0	No
INDIVIDUAL CANCER*	0.08×10^{-6}	1.0×10^{-5}	No
INDIVIDUAL CANCER**	0.15×10^{-6}	1.0×10^{-5}	No

Source: Duke Avenal 2001, Section 6.16.1 and Table 6.16-7.
*At location of maximum cancer risk impact, excluding risk due to testing of diesel-fueled emergency equipment.
**At location of nearest residence, represents risk due to testing of diesel-fueled emergency equipment only.

Cancer Risk

As shown in **Public Health Table 2**, maximum worst-case individual cancer risk is calculated to be 0.08 in one million at a location approximately 0.4 miles south of the project site.

The nearest residence is located more than 1 mile away. At the location of the nearest residence, the modeled risk from the diesel-fueled emergency equipment is 0.15 in one million.

CUMULATIVE IMPACTS

The maximum cancer risk for the Avenal Energy Project is 0.08 in one million, about 0.4 mile south of the proposed site, while the maximum risk from the diesel-fueled emergency equipment is 0.15 in one million, at the nearest residence more than 1 mile away.

The maximum impact location occurs where pollutant concentrations from the Avenal Energy Project would theoretically be the highest. Even at this location, staff does not expect any significant change in lifetime risk to any person, and the increase does not represent any real contribution to the average lifetime cancer risk of 250,000 in one million. Modeled facility-related residential risks are lower at more distant locations, and actual risks are expected to be much lower, since worst-case estimates are based on conservative assumptions, and overstate the true magnitude of the risk expected. Therefore, staff does not consider the incremental impact of the additional risk posed by the Avenal Energy Project to be either significant or cumulatively considerable.

The worst-case long-term noncancer health impact from the Avenal Energy Project (0.01 hazard index) is well below the significance level of 1.0 at the location of maximum impact. At this level, staff does not expect any cumulative health impacts to be significant. As with cancer risk, long-term hazard would be lower at all other locations, and cumulative impacts at other locations would also be less than significant.

Even in the unlikely event that worst-case emissions from an existing facility were to coincide both geographically and temporally with emissions from the Avenal Energy Project at the location of maximum impact, the overall long-term health outlook would not change for anyone. Thus, the Avenal Energy Project will not result in any significant cumulative cancer or chronic noncancer health impacts.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is greater than fifty percent within a six-mile radius of the proposed Avenal Energy Project (please refer to **Socioeconomics Figure 1** in this Staff Assessment), and Census 1990 information that shows the low-income population is less than fifty percent within the same radius. Although the minority population within the six-mile radius is greater than 50 percent, the actual number of people living within the six mile radius (331) is very small and widely dispersed. Since staff has concluded that there will be no significant direct or cumulative public health-related impacts, there will also be no significant impact to any minority or low-income populations. Therefore, from a public health prospective, there are no environmental justice issues.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of the Avenal Energy Project will be in compliance with all applicable LORS regarding long-term and short-term project impacts.

FACILITY CLOSURE

The scope of staff's public health analysis is limited to routine releases of harmful substances to the environment. During either temporary or permanent facility closure, the major concern would be from accidental or non-routine releases from either hazardous materials or wastes which may be onsite. These are discussed in the sections **Hazardous Materials** and **Waste Management**, respectively. During temporary closure (periods greater than those required for normal maintenance), it is unlikely that there would be any routine releases of harmful substances to the environment, since the facility would not be operating. For permanent closure, the only routine emissions would be related to facility demolition or dismantling, such as exhaust from heavy equipment or fugitive dust emissions. These would be subject to closure conditions adopted by the Energy Commission once a closure plan is received from the project owner.

CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the Avenal Energy Project, and does not expect there to be any significant adverse cancer, or short- or long-term noncancer health effects from project emissions.

The health risk assessment performed by the applicant has been reviewed by CEC staff and was found to be in accordance with guidelines adopted by OEHHA (Office of Environmental Health Hazard Assessment), CARB and CAPCOA. Pursuant to the SJVUAPCD Risk Management Policy, the increased carcinogenic risk attributed to this project is considered to be not significant since it is less than 10 in one million. The chronic hazard index attributed to the emission of non-carcinogenic air contaminants is considered to be not significant since it is much less than 1.0. Therefore, the Avenal Energy Project facility is in compliance with the SJVUAPCD Toxic Risk Management Policy (for example see the policy stated in BAAQMD 2000b, p. 21).

Staff also evaluated the potential impacts on children and adults using the proposed athletic fields that the applicant proposes to provide near the facility. Because the health risks and hazards as presented by the applicant are estimates of the maximum risk and hazard possible over a 70-year period at the point of maximum exposure – and the methodology used to asses those risks is protective of even the most sensitive members of the public - exposures at a different locations and for shorter periods of time would necessarily be much lower. Therefore, staff finds that use of the athletic field would not result in a significant risk to children or adults.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions are proposed.

REFERENCES

California Air Resource Board. 2002. California Air Quality Data, http://www.arb.ca.gov/aqd/aqd.htm

CAPCOA. 1993. California Air Pollution Control Officers Association. CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines. Prepared by the Toxics Committee. October.

BAAQMD. 1993. Bay Area Air Quality Management District. Cumulative Air Toxics Modeling Study. Staff Report. July.

Duke Avenal 2001a. Application for Certification for the Avenal Energy Project (01-AFC-20). October 2001.

SRP. 1998. Scientific Review Panel on Toxic Air Contaminants. Findings of the Scientific Review Panel on The Report On Diesel Exhaust as adopted at the Panel's April 22, 1998 Meeting.

SOCIOECONOMICS

Negar Vahidi

INTRODUCTION

A staff Socioeconomics impact analysis evaluates the potential short-term and long-term project-related population changes on local housing, schools, public utilities and services, as well as the fiscal and physical capability of local governmental agencies to meet the needs of project-related changes to population. The Socioeconomics section also includes an environmental justice analysis, which determines whether the proposed project may result in disproportionate impacts to low-income or minority populations. For this analysis, staff has analyzed the potential direct and cumulative impacts of the proposed Avenal Energy Project (AEP) on local communities, community resources, and public services.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

Executive Order 12898

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses federal attention on the environment and human health conditions of minority communities and calls on agencies to achieve environmental justice as part of this mission. The order requires the US Environmental Protection Agency (EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

Civil Rights Act of 1964, Public Law 88-352, 78 Stat.241

(Codified as amended in scattered sections of 42 U.S.C.) Title VI of the Civil Rights Act prohibits discrimination on the basis of race, color, or national origin in all programs or activities receiving federal financial assistance.

STATE

California Government Code, Sections 65995-65997

SENATE BILL 50 AND OTHER STATUTORY AMENDMENTS ENACTED IN 1998 PROVIDE THAT, NOTWITHSTANDING ANY OTHER PROVISIONS OF LOCAL OR STATE LAW (INCLUDING CEQA), STATE AND LOCAL AGENCIES MAY NOT REQUIRE MITIGATION FOR THE DEVELOPMENT OF REAL PROPERTY FOR EFFECTS ON SCHOOL ENROLLMENT EXCEPT AS PROVIDED BY GOVERNMENT CODE SECTION 65996(A). THE RELEVANT PROVISIONS RESTRICT FEES FOR THE DEVELOPMENT

OF COMMERCIAL AND INDUSTRIAL SPACE TO APPROXIMATELY $0.31 PER SQUARE FOOT OF "CHARGEABLE COVERED AND ENCLOSED SPACE." (GOVT. CODE 65995 (B)(2))

14 California Code of Regulations, Section 15131

In accordance with the California Environmental Quality Act Guidelines (Section 15131):

(a) Economic or social effects of a project shall not be treated as significant effects on the environment.

(b) Economic or social factors of a project may be used to determine the significance of physical changes caused by the project.

(c) Economic, social and particularly housing factors shall be considered by public agencies together with technological and environmental factors in deciding whether changes in a project are feasible to reduce and or avoid the significant effects on the environment.

California Board of Equalization (BOE) – Rule 905

In November 28, 2001 the BOE took action to amend Rule 905 (Assessment of Electric Generation Facilities) to provide that electric generation facilities, over 50 megawatts, owned or used by an electrical corporation, as defined in the Public Utilities Code, will be assessed by the State. The assessed value of the power generating facility would be allocated to the county in which it is located. Certain small qualifying facilities and qualifying cogeneration facilities would be excluded from assessment by the State. The Office of Administrative Law (OAL) approved amended Rule 905, which became effective on May 14, 2002. The BOE action returns the power plant assessment methodology to that which existed prior to California's deregulation of public utilities in 1996, consistent with the assessment jurisdiction provisions in AB 81.

SETTING

PROJECT LOCATION

The proposed project site for the AEP would be located in Kings County, approximately six miles northeast of the commercial and residential districts of the City of Avenal, and approximately 16 miles east of the City of Coalinga. The proposed project site is primarily rural, but its close proximity to Interstate 5 makes it readily accessible.

DEMOGRAPHIC CHARACTERISTICS

Within the study area, the City of Avenal and adjacent counties of Kings, Tulare, and Fresno are considered areas that may be affected by potential population in-migration resulting from the proposed project. In order to characterize the population profile of the study area, historic and recent population trends for the study area are summarized in **SOCIOECONOMICS TABLE 1**. Between the period of 1990 and 2000, total population increased in the City of Avenal by 50 percent, Kings County by 28 percent, Tulare County by 18 percent, and Fresno County by 20 percent.

SOCIOECONOMICS TABLE 1
Demographic Profile of the Study Area

Area	Year	
	1990 Population	2000 Population
City of Avenal	9,770	14,674
County of Kings	101,469	129,461
County of Tulare	311,921	368,021
County of Fresno	667,490	799,407

Source: US Census, 1990 and 2000. http://factfinder.census.gov/servlet/BasicFactsServlet
N/A: Not Available – Information was not provided by CEC for 1990 data (CEC, 2002).

Minority Population

The demographic profile for the State of California, City of Avenal, surrounding counties in the study area, and within a six-mile radius of the proposed project site is provided in **SOCIOECONOMICS TABLE 2**. The ethnic/racial profile is based on 2000 Census data. As shown**,** the minority populations are below 50 percent in the State and the study area counties, but are well above 50 percent in the City of Avenal and within the six-mile radius of the proposed project site.

SOCIOECONOMICS TABLE 2
Demographic Profile of the Study Area, 2000

Area	Total Population	Minority Population
State of California	**33,871,648**	13,701,589 (40.5%)
City of Avenal	14,674	9405 (64.1%)
Kings County	129,461	59,969 (46.3%)
Tulare County	368,021	154,270 (41.9%)
Fresno County	799,407	365,362 (45.7%)
6-Mile Radius	331	306 (92.5%)[1]

Source: US Census, 2000. Http://factfinder.census.gov/servlet/BasicFactsServlet
* Minority definition derived from US Census Bureau by the California Energy Commission (CEC, 2001)
[1] California Energy Commission, Systems Assessment and Facilities Siting Division, Cartography Unit.

SOCIOECONOMICS FIGURE 1 presents the ethnic/racial makeup of the census blocks within the six-mile radius of the proposed project site. As shown, 16 of the Census blocks within six miles of the proposed project site have minority populations greater than 75 percent, and 18 Census blocks have minority populations above 50 percent.

Socioeconomics Figure 1 – Six mile radius demographic data

Low-Income Population

For the purposes of this analysis, a household has been defined as *low-income* if its income is less than 80 percent of the median for that area (usually defined by city or county boundaries) (DOF, 2000). Consequently, a household would be considered low-income if its annual income in 1989 was less than $26,754 (US Census, 1990). The US Census Bureau derived its low-income policies based on the Office of Management and Budget's Statistical Policy Directive 14 (Dalaker, 2000; OMB, 1978).

Because certain year 2000 economic census data remains unavailable, **SOCIOECONOMICS TABLE 3** summarizes the low-income population from the 1990 census (U.S. Census, 2002). As shown, low-income populations throughout the study area were well below 50 percent. Within the three county study area, Tulare County had the highest percentage of low-income persons (22.2 percent), while the City of Avenal had the lowest (15.1 percent).

SOCIOECONOMICS TABLE 3
Low-Income Population Profile of the Study Area

Area	Total Population	Low-Income Population
City of Avenal	9,770	1,475 (15.1 %)
Kings County	101,469	16,218 (16.0 %)
Tulare County	311,921	69,125 (22.2 %)
Fresno County	667,490	140,447 (21.0 %)

Source: US Census, 1990. 1990 Census data was used because income information is not available for 2000 (U.S. Census, 2002). Http://factfinder.census.gov/servlet/BasicFactsServlet.

EMPLOYMENT CHARACTERISTICS

Labor force characteristics for the study area are described in **SOCIOECONOMICS TABLE 4**. The identified labor sectors are based on guidance from the California Employment Development Department (EDD, 2001a). The largest sectors of employment in the study area are agriculture, construction, trade, manufacturing, services, and government.

The unemployment rates within the study area are relatively high. Based on data from the California Employment Development Department, the 2002 unemployment rate in California was 6.7 percent, while it was 17.6 percent for Kings County, 16 percent for Fresno County, and 18.3 percent in Tulare County (EDD, 2002). As of March 2002, the unemployment rate in the City of Avenal was 21 percent (Doughty, 2002).

HOUSING

Current housing conditions within the three counties surrounding the City of Avenal are shown in **SOCIOECONOMICS TABLE 5.** There were 429,030 housing units in the study area in 2000, with a homeowner vacancy rate of approximately 1.8 percent and a renter vacancy rate of approximately 5.6 percent. There were 6,545 vacant housing units for seasonal, recreational or temporary use, and 29,359 overall vacant housing units.

SOCIOECONOMICS TABLE 4

Labor Force Characteristics for the Three County Study Area, 2001

Labor Force	Kings County	Tulare County	Fresno County
Civilian labor force	45,880	170,000	398,600
Civilian employment	39,460	143,800	342,300
Unemployment	6,420	26,200	56,300
Unemployment rate	14.0	15.4	14.1
Non-agrarian labor force*	29,960	98,200	297,600
Farming**	9,510	34,500	60,300
Construction	1,030	5,100	16,900
Manufacturing	3,320	12,400	31,300
Transportation-utility	810	4,700	14,100
Trade	6,370	24,900	70,500
Finance/Insurance/Real Estate	720	3,700	14,500
Services	5,300	19,800	77,900
Federal Government	1,080	1,300	11,600
State & Local Government	11,330	26,500	60,700

Source: California Department of Finance. California County Profiles. Updated March 20, 2001, using 2000 Benchmark from the California Employment Development Department (Palada, 2001).
* Numbers may not add exactly due to slight rounding
** Farming employment estimates are based on 2000 California Employment Development Department data for 1997

SOCIOECONOMICS TABLE 5
Housing Units in the Study Area, 2000

	City of Avenal	Kings County	Tulare County	Fresno County
Total Housing Units	2,061	36,563	119,639	270,767
Occupied Housing Units	1,928	34,418	110,385	252,940
Owner Occupied	984	19,253	67,913	142,795
Renter Occupied	944	15,165	42,472	110,145
Vacant Housing Units	133	2,145	9,254	17,827
Vacant Housing Units for Seasonal, recreational or occasional use	11	116	2,775	3,643
Homeowner Vacancy Rate	2.1%	1.8%	1.8%	1.6%
Renter Vacancy Rate	5.2%	5.6%	5.8%	5.5%
Persons Per Household	4.14	3.18	3.28	3.09

Source: US Census, 2000. Http://factfinder.census.gov/servlet/BasicFactsServlet

FINANCIAL RESOURCES

Personal income earnings within the study area are summarized by **SOCIOECONOMICS TABLE 6**. As shown, personal income revenue by industry for Fresno, Tulare, and Kings (including the City of Avenal) County is dominated by the industries of government, services, retail trade, manufacturing and farming. The services and government industries generate approximately one-half of non-farm personal income earnings in the study area. Construction activities also play an important income-producing role in the study area, generating 6.2 percent of the total personal income.

SOCIOECONOMICS TABLE 6
Personal Income Earnings By Industry for the Three County Study Area, 1997

Industry	County of Fresno*	County of Kings*	County of Tulare*
Farming	723,292	90,351	508,486
Services	2,457,562	178,490	650,045
Wholesale Trade	551,184	37,318	168,859
Retail Trade	1,033,009	119,067	463,872
Manufacturing	945,488	133,980	395,941
Government	1,864,421	458,251	758,771
Transportation & Public Utilities	635,255	42,536	213,032
Construction	603,200	47,790	210,841
Finance, Insurance & Real Estate	591,433	N/A	147,967
Mining	25,597	N/A	600
Total Non-Farm Earnings	9,239,771	1,111,250	3,388,142

Source: US Department of Commerce, Bureau of Economic Analysis: Regional Economic Information Systems. http://govinfo.library.orst.edu/reis-stateis.html. 2001.
N/A – Not Available
*In thousands of dollars.

Fiscal Revenue

The two key taxing agencies in the study area are the City of Avenal and the County of Kings. **SOCIOECONOMICS TABLE 7** shows the revenues and expenditures for both agencies for the fiscal year ending in June 30, 2001. As shown, both the City of Avenal and County of Kings had more expenditures than revenues in the 2000-2001 fiscal year.

Taxes

In California, sales tax on purchases is collected by the seller and paid to the State. One percent of the local sales tax is paid back to the city or county where the tax is collected, which distributes it to local cities. An additional 0.25 percent is paid back to the county for transportation projects. The sales tax rate in Kings County and the City of Avenal is 7 percent. The State retains the remaining 5.75 percent of the total 7 percent sales tax collected for State programs and projects.

The countywide property tax rate of one percent would be applied to the property value of the site, which after construction would be approximately $325 million.

PUBLIC SERVICES

Police Protection

The Kings County Sheriff's Department (KCSD) provides law enforcement services in Kings County. KCSD has a station in the City of Avenal, which would be the primary law enforcement provider for the proposed project. The City of Avenal station has 15 full-time officers and two reserve officers, 10 citizen volunteer patrollers, and 14 patrol cars.

The California Highway Patrol would provide the primary law enforcement services for the State highways and unincorporated roads in the project area.

SOCIOECONOMIC TABLE 7
Fiscal Revenue and Expenditures for Kings County and Avenal City

Kings County		City of Avenal	
Revenue/Expenditure/Fund	**Budget***	**Revenue/Expenditure/Fund**	**Budget***
Revenue		**Revenue**	
Taxes	$15,129,200	Taxes	$944,797
Licenses and Permits	881,640	Licenses and Permits	53,070
Fines and Forfeits	324,100	Charges for Services	16,727
Use of Money and Property	1,984,700	Federal Revenue	271,761
Intergovernmental Revenues	85,913,052	Intergovernmental Revenues	1,095,341
Charges for Services	8,457,813	Fines	55,786
Miscellaneous Revenue	2,105,211	Investment Income	809,375
Total Revenue	**114,795,716**	Rents	8,492
		Loan Repayments	64,648
Expenditures		Streets	107,756
General Government	9,780,242	Other Revenue	168,205
Public Safety	37,803,137	Total Revenue	**3,595,958**
Public Transportation	5,872,927		
Health	14,689,976	**Expenditures**	
Welfare	42,084,039	General Government	69,340
Education	1,351,248	Management and Support	186,816
Recreation	921,805	Building Regulation	95,855
Capital Outlay	24,536,291	Planning	34,243
Debt Service	0	Community Development	495,250
Total Expenditures	**137,039,665**	Public Safety	708,870
Revenue Over (Under) Expenditures	(22,243,949)	Parks and Recreation	193,496
Other Financing Sources	19,908,000	Streets	895,185
Other Changes in Fund Balance	798,000	Capital Outlay	798,370
		Debt Service	1,675,526
		Total Expenditures	**5,152,952**
		Revenue Over (Under) Expenditures	(1,556,994)

Source: Based on information from the Kings County Auditor's Office, 2001 and the City of Avenal, "Preliminary Combined Statement of Revenues, Expenditures and Changes in Fund Balances for Fiscal Year Ended June 30, 2001".
* Budget was for the 2000-2001 fiscal year that ended on June 30, 2001.

Schools

The project is located within the Reef-Sunset Unified School District (District). Enrollment figures at the District are summarized in **SOCIOECONOMICS TABLE 8**.

SOCIOECONOMICS TABLE 8
Enrollment Figures for the Reef-Sunset Unified School District

Student Level	Enrollment Status
Kindergarten through 8th Grade	1,816 students in October 2001 (up from 1,808 students in October 2000[1])
High School (9th through 12th Grade)	547 students October 2001 (down from 580 students in October 2000[1,2])
District-wide	2,403 students[3]

[1] Marroquin, 2002
[2] Kings County Enrollment Report, 2001
[3] Jordan, 2002

The District experienced some enrollment constraints in the 2001-2002 school year because of class size reduction goals that mandated a 20 to 1 student to teacher ratio (Jordan, 2002). Kindergarten and first-grade classes were particularly over-enrolled, and had trouble reaching the mandated student to teacher ratio. The school district could not speculate whether the same enrollment pressures would occur in the future (Jordan, 2002). The 2002-2003 school year enrollment is projected to be the same as 2001-2002 school year (Jordan, 2002).

Hospitals

The nearest emergency medical facility is the Coalinga Regional Medical center located in the City of Coalinga. This hospital has 78 staffed beds, with an emergency room and numerous other medical services. Another community hospital is located in the City of Hanford. The nearest hospital with a trauma center is the University Medical Center in Fresno, which provides helicopter transport services (TRC 2001a, p 6.10-14).

Electricity and Gas

Pacific Gas and Electric (PG&E) would provide electrical power and natural gas for the proposed project. The proposed project would use natural gas from PG&E's 300 line and transfer electrical power into the nearby PG&E transmission line system (TRC 2001a, p 6.10-12).

Sewer

There is no sewer service in the vicinity of the proposed project site. The proposed project would use one onsite septic tank and leach field for any sewer produced onsite (TRC 2001a, p 6.10-12).

Water

AEP would get potable water from the City of Avenal Water Treatment Plant, where water is taken from the California Aqueduct and treated for residential use. The current capacity of the water treatment plant is 5.4 million gallons per day, and the current demand is 3 to 3.5 million gallons per day. In addition, the City is planning to install a new water turnout for the Water Treatment Plant whether or not the AEP is built (TRC 2001a, p 6.10-12).

IMPACTS

POPULATION

Construction

Construction of the proposed project would be completed in a 20-month construction period. Construction is planned to begin in the third quarter of 2002, and is expected to be completed by mid 2004. The number of workers would range from 28 to 425, depending on the month and the work required. **SOCIOECONOMICS TABLE 9** illustrates the number of construction workers required for the proposed project by month, and by task. The employment estimates used in **SOCIOECONOMICS TABLE 9** were derived from the Application for Certification (AFC), with the calculations verified by staff. As shown, the construction labor force projected for the proposed project peaks at 425 total construction workers during the 9th month.

For the purposes of defining the affected socioeconomics study area of the proposed project and based on recent power plant construction projects, staff assumed that most, if not all, construction workers would be willing to commute to the proposed project site on a daily basis. This assumption is consistent with the Electric Power Research Institute's report titled "Socioeconomic Impacts of Power Plants," which states that construction workers will commute as much as two hours to construction sites from their homes rather than relocate. Additionally, the report states operational workers will commute as much as one hour to a power plant site from their homes rather than relocate. Staff reviewed the socioeconomics data for counties within that commute range, which includes Kings County, Fresno County, and Tulare County. Kern County was not included in the study area because the nearest major metropolitan area (City of Bakersfield) is located outside of the 1 to 2 hour commute range.

SOCIOECONOMICS TABLE 9
Projected Monthly Construction Labor By Craft

	Months																				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Total Person Months**
Millwrights				6	6	16	20	24	24	24	24	24	24	21	13	4	4				**234**
Pipefitters		9	9	15	38	40	65	70	75	75	75	75	70	60	55	25	5	4	3		**768**
Equipment Operators	5	8	11	15	23	24	25	27	30	36	27	27	22	22	15	7	2				**326**
Iron Workers		5	15	20	24	24	24	24	24	15	15	10	10	5	5						**220**
Carpenters		8	20	30	36	36	36	36	30	24	10	10	10	6	6						**298**
Electricians	4	10	10	15	22	32	42	60	70	70	75	75	75	60	50	30	10	10	6	6	**732**
Teamsters	4	4	4	4	7	7	7	12	12	17	17	17	16	16	11	10	6				**171**
Boilermakers					8	20	30	55	60	60	60	60	60	44	35	20	5				**517**
Surveyors	3	3	4	5	6	6	6	6	6	6	6	4	3	2	1	1	1	1	1	1	**72**
Laborers	5	20	30	40	40	40	40	40	40	40	40	30	20	15	15	13	10	5	5	5	**493**
Painters / Insulators														10	10	10	5	5			**40**
Brick Layers / Masons							8	8	4	4											**24**
Total Craft Manpower	21	67	103	150	210	245	303	362	375	371	349	332	310	261	216	120	48	25	15	12	**3895**
Total Staff Manpower	17	28	36	50	50	51	52	49	50	53	53	59	59	59	54	50	46	31	28	16	**891**
Total Construction Manpower	**38**	**95**	**139**	**200**	**260**	**296**	**355**	**411**	**425**	**424**	**402**	**391**	**369**	**320**	**270**	**170**	**94**	**56**	**43**	**28**	**4786**

Source: (TRC 2001a)

SOCIOECONOMICS TABLE 10 identifies the availability of specific construction and operations trade workers within the study area.

SOCIOECONOMICS TABLE 10
Projected Workers: By County, By Craft, Years 1997 and 2004

Trade	Workers by Trade Available in Fresno County		Workers by Trade Available in Kings County		Workers by Trade Available in Tulare County	
	1997	2004	1997	2004	1997	2004
Specialized Insulation Workers	N/A	120*	N/A	230*	N/A	80*
Boiler Makers/Iron Workers	N/A	N/A	N/A	N/A	N/A	N/A
Carpenters	2,080	2,290	120	140	500	530
Electricians	1,000	1,070	80	100	290	330
Laborers	10,190	11,730	1,900	2,120	4,980	5,560
Millwrights	N/A	N/A	N/A	N/A	40	50
Operating Engineers	120	120	50	60	120	130
Painters	540	580	50	50	190	220
Pipe Fitters	740	780	40	50	230	250
Plasterers	210	230	N/A	N/A	N/A	N/A
Sheetmetal Workers	280	330	30	40	80	90
Surveyors	50	60	N/A	N/A	N/A	N/A
Welders	690	790	40	50	200	220
Mechanics	420	500	40	50	N/A	140*
Teamsters	N/A	6,580*	N/A	540*	N/A	2,220*
Management/Office	N/A	N/A	N/A	N/A	N/A	N/A

Source: Data from the State of California, Employment Development Department, Labor Market Information, Table 6, Occupational Employment Projections 1997-2004. Total workers calculated from the 1995 EDD estimated workforce for the counties. (EDD, 2001b). Staff has assumed that Flagmen are grouped in with Laborers and the contractor or owner will supply Foremen Staff.
* Figures are derived from the AFC and based on 2000 projections by the California Employment Development Department for Year 2002. No data was available for these trade workers for 1997 or 2004 so the 2002 data was used as a proxy.

SOCIOECONOMICS TABLE 10 indicates that a total of 23,030 construction workers are available within the study area. An assumed need of 425 construction workers (expected peak labor for the project) represents 1.8 percent of the total construction workforce within the study area. Because the number of construction workers required represents such a small portion of the local available labor force, it is assumed that almost no population in-migration would occur as a result of project-related construction activities.

The AFC conservatively estimated that up to 20 percent of the construction workforce may temporarily relocate near the study area, which translates into 50 to 85 construction workers. Since construction activities for different trades would only last between 4 to 20 months, it is unlikely that construction staff would permanently relocate to the study area. With a 2000 population level of 1,311,563 in the study area (described in **SOCIOECONOMICS TABLE 1)**, a short-term influx of 85 temporary workers would represent a negligible population increase. Therefore, no significant impacts would result from construction-related population increase.

Operation

According to the AFC, an estimated 30 permanent employees will be required for operations of the proposed facility, with approximately two-thirds of the power plant operation employees to be hired from the existing local labor force within the three-county study area (i.e., Kings, Tulare, and Fresno Counties), resulting in an estimated 10 operational employees coming from outside the local labor force. To assess the potential for long-term population impacts, the expected scenario of ten operational employees relocating to the area is used to determine the impact. As stated in **SOCIOECONOMICS TABLE 5**, the most recent household figures for Kings County (including the City of Avenal) identifies an average of 3.18 persons per household (2000 US Census). Using this figure, the worst-case assumption for project operation-related population inmigration would be approximately 32 persons.

The potential estimated relocation of 32 persons to the Kings County area would account for less than .02 percent of the most recent County population of 129,461. While these additional persons could locate near the proposed project site, they would likely be dispersed throughout the Kings County area. Given the small size of the proposed operational workforce, and the minimal impact of the worst-case induced population figure resulting from the operational workforce, population inmigration impacts resulting from the operational workforce would be insignificant.

HOUSING

The proposed project site is currently used for agriculture and contains no housing. As such, no housing would be displaced as a result of the proposed project.

As presented in **SOCIOECONOMICS TABLE 5**, there were 429,030 total housing units within the study area with 29,359 vacant units, resulting in a 6.8 percent vacancy rate within the study area. During project construction, it is expected that most construction workers are within commuting distance of the proposed project site and therefore would not need to move into the area for the duration of construction (Doughty, 2002). However, given a reasonable worst-case scenario (as presented above), up to 85 construction workers could temporarily relocate to the study area during peak construction periods. This would represent less than 0.05 percent of the estimated vacant housing units available in the study area. In addition to the available housing units, there are over 120 motels and hotels within commuting distance of the proposed project site (TRC 2001a, P 6.10-21). Therefore, no construction-related impacts are expected on the local housing supply.

During the proposed project operations, only 30 full-time employees would be required to operate the plant, with an estimated scenario of 10 families relocating to the study area (as presented above). Based on data presented in **SOCIOECONOMICS TABLE 5,** this number represents less than .03 percent of the available housing units. As a result, the proposed project operations would not significantly impact current housing availability.

EMPLOYMENT AND ECONOMY

Based on **Socioeconomics Table 9**, proposed project construction would create 4,786 Total Person Months of employment over a 20-month period. During peak employment months, between 402 to 425 construction workers would be employed. Approximately 80 percent of the construction work force of 240 average and 425 peak workers is expected to be drawn from the existing regional labor pool, providing an average of approximately 190 jobs for the existing labor force for the construction period, and a peak of approximately 340 jobs for the local labor force during the period of maximum activity. According to the AFC, the estimated payroll for the proposed project would be $69.5 million, of which 80 percent is projected to be spent by a work force living within the study area. Therefore, approximately $55 million would be spent in the study area. In addition to the estimated payroll, the proposed project could also create additional employment opportunities and, therefore, personal income in the region through the project's local expenditures on construction materials and services. According to the AFC (p 6.10-21), the personal income multiplier for project construction is estimated to be 1.99, which means that for each one dollar of direct income generated, 0.99 dollars of indirect and induced income is generated. The total value added multiplier for project construction is 2.38, which means that for each dollar of value added directly by the project, another 1.38 dollars is added as indirect and induced value. Value added includes employee compensation, proprietary income, other property-type income and indirect business taxes (TRC 2001a, P 6.10-21). In general, the influx of direct construction wages and indirect induced employment would result in a positive fiscal and economic impact on the local area.

The construction payroll for the proposed project is estimated to be $69.5 million. The proposed project is expected to employ approximately 30 people in full-time, onsite positions, which would generate an annual operation payroll of $2.1 million, resulting in a permanent increase in tax revenues and local and regional spending by the operations staff. Annual expenditures from AEP for supplies and materials are estimated to be approximately $2 million, which would help generate additional jobs. According to the AFC, the personal income multiplier for project operation is 1.76, and the value added multiplier is 1.29. Based on these multipliers, the annual project operation personnel income of $2.1 million will result in an additional $1.5 million to the regional economy. Operations and wages from the proposed AEP would result in a positive fiscal and economic impact on the local area.

The unemployment rates within the study area are relatively high. According to the California Employment Development Department (EDD, 2002), the 2002 (first quarter) unemployment rate in California was 6.7 percent, while it was 17.6 percent for Kings County, 16 percent for Fresno County, and 18.3 percent in Tulare County. As of March 2002, the unemployment rate in the City of Avenal was 21 percent (Doughty, 2002). In addition, the proposed project would benefit employment opportunities in the study area. Staff recommends **Condition of Certification SOCIO-1** to maximize the local economic benefit of the proposed project, and ensure the hiring of local work force for the proposed project. No adverse employment impacts would occur.

FISCAL

The proposed project would generate sales and property tax revenue for the State of California, Kings County, and the City of Avenal.

The property value of the site with the proposed power plant would be approximately $325 million (TRC 2001a, P 6.10-20). Based on a county-wide tax rate of 1.0 percent, the proposed project is expected to generate $3.25 million in property taxes for Kings County. Of the $1,614,000 per year that would remain in Kings County, about $653,000 per year would go to the City of Avenal, with the remaining $961,000 per year going to the County General Fund. This influx in property tax revenue would represent an approximate 18 percent increase to the City's total revenue (approximately $3.6 million in the 2000 fiscal year) and an approximate 0.8 percent increase to County's total revenue (approximately $114.8 million in the 2000 fiscal year).

AEP is expected to generate $3 million in sales taxes within the State (TRC 2001a, p 6.10-23). On a local level, about $1.5 million is expected to be spent on construction materials and supplies. Based on the 7 percent sales tax rate, $105,000 in sales tax would be generated during project construction. AEP operations would result in approximately $2 million spent per year in the project region for materials and supplies, which represents an estimated annual revenue stream of $140,000 in sales taxes. This represents an approximate one percent increase in the total Kings County tax revenues based on fiscal year 2000/2001 revenue data (see **SOCIOECONOMICS TABLE 7).**

Based on the fiscal resource data for Kings County and the City that was presented in **SOCIOECONOMICS TABLE 7**, the influx of additional fiscal revenue from AEP would help Kings County and the City of Avenal balance their revenue and expenditure budgets. No adverse impacts would occur.

However, there are two actions at the State level, which would alter the method by which power plants are assessed and the way property tax revenue they generate is allocated.

The first action, Assembly Bill 81 (Proposed by Migden), as amended was held in the Senate Appropriations Committee for consideration in 2002. This bill would change the method by which the AEP property and other large power plant properties (with generating capacities of greater than 50 Megawatts) are taxed. It would shift the responsibility for property tax assessment from the County Assessor to the State Board of Equalization (BOE) by making it a "state assessed property." In addition, it would require annual reassessment at fair market value, and provide that property tax collected be distributed exclusively to the taxing jurisdictions within the Tax Rate Area in which the facility is located, which is typically an area much smaller than a county as a whole. A "Tax Rate Area" is a grouping of properties within a county wherein each parcel is subject to the taxing powers of the same combination of taxing agencies.

This Bill would require the revenue for the AEP be allocated in the same manner as other properties within the facility's Tax Rate Area. While AB 81 could substantially increase total property tax revenue derived from the AEP over its lifespan, local governments, schools and other special districts in the AEP Tax Rate Area, would

receive the property tax revenue from the property at the same percentage of the total that they currently receive from property that is locally assessed by the County Assessor in that same Tax Rate Area. As of the writing of this Staff Assessment, the State Legislature had not taken action on AB81. Staff does not know when action on AB81 will occur. However, as written, AB81 is proposed to come into effect for the 2003-2004 fiscal year.

The second action is the BOE's November 28, 2001 action to amend Rule 905 (Assessment of Electric Generation Facilities) to provide that electric generation facilities, over 50 megawatts, that are owned or used by an electrical corporation, as defined in the Public Utilities Code, will be assessed by the State. Certain small qualifying facilities and qualifying cogeneration facilities would be excluded. The Office of Administrative Law (OAL) approved the amended Rule 905, which became effective on May 14, 2002, and would apply to assessments starting January 1, 2003.

If it takes effect, the BOE action would return the power plant assessment methodology to that which existed prior to California's deregulation of public utilities in 1996, consistent with the assessment jurisdiction provisions in AB 81. However, Rule 905 does not address revenue allocation. For State assessed property, the property tax collected is distributed to all the taxing jurisdictions in the county according to a statutory formula. For locally assessed property, only those taxing jurisdictions in the Tax Rate Area where the property is located receive the property tax collected. The allocation of the revenue derived is solely within the purview of the Legislature and the Governor. Now that the BOE has acted, it is expected that the Legislature will address the issue of revenue allocation in 2002 to find a formula that is equitable to all of the affected parties. As a backup to AB 81, Assemblymember Joe Canciamilla, Contra Costa County, introduced AB 2073, which proposes BOE to retain assessment responsibility, and the County Assessor to be responsible for the revenue allocation formula.

PUBLIC SERVICES

Physical impacts to public services and facilities are usually associated with population in-migration and growth in an area, which increase the demand for a particular service leading to the need for expanded or new facilities. An increase in population in any given area may result in the need to develop new, or alter existing, government facilities in order to accommodate increased demand. As an electric generation project seeking to meet the current demand of customers, the proposed project is not expected to result in a significant increase in the population of the area (as described above). In addition, the proposed power plant itself will not lead to the need for increase in the physical capacity of services in the project area.

Schools

It is estimated that up to 10 operational workers could permanently relocate to the study area. It is possible that all 10 operational workers and their families would relocate within the boundaries of the Reef-Sunset School District (District). Based on current capacity numbers, the District could easily accommodate the number of students that would result from the permanent relocation of 10 families (Jordan, 2002).

However, there is a chance that the District would experience similar enrollment pressures in 2002 as it did in 2001, where a few grade levels (namely kindergarten and first-grade) had difficulty meeting classroom reduction goals of having one teacher for every 20 students (Jordan, 2002). The District has no way of predicting if any grade levels would experience the same enrollment pressures in 2002, but since enrollment is expected to remain flat, it is not unreasonable to presume that the early elementary grade levels would continue to experience difficulty reaching classroom reduction goals (Jordan, 2002). If, as a result of AEP, the incoming students happened to be grouped in the lower elementary age groups, the influx of students could make it even more difficult for the District to reach its classroom reduction goals.

As provided for by the State Education and Government Codes, the applicant must pay a one-time School Impact Fee to the Reef-Sunset Unified School District, as described in **Condition of Certification SOCIO-2**. Based on the project's building area of 9,000 square feet and a current assessment charge of $0.33 per square foot, the AEP would pay $2,970 to the Reef-Sunset School District. These fees are intended to help school districts address their capacity problems by requiring developments to provide a fair share of the cost to develop new school facilities. Given the proposed project's contribution of School Impact Fees, as described in **Condition of Certification SOCIO-2**, and the probability that there would be only minimal population in-migration into the area, there would be no need for new school facilities resulting from the proposed project. No significant impacts to schools would occur.

Police Protection

The estimated response time to the site would be 3-8 minutes (Hill, 2002). Commander Hill, of the Kings County Sheriff Department (KCSD), has stated to staff that the proposed plant would not represent a significant increase in patrolling responsibility since KCSD already monitors the nearby City of Avenal Water Treatment Plant and the PG&E Compressor Station. Commander Hill has also stated to staff that the only coordination KCSD would require with AEP would be knowledge of the facilities access routes in case of an emergency (Hill, 2002). No impact to police protection practices would occur.

Other Public Services

The proposed project would not directly or indirectly induce substantial population growth in the area. Any short-term increase in population due to construction activities is considered to be minimal, with adequate numbers of construction workers currently residing within the project area. Therefore, no further constraints would be placed on any current public service providers as a result of the proposed project. No adverse physical impacts associated with the provision of public facilities (new or altered) would occur.

CUMULATIVE IMPACTS

Cumulative socioeconomic impacts were assessed by researching other large-scale construction projects in the study area, where overlapping construction schedules could create a demand for workers that may not be met by labor in the study area. Due to the large size of the study area and the large labor pool, staff assumed that only

construction projects located near the proposed project site would need to be considered. Based on the AFC and other sources, the projects listed in **SOCIOECONOMICS TABLE 11** are expected to occur at a similar time to the proposed project.

SOCIOECONOMICS TABLE 11
Cumulative Projects List

Potential Developments	Construction Dates	Distance to AEP	Overlap AEP Construction	
City of Avenal Water Turnout Relocation	Expected to begin in early 2002 and last 8 to 12 months	Within a quarter mile	Yes	Maximum daily workforce of 6 to 10 workers
City of Avenal Industrial Park*	Expected to begin in Winter 2002 and last for up to 30 months	Surrounding Area	Yes	100 construction workers
Coalinga Mental Health Facility*	Construction expected to begin in Fall 2001 and end by 2004	Located in the City of Coalinga, 20 miles to west	Yes	The number of construction workers employed would range between 50 to 900 from November 1, 2001 to January 1, 2004. Peak employment would occur between September 1, 2002 and August 2003, with an average of 650 construction workers on site and a peak of 900. The number of permanent employees would start at 800 to 1000 in October 2004 and increase to 100 to 2000 by June 2009.
Hanford Hospital	Expected to begin in 3 to 5 years	30 miles northeast	No	Project details have not been developed
City of Mendota Prison	Expected to begin within 2 years	50 miles north	Start may overlap slightly with very finish of AEP	Preliminary project details are for a 1500-bed prison
San Joaquin Valley Energy Center Power Plant Project – Formerly the Central Valley Energy Center	Expected to begin late 2002 and end early 2005	San Joaquin, approx. 45 miles north	Yes	The total construction workforce will range between 390 and 605, peaking during the 12th and 21st months. Peak work week permanent operation staff would be 20.

Source: Doughty, 2002 and TRC 2001a, p 6.10-29.
* Construction data for the Coalinga Mental Health Facility was based on estimates of the California Department of Mental Health that were made on April 30, 2001 (Coalinga, 2001).

All but one of the projects listed above has the potential to create a cumulative socioeconomic impact in the immediate area of the project. An analysis of each project follows.

City of Avenal Water Turnout Relocation – This project would occur almost concurrently with AEP, within a quarter mile. Due to the small number of construction employees required, it would not significantly contribute to a labor shortage problem. Therefore, this project would not contribute to a shortage of qualified construction workers in the study area.

City of Avenal Industrial Park – This project would overlap with AEP construction and its location would be near the AEP. Approximately 100 construction workers would be required for this project at about the same time that construction workers would be needed for AEP. However, based on the large construction work force available within the study area (approximately 23,030 construction workers), there would be adequate labor within a commuting distance of the project to fulfill construction demands. Therefore, this project would not contribute to a shortage of qualified construction workers in the study area.

Coalinga Mental Health Facility – This project will require a large number of construction workers (600-900 in peak months) in the City of Coalinga, located approximately 20 miles west of AEP. Peak construction periods for this project and AEP would overlap between late 2002 and late 2003. This project would draw from the same construction labor pool as AEP. However, based on the large construction work force available within the study area (approximately 23,030 construction workers), there would be adequate labor within a commuting distance of the project to fulfill construction demands. Even if some construction workers or operations workers decided to relocate to the Coalinga area because of this project, it would not likely have an impact on the housing market within the City of Avenal or the study area as a whole.

Hanford Hospital – The construction schedule of this project would not overlap with AEP construction. Therefore, this project would not contribute to a significant socioeconomics impact.

City of Mendota Prison – This project is located 50 miles north of AEP and the construction peak periods are very unlikely to overlap. Therefore, this project would not contribute to a significant cumulative socioeconomic impact.

San Joaquin Valley Energy Center Power Plant Project – Formerly the Central Valley Energy Center – The construction of this power plant may overlap with the proposed AEP. Although both projects would require the same type of construction workers, based on the large construction work force available within the study area (approximately 23,030 construction workers), there would be adequate labor within a commuting distance of the project to fulfill construction demands. Even if some construction workers or operations workers decided to relocate to the San Joaquin area

because of this project, it would not likely have an impact on the housing market within the City of Avenal or the study area as a whole.

No significant socioeconomics impacts would occur from the cumulative actions of AEP and other potential projects. Due to the large number of available workers within the study area (approximately 23,030 construction workers), it is very unlikely that a significant number of construction or operations workers would relocate to the study area. Even if some workers did relocate to the study area, there would be adequate available housing units to accommodate them. Therefore, due to an available large labor pool of construction workers, the cumulative demand for workers resulting from cumulative projects in combination with the AEP can be met without causing a significant influx of workers from outside the study area. No significant cumulative socioeconomic impacts would occur.

ENVIRONMENTAL JUSTICE SCREENING ANALYSIS

The purpose of the environmental justice screening analysis is to determine whether there exists a low-income and/or minority population within the potential affected area of the proposed site. Staff conducted the screening analysis in accordance with the "Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis (Guidance Document) dated April 1998. Minority populations, as defined by this Guidance Document, are identified where either:

- the minority population of the affected area is greater than fifty percent of the affected area's general population; or
- the minority population percentage of the area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Energy Commission staff has determined the potential affected area as a six-mile radius of the proposed AEP site. The six-mile radius is consistent with the radius used for staff's cumulative air quality analysis. In addition, there may be one or more census blocks or "pockets" that have a minority or low-income population greater than 50 percent. When a minority and/or low-income population is identified per the above, staff in the technical areas of air quality, public health, hazardous materials, noise, water, waste, traffic and transportation, visual resources, land use, socioeconomics and transmission line safety and nuisance consider possible impacts on the minority/low-income population as part of their analysis. This "environmental justice" (EJ) analysis consists of identification of significant impacts (if any), identification of mitigation, and determination of whether there is a disproportionate impact if an unmitigated significant impact has been identified. Staff's environmental justice approach includes providing notice (in appropriate languages) of the proposed project and opportunities for participation in public workshops to minority and/or low-income communities, and providing information on staff's EJ approach to minority and/or low-income persons who attend staff's public workshops.

The total minority population within the City of Avenal and the six-mile radius of the proposed project is greater than 50 percent (refer to **SOCIOECONOMICS FIGURE 1**). As indicated in **SOCIOECONOMICS FIGURE 1**, there are multiple census blocks with greater than 50 percent minority persons within the six-mile radius; staff considers these to be pockets or clusters. Sixteen of the 18 census blocks have minority percentages greater than 50 percent. Although there are clusters of minority populations greater than fifty percent within the six-mile radius, these clusters are widely dispersed and have very low population densities.

In addition, while low-income statistics are not currently available for 2000, the 1990 data show that less than 20 percent of residents within City of Avenal were living under low-income conditions. Assuming that low-income levels have increased proportionate to total population, the percentage of residents currently living under low-income conditions within the City of Avenal is not expected to exceed 50 percent.

Because staff has determined there to be pockets or clusters of minority population within the six-mile radius, staff has conducted a focused environmental justice analysis for socioeconomics.

Based on the socioeconomics analysis, staff has not identified any significant direct or cumulative socioeconomics impacts resulting from the construction or operation of the project. Therefore, there are no environmental justice issues in the area of socioeconomic resources related to this project. Other technical areas of this Staff Assessment (e.g., **Air Quality, Public Health, Land Use**, and **Visual Resources**) also analyze the potential for any environmental justice impacts resulting from the proposed AEP.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATION AND STANDARDS

No specific laws, ordinances, regulations, or standards apply to socioeconomics impacts. California State Planning Law (Government Code Sections 65302 et seq.) requires that each city and county adopt a General Plan consisting of seven mandatory elements to guide planning and development within the jurisdiction. Most jurisdictions do not have laws, ordinances or regulations specifically affecting the socioeconomics aspects of a project.

FACILITY CLOSURE

Should the plant be permanently closed, the beneficial socioeconomic impacts such as worker payroll, project expenditures, local economic stimulus, and property tax revenues would no longer occur. The planned lifetime of the proposed power plant is thirty years; however, given unforeseen circumstances the plant may be retired prematurely for a variety of reasons. This could include the determination that the plant is no longer economically viable. Should the plant be temporarily shutdown or closed, there would not be any significant socioeconomic impacts. In the event that the

decision is made to permanently close the facility, the Applicant will develop a plan for decommissioning that will be submitted to the Energy Commission for approval.

MITIGATION

Energy Commission staff has identified economic and fiscal benefits to the project area such as employment, project expenditures and sales and property tax revenues. To ensure that the AEP procures labor from the local labor force, staff is proposing a condition of certification that will lead to local employment and project-related expenditures. A condition is proposed to ensure that the project owner pays the Reef-Sunset School District a one-time school impact fee. See Conditions of Certification **SOCIO-1** and **SOCIO-2**.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Staff believes that AEP would not cause a significant adverse direct or cumulative impact on housing, employment, public finance, or public services. AEP would benefit the three-county study area and the local project vicinity in terms of an increase in local jobs and commercial activity during construction and operation of the facility. The construction payroll and project expenditures would also have a positive effect on the local and regional economy.

Minority populations within the City of Avenal and the six-mile radius of the proposed project site exceed 50 percent of the total population, thereby triggering an environmental justice analysis by several technical disciplines in this Staff Assessment. Staff has determined that the proposed project will not result in any significant adverse socioeconomic impacts on any low-income populations and/or minority populations.

No significant adverse socioeconomics impacts would occur as result of the construction or operation of AEP.

RECOMMENDATIONS

If the Energy Commission certifies the proposed project, staff recommends that it adopt the following proposed conditions of certification.

PROPOSED CONDITIONS OF CERTIFICATION

SOCIO-1 The project owner and its contractors and subcontractors shall recruit employees and procure materials and supplies within the City of Avenal or Counties of Kings, Tulare, Fresno or Kern area first, unless:

a) to do so will violate federal and/or state statutes;

b) the materials and/or supplies are not available;

c) qualified employees for specific jobs or positions are not available; or

d) there is a reasonable basis to hire someone for a specific position from outside the City of Avenal or Counties Kings, Tulare, Fresno or Kern area.

Verification: At least 60 days prior to site mobilization, the project owner shall submit to the CPM copies of contractor, subcontractor, and vendor solicitations and guidelines stating hiring and procurement requirements and procedures. In addition, the project owner shall notify the CPM by letter of the reasons for any planned procurement of materials or hiring outside the City of Avenal or Counties of Kings, Tulare, Fresno or Kern area that will occur during the construction period.

SOCIO-2 The project owner shall pay the one-time statutory school facility development fee as required at the time of filing for the in-lieu building permit with the Kings County Building Department.

Verification: The project owner shall provide proof of payment of the statutory development fee in the next Monthly Compliance Report following the payment.

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TRAFFIC AND TRANSPORTATION

David Young

INTRODUCTION

The traffic and transportation section of this preliminary staff assessment provides an independent analysis of the Avenal Energy Project (AEP) proposed by Duke Energy North America, LLC. Potential impacts related to traffic operations and safety hazards resulting from the construction and operation of the project are discussed.

LAWS, ORDINANCES, REGULATION AND STANDARDS

Federal, state, and local regulations applicable to the area roadways for the project and transportation of hazardous materials are listed below. These regulations ensure public safety and are implemented to control and mitigate potential impacts arising from the construction, operation and transportation of hazardous materials related to the AEP.

FEDERAL

- Title 49, Code of Federal Regulations, Sections 171-177, governs the transportation of hazardous materials, the type of materials defined as hazardous, and the marking of the transportation vehicles.
- Title 49, Code of Federal Regulations, Sections 350-399, and Appendices A-G, Federal Motor Carrier Regulations, addresses safety considerations for the transport of goods, materials, and substances over public highways.

STATE

- California Vehicle Code, Section 353 defines hazardous materials.
- California Vehicle Code, Sections 31303-31309 regulate the highway transportation of hazardous materials, the routes used, and restrictions thereon.
- California Vehicle Code, Sections 31600-31620 regulate the transportation of explosive materials.
- California Vehicle Code, Sections 32000-32053 regulate the licensing of carriers of hazardous materials and includes noticing requirements.
- California Vehicle Code, Sections 32100-32109 establish special requirements for the transportation of inhalation hazards and poisonous gases.
- California Vehicle Code, Sections 34000-34121 establish special requirements for the transportation of flammable and combustible liquids over public roads and highways.
- California Vehicle Code, Sections 34500 et seq. regulate the safe operation of vehicles, including those that are used for the transportation of hazardous materials.

- California Vehicle Code, Sections 2500-2505 authorize the issuance of licenses by the Commissioner of the California Highway Patrol for the transportation of hazardous materials including explosives.
- California Vehicle Code, Sections 13369, 15275, and 15278, address the licensing of drivers and the classifications of licenses required for the operation of particular types of vehicles. In addition, these sections require the possession of certificates permitting the operation of vehicles transporting hazardous materials.
- California Streets and Highways Code, Sections 117 and 660-72, and California Vehicle Code 35780 et seq., require permits for the transportation of oversized loads on county roads.
- California Streets and Highways Code, Sections 660, 670, 1450, 1460 et seq., and 1480 et seq., regulate right-of-way encroachment and the granting of permits for encroachment on state and county roads.
- California Health and Safety Code, Section 25160 et seq., addresses the safe transport of hazardous materials.

LOCAL

- Kings County General Plan: Circulation Element–ensures the efficient movement of people and goods, promotes compatibility between transportation modes and land use, and reduces the adverse air quality impacts of transportation.
- Council of Fresno County Governments Regional Transportation Plan – addresses several issues and establishes goals, policies, and objectives of regional importance including air quality, highways, streets and roads, aviation, rail, goods movement, and transportation demand efforts.
- County of Fresno, General Plan: Transportation and Circulation Element- provides the framework for Fresno County decisions concerning the countywide transportation system, including various transportation modes and related facilities.
- City of Avenal General Plan: Circulation Element- contains primary components that describe roadway classifications, evaluate the existing conditions and projections of the circulation system and sets community goals, defines issues, and establishes policies and action programs.

SETTING

REGIONAL SETTING

The proposed Avenal Energy Project (AEP) would be located in the southwestern portion of the San Joaquin Valley, approximately 70 miles southwest of Fresno and 90 miles northwest of Bakersfield. Interstate 5 (I-5) is a four-lane freeway that runs northwest to southeast through Kings and Fresno counties. I-5 is located approximately two miles to the west of the project site. The state highways in the vicinity of the AEP include State Route (SR) 33 that runs parallel to I-5 and is approximately 7.5 miles to the southwest of project site; SR-41 runs north to south and is located approximately

eight miles to the east of the AEP site; SR-198 runs east to west and adjoins Avenal Cutoff Road approximately 11 miles to the north of the project site; SR-269 runs north to south and is located east of I–5, two miles west of the project site. **Traffic and Transportation Figure 1**, displays the regional transportation network in the vicinity of the project.

The nearest regional airport is the Fresno-Yosemite International Airport located almost 57 miles to the northeast of the site. The Lemoore Naval Airstation (NAS) is located approximately 15 miles to the northeast of the AEP site. The Burlington Northern and Santa Fe Railroad (BNSF) has a main line that runs through the central portion of California. The (BNSF) operates a spur located in Corcoran, approximately 28 miles east of the project site.

LOCAL SETTING

The AEP would be located on an approximate 148-acre parcel, six miles northeast of the City of Avenal, eight miles northwest of Kettleman City and eight miles south of the City of Huron. The entire project would be constructed within Avenal's city limits except for an approximate 200 feet of the water pipeline, which would be located in an unincorporated portion of Fresno County. The transmission system may require further modifications. Staff has requested a complete interconnection study to analyze the reliability, interconnection and modification of electrical transmission facilities; however, the study was not available at the time of this preliminary staff assessment.

The AEP site is located on industrial zoned land that has been used extensively for agriculture production. The site would provide adequate area for construction trailers, laydown requirements, and adequate parking for construction and operational employees.

A number of local roadways and access routes are proposed for use during the construction and operational phases of the project. **Traffic And Transportation Figure 2**, displays the local transportation network in the vicinity of the AEP. The local roadways potentially affected by the AEP include: Avenal Cutoff Road, Jayne and Nevada Avenues, 25th Avenue and Plymouth Avenue. There are a number of municipal airports in the vicinity of the AEP. Avenal Airport is located more than seven miles southwest of the project site. The New Coalinga, Hanford Municipal, and Visalia Municipal airports are 13 miles to the northwest, 28 miles to the northeast and 40 miles to the east, respectively. There are six private landing strips within nine miles of the AEP site. The Union Pacific's Coalinga Branch Line is operated by San Joaquin Valley Railroad and runs east to west between Lemoore and Coalinga, roughly eight miles north of the project site.

ANALYSIS AND IMPACTS

THRESHOLDS OF SIGNIFICANCE

Significance criteria are based on the California Environmental Quality Act (CEQA) Guidelines, the CEQA Environmental Checklist Form (amended December 1, 1999),

PLACE HOLDER FOR TRAFFIC & TRANSPORTATION FIGURES 1&2

and on the CEQA Guidelines performance standards or thresholds listed below. An impact may be considered significant if the project results in:

- an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).
- a level of service (LOS) standard being exceeded, as established by the county congestion management agency for designated roads or highways.
- a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.
- the increase of hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., slow moving and wide farm equipment that could affect general traffic flow and project construction vehicles.
- inadequate emergency access.
- inadequate parking capacity.
- the creation of a significant hazard to the public or the environment through the routine transportation of hazardous materials.

When evaluating a project's potential impact on the local transportation system, staff uses level of service (LOS) measurements as the foundation on which to base its analysis. LOS measurements represent the flow of traffic. In general, LOS ranges from "A" with free flowing traffic, to "F" which is heavily congested with flow stopping frequently.

The following discussion identifies potential impacts associated with the construction and operation of the AEP, and provides an explanation of the impact conclusion.

CONSISTENCY WITH LAWS, ORDINANCES, REGULATIONS AND STANDARDS

Public Resources Code Section 25525 states that the Energy Commission shall not certify any facility when it finds "that the facility does not conform with any applicable state, local, or regional standards, ordinances, or laws, unless the Energy Commission determines that such a facility is required for public convenience and necessity and that there are not more prudent and feasible means of achieving such public convenience and necessity. In making the determination, the Commission shall consider the entire record of the proceeding, including, but not limited to the impacts of the facility on the environment, consumer benefits, and electric system reliability." In no event shall the Commission make any finding in conflict with applicable federal law or regulation.

When determining if a project is in conformance with state, local or regional ordinances or regulations, the Energy Commission typically meets and consults with applicable agencies to determine conformity and, when necessary, "to attempt to correct or eliminate any noncompliance" (Public Resources Code, Section 25523(d)(1)). The laws, ordinances, regulations, standards (LORS), and policies applicable to the project

have been analyzed below to determine the extent to which the AEP is consistent or at variance with each requirement or standard.

IMPACTS AND ANALYSIS

TRAFFIC INCREASES

Construction Impacts

Construction Workforce Traffic

The construction phase of the AEP will increase traffic volumes in relation to existing conditions on the areas' roadways, but the effects would be temporary and less than significant. The construction of the AEP is expected to take place over a 20-month period. The average daily construction work force would be 240 workers. The applicant has indicated that approximately 15 percent of the workforce would be involved in carpooling activities. This assumption is based on similar projects developed by the applicant (i.e., Moss Landing). The project's peak construction period would be between months 9 and 10 of the 20-month construction period. The workforce would increase to 425 workers during this two-month "peak" period.

Traffic and Transportation Figure 3 displays the workforce travel routes proposed for use during the construction phase of the AEP. The applicant has indicated that 30 percent of the workforce will use SR-198 to the Avenal Cutoff Road, exiting at the project site. 20 percent of the workforce would travel northbound on I-5, exiting at the Avenal Cutoff Road and continuing to the site. Five percent would use southbound I-5; exit at the Avenal Cutoff Road and then to the project site. 10 percent of the workforce is expected to originate from the City of Avenal, traveling on Lassen Avenue (SR-269) to the Avenal Cutoff Road and then to the AEP site. five percent of the workforce will travel from the town of Huron using Lassen Avenue (SR-269), exiting at the Avenal Cutoff Road and then to the project. The remainder of the workforce (30 percent) would travel southbound SR-41, to the Avenal Cutoff Road and proceed to the site. The greatest increase of construction related traffic would be on the Avenal Cutoff Road, which would be used by 60 percent of the construction work force. Avenal Cutoff Road is projected to deteriorate to a LOS C

during the construction phase of the AEP; however, a LOS C is still within acceptable limits established by California Department of Transportation (Caltrans) and local jurisdictions.

Caltrans growth projections and Kings County growth factors were used to estimate future traffic volumes in the project's vicinity. The growth rates used existing volumes (year 2001) and projected increases over the construction phase of the AEP (years 2002-2004). Based on these projections, all the roadways in the area of the AEP will experience growth (even with a no project alternative) over the two-year construction phase of the AEP. The increases are expected to be between 1.5 and 2.5 percent for freeways and state routes in the area and 1.5 percent for local roadways.

PLACE HOLDER FOR INSERT # 3

Given that all roadways in the area of the project are expected to show moderate increases in traffic volumes during the construction and operational phases of the AEP, the increases as a result of the AEP project are expected to be less than significant. Condition of Certification **TRANS-6** will ensure that construction commute activities and truck deliveries will be scheduled outside the peak hours of 7:00-9:00 a.m. and 4:00-6:00 p.m. to lessen potential impacts to the roadway network.

Truck Traffic

The majority of the truck deliveries to the site would be via I-5 to the Avenal Cutoff Road, continuing to the project site, or via SR-198 to the Avenal Cutoff Road, then to the project site. The AEP is expected to generate approximately 2000 truck deliveries over the construction phase of the project. The average daily truck traffic for deliveries would be between 15-20 trucks per day. The applicant has indicated that on two occasions during early construction the truck traffic could reach as high as 110 truck deliveries per day. This temporary increase of truck traffic would be for large concrete pours and material deliveries required for initial construction startup activities.

The eastbound ramp on SR 198 at Avenal Cutoff Road is currently operating at a LOS D during the peak a.m. commute hours. Based on the above growth projections, this ramp is not expected to decrease in LOS (through 2004) during the construction or operational phase of the AEP.

The truck traffic generated during the construction phase would be temporary and would not cause LOS standards on area roadways to be exceeded; therefore, the effects would be less than significant.

Linears

The construction of the linear facilities associated with the AEP is not expected to significantly affect the area's roadways or transportation system. The transmission line would require the construction of seven towers to complete the electrical interconnection, which would tie into PG&E's existing 230-kV Gates-ARCO line. The interconnection would take place on previously disturbed agricultural lands to the southwest of the project site and would not require construction work being done in the public right-of-way; therefore, the effects on the transportation network from the construction of this linear facility are expected to be less that significant.

The transmission system may require further modifications. Staff has requested a complete interconnection study to analyze the reliability, interconnection and modification of electrical transmission facilities; however, the findings of the study were not available at the time this preliminary staff assessment was written.

The construction of the gas pipeline is expected to take up to 4 months to complete. The proposed route affected by construction activities would include portions of Avenal Cutoff Road and Plymouth Avenue. Construction of the gas pipeline would require trenching and other related work done in the right-of-ways of these roadways. Condition of Certification **TRANS-4** would reduce the potential impacts of the gas pipeline construction to a less than significant level.

The water for the AEP would be supplied to the project site via an underground pipeline extending from the San Luis Canal (which is operated and maintained by the California Department of Water Resources) approximately 1000 feet to the project site. No significant traffic effects are expected as a result of the water pipeline construction, as all construction activities would take place off of public right-of-ways.

The construction of the linear facilities would require a small amount of the workforce traveling to and from the gas pipeline interconnection and transmission line tie-in sites for construction purposes and short-term maintenance. The numbers of workers required for the construction of the gas pipeline and the other linear facilities are included in estimates for the entire construction related workforce of the AEP. Parking for the linear facility workforce would be provided on the AEP project site. All linear-associated construction activities would be temporary, and would not decrease LOS, result in inadequate access, or threaten public safety on Avenal Cutoff Road, Plymouth Avenue, or other affected roadways; therefore, less than significant effects are expected from linear construction activities.

CHANGES TO LEVELS OF SERVICE[1]

Level of Service (LOS) is a measure of roadway performance that assigns a letter grade A-F describing various ranges of operating conditions.[1] The AEP construction period is expected to take place over a 20-month period and would not result in significant effects on the roadway's LOS and Volume to Capacity (v/c) ratios in project's vicinity. The Circulation Element of the Kings County General Plan has established a LOS D as the minimal allowable LOS and a v/c Ratio of 0.51 percent to 0.89 percent of their overall capacities for roadways and intersections. The City of Avenal's General Plan has established a LOS C for all roadways within the city limits and a maximum v/c Ratio of 0.79 percent. All state highways in the vicinity of the project are operating at or above the minimum acceptable LOS D. Additionally, all of the local roadways in the vicinity of the AEP are operating above an acceptable LOS.

Traffic and Transportation Table 1, displays the existing roadway characteristics and projected LOS with and without the AEP construction workforce for regional and local roadways in the project's vicinity. All roadways proposed for use by the AEP project are currently operating and expected to continue to operate at or above an acceptable LOS established by applicable local jurisdictions.

Traffic conditions on the westbound (WB) approach of SR 269 at the Avenal Cutoff Road are expected to deteriorate slightly during the a.m. peak from a LOS B to a LOS C. In addition, portions of I–5 would decrease from a LOS B to a LOS C during the p.m. peak. However, these decreases in LOS would be temporary, and would not cause LOS standards established by the applicable plans and jurisdictions to be exceeded; therefore the effect would be less than significant. The eastbound (EB) ramp of SR

[1] A LOS A represents free flow and an uninterrupted traffic stream. A LOS F is characterized by stop-and-go waves, and traffic saturation with delays. LOS is determined by using a Volume to Capacity (v/c) Ratio is used to calculate roadway efficiency. V/C is indicative of traffic conditions, speeds, and driver maneuverability on given roadway segments. LOS A, B, and C are represented by v/c ratios below 0.80 percent of overall capacity. LOS D is between 0.80 and 0.90 percent, LOS E has a v/c between 0.90 and 1.00 percent, and LOS F is represented by a v/c greater than 1.00 percent of overall roadway capacity. The criteria for LOS on state highways are established by Caltrans policies. A LOS D is considered as a minimum acceptable level for planning purposes.

198/Jackson Avenue at Avenal Cutoff Road is currently operating at a LOS D during the peak a.m. commute between 7:00-8:00 a.m. The construction related activities of the AEP would not result in a deteriorated LOS at this ramp, as it is projected to operate at a LOS D even with a no project alternative.

The AEP will add some traffic to the existing transportation network but it will not cause any established LOS to be exceeded. In addition, the project would not decrease the LOS or cause any roadway to exceed its v/c ratio to an unacceptable level; therefore, the impacts from this perspective are expected to be less than significant.

TABLE 1
Existing Roadway Characteristics and Projected LOS Through the Construction Period of the Avenal Energy Project

Roadway/Segment	Classification	Existing Average Daily Traffic (ADT)	Daily Design Capacity[1]	Estimated AEP Peak Construction Workforce[2]	Construction LOS (2003) Without Project Workers-AM/PM[3]	Construction (2003) With Project Workers AM/PM
SR 198 (EB) at Avenal Cutoff Road	Freeway/Minor Arterial	2,440	12,000	425[4]	D/B	D/B
Interstate 5	Interstate/Freeway	27,750	80,000	425[4]	A/A	A/A
SR 198	Freeway/Expressway Principle Arterial	13,600	80,000	425[4]	A/A	A/A
SR 41	Expressway Principle Arterial	9,600	80,000	425[4]	A/A	A/A
SR 269	Expressway Principle Arterial	2,440	12,000	425[4]	B/A	C/A
Avenal Cutoff Road	Minor Arterial	2,455	12,000	425[4]	B/A	C/A
Jayne/Nevada Avenue	Expressway Major Collector	2,408	18,000	425[4]	B/B	B/B
25th Avenue	Major Collector	153	18,000	425[4]	B/A	B/A
Plymouth Avenue	Major Collector	368	9,000	N/A	A/A	A/A

Notes for Table 1
(1) Daily Design Capacity interpolated from the City of Avenal General Plan.
(2) Peak workforce counts were used to display maximum traffic increases resulting from AEP construction activities.
(3) Includes a yearly growth rate that varies between 1.5 and 2.5 for freeways and state highways; 1.5 percent yearly growth rate for local roads.
(4) Represents overall peak construction workforce. No more than sixty percent of peak construction workforce would travel on any roadway or segment.

Operational Impacts

Permanent Workforce Traffic

The AEP is expected to have between 20-30 operational employees commuting to the project site on a daily basis. Staff concurs with the applicant's assumption that the operational workforce would use the same travel routes as the construction workforce (see **Traffic and Transportation Figure 3**). The 148-acre project site provides adequate parking capacity for all operational personnel. Between the peak commute hours of 7:00-9:00 a.m., the westbound ramp at SR 198 and Avenal Cutoff Road is projected to decrease from a LOS B to a LOS C. This decrease would still be within acceptable levels established by Caltrans and local authorities. Even if the operations workforce traveled to and from the site during peak a.m. and p.m. commute hours, the

addition of 60 daily vehicle trips on the area's roadways during these peak times would result in minimal increases in traffic volume and would not cause LOS to decrease to an unacceptable level. Therefore, the operations workforce would have a less than significant effect on the state and local roadways in the vicinity of the AEP.

Truck Traffic

The volume of truck traffic associated with the operational phase of the AEP is expected to be less than significant. Staff concurs with the applicant's assumptions that the project's operations would require less than five truck deliveries per day.

Most of the truck deliveries associated with the plant's operations would consist of deliveries of aqueous ammonia, flammable and compressed gases, petroleum products, solvents and propane. Conditions of certification **TRANS-3** will ensure compliance with all applicable federal, state and local LORS (also discussed in the **Waste Management** and **Hazardous Materials Sections** of this staff assessment regarding the safety requirements, transportation and disposal of hazardous materials). Due to the limited amount of truck traffic associated with the operational phase of the project, the effects on the regional and local roadways in the vicinity of the AEP are expected to be less than significant.

CHANGE IN AIR TRAFFIC PATTERNS

The AEP would not air affect traffic patterns in the vicinity of the project. There are a number of public and private airports and airstrips servicing the AEP area. The nearest regional airport is the Yosemite-Fresno International Airport located nearly 57 miles to the northeast of the site. There are three municipal airports in the general vicinity of the AEP. The New Coalinga Airport is located approximately 13 miles to the northwest. The Hanford Municipal Airport is 28 miles to the northeast of the site and the Visalia Municipal Airport is roughly 40 miles east of the project site. The Lemoore Naval Air Station (NAS), a navy master jet base, is 15 miles the to northeast of the AEP.

In addition, there are two privately owned airports near the project site that are open for public use. The Avenal Airport is seven miles to the northwest of the project site and the Harris Ranch Airport is approximately 15 miles northwest of the AEP.

There are a number of private airstrips in the immediate vicinity of the site. The nearest airstrip is located approximately three miles east of the project site. There are five additional airstrips located within nine miles of the site. The airstrips are used for aerial spraying and crop dusting activities. These activities are common throughout the entire area and require aircraft to operate safely around existing transmission lines, communication towers, and irrigation standpipes. Condition of Certification **TRANS-8** requires the applicant to incorporate lighting and visibility features on the taller structures (e.g. the stacks) to minimize the possibility of the structures presenting a hazard to aerial spray applicators.

Staff believes that the AEP would not affect any air traffic patterns nor would it cause safety risks to air facilities in the vicinity; thus no impact is expected.

HAZARDS POSED BY DESIGN FEATURE OR INCOMPATIBLE USE

There are no identified roadway features (e.g., sharp curves), dangerous intersections or incompatible uses in the project's vicinity that would cause a substantial increase in roadway hazards. However, for trucks traveling eastbound on Jayne Avenue and turning onto Avenal Cutoff Road there is a narrow curb that would require additional time to negotiate. The applicant has indicated that approximately 7-8 trucks per day would use this route traveling to the project site. It is staff's opinion that this roadway feature would not pose a threat to public safety or result in any decrease in LOS.

Additionally, there are no active railroad crossings between the site and other alternative rail siding locations that would pose hazardous design features. There is an active crossing at the rail siding facility in Corcoran. A rail siding location in Huron is currently out of service but would be considered for deliveries if repaired in time for the AEP construction activities.

The City of Avenal approved the construction of turning lanes and a turnaround circle on Avenal Cutoff Road in 1995. According to the City of Avenal's Planning Department, the initial construction date for the turning lanes and turnaround was not determined at the time of this preliminary staff assessment, as the City is still awaiting funding and infrastructure grants. However, the turnaround construction and related activities would assist in improving site access and are not expected to run concurrently with the construction of the AEP; therefore, no incompatible uses or design feature impacts are expected.

EMERGENCY ACCESS

The applicant has indicated that it would consult with the City of Avenal, Kings County and Caltrans to prepare a traffic control plan (TCP) that addresses emergency access. Condition of Certification **TRANS-4** will ensure that an acceptable TCP has been submitted prior to the start of any construction activities.

The nearest fire station to the AEP is at 516 Fresno Street in the city of Avenal, roughly 6 miles to the southwest of the project site. The nearest emergency care facility is the Avenal Community Health Center located at 1000 Skyline Boulevard, approximately six miles to the southwest of the site, also in the city of Avenal. The nearest full service hospital is the Coalinga Regional Medical center located in the city of Coalinga, 15 miles to the northwest of the AEP. The surrounding roadways are all currently operating and are expected to continue to operate throughout construction phase at or above an allowable LOS, with no significant decreases expected from the construction or operation of the AEP facility; therefore, no impact is expected.

PARKING

The project laydown area and construction workforce parking lot would be on an approximate 28-acre portion of the 148-acre subject property. The average daily workforce would be 240 workers and would increase to a high of 425 workers during the peak construction period (months 9 and 10 of the 20-month overall construction period). Therefore, the applicant would need to provide adequate parking for the entire peak workforce of 425 workers. The applicant has indicated that 15 percent of the workforce

would carpool, bringing the total amount of spaces needed for parking to 360 spaces. The assumption of 15 percent of the construction workforce being involved in carpooling activities is based on similar projects developed by the applicant. Using a typical 9' X 18' parking space, staff believes that the proposed 28-acre portion of the 148-acre site designated for construction related activities would provide adequate parking facilities for the construction workforce and related equipment. The construction of the associated linear facilities would not require additional parking capacity.

If the AEP is certified, Condition of Certification **TRANS-7** would ensure that all construction and operational parking take place in designated parking areas only. In addition, staff concludes that the AEP would result in no impacts to parking capacities in the vicinity of the project.

TRANSPORTATION OF HAZARDOUS MATERIALS

The construction and operation of the power plant would require the routine transportation of various hazardous materials as indicated in the **HAZARDOUS MATERIALS** section of this staff assessment. Staff concurs with the applicant's proposed routes for the delivery and transportation of hazardous materials and waste. The proposed routes for the AEP would be via state routes approved for hazardous material transport including; I-5, SR-41, SR-43, SR-198, and SR-269. There are no hospitals along any of the routes proposed for the transportation of hazardous materials. However, there are schools and educational facilities that are located less than ½ of a mile from SR 198. The Kit Carson School District office and Kit Carson Elementary School is located at 9895 7th Avenue in Hanford. Roosevelt Elementary is located at 870 W. Davis also in Hanford. Delta View Elementary is located at 1201 Lacey Boulevard at SR 198 and Central Elementary is located at 15783 18th Avenue in Lemoore. The anticipated routes for the transportation of hazardous materials would depend on vendor availability and the origin of the shipments. State Route 198 is routinely used for the transportation of hazardous materials; therefore, it is staff's opinion that the AEP would not result in significant impacts or increased threats to public safety associated with hazardous material transport.

The applicant has identified three potential Class I hazardous waste landfill sites for the disposal of hazardous waste generated from the AEP's construction and operational phases including; the Buttonwillow facility in Kern County, the Westmoreland facility in Imperial County, and the Chemical Waste Management facility located in Kettleman Hills. Most likely, the hazardous materials would be disposed of at the Kettleman Hills Chemical Waste Management facility located at 35251 Old Skyline Road in Kettleman City, approximately 11 miles from the project site. The trucks transporting the hazardous waste would travel east on Avenal Cutoff road, merge onto I-5 south and travel into Kings County, then take SR-41 north and exit to the facility. If the other facilities are used the transport routes would be on the above roadways approved for hazardous material transport. Condition of Certification **TRANS-3** requires the applicant to follow all federal and state LORS for the handling and transportation of hazardous materials. Therefore, less than significant impacts are expected.

CUMULATIVE IMPACTS

The AEP project site is located in a sparsely populated, rural area generally used for agricultural production. There are no planned or proposed projects, in addition to the AEP, that would result in substantial cumulative effects on the surrounding roadways and transportation system.

The Oasis Industrial Park is a planned industrial park situated on 100-140 acres approximately 1 mile to the northwest of the AEP. The Oasis Industrial Park is currently in the Federal Economic Development Agency's (FEDA) pre-application and infrastructure funding phase. The City of Avenal expects FEDA approval and funding by July 1, 2002. The park will feature a wide variety of industrial uses including: light manufacturing and warehouse staging distribution centers. This project has been approved as part of Avenal's 1993 General Plan and reaffirmed in the City's 2000 General Plan Update. Oasis Development, LLC will manage all application processing, phasing, and approval for all of the Oasis Industrial Park projects. Consequently, the Oasis Industrial Park's construction start date has not been determined, pending FEDA funding. Therefore, the Oasis Industrial Park's construction is not expected to run concurrently with the proposed construction schedule of the AEP.

Additionally, the City of Avenal is currently in the permitting process for relocating the water turnout on the northeast corner of the site 600 feet north of its current location. The proposed construction schedule of the water turnout relocation is expected to begin in early 2003 and last approximately 8 to 12 months. The construction workforce of the turnout relocation is expected to be between 6 and 10 employees. Although, the construction schedule of the AEP and the above turnout relocation would run concurrently, no cumulative or significant traffic or transportation effects are expected to result from the implementation of these projects.

Based on the limited amount of proposed, planned, and approved projects in the vicinity of the project site, it is staff's opinion that no cumulative transportation effects are expected from the AEP construction or operational phases.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is less than 50 percent within a six-mile radius of the proposed AEP. Census 1990 information shows the minority/low income population is less than 50 percent within the same radius. However, there is a pocket population of minority persons within six miles that staff has considered for impacts. Based on the Traffic and Transportation analysis, staff has not identified significant direct or cumulative impacts resulting from the construction or operation of the project. Therefore, there are no Traffic and Transportation environmental justice issues related to this project.

COMPLIANCE WITH LORS

The applicant has stated its intention to comply with all LORS. Conditions ensuring compliance are included below. Staff believes such compliance would not present any

unusual difficulties. Therefore, the project is considered consistent with identified federal, state and local LORS.

FACILITY CLOSURE

Planned closure occurs at the end of a project's life, when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence. The applicant would prepare a Facility Closure Plan for submittal to the Energy Commission for review and approval, at least 12 months prior to the proposed closure. At the time of closure, all then-applicable LORS would be identified and the closure plan would address how these LORS will be complied with.

Unexpected temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster, or an emergency. In the event of temporary closure, the effects on traffic and transportation would be similar to those for normal operation of the power plant facility, and the applicant would have to comply with all applicable LORS with respect to transportation permits for hazardous materials and equipment deliveries and removal.

Unexpected permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unexpected closure where the owner remains accountable for implementing the on-site contingency plan. It can also include unexpected closure where the project owner is unable to implement the contingency plan, and the project is essentially abandoned. Staff assumes that the facility will either remain idle until such time that new ownership is established, or dismantling of the facility would occur. In any event, the owner would have to secure applicable transportation permits to satisfy the LORS requirements as stated in this report.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No public comments have been received at this time.

CONCLUSIONS AND RECOMMENDATIONS

The project would have minimal effects on area roadways, intersections, and transportation system. The construction and operational phases would cause increases in roadway demand and traffic but would not result in any decrease in LOS or exceed any volume/capacity ratio thresholds established by local or regional authorities. There are no design features or incompatible uses on the area's roadways that would result in a threat to public safety. Additionally, the project would not affect air traffic patterns, result in inadequate parking capacities, or impede emergency access.

The applicant would be required to develop and implement a traffic control plan that is acceptable to Caltrans, Fresno and Kings Counties and the City of Avenal. Therefore, the project would not have a significant effect on the transportation system in the vicinity.

If the Energy Commission certifies the AEP facility, staff recommends that the Commission adopt staff's proposed conditions of certification.

PROPOSED CONDITIONS OF CERTIFICATION

TRANS-1: The project owner shall comply with Caltrans, the City of Avenal, and Fresno and Kings counties limitations on vehicle sizes and weights. In addition, the project owner or its contractor shall obtain necessary transportation permits from Caltrans and all relevant jurisdictions for roadway use.

Verification: In the Monthly Compliance Reports, the project owner shall submit copies of any oversize and overweight transportation permits received during that reporting period. In addition, the project owner shall retain copies of these permits and supporting documentation in its compliance file for at least six months after the start of commercial operation.

TRANS-2: The project owner or its contractor shall comply with Caltrans, the City of Avenal and the affected municipalities' limitations for encroachment into public rights-of-way and shall obtain necessary encroachment permits from all relevant jurisdictions.

Verification: In Monthly Compliance Reports, the project owner shall submit copies of any encroachment permits received during the reporting period. In addition, the project owner shall retain copies of these permits and supporting documentation in its compliance file for at least six months after the start of commercial operation.

TRANS-3: The project owner shall ensure that permits and/or licenses are secured from the California Highway Patrol and Caltrans for the transport of hazardous materials.

Verification: The project owner shall include in its Monthly Compliance Reports, copies of all permits/licenses acquired by the project owner and/or subcontractors concerning the transport of hazardous substances. The project owner shall maintain copies of these permits at the project site for inspection by the CPM.

TRANS-4: Prior to earth moving or ground disturbance activity for development of the AEP, the project owner shall consult with the City of Avenal and affected municipalities, and prepare and submit to the CPM for approval a construction traffic control plan and implementation program which addresses the following issues:

- Use of carpools, vanpooling or other ride share programs;
- Timing of heavy equipment and building materials deliveries;
- Lane closures during construction
- Signing, lighting, and traffic control device placement if required;
- When construction work hours need to be established outside of peak traffic periods;
- Insure that construction doesn't interfere with emergency access to the construction sites;

- Redirecting construction traffic with a flagperson;
- Insure that adequate construction worker parking is provided on site;
- Maintaining access to adjacent residential and commercial properties;
- Maintaining utility services to adjacent residential and commercial properties.

Verification: At least thirty (30) days prior to earth moving or ground disturbance activity, the project owner shall provide to the CPM for review and approval, a copy of its construction traffic control plan and implementation program.

TRANS-5: Based on the determined state of primary roadways to be used in the traffic control plan and implementation program and following construction of the power plant and all related facilities, the licensee shall repair those primary roadways to original or as near original condition as possible.

Verification: Thirty days prior to construction, the licensee shall photograph the primary roadways. The licensee shall provide the CPM, the City of Avenal, Kings County and Fresno County with a copy of these photographs. Within 30 days of the completion of project construction, the licensee will meet with the CPM, the City of Avenal, Kings County and Fresno County Public Works Department to determine and receive approval for the actions necessary and scheduled to complete the repair of those roadways to original condition as possible.

TRANS-6: The Owner shall schedule construction work hours in potentially impacted areas avoiding morning (7 a.m. to 9 a.m.) and evening (4 p.m. to 6 p.m.) peak hour traffic periods (including all heavy truck related traffic).

Verification: The project owner shall maintain a construction log, which specifies, in part, the time and date of all construction related activities in the on-site compliance file.

TRANS-7 During construction of the power plant and all related facilities, the project owner shall enforce a policy that all project-related parking occurs in designated parking areas only.

Verification: At least 30 days prior to start of site preparation or earth moving activities, the project owner shall submit a parking and staging plan for all phases of project construction to the City of Avenal, Kings County, and the CPM for concurrent review and comment.

TRANS-8 The AEP stacks shall incorporate lighting and marking as required by the Kings County Public Works Department so that the stacks do not create a hazard to aerial spraying operations or other air navigation in the vicinity of the project site.

Verification: At least 30 days prior to the start of site preparation or earth moving activities, the applicant shall provide lighting and marking plans for the AEP structures to the City of Avenal, the Kings County Public Works Department, and the CPM for review and approval.

REFERENCES

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TRANSMISSION LINE SAFETY AND NUISANCE

Obed Odoemelam, Ph.D.

INTRODUCTION

The energy from the proposed Avenal Energy Project (AEP) will be delivered to the Pacific Gas and Electric (PG&E) power grid through a looping connection involving a new 1.3-mile, 230 kV, double-circuit, overhead line to be erected between the project's 230 kV switchyard and the 230 kV Gates-ARCO 230 kV transmission line to the west of the project site. This 230 kV PG&E line is located within a north-south running transmission line corridor which it shares with two 500 kV PG&E lines, the Gates-Midway 500 kV line and the Los Banos-Midway 500 kV line

The purpose of this staff analysis is to assess the proposed transmission line construction and operation plan for incorporation of the measures necessary to minimize the field and non-field impacts whose reduction remains the focus of the existing health and safety LORS. If such compliance were established, staff would not recommend further mitigation measures with respect to the issues of concern in this analysis; if not, staff would recommend revisions as appropriate. Staff's analysis will focus on the following issues as related primarily to the physical presence of the lines or secondarily to the physical interactions of their electric and magnetic fields:

- Aviation safety;
- Interference with radio-frequency communication;
- Audible noise;
- Fire hazards;
- Hazardous shocks;
- Nuisance shocks; and
- Electric and magnetic field (EMF) exposure.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Discussed below by subject area are design-related LORS applicable to the physical impacts of the overhead transmission lines as proposed for AEP. The potential for these impacts is assessed in terms of compliance with specific federal or state regulations or established industry standards and practices. There presently are no local laws or regulations specifically aimed at the physical structure or dimensions of electric power lines to limit the impacts noted above. However, many local jurisdictions require such lines to be located underground because of the potential for visual impacts on the landscape.

AVIATION SAFETY

Any potential hazard to area aircraft would relate to the potential for collision in the navigable air space. The applicable federal LORS as discussed below are intended to ensure the distance and visibility necessary to prevent such collisions.

Federal

- Title 14, Part 77 of the Code of Federal Regulations (CFR), "Objects Affecting the Navigation Space." Provisions of these regulations specify the criteria used by the Federal Aviation Administration (FAA) for determining whether a "Notice of Proposed Construction or Alteration" is required for potential obstruction hazards. The need for such a notice depends on factors related to the height of the structure, the slope of an imaginary surface from the end of nearby runways to the top of the structure, and the length of the runway involved. Such notification allows the FAA to ensure that the structure is located to avoid the aviation hazards of concern.
- FAA Advisory Circular (AC) No. 70/460-2H, "Proposed Construction and or Alteration of Objects that May Affect the Navigation Space." This circular informs each proponent of a project that could pose an aviation hazard of the need to file the "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA.
- FAA AC No. 70/460-1G, "Obstruction Marking and Lighting." This circular describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR.

INTERFERENCE WITH RADIO-FREQUENCY COMMUNICATION

Transmission line-related radio-frequency interference is one of the indirect effects of line operation as produced by the physical interactions of line electric fields. Since electric fields are unable to penetrate most materials, including soil, such interference and other electric field effects are not associated with underground lines. The level of any such interference usually depends on the magnitude of the electric fields involved. Because of this, the potential for such impacts could be assessed from field strength estimates obtained for the line. The following regulations are intended to ensure that such lines are located away from areas of potential interference and that any interference is mitigated whenever it occurs.

Federal

- Federal Communications Commission (FCC) regulations in Title 47 CFR, Section 15.25. Provisions of these regulations prohibit operation of any devices producing force fields, which interfere with radio communications, even if (as with transmission lines) such devices are not intentionally designed to produce radio-frequency energy. Such interference is due to the radio noise produced by the action of the electric fields on the surface of the energized conductor. The process involved is known as corona discharge but is referred to as spark gap electric discharge when it occurs within gaps between the conductor and insulators or metal fittings. When generated, such noise manifests itself as perceivable interference with radio or television signal reception or interference with other forms of radio communication. Since the level of interference depends on factors such as line voltage, distance from the line to the receiving device, orientation of the antenna, signal level, line configuration and weather conditions, maximum interference levels are not specified as design criteria for modern transmission lines. The FCC requires each line operator to mitigate all complaints about interference on a case-specific basis. Staff recommends a specific condition of certification (TLSN-3) to ensure compliance with this FCC requirement.

State

- General Order 52 (GO-52), California Public Utilities Commission (CPUC). Provisions of this order govern the construction and operation of power and communications lines and specifically deal with measures to prevent or mitigate inductive interference. Such interference is produced by the electric field induced by the line in the antenna of a radio signal receiver.

Several design and maintenance options are available for minimizing these electric field-related impacts. When incorporated into the line design and operation, such measures also serve to reduce the line-related audible noise discussed below.

AUDIBLE NOISE

Industry Standards

There are no design-specific federal regulations to limit the audible noise from transmission lines. As with radio noise, such noise is limited instead through design, construction or maintenance practices established from industry research and experience as effective without significant impacts on line safety, efficiency maintainability and reliability. All modern overhead high-voltage lines are designed to assure compliance. As with radio-frequency noise, such audible noise usually results from the action of the electric field at the surface of the line conductor and could be perceived as a characteristic crackling, frying or hissing sound or hum, especially in wet weather. Since the noise level depends on the strength of the line electric field, the potential for perception can be assessed from estimates of the field strengths expected during operation. Such noise is usually generated during rainfall, but mainly from overhead lines of 345 kV or higher. It is, therefore, not generally expected at significant levels from those of less than 345 kV such as the ones proposed for AEP. Research by the Electric Power Research Institute (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a 100-ft right-of-way.

NUISANCE SHOCKS

Industry Standards

There are no design-specific federal regulations to limit nuisance shocks in the transmission line environment. For modern overhead high-voltage lines, such shocks are effectively minimized through grounding procedures specified in the National Electrical Safety Code (NESC) and the joint guidelines of the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). Nuisance shocks are caused by current flow at levels generally incapable of causing significant physiological harm. They result mostly from direct contact with metal objects electrically charged by fields from the energized line. Such electric charges are induced in different ways by the line electric and magnetic fields. As with the proposed overhead line, the applicant will be responsible in all cases for ensuring compliance with these grounding-related practices within the right-of-way. Staff recommends a specific condition of certification (TLSN-2) to ensure such grounding along the proposed route.

FIRE HAZARDS

The fire hazards addressed through the following regulations are those that could be caused by sparks from conductors of overhead lines, or that could result from direct contact between the line and nearby trees and other combustible objects.

State

- General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction" specifies tree-trimming criteria to minimize the potential for power line-related fires.
- Title 14 Section 1250 of the California Code of Regulations: "Fire Prevention Standards for Electric Utilities" specifies utility-related measures for fire prevention.

HAZARDOUS SHOCKS

The hazardous shocks addressed by the following regulations and standards are those that could result from direct or indirect contact between an individual and the energized line whether overhead or underground. Such shocks are capable of serious physiological harm or death and remain a driving force in the design and operation of transmission and other high-voltage lines.

state

- GO-95, CPUC. "Rules for Overhead Line Construction". These rules specify uniform statewide requirements for overhead line construction regarding ground clearance, grounding, maintenance and inspection. Implementing these requirements ensures the safety of the general public and line workers.
- Title 8, California Code of Regulations, section 2700 et seq., Sections 2700 through 2974. "High Voltage Electric Safety Orders". These safety orders establish essential requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment

local

There are no shock hazard-related requirements on the physical dimensions of power lines at the local level.

Industrial Standards

No design-specific federal regulations have been established to prevent hazardous shocks from overhead power lines. Safety is assured within the industry from compliance with the requirements in the National Electrical Safety Code, Part 2: Safety Rules for Overhead Lines. These provisions specify the minimum national safe operating clearances applicable in areas where the line might be accessible to the public. They are intended to minimize the potential for direct or indirect contact with the energized line.

ELECTRIC AND MAGNETIC FIELD (EMF) EXPOSURE

The possibility of deleterious health effects from electric and magnetic field exposure has increased public concern in recent years about living near high-voltage lines. Both fields occur together whenever electricity flows, hence the general practice of describing exposure to them together as EMF exposure. The available evidence as evaluated by

CPUC, other regulatory agencies, and staff, has not established that such fields pose a significant health hazard to exposed humans. However, staff considers it important, as does the CPUC, to note that while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. Staff, therefore considers it appropriate in light of present uncertainty, to recommend reduction of such fields as feasible without affecting safety, efficiency, reliability and maintainability.

While there is considerable uncertainty about the EMF/health effects issue, the following facts have been established from the available information and have been used to establish existing policies:

- Any exposure-related health risk to the exposed individual will likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- The measures employed for such field reduction can affect line safety, reliability, efficiency and maintainability, depending on the type and extent of such measures.

State

In California, the CPUC (which regulates the installation and operation of high-voltage lines in California) has determined that only no-cost or low-cost measures are presently justified in any effort to reduce power line fields beyond levels existing before the present health concern arose. The CPUC has further determined that such reduction should be made only in connection with new or modified lines. It required each utility within its jurisdiction to establish EMF-reducing measures and incorporate such measures into the designs for all new or upgraded power lines and related facilities within their respective service areas. The CPUC further established specific limits on the resources to be used in each case for field reduction. Such limitations were intended by the CPUC to apply to the cost of any redesign to reduce field strength or relocation to reduce exposure. Utilities not within the jurisdiction of the CPUC voluntarily comply with these CPUC requirements. This CPUC policy resulted from assessments made to implement CPUC Decision 93-11-013.

In keeping with this CPUC policy, staff requires evidence that each proposed overhead line will be designed according to the EMF-reducing design guidelines applicable to the utility service area involved. These field-reducing measures can impact line operation if applied without appropriate regard for environmental and other local issues bearing on safety, reliability, efficiency and maintainability. Therefore, it is up to each applicant to ensure that such measures are applied to an extent without significant impacts on line operation and safety. The extent of such applications would be reflected by the ground-level field strengths as measured during operation. When estimated or measured for lines of similar voltage and current-carrying capacity, such field strength values can be used by staff and other regulatory agencies to assess each line for effectiveness at field strength reduction. These field strengths can be estimated for any given design using established procedures. Estimates are specified for a height of one meter above the ground, in units of kilovolts per meter (kV/m), for the electric field, and milligauss (mG) for the companion magnetic field. Their magnitude depends on line voltage (in the case of electric fields), the geometry of the structures, degree of cancellation from nearby

conductors, distance between conductors and, in the case of magnetic fields, amount of current in the line.

Since each new line in California is currently required to be designed according to health, safety, and EMF-reducing guidelines of the utility in the service area involved, its fields are required under existing CPUC policies to be similar to fields from similar lines in that service area. A condition of certification is usually proposed by staff to ensure implementation of the design measures necessary. The applicable condition for this project is **TLSN-1**.

Industrial Standards

There are no health-based federal regulations or industry codes specifying environmental limits on the strengths of fields from power lines. However, the federal government continues to conduct and encourage research necessary for an appropriate policy on the EMF health issue.

In the face of the present uncertainty, several states have opted for design-driven regulations ensuring that fields from new lines are generally similar to those from existing lines. Some states (Florida, Minnesota, New Jersey, New York, Montana) have set specific environmental limits on one or both fields in this regard. These limits are, however, not based on any specific health effects. Most regulatory agencies believe, as does staff, that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Before the present health-based concern developed, measures to reduce field effects from power line operations were mostly aimed at the electric field component whose effects can manifest themselves as the previously noted radio noise, audible noise and nuisance shocks. The present focus is on the magnetic field because only it can penetrate the soil, building and other materials to potentially produce the types of health impacts at the root of the present concern. As one focuses on the strong magnetic fields from the more visible overhead transmission and other high-voltage power lines, staff considers it important for perspective, to note that an individual in a home could be exposed for short periods to much stronger fields while using some common household appliances (National Institute of Environmental Health Services and the U.S Department of Energy, 1995). Scientists have not established which of these types of exposures would be more biologically meaningful in the individual. Staff notes such exposure differences only to show that high-level magnetic field exposures regularly occur in areas other than around high-voltage power lines.

SETTING

According to information from the applicant (TRC 2001a, pages 1-4 through 1-9, 2-1 through 2-9, and 6.18-1), the proposed AEP and related switchyard will be located on 25 acres within a 148-acre land parcel in the northeast corner of the City of Avenal, Kings County, California. The site is zoned for industrial uses and is surrounded by agricultural land through which the project's transmission line will pass as it extends to the tie-in points on the 230 kV Gates-ARCO line.

This location was chosen in part because for its proximity to this PG&E line corridor (TRC 2001a, pages 1-1, 1-27, 2-17, 2-20, and 6.18-1). The closest population centers are the business and residential districts of the City of Avenal approximately 6 miles to the southwest. The nearest residence to the line's route is a farmhouse located more than one-half mile at the closest point. The areas that the route would cross are mostly open fields of orchards and row crops.

The general absence of residences along the proposed route means that the residential magnetic field exposure at the root of the present health concern would be insignificant for this project. The only project-related EMF exposures of potential significance are the short-term exposures to plant workers, regulatory inspectors, maintenance personnel, approved guests, or individuals in transit across the project's lines. These types of exposures are short term and well understood as not significantly related to the present health concern.

PROJECT DESCRIPTION

The proposed AEP line will consist of the segments listed below:

- A new double-circuit overhead line within a 1.3-mile route from the proposed on-site AEP Switchyard (at the southeast corner of the site) to the existing 230 kV double-circuit Gates-ARCO line to the west;
- The new AEP Switchyard; and
- Relatively minor project-related modifications at the interconnected Gates Substation.

As more fully discussed in the information from the applicant (TRC 2001a, pages 2-84, 2-85, and 2-89 through 2-103) the looping connection to the project switchyard will yield two separate lines: the Avenal-Gates and the Avenal-ARCO 230 kV lines as would be necessary to facilitate controlled power delivery from the project to the Gates and ARCO Substations. The project line will be carried on lattice-type steel support towers approximately 120 feet high. The basic structure of these support towers was provided by the applicant as relevant to safety and field reduction effectiveness (AEP 2001a, pages 2-99, 2-100, and 6.18-1 and 6.18-2). Details of the proposed tower placement and tie-in schemes were also provided for the seven towers to be used. Since the proposed project line will be located within the PG&E utility service area and operated by PG&E (TRC 2001a, pages 1-4), its interconnection line is required under present CPUC policy to be designed constructed and operated according to standard PG&E practices reflecting compliance with the noted health and safety laws, ordinances, regulations, and standards (LORS). The generated electric and magnetic field should therefore be of similar intensity to those from PG&E lines of the same voltage and current-carrying capacity. The proposed right-of-way would be 120 feet wide.

IMPACTS

GENERAL IMPACTS

GO-95, and Title 8, CCR Section 2700 et seq., as noted in the LORS section, ensures the minimum regulatory requirements necessary to prevent the direct or indirect contact previously discussed in connection with hazardous shocks or aviation hazards. Of secondary concern are the noted field impacts manifesting themselves as nuisance shocks, radio noise, communications interference and magnetic field exposure. The relative magnitude of such impacts would be reflected in the field strengths characteristic of a given line design. Since applied field-reducing measures can affect line operations and safety, the extent of their implementation and resulting field strengths will vary according to environmental and other local conditions bearing on line safety, efficiency, reliability and maintainability. They will therefore, vary from one service area to the other according to prevailing conditions. It would be up to each project proponent to apply such measures to the extent appropriate for the geographic area involved.

PROJECT SPECIFIC IMPACTS

Aviation Safety

There are no major airports in the immediate vicinity of the proposed interconnection line pointing to a potential lack of a collision hazard to area aircraft. Furthermore, the support towers would (at a maximum height of 120 feet) not be tall enough to pose a potential collision hazard to area aircraft as defined using existing FAA criteria. The use of 120-foot support structures would be adequate to provide the ground clearance necessary for the safe operation of aircraft used in agricultural operations. The same lack of a collision hazard is true for the other area PG&E lines with the same safety designs (TRC page 6.9-22). While an FAA “Notice of Construction or Alteration” will not be required for the proposed line, the applicant will contact the FAA about the proposed line, as is standard industry practice.

Interference with Radio-Frequency Communication

The previously noted corona-related communications interference is most commonly caused by irregularities (such as nicks and scrapes on the conductor surface), sharp edges on suspension hardware, and other discontinuities around the conductor surface. The proposed lines will be built and maintained according to PG&E practices minimizing such surface irregularities and discontinuities (TRC 2001a, page 6.18-2 and 6.18-3). Moreover, the potential for such corona-related interference is usually of concern only for lines of 345 kV and above, and not the proposed 230 kV lines except in rainy weather (when the presence of raindrops increases the strengths of the offending surface electric fields). The low-corona design for the proposed project lines would be the same as used for the exiting 230 kV lines to which the lines would be connected. Since these existing lines do not currently produce the corona effects of specific concern, staff does not expect any corona-related radio-frequency interference any where around the proposed route. In the unlikely event of specific complaints, the applicant would be responsible for the necessary mitigation as required by the FCC. Staff recommends a specific condition of certification (**TLSN-3**) in this regard.

Audible Noise

As happens with radio noise, the low-corona design for the proposed AEP lines (TRC 2001a, pages 2-92 and 2-103) will minimize the potential for corona-related audible noise, as with similar area PG&E lines. This means, as reflected in the applicant's calculations (TRC 2001a, page 6.18-7, and Appendix 6.18-1), that the proposed interconnection line will not add significantly to current background noise levels in the project area. For an assessment of the noise from all phases of the proposed project and related facilities, please refer to staff's analysis in the **Noise** section.

Fire Hazards

Standard fire prevention and suppression measures for all PG&E lines will be implemented for the proposed line. The applicant's intended compliance with the clearance-related aspects of GO-95 would be an important part of this compliance approach (TRC 2001a page 2-111 through 2-113). Moreover, the route for the proposed interconnection line will be agricultural land with no trees or brush that would pose a significant hazard of contact-related line fires.

Hazardous Shocks

The applicant's noted intention to implement the GO-95- related measures against direct contact with the energized line (TRC 2001a, page 6-18-10) would serve to minimize the risk of hazardous shocks. Staff recommends condition of certification **TLSN-1** to ensure implementation of the necessary mitigation measures.

Nuisance Shocks

As is current PG&E practice, the potential for nuisance shocks around the proposed lines will be minimized through standard grounding practices (TRC 2001a, page 6.18-4). Staff recommends condition for certification, **TLSN-2** to ensure such grounding.

Electric and magnetic field exposure

The applicant calculated the maximum field strengths along the route of the proposed interconnection line (TRC 2001a, page 6.18-8, and Appendix 6.18-1) to assess the effectiveness of the field reduction measures to be incorporated into the line design. The maximum electric field strength within the right-of-way was calculated as 3.309 kV/m, diminishing to 0.531 kV/m at the edges of the right-of-way. Staff has verified the accuracy of the applicant's calculations with regard to parameters bearing on field strength dissipation and exposure assessment. These values are, within the range that staff expects for PG&E lines of the same voltage rating and could be compared with values ranging from 1.0 kV/m to 2.0 kV/m at the edge of the right-of-way for states with regulatory limits.

The maximum magnetic fields within the right-of-way were calculated as ranging from 33.12 mG to 182.92 mG within the right-of-way and 80.3 mG and 29.77 mG at the edge of the right-of-way. These magnetic field strength values are as staff would expect for PG&E lines of the same voltage and current-carrying capacity and reflect incorporation of effective field-reducing measures. These magnetic field strengths are much lower than the 150 mG to 250 mG established for the edge of the rights-of-way by the few states with regulatory limits on these line magnetic fields.

The field reduction approaches to be incorporated into the line's design include the following:

1. Increasing the distance between the conductors and the ground;
2. Reducing the spacing between the conductors;
3. Minimizing the current in the line; and
4 Arranging current flow to maximize the cancellation effects from interacting fields from nearby conductors.

Since these field reducing measures have been incorporated into the proposed line design to the extent considered by PG&E as without impacts on line safety, efficiency, reliability and maintainability, staff considers further mitigation as unnecessary but recommends a specific condition of certification (**TLSN-4**) to allow for verification of the reduction efficiency assumed by the applicant.

CUMULATIVE IMPACTS

The reported field strengths were calculated by the applicant to factor the interactive effects of the fields from the proposed and nearby PG&E lines. Therefore, these values should be seen as representing cumulative exposures from the project's and nearby area lines. As reflected in the calculated values, any such exposures would be similar to those associated with PG&E lines of similar voltage and current-carrying capacity.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population to be greater than 50 percent within a six-mile radius of the proposed project (as more clearly shown in Socioeconomics Figure 1 in this assessment). However, Census 1990 information shows the low-income population as less than 50 percent within the same radius. Since this analysis has not identified any significant impacts from the project's transmission line operation, staff found no disproportionate impacts.

COMPLIANCE WITH LORS

The magnitude of the line impacts of concern in this analysis are within the limits associated with similar transmission lines designed and operated in compliance with existing LORS. Staff, therefore, considers the proposed project transmission lines design and operational plan to be in compliance with the applicable health and safety LORS.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Since electric or magnetic field health effects have neither been established nor ruled out for overhead and underground lines, the public health significance of any AEP -

related field exposures cannot be characterized with certainty. The long-term, mostly residential magnetic exposure at the root of the present health concern will be insignificant for the proposed interconnection lines given the general absence of residences along the proposed route. On-site worker or public exposures would be short term and at levels expected for similar PG&E designs and current-carrying capacity. Such exposures are well understood and have not been established as posing a health hazard to humans.

The potential for nuisance shocks will be minimized through grounding and other field-reducing measures to be implemented by the applicant in keeping with current PG&E guidelines reflecting common industry practices. Since there are no major airports or aviation centers in the immediate project area, staff does not expect the proposed lines to pose a significant aviation hazard. The use of low-corona line design together with appropriate corona-minimizing construction practices will minimize the potential for corona noise and its related interference with radio-frequency communication any where in the project area.

RECOMMENDATIONS

Since the project's interconnecting 230 kV lines will be designed to minimize the safety and nuisance impacts of specific concern to staff and routed away from residential areas, staff does not recommend any changes to the proposed construction and operational plan. If the project is approved, staff recommends that the Energy Commission adopt the conditions of certification specified below to ensure implementation of the measures necessary to achieve the field reduction and safety assumed by the applicant for its related transmission line.

CONDITIONS OF CERTIFICATION

TLSN-1 The project owner shall construct the proposed interconnection transmission lines according to the requirements of CPUC's GO-95, GO-52, Title 8, Section 2700 et seq. of the California Code of Regulations and PG&E's EMF reduction guidelines arising from CPUC Decision 93-11-013 of 1989.

Verification: Thirty days before starting construction of AEP's transmission line or related structures and facilities, the project owner shall submit to the Commission's Compliance Project Manager (CPM) a letter signed by a California registered electrical engineer affirming that the overhead section will be constructed according to the requirements GO-95, GO 52, Title 8, Section 2700 et seq. of the California Code of Regulations, and PG&E's EMF-reduction guidelines arising from CPUC Decision 93-11-013.

TLSN-2 The project owner shall ensure that all metallic objects along the route of the overhead section are grounded according to industry standards.

Verification: At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition.

TLSN-3 The project owner shall take reasonable steps to resolve any complaints of interference with radio or television signals from operation of the proposed lines.

Verification: Any reports of line-related complaints shall be summarized along with related mitigation measures for the first five years, and provided in an annual report to the CPM.

TLSN-4 The project owner shall engage a qualified consultant to measure the strengths of the line electric and magnetic fields from the proposed lines before and after they are energized. Measurements shall be made at representative points (on-site and along the line route) as necessary to identify the maximum field exposures possible during AEP operations. Staff would assess the need for further mitigation from results of these measurements.

Verification: The project owner shall file copies of the pre-and post-energization measurements with the CPM within 60 days after completion of the measurements.

REFERENCES

Electric Power Research Institute (EPRI) 1982. Transmission Line Reference Book: 345 kV and Above.

Energy Commission Staff 1992. High Voltage Transmission Lines: Summary of Health Effects Studies. California Energy Commission Publication, P700-92-002.

National Institute of Environmental Health Services 1998. An Assessment of the Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. A Working Group Report, August, 1998.

TRC (TRC/Stenger) 2001a. Application for Certification, Volumes I and II for the Avenal Energy Project. Submitted to the California Energy Commission on October 9, 2001

VISUAL RESOURCES

Christa Fay, Eric Knight, and William Walters

INTRODUCTION

Visual resources are the natural and cultural features of the environment that can be viewed. This analysis focuses on whether the construction of the Avenal Energy Project (AEP) would cause significant adverse visual impacts and whether the project would be in compliance with applicable laws, ordinances, regulations, and standards. The determination of the potential for significant impacts to visual resources resulting from the proposed project is required by the California Environmental Quality Act (CEQA).

SUMMARY OF ANALYSIS

The analysis of visual resources included the evaluation of five key observation points (KOP) with the proposed project facility only, the five KOPs with the anticipated vapor plumes, and lighting and glare. KOPs 1, 2, 3, and 4 represent views seen by travelers along Avenal Cutoff Road and Interstate 5 (I-5). KOP 5 represents the view from the six residential units on Orange Avenue. The evaluation of the KOPs with the proposed project structures only resulted in staff's conclusion that the visual impact significance for KOPs 1, 2, and 5 would be adverse but less than significant. KOP 3 is considered to be peripheral to the primary viewing direction of motorists on Avenal Cutoff Road and therefore, the visual impact significance is considered adverse and less than significant. KOP 4 has moderate sensitivity and moderately high visual change, resulting in an adverse and significant visual impact. Proper implementation of staff's proposed Condition of Certification **VIS-5** (landscaping) would reduce the impacts to KOP 4 to a less than significant level.

Visible plume frequencies for the main cooling tower are substantially greater than the threshold that would trigger an impact analysis of the plumes. Based on the dimensions of the predicted plumes, and the evaluation of the plumes from the five KOPs, staff concluded that KOPs 2, 3, 4, and 5 would experience adverse and significant visual impacts. Staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes. Proper implementation of this condition would reduce the visual impacts of the plumes to a less than significant level.

ANALYSIS METHODOLOGY

Visual resources analysis has an inherently subjective aspect. However, the use of generally accepted criteria for determining impact significance and a clearly described analytical approach aid in developing an analysis that can be readily understood.

SIGNIFICANCE CRITERIA

Commission staff considered the following criteria in determining whether a visual impact would be significant.

State

The CEQA Guidelines define a "significant effect" on the environment to mean a "substantial, or potentially substantial," adverse change in any of the physical conditions within the area affected by the project including…objects of historic or aesthetic significance (California Code of Regulations [CCR] title 14, §15382).

Appendix G of the Guidelines, under Aesthetics, lists the following four questions to be addressed regarding whether the potential impacts of a project are significant:

1. Would the project have a substantial adverse effect on a scenic vista?

2. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

3. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

4. Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

Local

Energy Commission staff considers any local goals, policies, or designations regarding visual resources. Conflicts with such laws, ordinances, regulations and standards (LORS) can constitute significant visual impacts. See the section on Laws, Ordinances, Regulations and Standards for details on these LORS and a discussion of consistency.

Professional Standards

Professionals in visual impact analysis have developed a number of questions as a means of evaluating the potential significance of visual impacts. The questions listed below address issues commonly raised in visual analyses for energy facilities. Staff considers these questions in assessing whether a project would cause a significant impact in regard to any of the four CEQA criteria listed above.

- Will the project substantially alter the existing viewshed, including any changes in natural terrain?
- Will the project deviate substantially from the form, line, color, and texture of existing elements of the viewshed that contribute to visual quality?
- Will the project eliminate or block views of valuable visual resources?
- Will the project result in significant amounts of backscatter light into the nighttime sky?
- Will the project be in conflict with directly identified public preferences regarding visual resources?
- Will the project result in a significant reduction of sunlight, or the introduction of shadows, in areas used extensively by the community?
- Will the project result in a substantial and persistent visible exhaust plume?

IMPACT DURATION

The visual analysis typically distinguishes three different impact durations. **Temporary impacts** typically last no longer than two years. **Short-term impacts** generally last no longer than five years. **Long-term impacts** are impacts with duration greater than five years.

VIEW AREAS AND KEY OBSERVATION POINTS

The proposed project is visible from a number of areas in the project region. Energy Commission staff evaluated the visual impact of the project from each of these areas. Staff used Key Observation Points, or KOPs, as representative locations from which to conduct detailed analyses of the proposed project and to obtain existing conditions photographs and prepare visual simulations. KOPs are selected to be representative of the most critical locations from which the project would be seen. However, KOPs are not the only locations that staff considered in each view area.

EVALUATION PROCESS

For each view area, staff considered the existing visual setting and the visual changes that the project would cause to determine impact significance. Staff conducted a site visit and concluded that the KOPs presented in the AFC were appropriate for this analysis. However, staff did request that all photographs and simulations be revised so as to be represented at life-size scale. The results of staff's analysis are summarized in table form, in **Visual Resources Appendix VR-1** located at the end of the Visual Resources section. Existing conditions photographs and photo simulations from each KOP are presented with all other figures in **Appendix VR-3**.

Elements of the Visual Setting

Visual Quality

Visual quality is the value of visual resources in a particular setting, determined by the visible environment's intrinsic physical properties and by associated cultural or public values. Where publicly adopted goals, policies, designations, or guidelines exist, they are given great weight in assessing visual quality. A basic premise in the evaluation of the visual quality is whether a project will be compatible with the character of the landscape.

Viewer Concern

Viewer Sensitivity is a measurement of the level of interest or concern of viewers regarding the visual resources of an area. It is generally expressed as high, medium, or low.

Viewer Exposure

Viewer exposure is important in determining the potential for a change in the visual setting to be significant. Viewer exposure consists of four elements: 1) the general visibility of the feature being evaluated, 2) the distance from the feature or view being evaluated, 3) the number of viewers, and 4) the length of time the viewer is exposed to the view.

Overall Visual Sensitivity

The overall level of visual sensitivity assesses a view area by considering visual quality, viewer concern, and viewer exposure. The value of overall visual sensitivity ranges from low to high.

Types of Visual Change

The visual impacts that the proposed project would cause, were assessed by the following factors:

Contrast

Visual contrast describes the project's visual characteristics or elements (form, line, color, and texture) with respect to the existing landscape. The degree of contrast can range from low to high (Newman and Sheppard 1979).

Dominance

Visual dominance is a measure of a feature's apparent size relative to other visible landscape features and the total field of view. A feature's dominance is affected by its relative location in the field of view and the distance between the viewer and the feature. Visual dominance typically ranges from low to high.

Blockage

The extent to which any previously visible landscape features are blocked from view by the project is described as view blockage. Blockage of higher quality landscape features by lower quality project features causes adverse visual impacts. The degree of view blockage can range from none to high.

Overall Visual Change

Considering the visual change factors discussed above, an assessment is made of the overall level of visual change. Overall visual change can range from low to high.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

The following discussion of Federal, State and Local laws, ordinances, regulations and standards is based on Section 6.13.12 (LORS) and Sections 6.9.3.4 and 6.9.3.5 (Land Use Impacts) of the AFC, and a conversation with Jim Doughty from the City of Avenal.

FEDERAL

The proposed project is located on private property. Therefore, the project is not subject to federal regulations pertaining to visual resources.

STATE

The proposed project is located on private land, approximately two miles east of Interstate 5 (I-5). I-5, in this location, has not been designated as a State Scenic Highway. It also has not been deemed eligible for the state scenic highway system (State Scenic Highway System Web Site: www.dot.ca.gov/hq/LandArch/scenic/cahisys.htm).

LOCAL

The proposed project is located on private land within the City of Avenal. The City's primary policies and standards applicable to the visual resources within the proposed project area are found in two documents: the City of Avenal General Plan and its elements, and the City Zoning Ordinance. There are four LORS that have been found to be applicable to this project. These four LORS include: Industrial Performance Standards, Parking Standards under the Circulation Element, Open Space Resources, and Parking Lot Landscaping under the Zoning Ordinance. No other LORS are applicable, as the majority of the visual resource LORS are applicable only to the City of Avenal city proper, located approximately 6 miles west of the proposed project site, west of the Kettleman Hills (Doughty 2002). The relevant local LORS and an assessment of the project's LORS consistency are presented in a later section of this analysis.

PROJECT DESCRIPTION

The following section describes the aspects of the project that may have the potential for significant visual impacts and includes the power plant and associated facilities, electrical transmission interconnection, and pipelines.

POWER PLANT AND ASSOCIATED FACILITIES

The proposed generating plant and ancillary facilities are located on a 148-acre agricultural parcel on the San Joaquin Valley floor, along Avenal Cutoff Road. The proposed generating plant and associated facilities would occupy approximately 25 acres of this parcel. The most visible features of the proposed project include: two 145-foot tall heat recovery steam generator (HRSG) stacks, two 68-foot tall combustion turbine generator (CTG) air inlets, one 52-foot tall steam turbine generator (STG), one 80-foot tall brine concentrator, and a 45-foot tall and 400-foot long cooling tower.

SWITCHYARD

A new on-site switchyard would be located on the property. Components of the new switchyard include transformers, take-off structures, and other electrical equipment. The transformers would be 25 feet in height, 29 feet in length and 16 feet in width. The switchyard would have an industrial appearance, with each transformer resting on a concrete pad.

ELECTRICAL TRANSMISSION INTERCONNECTION

Transmission lines would extend southeast off the property from the onsite switchyard, continue south, for the length of the adjacent property, turn to the west and continue west, hooking into the existing PG&E transmission lines. The transmission lines would be supported by double-circuit 230-kilovolt (kV) lattice type tower structures that are approximately 120 feet in height. Single-circuit structures (a single-shaft tubular steel or concrete pole) may be used in some areas if warranted. The transmission line would extend a total of approximately 7,000 feet.

PIPELINES

Three pipelines, one gas and two water, would be constructed to serve the proposed project. The natural gas pipeline route would parallel Avenal Cutoff Road starting from the interconnection point at the PG&E Kettleman compressor station, located approximately 7,000 feet southwest of the power plant site. Water would be delivered to the site from the San Luis Canal (California Aqueduct). A backup water supply would be available via two pipelines from nearby agricultural wells. One water supply pipeline would travel approximately 3,500 feet and supply the site from wells located near the San Luis Canal, north of the power plant site. The other water supply pipeline would travel approximately 4,000 feet, paralleling the Avenal Cutoff Road, from wells located southwest of the power plant site. The pipelines would be placed underground and would not be visible from public roadways, except for the occasional warning signs identifying the location of the gas pipeline.

LANDSCAPING

The applicant has proposed landscaping for the project. The conceptual landscaping plan presented in the AFC was developed in cooperation with the City of Avenal. The landscaping is intended to enhance the appearance of the power plant and to blend the industrial character of the proposed project into its agricultural setting by extending agricultural patterns into the proposed project site (TRC 2001a, p 6.13-17).

SETTING

REGIONAL LANDSCAPE

The proposed project is located in the southwestern San Joaquin Valley, approximately 200 miles north of Los Angeles and 200 miles south of San Francisco. The San Joaquin Valley is dominated by agricultural lands. Man-made structures such as electrical transmission lines, ranch structures, and water irrigation systems dot the landscape. The Kettleman Hills are located approximately two miles to the west of the proposed site location and rise to a maximum height of approximately 1,200 feet above the valley floor.

LOCAL LANDSCAPE

Locally, the site is approximately two miles east of I-5 on Avenal Cutoff Road. The area is characterized by the Kettleman Hills to the west and the flat valley floor of the San Joaquin Valley to the east. The area is predominantly rural surrounded by agricultural lands such as croplands, orchards, and vineyards. The proposed project site is currently farmed for row crops. The City of Avenal's water treatment facility and the San Luis Canal are adjacent to the proposed project site. The City of Avenal's residential and business areas are approximately six miles southwest of the project area, separated visually by the Kettleman Hills. I-5 parallels the Kettleman Hills and runs along the valley floor, approximately 2 miles west of the project site. I-5 is a four-lane freeway at this location and is not designated as a local, state or federal scenic highway.

IMMEDIATE PROJECT SITE VICINITY

Adjacent to the proposed project site, or nearby, are mostly man-made features. These features include transmission lines, the San Luis Canal, Avenal Cutoff Road, the Water treatment plant, and ranch and farm structures. The transmission lines traverse the valley floor. PG&E high-voltage transmission lines pass within 3,000 feet of the proposed project site. These lines run in a north-south direction with steel towers ranging in height from 120 feet to 150 feet. The San Luis Canal is to the east of the proposed project site. The canal is protected by levees with maintenance roads located on top of the levees. Avenal Cutoff Road connects I-5 to the west with the cities of Hanford and Lemoore to the east. The roadway is two lanes and is not a local, state or federally designated scenic route. The water treatment plant is adjacent to the project site to the east, and is made up of one-story buildings, storage tanks, and a treatment area enclosed by a cyclone fence. Farm and ranch structures are dispersed throughout the valley floor. These structures are typically one to two stories high and are often bordered by a vegetation screen.

VIEWING AREAS AND KEY OBSERVATION POINTS

VISUAL RESOURCES Figure 1 depicts the areas from which the project would generally be seen. The viewshed map is based on terrain and does not account for vegetation, structures, or other landscape features that may interfere with views toward the project site from the areas depicted (TRC 2001a). Staff evaluated the visual setting and proposed project from several viewing locations. Staff believes that the KOPs presented in the AFC, which were selected in consultation with Energy Commission staff, are appropriate for this analysis. Views of the proposed project from I-5 have also been addressed and discussed in general since in staff's view KOP 1 better represents views of the project that would be experienced from Avenal Cutoff Road than from I-5. The five KOP locations include (see **VISUAL RESOURCES Figure 2**): 1) Avenal Cutoff Road overcrossing at I-5; 2) Avenal Cutoff Road, approximately one mile southwest of the site; 3) Avenal Cutoff Road at the entrance to the proposed project site; 4) Avenal Cutoff Road at the San Luis Canal, approximately one-half mile northeast of the site; and 5) Orange Avenue, approximately 1.3 miles northeast of the proposed project site.

KOP 1 – Avenal Cutoff Road Overcrossing at I-5

KOP 1 represents the view to the northeast from the Avenal Cutoff Road overcrossing at I-5 **(VISUAL RESOURCES Figure 3)**. This viewpoint is approximately two miles southwest of the proposed project area and approximately 25 feet above I-5. This KOP was also selected to represent the nearest view of the project from I-5, although because the viewpoint is located 25 feet above I-5, the view shown in **Figure 3** is broader than the view that would actually be experienced by a motorist traveling on I-5. The project would be intermittently visible at various points north and south of KOP 1 along I-5 due to obstructions by the PG&E substation, road cuts, and orchards. In addition, these views would be brief given the high rate of speed of I-5 motorists (the posted speed limit is 70 miles per hour [mph]). Thus, KOP 1 is assumed to represent the worst case scenario for I-5, since it presents the nearest, unobstructed view of the site for motorists exiting or entering I-5.

Visual Quality

The most prominent features in the existing landscape are the flat, open agricultural fields that occupy the view; the local road (Avenal Cutoff Road) that is visible in the foreground and middleground; the overhead utility lines and poles in the foreground; the PG&E electric transmission lines and structures in the middleground and background; the orchard in the left middleground; and the Sierra Nevada mountain range in the far background. Farm residences and support structures are located in the northern portion of the view in the middleground and background. A pumping/irrigation system is present in the foreground. The open expanse of the landscape is dotted with intrusive wood poles and transmission lines and structures. The visual quality is considered low to moderate due to the transmission lines, wood poles and other prominent man-made features.

Viewer Concern

Travelers on Avenal Cutoff Road would consist mainly of agricultural workers and people traveling to the neighboring cities of Lemoore and Hanford, and those returning home to the nearest ranch house or to the houses on Orange Avenue. The viewer concern for these travelers is considered moderate. Viewer concern for I-5 travelers is also considered moderate.

Viewer Exposure

The view of the site from the elevated viewpoint shown in KOP 1 is unobstructed with the exception of the transmission lines, at the middleground to background viewing distance (approximately two miles). The number of viewers at this location is approximately 2,455 vehicles per day on Avenal Cutoff Road resulting in a moderate number of viewers; however, I-5 has approximately 27,750 vehicles per day resulting in a high number of viewers from I-5. Travelers on I-5 at this location do not have a direct view of the proposed project site; however, travelers on Avenal Cutoff Road have a direct view of the site. Avenal Cutoff Road viewers are traveling east, in the direction of the proposed project site, thus giving these travelers unobstructed views and a longer viewing time. Viewer exposure is considered to be moderate for Avenal Cutoff Road viewers, when considering duration of the view and the openness of the agricultural lands. Viewer exposure is considered to be low for I-5 viewers since this KOP is located approximately 25 feet above I-5 and, therefore, the I-5 travelers do not have a direct view of the site at this location.

Overall Visual Sensitivity

For the eastbound Avenal Cutoff Road travelers, the low to moderate visual quality, moderate viewer concern, and moderate viewer exposure result in moderate overall visual sensitivity. I-5 motorists would have a low to moderate overall visual sensitivity. This results from the low to moderate visual quality, moderate viewer concern, and low viewer exposure.

KOP 2 – Avenal Cutoff Road, Southwest of the Site

KOP 2 was selected to represent the view to the northeast from Avenal Cutoff Road **(VISUAL RESOURCES Figure 4)**. The viewpoint is approximately one mile southwest of the site.

Visual Quality

KOP 2 contains two prominent features. The first is in the foreground, where the landscape is flat, open agricultural fields used mainly for row crops. The second feature is in the middleground, where transmission lines and towers traverse the view. Other overhead utilities are located along Avenal Cutoff Road, on the left side of the view, and agricultural equipment dots the landscape. Visual quality is considered low to moderate, given the transmission lines and towers in the middleground.

Viewer Concern

The KOP represents the view encountered by travelers in route to destinations such as the residences on Orange Avenue, agricultural fields, or the towns of Lemoore or Hanford. The viewer currently notices the transmission lines and towers. Therefore, the viewer concern for this KOP is considered moderate.

Viewer Exposure

The view of the proposed project site is unobstructed, at a middleground location. The number of viewers from this location would be approximately 1,228 vehicles per day traveling toward the northeast on Avenal Cutoff Road. The duration of the viewing, although somewhat extended because the traveler is moving closer to the site, is shortened by attention to driving activities. Viewers have a direct view of the proposed site. Viewer exposure is considered moderate to high when considering the duration of viewing, the number of viewers and the openness of the agricultural lands.

Overall Visual Sensitivity

For the eastbound Avenal Cutoff Road travelers, the low to moderate visual quality, moderate viewer concern and the moderate to high viewer exposure results in a moderate overall visual sensitivity.

KOP 3 – Avenal Cutoff Road at the Entrance to the Site

This view was selected to represent the closest publicly accessible vantage point to the site. This KOP is located at the proposed entrance to the site, approximately 2,000 feet northwest of the proposed power plant. The KOP views the proposed project site directly, from what would be the entrance road **(VISUAL RESOURCES Figure 5)**. Viewers who would experience this view of the project would be those driving into the site and would be few in number. For travelers on Avenal Cutoff Road, this view would be experienced very briefly, since at this viewpoint, the project would be at almost a 90 degree angle to the primary view direction.

Visual Quality

From this KOP, the most prominent features in the existing landscape are the flat, open agricultural fields that occupy the entire view. Overhead utilities are visible in the background, while agricultural related features such as irrigation systems are visible in the foreground. The visual quality is considered low to moderate, given the lack of notable scenic natural features in the view.

Viewer Concern

The KOP represents travelers along Avenal Cutoff Road going toward the northeast, with destinations of Orange Avenue, the City of Lemoore and the City of Hanford. Travelers currently notice the openness of the agricultural lands and the overhead utilities in the background. Viewer concern is moderate.

Viewer Exposure

The view of the site is unobstructed in the foreground. The number of viewers is moderate, with 1,228 vehicles per day traveling toward the northeast along Avenal Cutoff Road. At the viewpoint represented by KOP 3, the project site is substantially outside the primary cone of vision of the travelers (45 degrees on either side of the direction of travel). In addition, they are traveling at speeds of approximately 55 mph so view duration at KOP 3 is low. Overall viewer exposure is considered to be moderate.

Overall Visual Sensitivity

The low to moderate visual quality, moderate viewer concern and moderate viewer exposure results in moderate overall visual sensitivity.

KOP 4 – Avenal Cutoff Road at the San Luis Canal

This KOP was chosen to represent travelers going west, toward I-5 and the City of Avenal **(VISUAL RESOURCES Figure 6)**. This viewpoint is located at the Avenal Cutoff Road bridge over the San Luis Canal, approximately one-half mile northeast of the proposed site.

Visual Quality

From this viewpoint, the most prominent visual features include the San Luis Canal in the foreground, the water treatment plant in the middleground, and the flat, open agricultural lands in the middleground and background. Also in the background are the PG&E transmission lines and towers. In the distant background, the Kettleman Hills are present. Visual quality is considered moderate given the presence of the San Luis Canal and the water treatment plant.

Viewer Concern

The viewer currently notices the San Luis Canal, the water treatment plant and the transmission lines and towers. Viewer concern for this KOP is considered moderate.

Viewer Exposure

The view of the proposed project site is unobstructed from this KOP location. The number of viewers is considered moderate, with the number of vehicles per day on Avenal Cutoff Road averaging 1,228 vehicles per day traveling toward the southwest. The viewer is traveling in the direction of the proposed project site, which increases the viewing time of the project. However, the majority of the viewers are involved in driving activities, taking away from the length of time spent looking in the direction of the proposed project site. Thus, view duration is considered to be moderate. Viewer exposure is considered moderate to high when considering the moderate duration of viewing, the moderate number of viewers and the unobstructed views of the site.

Overall Visual Sensitivity

For westbound Avenal Cutoff Road travelers, the moderate visual quality, moderate viewer concern and moderate to high viewer exposure results in a moderate overall visual sensitivity.

KOP 5 – Orange Avenue

This KOP was selected to represent the view of residents living along Orange Avenue, with views directly facing the proposed project site **(VISUAL RESOURCES Figure 7)**. The residences are located approximately 1.3 miles east of the proposed project site.

Visual Quality

The main visual feature within this KOP is the flat, open agricultural lands that appear in the foreground and middleground. The water treatment plant and overhead utilities are present in the middleground. In the background, the Kettleman Hills and the PG&E transmission lines and towers are present. Visual quality is considered moderate given the unobstructed view of agricultural field in the foreground and the Kettleman Hills in the distance.

Viewer Concern

Most viewers at this KOP are permanent residents. Due to the sensitivity with which people regard their place of residence, viewer concern is considered high at this KOP.

Viewer Exposure

The view of the site is unobstructed in the middleground, approximately 1.3 miles away. The number of viewers is relatively low – with six residential units at this location. Length of viewing time is longer than at the other KOPs because of the permanence of the viewer. Residential viewers would be expected to be involved in family activities inside and outdoor activities such as yard work or visiting with neighbors, resulting in an extended viewing time. Viewer exposure is considered moderate to high at this KOP due to the length of viewing time and the unobstructed middleground views in the direction of the proposed project site.

Viewer Sensitivity

For Orange Avenue residents, the moderate visual quality, high viewer concern, and moderate to high viewer exposure results in moderate to high overall visual sensitivity.

IMPACTS

CONSTRUCTION IMPACTS

Construction of the proposed power plant and ancillary structures would cause temporary adverse visual impacts due to the presence of equipment, materials, and workforce. Construction would involve the use of cranes, heavy construction equipment, temporary storage and office facilities, and temporary laydown/staging areas. Construction would include site clearing and grading, construction of the actual facilities, and site and rights-of-way cleanup and restoration. The proposed project

construction would occur over a 25-month period. Due to the relatively short-term nature of project construction, the adverse visual impacts that would occur during construction would not be significant. However, this conclusion assumes that complete restoration of construction areas and rights-of-way is accomplished. Proper implementation of staff's recommended condition of certification **VIS-1** would ensure that the visual impacts associated with project construction remain less than significant.

OPERATION IMPACTS

An analysis of operation impacts was conducted for the selected key observation points. The results of the operation impact analysis are discussed below by KOP. The visual impacts of vapor plume formation and night lighting, and impacts to I-5 viewers are discussed in separate sections of this analysis. For each KOP, an evaluation of visual contrast, project dominance, and view blockage is presented with a concluding assessment of the overall degree of visual change caused by the proposed project.

Impacts of Power Plant Structures

VISUAL RESOURCES Table 1 presents the heights for a number of the project's key components. As shown in the table, the most prominent project structures would be the two 145-foot tall heat recovery steam generator (HRSG) stacks, the 95-foot tall and 110-foot long HRSG structures, the 53-foot tall inlet air chillers, the 80-foot tall brine concentrator, the 45-foot tall and 400-foot long cooling tower structure, the 52-foot tall steam turbine generator (STG), and the 68-foot tall combustion turbine generator (CTG) air inlet.

VISUAL RESOURCES Table 1
Dimensions of Key Project Components[1]

Component	Height (feet)	Length (feet)	Diameter/Width (feet)
HRSG(s)	95	110	32
HRSG Stacks	145		19
Combustion Turbine Generator (CTG)	26	100	23
Brine Concentrator	80		
CTG Air Inlet	68	45	13
4.1 kV Substation	20	110	84
Transformer	25	29	16
Steam Turbine Generator (STG)	52	94	35
Cooling Tower	45	400	50
Raw Water/Fire Water Storage Tank	40		90
Inlet Air Chillers/Auxiliary Cooling Towers	53	63	31
Administration Building	13	116	42
Warehouse/Maintenance Building	24	123	42

[1] Source: TRC 2001a, AFC Table 6.13.1

KOP 1 – Avenal Cutoff Road Overcrossing at I-5

VISUAL RESOURCES Figure 8 presents a visual simulation of the proposed project as viewed from KOP 1 at the Avenal Cutoff Road overcrossing at I-5. The most obvious change to the landscape would be the introduction of geometric forms with vertical and

horizontal lines of an industrial character. The resulting structural mass would be greater than the surrounding structures.

Visual Contrast

The rural agricultural landscape is dominated by the flat, horizontal form of the valley floor, the horizontal lines of the orchard, the vertical forms of electric transmission towers, and roadside utility poles. The proposed project would introduce geometric forms and vertical and horizontal lines associated with the HRSG structures and stacks, the cooling towers, transmission towers, and other structures associated with the proposed power plant. The structural characteristics of the project would contrast moderately with the forms and lines established by the broad, horizontal landform of the valley floor, and the horizontal appearance of the hills in the background. The contrast between the proposed colors of the project and the surrounding colors of the landforms is considered low. Because existing structures have already caused a high degree of contrast with the landforms at this distance, the increment of visual contrast caused by the project would be low to moderate.

Project Dominance

The scale of the proposed power plant would be subordinate to the expansive nature of the landforms. Although the project would be entirely back-dropped by the hills, spatial dominance would be co-dominant since the project would be located prominently within the normal cone of vision of motorists on Avenal Cutoff Road. Overall project dominance would be low.

View Blockage

From KOP 1, the proposed project structures (lower quality landscape features) would block a very small portion of the expansive valley floor and hills (higher quality landscape features) in the background. The view blockage caused by the proposed project would be low.

Overall Visual Change

At KOP 1, the project would result in a low to moderate degree of overall visual change due to the low to moderate levels of visual contrast.

Visual Impact Significance

When considered within the context of the moderate sensitivity of the existing landscape, the low to moderate visual change that would be perceived from KOP 1 would cause an adverse but less than significant visual impact.

KOP 2 – Avenal Cutoff Road, Southwest of the Site

VISUAL RESOURCES Figure 9 presents a visual simulation of the proposed power plant facility as viewed from KOP 2 on Avenal Cutoff Road approximately one mile southwest of the site. The most obvious change to the landscape would be the introduction of the geometric forms with vertical and horizontal lines of an industrial character. The resulting structural mass would be greater than the surrounding structures and transmission towers.

Visual Contrast

The proposed project would introduce geometric forms and vertical and horizontal lines associated with the HRSG structures and stacks, and the cooling towers. The structural characteristics of the HRSG stacks would not be consistent with the forms and lines established by the flat, horizontal expanse of the valley floor or the horizontal lines created by the hills in the background. Existing structures for the water treatment plant and the PG&E transmission lines and associated towers also contrast with the surrounding horizontal lines, considerably mitigating the vertical contrast of the HRSG stacks. The scale of the proposed project would be larger than the surrounding structures, although it would not be taller than the existing transmission towers and also much smaller in overall scale to the landforms. The contrast between the proposed colors of the project and the surrounding landforms is considered moderate. The resulting visual contrast for KOP 2 would be moderate.

Project Dominance

The scale of the proposed project would be subordinate to the expansive nature of the landscape. The proposed power plant facility would be located within motorists' normal cone of vision. The proposed project would extend above the ridgelines, contributing to the prominence of the facility. Thus, overall project dominance would be low to moderate.

View Blockage

The proposed project structures (lower quality landscape features) would block a very small portion of the valley, the hills in the background, and the sky (higher quality landscape features). The view blockage caused by the proposed project would be low.

Overall Visual Change

The proposed project would cause a moderate level of visual change as a result of the moderate degree of visual contrast.

Visual Impact Significance

When considered within the context of the moderate sensitivity of the existing landscape and viewing characteristics, the moderate visual change that would be perceived from KOP 2 would cause an adverse but less than significant visual impact.

KOP 3 – Avenal Cutoff Road at the Entrance to the Site

VISUAL RESOURCES Figure 10 presents a visual simulation of the proposed project as viewed from KOP 3 on Avenal Cutoff Road at the entrance to the proposed project. The most obvious change in the landscape is the introduction of geometric forms with horizontal and vertical lines of an industrial character. The resulting structural mass would be substantially greater than the overhead utilities and structures located in the background of this KOP.

Visual Contrast

The proposed power plant facility would introduce the prominent geometric forms and vertical and horizontal lines associated with the HRSG structures and stacks,

transmission lines and towers, and the other structures associated with the facility. The structural characteristics would cause high contrast with the existing flat, horizontal valley floor. The scale of these introduced forms and structural masses would be substantially larger than developed features that appear in the background of this KOP. The contrast between the proposed colors of the project and the surrounding landforms is considered moderately high. Visual contrast would be high.

Project Dominance

The rural agricultural landscape is dominated by the flat, horizontal expanse of the valley floor. The proposed project would occupy a moderate portion of the total field of view. The proposed power plant extends beyond the horizon line, contributing to the prominence of the facility. For viewers on Avenal Cutoff Road, the project is peripheral to the primary view direction. Overall project dominance would be moderate.

View Blockage

From KOP 3, the proposed project structures would block portions of the sky, valley floor and the horizon line from view. Existing landscape features are low to the ground and are generally lacking notable scenic qualities. The proposed project would block an otherwise unobstructed view of the valley floor and its agricultural lands. The proposed project's view blockage would be low given the low to moderate visual quality.

Overall Visual Change

The project would cause a moderate to high level of visual change as a result of the high contrast and moderate dominance.

Visual Impact Significance

Although the project would cause a moderate to high degree of visual change at KOP 3 (which has moderate sensitivity), because the project would be peripheral to the primary view direction of motorists on Avenal Cutoff Road and the view shown in **VISUAL RESOURCES Figure 10** would be experienced so briefly, the impact would be adverse but not significant. This viewpoint is within an open viewing corridor, as requested by the City of Avenal. The conceptual landscape plan would further soften the view, both for those entering the site and for the motorists on Avenal Cutoff Road (see **VISUAL RESOURCES Figure 11**).

KOP 4 – Avenal Cutoff Road at the San Luis Canal

VISUAL RESOURCES Figure 12 presents a visual simulation of the proposed project as viewed from KOP 4 on Avenal Cutoff Road at the San Luis Canal. The most obvious change to the landscape would be the introduction of additional geometric forms with vertical and horizontal lines of an industrial nature. The resulting structural mass would be greater than the surrounding structures.

Visual Contrast

The proposed project would introduce the prominent geometric forms and vertical and horizontal lines associated with the HRSG structures and stacks, the cooling towers, the transmission lines and other structures associated with the proposed power plant facility. Existing features include the flat horizontal valley floor, the rolling form of the

Kettleman Hills, the curved forms and lines of the San Luis Canal and the geometric forms of the water treatment plant. The structural characteristics would be moderately consistent with the lines and forms established by the water treatment plant and the San Luis Canal. The structural characteristics would not be consistent with the flat, horizontal expanse of the valley floor or the rolling form of the Kettleman Hills. The scale of the proposed power plant would be larger than the water treatment plant and the transmission towers in the background, but smaller than the landforms and canal. The contrast between the colors of the surrounding landforms and the colors and hues of the proposed project is moderately high. The resulting visual contrast would be moderate to high.

Project Dominance

The proposed project would be subordinate to the existing landforms. Although, the proposed project would be located prominently within a motorist's cone of vision, the project would not extend above the ridgeline of the Kettleman Hills. Overall project dominance would be moderate.

View Blockage

From KOP 4, the proposed project structures (lower quality landscape features) would block a relatively small portion of the valley floor and Kettleman Hills (higher quality landscape features). This view is already obscured by the overhead utility lines, overhead utility poles, and the structures associated with the water treatment plant. The view blockage caused by the proposed project would be low.

Overall Change

The proposed project would cause moderate to high visual change as a result of the moderate to high visual contrast and moderate dominance.

Visual Impact Significance

When considered within the context of the moderate sensitivity of the existing landscape, the moderate to high visual change would cause an adverse and significant visual impact.

KOP 5 – Orange Avenue

VISUAL RESOURCES Figure 13 presents a visual simulation of the proposed project as viewed from KOP 5 on Orange Avenue near a cluster of six residential units. The most obvious change to the landscape would be the introduction of geometric forms with vertical and horizontal lines of an industrial character. The resulting structural mass would be greater than the surrounding structures.

Visual Contrast

The proposed project would introduce additional geometric forms and vertical and horizontal lines associated with the HRSG structures and stacks, the cooling tower facilities, the transmission lines and towers, and other structures associated with the proposed power plant. Within this view, geometric forms with vertical and horizontal lines are already present, as they are associated with the water treatment facility, agricultural related buildings, and the PG&E transmission lines and towers. The

structural characteristic of the proposed project would be substantially similar to the lines and forms established by the water treatment plant, agricultural buildings, and transmission lines and towers. The structural characteristics of the project would contrast moderately with the flat, horizontal expanse of the valley floor and the rolling horizontal form of the Kettleman Hills. The scale of the proposed power plant would be larger than the surrounding man-made features but not the surrounding landforms. The contrast between the colors of the proposed power plant and the colors of the surrounding landforms is low. The resulting visual contrast would be low to moderate.

Project Dominance

The proposed project would be located central to the view of the residences at this KOP. The proposed project occupies a very small portion of the overall view and is subordinate to the expansive nature of the landforms. The proposed project would be entirely backdropped by the hills. Overall project dominance would be low.

View Blockage

From KOP 5, the proposed project structures (lower quality landscape features) would block a very small portion of the views of the valley floor's agricultural lands and the Kettleman Hills (higher quality landscape features). This view is already obscured by the transmission lines and towers, the water treatment plant, and the agricultural buildings. The additional view impairment would result in a minor increase in the blockage of the valley and hills. The additional view blockage associated with the proposed power plant is considered low.

Overall Change

The proposed project would cause a low to moderate level of contrast, which would result in low to moderate overall visual change for KOP 5.

Visual Impact Significance

When considered within the context of the moderate to high sensitivity of the existing landscape, the low to moderate visual change would result in an adverse but less than significant visual impact.

Interstate-5

At its nearest point, I-5 is located at a distance of over two miles west of the proposed project site. I-5 is a major north-south highway for the state with an average daily traffic level of approximately 27,750 vehicles (TRC 2001a). I-5 is not a federal, state, or local designated scenic route or highway at this location.

KOP 1 was established to represent views of the project from I-5; however KOP 1 is located 25 feet above I-5 and presents a broad representation of the view from I-5. The proposed power plant would be visible at various points north and south of KOP 1 along I-5. Views from I-5 along this area would be brief, due to obstructions along the freeway, such as the PG&E compressor station, road cuts and orchards, and the high rate of speed of motorists. The project would be visible to the east and located in I-5 motorists' primary cone of vision (an area 45 degrees to either side of the center line of the direction of travel) at distances greater than three miles for extended periods of

time. The proposed project would not be prominent from these distances, as the project would appear smaller than that shown in **VISUAL RESOURCES Figure 8**. At distances between two and three miles, the proposed project is at the edge or outside the primary cone of vision. The project would be at its closest point, but outside travelers' primary cone of vision, at approximately two miles east of I-5.

The proposed project would not be consistent with the surrounding landscape forms; however, at its nearest distance, the project would be located approximately two miles (far middleground distance zone) east of I-5. Therefore, the contrast would be moderately low. In addition, the proposed project would be considered negligible in spatial dominance, being dominated by the natural landforms. The proposed project would be subordinate to the structures adjacent to I-5, the PG&E substation overhead utilities and poles. The proposed power plant would block a small portion of the valley floor and the sky; however, because it is in the far middleground, this viewing impairment is considered low. Thus, the overall visual change experienced by I-5 motorists would be low to moderate. Considering the low to moderate overall visual sensitivity of I-5 motorists, the low to moderate level of visual change would result in an adverse but less than significant impact.

Lighting

Existing Lighting

The proposed project would be located in a rural agricultural area, which has relatively minimal existing night lighting. The night lighting that does exist in the vicinity of the proposed project site includes lights from the Kochergen Farms ranch office, the Kettleman Compressor Station, the residential units on Orange Avenue, the water treatment plant, and the vehicle headlights on Avenal Cutoff Road and I-5 (DENA 2002f).

Proposed Project Lighting

Operational Lighting

The proposed power plant would require nighttime lighting for operational safety and security. Lighting would include caps so as to reduce the upward glare during nighttime operations. The proposed project would not require FAA-style red, flashing warning lights on the HRSG stacks; however, to ensure safety with crop dusting aircraft, lighting of the HRSG stacks, as discussed with the local agricultural commissioners, would be provided for the proposed project (DENA 2002f).

Construction Lighting

Normal construction hours are typically Monday through Friday, 7:00 a.m. to 5:30 p.m. Nighttime lighting for construction purposes would generally be required if nighttime construction is necessary to meet the schedule. In the event that nighttime construction is necessary, lighting would be directional, non-glare lighting with shielding or hoods so as to avoid light scatter and glare to adjacent properties and roadways (DENA 2002f).

Lighting Impacts

Due to the rural nature of the surrounding area, and the lack of nighttime lighting, the proposed project, even with capped light sources, would create a significant light and glare impact as a result of indirect lighting of project structures and backscatter. In addition, the lighting to illuminate the HRSG stacks for crop dusting aircraft safety would elevate the light and glare in the vicinity of the HRSG stacks. Proper implementation of staff's proposed condition of certification **VIS-2** and its required lighting controls as well as other design features and mitigation measures, such as landscaping, would reduce visible nighttime lighting and glare impacts on the adjacent properties and roadways to less than significant levels.

Construction impacts with regard to nighttime lighting would be minimal as general practice is that no nighttime construction would be needed. If nighttime construction is necessary, proper implementation of staff's recommended condition of certification **VIS-3** would ensure that impacts from construction lighting would be less than significant.

Visible Plumes

Staff analyzed the AEP main cooling tower, chiller cooling towers, HRSG and auxiliary boiler exhaust stack visible plumes. The applicant has not proposed any visible plume abatement for the main cooling tower, chiller cooling tower, HRSG or auxiliary boiler exhausts.

Main Cooling Tower Visible Plumes

Staff modeled unabated conditions with duct firing, limited duct firing (noon to 8 pm), and no duct firing from the main cooling tower using exhaust data provided by the applicant (TRC 2001a, Section 6.13.3.6; DENA 2002f, Exhibit 126-1, Data Response 126-130; DENA 2002g, Data Response 154-155). The visible plume frequency results from the Combustion Stack Visible Plume (CSVP) model are presented in **Visual Resources Table 2**.

VISUAL RESOURCES: Table 2
Staff Predicted Hours with Cooling Tower Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

		Peaking (All Hours)		Limited Peaking (Noon to 8 pm)		Baseload (All Hours)	
	Available (hr)	Plume (hr)	Percent	Plume (hr)	Percent	Plume (hr)	Percent
All	43,824	31,221	71.2%	26,306	60.0%	24,392	55.7%
Daylight	22,177	11,774	53.1%	9,848	44.4%	8,603	38.8%
Nighttime	21,647	19,447	89.8%	16,458	76.0%	15,789	72.9%
Daylight No Rain/Fog	19,384	9,032	46.6%	7,131	36.8%	5,945	30.7%
Seasonal Daylight No Rain/Fog*	7,371	5,760	78.1%	5,180	70.3%	4,219	57.2%

*Seasonal conditions occur anytime from November through April.

A plume frequency of 10% of seasonal (November through April) daylight no rain/fog hours is used as a plume impact study threshold trigger. The normal operating condition is expected to be base load operations with limited duct firing. Under these operating conditions, the seasonal daylight no rain/fog plume visibility is over 70%, well above the significance threshold of 10%.

Staff's review of the exhaust data provided by the applicant indicates that the exhaust temperature data appear to be too high considering the values of the other exhaust variables. Staff reviewed the applicant's heat balances (TRC 2001a, Appendix 2.6, Tables 2-6-1 through 2.6-6) and performed a separate heat balance based on the applicant's cooling tower exhaust data. The overall impact of these apparently overestimated exhaust temperatures is the overestimation of the cooling tower plume frequency. Staff is also concerned that the exhaust temperatures are too close to, and in some cases equal to or higher than, the inlet (hot) water temperatures.

Staff's SACTI modeling analysis visible plume dimension results are presented in **Visual Resources Table 3**.

VISUAL RESOURCES: Table 3
Staff Results of Cooling Tower Visible Plume Dimensions
Lemoore 1992-1995 and 1997 Meteorological Data

		SACTI Model	
All Hours	**Percentile**	**Peaking**	**Baseload**
Length (ft)	50%	100-130	100-130
	10%	985-1,310	260-295
	Maximum	6,560-9,840	2,950-3,280
Height (ft)*	50%	100-130	100-130
	10%	655-985	195-230
	Maximum	655-985	655-985
Width (ft)	50%	130-195	65-130
	10%	260-330	195-260
	Maximum	395-460	395-460
Daytime No Rain/Fog Hours		**Peaking**	**Baseload**
Length (ft)	50%	65-100	65-100
	10%	260-295	165-195
	Maximum	16,400-19,680	16,400-19,680
Height (ft)*	50%	100-130	65-100
	10%	130-165	100-130
	Maximum	1,970-2,295	1,640-1,970
Width (ft)	50%	65-130	65-130
	10%	130-195	130-195
	Maximum	1,310-1,970	1,310-1,970
Seasonal Daytime No Rain/Fog Hours		**Peaking**	**Baseload**
Length (ft)	50%	130-165	65-100
	10%	985-1,310	295-330
	Maximum	16,400-19,680	16,400-19,680
Height (ft)*	50%	100-130	65-100
	10%	330-655	100-130
	Maximum	1,970-2,295	1,640-1,970
Width (ft)	50%	130-195	65-130
	10%	195-260	130-195
	Maximum	1,310-1,970	1,310-1,970

Values are rounded to the nearest 5 feet from the SACTI model results (converted from meters to feet).
Seasonal = November through April (day 120-304).
*SACTI Plume height does not include the height (45 feet) of the cooling tower (release point).
Notes:
1. Due to meteorological data grouping and averaging by SACTI, generally the maximums for annual conditions appears lower than for daytime no rain/fog cases.

The SACTI model input parameters are heat rejection rate and inlet flow rate, while the CSVP models inputs are exhaust temperature and exhaust flow rate. Therefore, the

apparent inconsistencies in the applicant's data, with the possible exception of the modeled heat rejection rate, will not affect the SACTI model results.

Visual Impacts of Main Cooling Tower Vapor Plumes

The estimated plumes from the main cooling towers would be visible from a greater distance than the power plant facility structures. Reasonable worst case plumes (peaking) from the main cooling tower are anticipated to be 1,310 feet in length, 655 feet in height (not including the height of the cooling tower), and 260 feet in width. These dimensions occur ten percent (10%) of the seasonal daytime no rain/no fog hours. The high frequency of the plumes, when viewed within the context of the relatively open space (farmland) of the surrounding area, would cause a noticeable and persistent visual change. In addition, there are currently no existing plumes in the project region. The vapor plumes would appear as prominent, billowing linear-to-irregular forms, originating near the ground level (45 feet above the ground) and rising vertically and diagonally. The background for existing views from the local roadways is agricultural fields and sky, the Kettleman Hills, and the Sierra Nevada in the distant background. The background for existing views from the residences is agricultural fields and sky with the Kettleman Hills in the distance.

Staff's independent plume analysis indicates that the project as proposed would not be capable of reducing the plume frequency of the main cooling towers to less than the 10 percent significance threshold. The following discussions evaluate the vapor plumes on seasonal daytime hours with no rain and no fog. Based on the preliminary SACTI modeling results, determinations have been made for contrast, dominance and view blockage for the vapor plumes. Staff concludes that the main cooling tower plumes would have a potentially significant impact; however, after remodeling, staff will be able to assess with more confidence the visual impacts. Therefore, staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes in the event that, once the CSVP analysis is complete, staff continues to find the visual impacts of the plumes to be significant.

Visual Impacts to Travelers on Nearby Roadways

Nearby travelers' view under proposed conditions (without vapor plumes) is represented by KOPs 2, 3, and 4 **(VISUAL RESOURCES Figures 9, 10 and 12)**. Under clear conditions the large, billowing, white vapor plumes would have a backdrop of blue sky, so color contrast would be high. The form and line of the vapor plumes would be unique to the setting. This would result in viewers from Avenal Cutoff Road, Orange Avenue and Plymouth Avenue that are closer than approximately 1.5 miles from the proposed project site, experiencing a high degree of contrast. The scale dominance of the vapor plumes would be low to moderate given the expansive nature of the landscape. The plumes would occupy a high position in the landscape and would be located within motorists' primary view direction. Furthermore, the plumes would extend above the ridgelines of the Kettleman Hills and the Sierra Nevada mountain range, contributing to their prominence. The resulting spatial dominance would be high. Thus, the overall dominance of the plumes would be moderate to high. From nearby viewing locations along Avenal Cutoff Road, the vapor plumes would block a portion of the horizon as well as the surrounding views of the Kettleman Hills, the Sierra Nevada mountain range, and the sky. The resulting view blockage would be moderate.

Considering the high level of contrast and the moderate to high level of dominance, the plumes would cause a high degree of overall visual change.

When the vapor plumes are considered within the context of the moderate visual sensitivity of KOPs 2, 3, and 4, the high level of visual change would result in an adverse and significant impact. This impact can be reduced to a less than significant level with the implementation of mitigation measures. Based on this preliminary analysis, staff recommends condition of certification **VIS-6** to reduce the impacts of the vapor plumes to a less than significant level.

Visual Impacts to Travelers on Interstate 5 and Other Distant Roadways

Distant travelers' view under proposed conditions (without the vapor plumes) is represented by KOP 1 **(VISUAL RESOURCES Figures 8)**. Under clear conditions, the large, billowing, white vapor plumes would have a backdrop of blue sky; however, at a distance of greater than two miles, the color contrast is considered moderate to high. The form and line of the vapor plumes would be unique to the setting. This would result in viewers from I-5, Avenal Cutoff Road, Orange Avenue, and Plymouth Avenue that are greater than two miles from the proposed project site experiencing a moderate to high degree of contrast. The overall contrast is considered moderate to high. At this distance, the vapor plumes would occupy a very small portion of the expansive landscape, therefore scale dominance would be very low. The vapor plumes would occupy a high position in the landscape and would be located within motorists' primary view direction. The plumes would extend above the ridgelines of the Kettleman Hills and the Sierra Nevada mountain range, contributing to their prominence. Thus, spatial dominance would be high. The overall dominance of the vapor plumes would be low to moderate. From this viewing distance, the plumes would block a small portion of the surrounding hills, the horizon and the sky. View blockage is considered low. Considering the moderate to high contrast, low to moderate dominance, and low view blockage, the plumes would cause a moderate degree of overall visual change.

Within the context of the low to moderate sensitivity for I-5 travelers and moderate visual sensitivity for other distant roadways travelers represented by KOP 1, the moderate overall visual change caused by the plumes would result in an adverse but less than significant impact. This impact can be further reduced with the implementation of mitigation measures. Staff recommends condition of certification **VIS-6** to reduce the impacts of the vapor plumes.

Visual Impacts to Residences

Future views without vapor plumes from the six residential units on Orange Avenue are represented by KOP 5 **(VISUAL RESOURCES Figure 13)**. This residential area has the highest population in the surrounding project area. There are nine other structures within a three mile radius of the project site. These structures are mainly storage areas, the Kettleman Compressor Station, and a farm office. Under clear conditions, the large, billowing, white vapor plumes would be backdropped by blue sky and the earth tone colors of the Kettleman Hills, so color contrast would be high. The form and line of the vapor plumes would be unique to the setting, resulting in a high degree of contrast. Overall, residential viewers on Orange Avenue would experience a high degree of visual contrast. The vapor plumes would occupy a small portion of the expansive

landscape, so scale dominance would be low. The plumes would occupy a high position in the landscape and would be located prominently in the direct line of sight of the residences. Furthermore, the plumes would extend above the ridgeline of the Kettleman Hills and would be partly backdropped by sky. The resulting spatial dominance would be high. The overall dominance of the vapor plumes would be moderate. At this distance, the plumes would obscure a small portion of the Kettleman Hills, the horizon, and the sky. The resulting view blockage is considered low to moderate. Considering the high contrast, moderate dominance, and low to moderate view blockage, the plumes would cause a moderate to high level of overall visual change.

When the plumes are considered within the context of the moderate to high visual sensitivity of KOP 5, the moderate to high overall visual change would result in an adverse and significant impact. This impact can be reduced to a less than significant level with the implementation of mitigation measures. Staff recommends condition of certification **VIS-6** to reduce the impacts of the vapor plumes.

Chiller Cooling Tower Visible Plumes

Staff evaluated the chiller cooling towers using a single set of parameters provided by the applicant (TRC 2001a, Section 6.13.3.6; DENA 2002f, Exhibit 126-1, Data Response #126-130). The chiller cooling towers are not expected to operate at ambient temperatures of less than 60°F. The visible plume frequency modeling results are presented in **Visual Resources Table 4**.

VISUAL RESOURCES: Table 4
Staff Predicted Hours with Chiller Cooling Tower Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

	Available (hr)	Plume (hr)	Percent
All	43,824	6	0.01%
Daylight	22,177	4	0.02%
Nighttime	21,647	2	0.01%
Daylight No Rain/Fog	19,384	0	0%
Seasonal Daylight No Rain/Fog*	7,371	0	0%

*Seasonal conditions occur anytime from November through April.

These results indicate that the chiller cooling towers would have extremely infrequent visible plumes, which are well below the significance threshold of 10%.

Staff did not have adequate chiller heat load vs. ambient condition data to vary the heat rejection rate of the cooling tower. The heat rejection rate should be, at lower temperatures, inversely proportional to the ambient temperature. Therefore, Staff's modeling analysis should overstate the likely plume frequency from the chiller cooling towers, assuming the operating conditions provided by the applicant.

HRSG Visible Plumes

Staff modeled unabated conditions with duct firing, limited duct firing (noon to 8 pm), and no duct firing from the HRSGs using exhaust data provided by the applicant (TRC 2001a, Section 6.13.3.6; DENA 2002f, Exhibit 126-1, Data Response 126 to 130). The visible plume frequency modeling results are presented in **Visual Resources Table 5**.

VISUAL RESOURCES: Table 5
Staff Predicted Hours with HRSG Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

		Duct Firing (All Hours)		Limited Duct Firing (Noon to 8 pm)		No Duct Firing (All Hours)	
	Available (hr)	Plume (hr)	Percent	Plume (hr)	Percent	Plume (hr)	Percent
All Hours	43,824	6,280	14.33%	2,694	6.15%	2,078	4.74%
Daylight	22,177	1,625	7.33%	766	3.45%	505	2.28%
Nighttime	21,647	4,655	21.50%	1,928	8.91%	1,573	7.27%
Daylight No Rain/Fog	19,384	394	2.03%	98	0.51%	68	0.35%
Seasonal Daylight No Rain/Fog*	7,371	373	5.06%	93	1.26%	64	0.87%

*Seasonal conditions occur anytime from November through April.

As can be seen in **Table 5**, the unabated plumes resulting from the HRSG operations are highly dependent on whether the duct burners are operating. The normal operating condition is expected to be base load operations with limited duct firing. Under these operating conditions, the seasonal daylight no rain/fog plume visibility decreases to 1.26%, well below the significance threshold of 10%.

Auxiliary Boiler Visible Plumes

Staff modeled normal operations for the auxiliary boiler using exhaust data provided by the applicant (TRC 2001a, Section 6.13.3.6; DENA 2002f, Exhibit 126-1, Data Response 126 to 130). The visible plume frequency modeling results are presented in **Visual Resources Table 6**.

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VISUAL RESOURCES: Table 6
Staff Predicted Hours with Auxiliary Boiler Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

	Available (hr)	Plume (hr)	Percent
All Hours	43,824	1,226	2.80%
Daylight	22,177	298	1.34%
Nighttime	21,647	928	4.29%
Daylight No Rain/Fog	19,384	33	0.17%
Seasonal Daylight No Rain/Fog*	7,371	29	0.39%

*Seasonal conditions occur anytime from November through April.

As can be seen in **Table 6**, the frequency of plumes resulting from the auxiliary boiler under normal operating conditions during seasonal daylight no rain/fog hours is 0.39%, well below the significance threshold of 10%.

Conclusions

Visible plumes generally occur during periods of cold and wet weather. The actual frequency of occurrence is dependent on the plant operation and weather conditions, which will vary from year to year. Visible plume formation can occur during the daytime or nighttime; however, the meteorological data reviewed indicates that conditions for visible plume formation are more prevalent during nighttime and early morning hours.

Visible plume frequencies for the main cooling tower are substantially greater than the threshold that would trigger an impact analysis of the plumes. Based on the expected plume sizes, staff concludes that for motorists (KOPs 2, 3, and 4) and residents (KOP 5)

within 1.5 miles of the site, the visual impacts of the plumes would be adverse and significant. As previously discussed, the overall visual sensitivity of motorists on Avenal Cutoff Road within 1.5 miles of the site is moderate. The overall visual sensitivity of Orange Avenue residents is moderate to high. When the anticipated plumes are considered within the context of the moderate and moderate to high visual sensitivity of the existing landscape, the high (KOPs 2, 3, and 4) and moderate to high (KOP 5) levels of visual change would result in significant adverse visual impacts. Staff concludes that for viewers greater than two miles from the project site (KOP 1), such as I-5 motorists, the impacts are adverse but less than significant. The cooling tower plume frequency and plume dimension results will need to be remodeled using the CSVP model after the applicant responds to staff's data requests regarding apparent inconsistencies in the applicant's cooling exhaust temperature data. After remodeling, staff will be able to assess with added confidence the visual impacts that would be caused by the predicted cooling tower plumes. Staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes in the event that, once the CSVP analysis is complete, staff continues to find the visual impacts of the plumes to be significant.

Visible plume frequencies for the chiller cooling towers, HRSGs, and auxiliary boiler are demonstrated to be below the ten percent (10%) frequency significance thresholds for the expected operating conditions. Therefore, staff concludes that there will be no significant visual impacts from the chiller cooling towers, HRSG, and auxiliary boiler exhaust plumes.

CONSIDERATION OF IMPACTS IN RELATION TO CEQA SIGNIFICANCE CRITERIA

This analysis considered the potential impacts of the proposed project in relation to the four significance criteria for visual resource impacts listed in Appendix G of the CEQA Guidelines, under Aesthetics, specified below.

1. Would the project have a substantial adverse effect on a scenic vista?

Staff did not identify any designated scenic vistas in the surrounding project area. Panoramic views in the project region would be available from the Kettleman Hills, which are located two to three miles west of the proposed project site. Any scenic vistas from this location would look out across the San Joaquin Valley. The proposed project would not be prominent from these viewing areas, as the proposed project would appear smaller than that shown in **VISUAL RESOURCES Figure 8**. The resulting visual impact on any scenic vistas would be less than significant.

2. Would the project substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historical buildings within a state scenic highway?

The proposed project is not located within the viewshed of a designated scenic highway. In addition, the proposed project would not damage trees, rock outcroppings, historic buildings, or other visual resources within the proposed project site. This proposed project would not result in significant visual impacts under this criterion.

3. **Would the project substantially degrade the existing visual character or quality of the site and its surroundings?**

As discussed in a previous section of this analysis, the proposed project would introduce prominent structures of industrial character into foreground views from Avenal Cutoff Road. The resulting visual change would range from moderately high to high. Viewers on adjacent Avenal Cutoff Road (i.e., KOP 4) would experience a substantial degradation of visual quality and a significant visual impact under this criterion. However, with the incorporation of mitigation measures and conditions of certification, the impacts would be reduced to less than significant levels. Mitigation includes, but is not limited to, neutral color of structures, landscaping, lighting restrictions, and the use of non-reflective surfaces.

Because there are no other sources of visible plumes in the project vicinity, the project's main cooling tower plumes have the potential to substantially degrade the existing visual character and quality of the site and its surroundings. The proposed project's unabated main cooling tower plumes would be prominent and persistent features in views from nearby local roads and residences, resulting in a significant visual impact under this criterion. The cooling tower plume frequency and plume dimension results will need to be remodeled using the CSVP model after the applicant responds to staff's data requests regarding apparent inconsistencies in the applicant's cooling exhaust temperature data. After remodeling, staff will be able to assess with added confidence the visual impacts (due to contrast, dominance, and view blockage) that would be caused by the predicted cooling tower plumes. Staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes in the event that, once the CSVP analysis is complete, staff continues to find the visual impacts of the plumes to be significant.

4. **Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?**

The proposed project has the potential to create a new source of substantial light that would adversely affect nighttime views in the area and result in a significant visual impact under this criterion. Condition of certification **VIS-2** would reduce these adverse effects to a less than significant level.

CUMULATIVE IMPACTS

Cumulative impacts to visual resources could occur where project facilities or activities (such as construction) occupy the same field of view as other built facilities or impacted landscapes. It is also possible that a cumulative impact could occur if a viewer's perception is that the general visual quality of an area is diminished by the proliferation of visible structures (or construction effects such as disturbed vegetation), even if the new structures are not within the same field of view as the existing structures. The significance of a cumulative impact would depend on the degree to which (1) the viewshed is altered; (2) visual access to scenic resources is impaired; (3) visual quality is diminished; or (4) the proposed project's visual contrast is increased.

The City of Avenal has zoned the proposed project site and surrounding area as industrial. There are currently no industrial projects planned for the area (Doughty

2002). However, there is the potential for industrial projects in the future, unless zoning and land use are changed in this area.

Other cumulative impacts would occur when adding the proposed power plant to the viewshed, which already contains the San Luis Canal and the water treatment plant. The proposed project would be larger than the surrounding structures. However, this impact has been noted in the impact analysis above and the landscape plan would help to soften not only the proposed project, but the existing structures as well. The proposed project would also contribute to a significant increase in light and glare, resulting in impacts to the nighttime viewshed. This potential impact would be reduced by project design features such as capped lighting and landscaping. With the incorporation of the applicant's and Staff's proposed design features, cumulative visual impacts would not be significant.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is greater than fifty percent within a six-mile radius of the proposed AEP (please refer to **SOCIOECONOMICS Figure 1** in the PSA), and Census 1990 information that shows the low-income population is less than fifty percent within the same radius. With full and effective implementation of staff's proposed conditions of certification, the visual impacts experienced by local residents, including minority populations, would be reduced to levels that would not be significant. Therefore there are no visual resource environmental justice issues related to this project.

FACILITY CLOSURE

There are at least three circumstances in which a facility closure can take place: planned closure; unexpected temporary closure; and unexpected permanent closure.

Planned closure occurs in an orderly manner at the end of its useful economic and mechanical life. The closure plan that the project owner is required to prepare for the proposed project will address removal of the power plant structures.

Unexpected temporary closure occurs when the facility is closed suddenly and/or unexpectedly on a short-term basis. This type of closure is caused by unforeseen circumstances such as a disruption in the natural gas supply, damage to the plant from an earthquake, fire, storm or other natural disasters. No special conditions regarding visual resources are expected to be required to address temporary closure.

Unexpected permanent closure occurs if a natural act, such as an earthquake, fire, or storm, causes damage to the plant beyond repair. In this event, the contingency plan the project owner is required to prepare will address the removal of power plant structures.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

LOCAL

The following discussion provides an explanation of the applicable LORS for the proposed project and the consistency of the proposed project with the LORS. In general, the proposed project is found to be consistent with the LORS for the City of Avenal.

City of Avenal General Plan

Industrial Performance Standards

The Industrial Performance Standards help to regulate operations of industrial facilities. The policies and standards found in this section of the General Plan that relate to visual resources include Glare and Heat and Light.

Glare and Heat

The Industrial Performance Standards recommend that any operation producing intense glare or heat be conducted within an enclosed building. If this is not feasible, then effective screening must be provided to reduce the glare or heat, making it imperceptible from any point on the property line.

Consistency

The proposed project, after mitigation, would be consistent with this policy. Lighting controls would be implemented and hoods and shields would be placed on the lights (condition **VIS-2**). In addition, **VIS-4**, which requires project surfaces to be non-reflective, would help to reduce the daytime glare resulting from the proposed project.

Light

Exterior lighting should be installed in such a manner that the light source is obscured to prevent glare on public streets, walkways, and adjoining properties. The exception to this standard is when exterior lighting is used for overhead street lighting, warning and emergency lighting and traffic signals.

Consistency

The lighting fixtures would be equipped with hoods and shields, thus directing the light toward the area intended and reducing glare on adjacent properties and roadways. With mitigation, the proposed project would be consistent with this policy.

Circulation Element

The circulation element requires that all parking lots contain landscaping and proper lighting.

Consistency

With mitigation, the proposed project would be consistent. One design feature of the proposed project is the landscape plan and a provision for the parking lot landscaping is contained in **VIS-5**.

Open Space Resources

The City General Plan states that a buffer zone or transition zone between urban uses and agricultural land be provided to reduce the incompatibility of land uses associated with agricultural activities. Agricultural activities include, but are not limited to, cultivation, pest control, and harvesting of crops.

Consistency

The proposed project includes the provision of landscaping. The proposed landscaping would provide a visual buffer between the proposed power plant and the agricultural lands. The landscaping would include areas of orchards and row crops to blend the landscaping into the surrounding area.

City of Avenal Zoning Ordinance

The City of Avenal Zoning Ordinance has two parking lot landscape policies that apply to visual resources.

Parking Lot Landscaping

The parking lot landscaping policies state that:

1. One fifteen gallon shade tree shall be planted for every two parking spaces along every parking row. This requirement may be waived for areas where space is limited and would not permit tree growth. Fifty percent of the paved parking lot surface shall be shaded by tree canopies within fifteen years of planting.

2. The sum of the landscaping should equal at least five percent of the total ground area of the parking lot. If parking lot landscape does not equal five percent of the total ground area, then additional landscaping areas shall be designed to achieve the five percent coverage.

Consistency

The landscape plan was developed in cooperation with the City of Avenal. With the incorporation of **VIS-5**, the proposed project would be consistent with this policy.

RESPONSE TO COMMENTS

To date, no public or agency comments have been received regarding visual resources.

MITIGATION

APPLICANT'S PROPOSED MITIGATION MEASURES

The applicant maintains that the incorporation of design features, including a conceptual landscape plan, would be sufficient to mitigate the impacts of the proposed project. The design features include a landscape plan, which is depicted in **VISUAL RESOURCES Figure 14**. This conceptual landscape plan provides for partial screening of the proposed project with open viewing corridors, as requested by the City of Avenal (Doughty 2002). The viewing corridors are meant to give roadway travelers brief glimpses of the proposed power plant as they drive along Avenal Cutoff Road. For areas where viewing opportunities would be extended (i.e., Orange Avenue), a continuous row of vegetation screen would be provided. In order to reduce light and glare during nighttime hours, the applicant has proposed capped (i.e., hooded or shielded) outside lighting, except when the safety of crop dust aircraft is of concern.

ADDITIONAL MITIGATION PROPOSED BY STAFF

Energy Commission staff generally agrees with the applicant's proposals. However, staff's position is that some of the applicant's proposals need to be more precisely developed and in some cases expanded in conditions of certification. The following paragraphs discuss additional staff-proposed measures to mitigate project impacts.

Mitigation of Impacts of Proposed Structures

In general, the impacts to the KOPs are less than significant, with the exception of KOP 4. Staff believes that impacts to KOP 4 would not be reduced to less than significant levels with the implementation of the applicant's conceptual landscape plan, as illustrated in **VISUAL RESOURCES Figure 15**. **Figure 15** shows the view from KOP 4 approximately 12 to 17 years after landscape planting. Staff believes that additional mitigation is necessary and believes that the open viewing corridor for this location should be reduced. Staff believes that additional vegetative screening (i.e., tall, evergreen species) located on the northern property boundary would reduce the visual impacts to this KOP. The applicant's landscape plan includes the planting of 10 year old, tall, dense evergreen screening trees. The growth rate of these proposed trees is approximately two feet per year. Staff believes that with this rate of growth, the impacts to KOP 4 would be reduced to less than significant within five years of planting (particularly considering the moderate number of viewers and moderate view duration), provided that the landscape plan includes the following provision:

- Include landscaping on the northern property boundary to screen the majority of the project structural forms (not the upper portions of the stacks) from views from Avenal Cutoff Road in the area of KOP 4 with a continuous screen of tall, dense evergreens. This screening should be effective within a time frame of five years after the start of commercial operation of the project.

In addition, the proposed landscaping would not be consistent with the City of Avenal Zoning Ordinance as related to parking lot shading. Implementation of staff's proposed landscaping condition of certification (**VIS-5**) would ensure that the proposed project would be consistent with the zoning ordinance.

- At least fifty percent (50%) of the parking lot paved area shall be shaded during daylight hours.
- One fifteen gallon shade tree shall be planted for every two parking spaces along every row, except where space is limited and tree growth would not occur.
- The sum of the landscaping within the parking lot should equal at least five percent (5%) of the total ground area of the parking lot.
- To maximize the effect of the landscape plan and to further reduce visual impacts, staff proposes the following mitigation measures, which have been incorporated into condition of certification **VIS-4**.
- Color treat fences in order to blend with the surrounding environments.
- Structure colors shall be of a neutral tone, to minimize further contrast and maximize the visual integration of the proposed project with the surrounding environment.
- Non-reflective paint and non-refractive surfaces shall be used wherever possible.
- Transmission line structures shall have a neutral gray finish.

Mitigation of Project Lighting Impacts

As previously discussed, the proposed project lighting has the potential to change the character of the existing landscape at night both during construction and operation of the project. This could result in significant visual impacts to adjacent roads, such as Avenal Cutoff Road and Orange Avenue, and nearby residences. Staff proposes conditions of certification **VIS-2** and **VIS-3** to reduce the project night lighting impacts to less than significant.

- The project owner shall design and install all lighting such that light bulbs and reflectors are not visible from public viewing areas and illumination of the vicinity and the nighttime sky is minimized during both project construction and operation. The exception to this is the lighting needed on the HRSG stacks for aircraft safety.

Mitigation of Impacts of Visible Plumes

The frequencies of occurrence of visible plumes from the chiller cooling tower and HRSG and auxiliary boiler exhausts do not exceed staff's significance threshold of ten percent (10%), thus no mitigation is necessary for these plume sources.

Visible plume frequencies for the main cooling tower are substantially greater than the threshold that would trigger an impact analysis of the plumes. Based on the expected plume sizes, staff concludes that for motorists (KOPs 2, 3, and 4) and residents (KOP 5) within 1.5 miles of the site, the visual impacts of the plumes would be adverse and significant. The main cooling tower plume frequency and plume dimension results will need to be remodeled using the CSVP model after the applicant responds to staff's data requests regarding apparent inconsistencies in the applicant's cooling exhaust temperature data. After remodeling, staff will be able to assess with added confidence the visual impacts that would be caused by the predicted cooling tower plumes. Staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes in the event that, once the CSVP analysis is complete, staff continues to find the visual impacts of the plumes to be significant.

Mitigation of Impacts in Relation to CEQA Significance Criteria

The proposed project has the potential to cause significant visual impacts under CEQA significance criterion 3 and 4. Project structures would substantially degrade the existing visual character of foreground views from Avenal Cutoff Road (i.e., KOP 4). The proposed project would also create a new source of substantial light and glare.

These visual impacts can be reduced to a less than significant level with the implementation of the applicant's conceptual landscape plan as modified by staff. The landscape plan provides screening for the proposed power plant; however, there are areas that are not screened, giving the viewer a direct view of the proposed power plant. These direct viewing opportunities were provided at the request of the City of Avenal (TRC 2001a). The landscape plan includes screening vegetation, row crops, and orchards. This landscaping would help to soften the impacts from the introduced structures, providing screening from the distant viewpoints. Closing the viewing corridor and planting trees closer to viewers at KOP 4 would reduce impacts to a less than significant level within a five-year timeframe.

Design features such as capped lighting would help to reduce the impacts from the introduced light sources by shielding the viewer from direct light. In addition, the landscaping would also help to reduce light and glare impacts. Implementation of **VIS-2** would further reduce the impacts from project lighting. Implementation of the applicant's design features coupled with the staff's conditions of certification would reduce the impacts to a less than significant level.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Staff concludes that the proposed project would result in adverse and significant impacts if the proposed design features, landscape plan, and staff proposed conditions of certification were not implemented. With the implementation of proposed conditions of certification **VIS-2**, **VIS-4**, and **VIS-5**, the impacts from project structures would be considered less than significant.

Based on staff's preliminary modeling analysis of the expected operating conditions, visible plume frequencies for the main cooling tower are substantially greater than the threshold that would trigger an impact analysis of the plumes. Staff concludes that the main cooling tower would have a potentially significant impact based on the predicted dimensions. However, the cooling tower plume frequency and plume dimension results will need to be remodeled using the Combustion Stack Visible Plume (CSVP) model after the applicant responds to staff's data requests regarding apparent inconsistencies in the applicant's cooling exhaust temperature data. Staff proposes Condition of Certification **VIS-6** for the control of the main cooling tower plumes in the event that, once the CSVP analysis is complete, staff continues to find the visual impacts of the plumes to be significant.

Based on staff's independent plume modeling, the visual impacts of the predicted chiller cooling tower, HRSG and auxiliary boiler exhaust plumes would be less than significant.

Staff evaluated the applicable LORS and found that the proposed project with mitigation would be consistent with all LORS.

RECOMMENDATIONS

If the Energy Commission approves the project, staff recommends that the following proposed conditions of certifications be adopted.

PROPOSED CONDITIONS OF CERTIFICATION

VIS-1 The project owner shall restore the surface conditions of the rights-of-way disturbed during construction of the transmission line and underground pipelines. All evidence of construction activities, including ground disturbance due to staging and storage areas, shall be removed and remediated upon completion of construction.

The project owner shall submit a plan for restoring the surface conditions of any rights-of-way disturbed during construction of the transmission line and underground pipelines. The plan shall include grading to the original grade and contouring and re-vegetation of the rights-of-way.

Verification: At least sixty (60) days prior to ground disturbance, the project owner shall submit the plan to the Energy Commission Compliance Project Manager (CPM) for review and approval.

If the CPM notifies the project owner that any revisions of the plan are needed before the CPM will approve the plan, within thirty (30) days of receiving that notification, the project owner shall submit to the CPM a revised plan.

The project owner shall notify the CPM within seven (7) days after completing the surface restoration that the rights-of-way are ready for inspection.

VIS-2 The project owner shall design and install all permanent lighting such that light bulbs and reflectors are not visible from public viewing areas; lighting does not cause reflected glare; and illumination of the project, the vicinity, and the nighttime sky is minimized. To meet these requirements the project owner shall ensure that:

a) Lighting shall be designed so exterior light fixtures are hooded, with lights directed downward or toward the area to be illuminated and so that backscatter to the nighttime sky is minimized. The design of the lighting shall be such that the luminescence or light source is shielded to minimize light trespass outside the project boundary;

b) All lighting shall be of minimum necessary brightness consistent with worker safety;

c) High illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have switches or motion detectors to light the area only when occupied; and

d) A lighting complaint resolution form (following the general format of that in **Visual Resources Appendix VR-2**) shall be used by plant operations to record all lighting complaints received and document the resolution of those complaints. All records of lighting complaints shall be kept in the on-site compliance file.

Verification: At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM for review and comment written documentation describing the lighting control measures and fixtures, hoods, shields, proposed for use, and incorporate the CPM's comments in lighting equipment orders.

Prior to first turbine roll, the project owner shall notify the CPM that the lighting has been completed and is ready for inspection. If the CPM notifies the project owner that modifications to the lighting are needed to minimize impacts, within thirty days of receiving that notification the project owner shall implement the modifications and notify the CPM that the modifications have been completed.

The project owner shall report any lighting complaints and documentation of resolution in the Annual Compliance Report, accompanied by any lighting complaint resolution forms for that year.

VIS-3 The project owner shall ensure that lighting for construction of the power plant is used in a manner that minimizes potential night lighting impacts, as follows:

a) All lighting shall be of minimum necessary brightness consistent with worker safety.

b) All fixed position lighting shall be shielded, hooded, and directed downward to minimize backscatter to the night sky and prevent light trespass (direct lighting extending outside the boundaries of the construction area).

c) Wherever feasible and safe, lighting shall be kept off when not in use and motion detectors shall be employed.

d) A lighting complaint resolution form (following the general format of that in **Visual Resources Appendix VR-2**) shall be maintained by plant construction management, to record all lighting complaints received and to document the resolution of that complaint.

Verification: Within 7 days after the first use of construction lighting, the project owner shall notify the CPM that the lighting is ready for inspection.

If the CPM notifies the project owner that modifications to the lighting are needed to minimize impacts, within 15 days of receiving that notification the project owner shall implement the necessary modifications and notify the CPM that the modifications have been completed.

The project owner shall report any lighting complaints and documentation of resolution in the Monthly Compliance Report, accompanied by any lighting complaint resolution forms for that month.

VIS-4 Prior to first turbine roll, the project owner shall treat the surfaces of all project structures and buildings which are visible to the public such that: their colors minimize visual intrusion and contrast by blending with the landscape; their surfaces do not create glare; and they are consistent with local laws, ordinances, regulations, and standards. The project owner shall submit for CPM review and approval, a specific treatment plan whose proper implementation will satisfy these requirements. The treatment plan shall include:

Protocol:

a) Specification, and 11" x 17" color simulations at life size scale, of the treatment proposed for use on project structures, including structures treated during manufacture;

b) A list of each major project structure, building, tank, transmission line tower and/or pole, and fencing/walls specifying the color(s) and finish proposed for each (colors must be identified by name and vendor brand or a universal designation);

c) Two sets of brochures and/or color chips for each proposed color;

d) Samples of each proposed treatment and color on each material to which they would be applied that would be visible to the public;

e) A detailed schedule for completion of the treatment; and

f) A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated on site until the project owner receives notification of approval of the treatment plan by the CPM.

Verification: The project owner shall submit its proposed treatment plan to the City of Avenal for review and comment and to the CPM for review and approval, at least 90 (ninety) days prior to ordering the first structures that are color treated during manufacture.

If a revision is required, the project owner shall provide the CPM with a revised plan within 30 (thirty) days of receiving notification that revisions are needed.

Prior to first turbine roll, the project owner shall notify the CPM that all buildings and structures are ready for inspection.

The project owner shall provide a status report regarding treatment maintenance in the Annual Compliance Report.

VIS-5 Prior to first turbine roll, the project owner shall implement the proposed conceptual landscape plan. However, the planting of tall, dense evergreen trees along the northern property boundary shall be used to eliminate the open viewing corridor in the area of KOP 4 depicted on the conceptual landscaping plan. In addition, a 300-foot minimum buffer/avoidance zone measured from the San Luis Canal to any project related ornamental landscaped areas shall be established to minimize potential disturbance to the San Joaquin kit fox and other sensitive species (see Condition of Certification **BIO-10**).

Trees shall be of sufficient height and density to screen the majority of the project's structural forms (not the upper portions of the stack) within five years of commercial operation. Landscaping shall consist of a mix of evergreen trees, shrubs, groundcover, orchards, and row crops. Suitable irrigation shall be installed to ensure survival of the plantings.

Landscaping shall be installed consistent with the City of Avenal policies, and shall include parking lot landscaping, consistent with the City of Avenal Zoning Ordinance. The landscaping for the parking lot shall include shade trees. The landscape plan shall demonstrate that the parking lot has fifty percent (50%) of its total area shaded. This shall include one fifteen gallon shade tree for every two parking spaces along every parking row.

The project owner shall submit a landscape plan to the City of Avenal for review and comment, and to the CPM for review and approval. The submittal to the CPM shall include the City's comments. The plan shall include, but not be limited to:

Protocol:

a) An 11" x 17" color simulation at life size scale of the proposed landscaping at 5, 10, and 20 years as viewed from KOP 4 and at a point midway between KOPs 3 and 4;A detailed list of plants to be used, growth rates, and times to maturity given their size and age at planting;

b) Maintenance procedures, including any needed irrigation and a plan for routine annual or semi-annual debris removal for the life of the project; and

c) A procedure for monitoring for and replacement of unsuccessful plantings for the life of the project.

Verification: Prior to first turbine roll and at least sixty (60) days prior to installing the landscaping, the project owner shall submit the landscape plan to the CPM for review and approval.

If the CPM notifies the project owner that revisions of the submittal are needed before the CPM will approve the submittal, within thirty (30) days of receiving that notification,

the project owner shall prepare and submit to the CPM and City of Avenal a revised landscape plan.

The project owner shall notify the CPM within seven (7) days after completing the installation of the landscape that the planting and irrigation system are ready for inspection.

The project owner shall report landscape maintenance activities, including replacement of dead vegetation, for the previous year of operation in the Annual Compliance Report.

VIS-6 The project owner shall abate the plant cooling tower visible vapor plumes. The project owner shall abate the frequency of the plant cooling tower visible vapor plumes as follows:

Protocol:

a) A plume abated wet/dry cooling tower, or equally effective means, shall be used to reduce predicted cooling tower visible vapor plume frequency to less than 10 percent of seasonal (i.e., November through April) daylight no fog/no rain hours with high visual contrast. The project owner shall obtain from Energy Commission staff the appropriate meteorological data for use in designing a compliant cooling tower.

b) An automated control system shall be used to ensure that plumes are abated to the maximum extent possible for the stipulated cooling tower design.

Verification: At least 60 days prior to ordering the cooling tower, the project owner shall provide the CPM for review and approval the specifications of the cooling tower and the specifications for the automated control system and related systems and sensors that will be used to ensure compliance with the plume frequency limitation.

If the CPM notifies the project owner that any revisions of the specifications are needed prior to CPM approval, within thirty (30) days of receiving that notification, the project owner shall submit to the CPM revised specifications.

The project owner shall monitor the cooling tower visible plume frequency during the first year of operation from November 1st to April 30th and provide evidence of compliance (including physical evidence and frequency data), to the CPM within 30 days of the end of the monitoring period. This monitoring requirement shall be in force until there is a body of evidence demonstrating that the cooling tower is maintaining compliance with the plume frequency limitation listed in this condition.

REFERENCES

Caltrans (California Department of Transportation). 2002. State Scenic Highway System Web Site: http://www.dot.ca.gov/hq/LandArch/scenic/cahisys.htm. Accessed March 4,2002.

CEC (California Energy Commission/McKinney). 2002c. Data Requests. Docketed January 24, 2002.

CEC (California Energy Commission/McKinney). 2002d. Second Set of Data Requests. Docketed March 25, 2002.

DENA (Duke Energy North America/Cochran). 2001e. Data Adequacy Responses. Submitted to the California Energy Commission, December 7, 2001.

DENA (Duke Energy North America/Cochran). 2002f. Response to CEC January 24, 2002 Data Request to the Avenal Energy Project. Submitted to the California Energy Commission, February 25, 2002.

DENA (Duke Energy North America/Cochran). 2002g Response to CEC March 25, 2002 Second Data Requests to the Avenal Energy Project. Submitted to the California Energy Commission, April 25, 2002.

Doughty, Jim
2002 Conversation between Jim Doughty from the City of Avenal and Christa Fay with PAR Environmental Services, Inc. regarding local laws, ordinances, regulations, and standards.

Newman, Sarah and Stephen Sheppard
1979 *Prototype Visual Impact Assessment Manual*. December.

TRC (TRC/Stenger). 2001a. Application for Certification for the Duke Energy Avenal Project. Submitted to the California Energy Commission, October 9, 2001.

APPENDIX VR – 1: SUMMARY OF ANALYSIS

APPENDIX VR – 2

LIGHTING COMPLAINT RESOLUTION FORM

Avenal Energy Project Kings County, California
Complainant's name and address: Phone number:
Date complaint received: Time complaint received:
Nature of lighting complaint:
Definition of problem after investigation by plant personnel: Date complainant first contacted:
Description of corrective measures taken: Complainant's signature: _____ Date:
Approximate installed cost of corrective measures: $ Date installation completed: Date first letter sent to complainant: _____(copy attached) Date final letter sent to complainant: _____(copy attached)
This information is certified to be correct: Plant Manager's Signature:

(Attach additional pages and supporting documentation, as required.)

APPENDIX VR-3: FIGURES

Insert Figures 1 through 15

AVENAL ENERGY PROJECT
MAIN COOLING TOWER, CHILLER COOLING TOWER, HRSG, AND AUXILIARY BOILER
EXHAUST VISIBLE PLUME ANALYSIS

William Walters and Lisa Blewitt

INTRODUCTION

The following provides the assessment of the Avenal Energy Project (AEP) main cooling tower, chiller cooling towers, heat recovery steam generators (HRSG) and auxiliary boiler exhaust stack visible plumes. Staff completed a modeling analysis for the Applicant's proposed unabated main cooling tower, chiller cooling towers, HRSGs and auxiliary boiler designs.

PROJECT DESCRIPTION

The Applicant has proposed a linear 7-cell mechanical-draft cooling tower. The Applicant has not proposed to use any methods to abate visible plumes from the cooling towers.

The combustion turbine generator inlet air chilling system consists of three parallel refrigeration modules, which include three dedicated, factory-packaged inlet air chillers with associated 4-cell auxiliary cooling towers. The Applicant has not proposed to use any methods to abate visible plumes from the chiller cooling towers.

The project includes two separate turbine/heat recovery steam generator (HRSG) systems, each with separate exhaust stacks. Duct firing will be used during peaking operations, which causes increased exhaust moisture content and lowers exhaust temperatures, thereby increasing plume frequency potential. The Applicant has not proposed to use any methods to abate visible plumes from the HRSG exhausts.

The project also includes one 25,000 pound-per-hour (lb/hr) auxiliary boiler (AEP 2001a, page 6.2-27), which will be operated for up to 2,500 hours per year. The Applicant has not proposed to use any methods to abate visible plumes from the auxiliary boiler exhaust.

COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

EXISTING CONDITIONS

There are no known water vapor plume sources in the general area of the project site.

COOLING TOWER DESIGN PARAMETERS

Staff evaluated the Applicant's AFC (TRC 2001a, AFC Section 6.13.3.6), Data Response #126-130 (DENA 2002f, Exhibit 126-1), and Data Response #154-155 (DENA 2002g) and performed an independent psychrometric analysis and dispersion

modeling analysis to determine the frequency and dimensions of the project's proposed unabated cooling tower.

Based on the cooling tower exhaust parameters anticipated by the Applicant, the frequency and size of visual plumes can be estimated. The operating data for the cooling tower at 100% turbine load are provided in Table 1. Cases A through C represent peaking operations, which would normally occur between the hours of noon and 8 p.m. Cases D through H represent baseload operations, which would normally occur during all other time periods.

Table 1
New Cooling Tower Operating and Exhaust Parameters

Parameter	**New Cooling Tower Design Parameters**							
Number of Cells	7 (1 x 7)							
Stack Height	13.72 meters (45 feet)							
Cell Stack Diameter	9.639 meters							
Equivalent Stack Diameter	25.50 meters (1)							
Tower Housing Length	121.92 meters (400 feet)							
Tower Housing Width	15.24 meters (50 feet)							
Maximum Design Inlet Air Flow Rate, kg/s (2)	5,307.3 (Case B)					5,197.8 (Case F)		
Maximum Heat Rejection Rate, MW (2)	446 MW (with duct firing)					336 MW (without duct firing)		
	Case A	**Case B**	**Case C**	**Case D**	**Case E**	**Case F**	**Case G**	**Case H**
Ambient Temp	36 °F	63 °F	97 °F	14 °F	36 °F	63 °F	97 °F	115 °F
Ambient RH	85%	54%	24%	64%	85%	54%	24%	9%
Duct Burners	On	On	On	Off	Off	Off	Off	Off
Cells in Operation	7	7	7	5	7	7	7	7
Exhaust Flow, klb/hr	43,819	42,122	40,159	44,991	43,007	41,253	39,270	38,906
Exhaust MW, lb/lb-mol	28.80 Assumed							
Exhaust Gas Temp	91 °F	98 °F	106 °F	80 °F	81 °F	90 °F	98 °F	107 °F
L/G Ratio	1.27	1.34	1.42	1.26	1.29	1.35	1.44	1.47
Heat Rejection Rate	446	465	534	285	334	332	333	477

Source: AFC (TRC 2001a, page 6.13-12) and DR #154-155 (DENA 2002g, Exhibit 126-1, Table 1, revised April 12, 2002, page 26).
Note(s):
1. Cooling tower equivalent stack diameter is estimated for 7-cells.
2. These values were used for SACTI modeling of the cooling tower with duct firing (peaking) and without duct firing (baseload).
3. For CSVP modeling, values were extrapolated or interpolated between data points as necessary.

The exhaust temperature and exhaust mass flow rate values were calculated for the hourly ambient conditions modeled through linear interpolation and extrapolation of the data provided by the Applicant based on the three duct firing cases and the five non-duct firing cases presented in Table 1. The exhaust moisture content was determined by assuming saturated conditions at the calculated exhaust temperature.

COOLING TOWER DATA UNCERTAINTIES

Staff's review of the exhaust data provided by the Applicant indicates that the exhaust temperature data appears to be too high considering the values of the other exhaust variables. Staff reviewed the Applicant's heat balances (TRC 2001a, Appendix 2.6, Tables 2-6-1 through 2.6-6) and performed a separate heat balance based on their cooling tower exhaust data. A comparison of these two heat balances and the heat rejection rate provided by the Applicant for the cooling tower is provided in Table 2.

Table 2
Cooling Tower Heat Rejection Values

	Case A	Case B	Case C	Case D	Case E	Case F	Case G	Case H
Ambient Temp	36 °F	63 °F	97 °F	14 °F	36 °F	63 °F	97 °F	115 °F
Ambient RH	85%	54%	24%	64%	85%	54%	24%	9%
Duct Burners	On	On	On	Off	Off	Off	Off	Off
Cells in Operation	7	7	7	5	7	7	7	7
Applicant Data (Table 1)	446	465	534	285	334	332	333	477
AFC Data Heat Balance	446	446	477	ND	336	336	336	ND
Staff Heat Balance	561	551	572	364	396	395	389	574

Source: AFC (TRC 2001a, page 6.13-12) and DR #154-155 (DENA 2002g, Exhibit 126-1, Table 1, revised April 12, 2002, page 26).
Note(s):
1. Cooling tower equivalent stack diameter is estimated for 7-cells.
2. These values were used for SACTI modeling of the cooling tower with duct firing (peaking) and without duct firing (baseload).

The overall impact of these apparently overestimated exhaust temperatures is the overestimation of the cooling tower plume frequency. Staff is also concerned that the exhaust temperatures are too close to, and in some cases equal to or higher than, the inlet (hot) water temperatures. Staff will attempt to resolve the cooling tower data inconsistencies prior to publishing the Final Staff Assessment.

COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

Staff modeled the cooling tower plumes using both the Combustion Stack Visible Plume (CSVP) model and the Seasonal/Annual Cooling Tower Impact (SACTI) model. The SACTI model is designed to model multiple cell cooling towers, and the CSVP modeling analysis uses an equivalent stack diameter assumption in order to model the entire exhaust volume of the tower. Table 3 provides the CSVP model visible plume frequency results using a five-year (1992-1995, 1997) meteorological data set from the Lemoore Naval Air Station.

Table 3
Staff Predicted Hours with Cooling Tower Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

		Peaking (All Hours)		Limited Peaking (Noon to 8 pm)		Baseload (All Hours)	
	Available (hr)	Plume (hr)	Percent	Plume (hr)	Percent	Plume (hr)	Percent
All	43,824	31,221	71.2%	26,306	60.0%	24,392	55.7%
Daylight	22,177	11,774	53.1%	9,848	44.4%	8,603	38.8%
Nighttime	21,647	19,447	89.8%	16,458	76.0%	15,789	72.9%
Daylight No Rain/Fog	19,384	9,032	46.6%	7,131	36.8%	5,945	30.7%
Seasonal Daylight No Rain/Fog*	7,371	5,760	78.1%	5,180	70.3%	4,219	57.2%

*Seasonal conditions occur anytime from November through April.

For the proposed cooling tower, the maximum temperature where a visible plume is predicted is 84°F when the relative humidity is 100%.

Staff's SACTI modeling analysis visible plume dimension results, using a five-year (1992-1995, and 1997) meteorological data set from the Lemoore Naval Air Station are provided in Table 4.

Table 4
Staff Results of Cooling Tower Visible Plume Dimensions
Lemoore 1992-1995 and 1997 Meteorological Data

		SACTI Model	
All Hours	**Percentile**	**Peaking**	**Baseload**
Length (m)	50%	30-40	30-40
	10%	300-400	80-90
	Maximum	2,000-3,000	900-1,000
Height (m)*	50%	30-40	30-40
	10%	200-300	60-70
	Maximum	200-300	200-300
Width (m)	50%	40-60	20-40
	10%	80-100	60-80
	Maximum	120-140	120-140
Daytime No Rain/Fog Hours		**Peaking**	**Baseload**
Length (m)	50%	20-30	20-30
	10%	80-90	50-60
	Maximum	5,000-6,000	5,000-6,000
Height (m)*	50%	30-40	20-30
	10%	40-50	30-40
	Maximum	600-700	500-600
Width (m)	50%	20-40	20-40
	10%	40-60	40-60
	Maximum	400-600	400-600
Seasonal Daytime No Rain/Fog Hours		**Peaking**	**Baseload**
Length (m)	50%	40-50	20-30
	10%	300-400	90-100
	Maximum	5,000-6,000	5,000-6,000
Height (m)*	50%	30-40	20-30
	10%	100-200	30-40
	Maximum	600-700	500-600
Width (m)	50%	40-60	20-40
	10%	60-80	40-60
	Maximum	400-600	400-600

Seasonal = November through April (day 120-304).
*SACTI Plume height does not include the height (13.72 meters) of the cooling tower (release point).
Notes:
1. Due to meteorological data grouping and averaging by SACTI, generally the maximums for annual conditions appears lower than for daytime no rain/fog cases.

The SACTI model input parameters are heat rejection rate and inlet flow rate, while the CSVP models inputs are exhaust temperature and exhaust flow rate. Therefore, the apparent inconsistencies in the Applicant's, with the possible exception of the modeled heat rejection rate, will not affect the SACTI model results.

Applicant Modeling Analysis

The Applicant modeled the cooling tower visible plume dimensions using a program called MISTVUE (DENA 2002f, DR #126-130, Exhibit 126-1). MISTVUE uses a linear interpolation of water vapor pressure, between the stack exit and ambient conditions, together with the Goff-Gratch formulation of the Clausius-Clapeyron equation for water vapor pressure, to determine the amount of dilution required for the visible plume to not be visible. These calculations are performed for each hour. MISTVUE performs calculations for various sources including cooling towers and combustion sources. MISTUE determines the distance along the centerline of the plume where sufficient dilution has occurred such that the plume is no longer visible.

The Applicant models a single cooling tower cell, which staff believes causes the modeling analysis to underestimate the plume dimensions of the cooling tower by not accounting for the total water emissions from the contiguous cooling tower cell exhausts. The plume dimension (height and length) underestimation will be most pronounced when the wind direction is aligned along the length of the tower.

The MISTVUE modeling analysis visible plume frequency results provided by the Applicant using a one-year (1995) meteorological data set from the PG&E Kettleman City monitoring station, and relative humidity, rain and fog data from Fresno are provided in Table 5 along with staff's SACTI results using a five-year (1992-1995, and 1997) meteorological data set from the Lemoore Naval Air Station.

Table 5
Applicant and Staff Results of
Cooling Tower Visible Plume Frequencies

	MISTVUE Kettleman City 1995 All Hrs		**Staff SACTI 1992-1995 and 1997 All Hrs**	
Length	**Hours**	**Percent**	**Peaking**	**Baseload**
No Plume	2,977	33.98 %	N/A [1]	N/A [1]
(with plume) <10 m	844	9.63 %	---	---
10-60 m	2,253	25.72 %	75.21% [1]	82.02% [1]
60-100 m	955	10.90 %	7.44%	8.71%
100-400 m	1,082	12.35 %	11.19%	7.06%
>400 m	649	7.41 %	6.16%	2.21%
Reference Period	8,760		43,800	
	MISTVUE Kettleman City 1995 Day No Rain/Fog Hrs		**Staff SACTI 1992-1995 and 1997 Day No Rain/Fog Hrs**	
Length	**Hours**	**Percent**	**Peaking**	**Baseload**
No Plume	2,053 [2]	52.92%	N/A [1]	N/A [1]
(with plume) <10 m	482	12.43%	---	---
10-60 m	958	24.70%	88.09% [1]	91.31% [1]
60-100 m	236	6.08%	3.43%	4.00%
100-400 m	146	3.76%	6.16%	2.61%
>400 m	4	0.10%	2.32%	2.08%
Reference Period	3,879 [2]		19,384	

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 5, page 7) with the Day No Rain/Fog Hours adjusted to exclude the Rain/Fog hours.

Note(s):
1. SACTI modeling results includes 0-60 meters. The "no plume" condition is not provided.
2. Estimated Value based on meteorological files provided by the Applicant.

As shown in Table 5, staff's SACTI plume dimension modeling generally predicts a larger maximum plume size while the Applicant's MISTVUE modeling predicts a greater frequency of medium sized plumes. The MISTVUE results are based on a single cooling tower cell and underestimate the total plume dimensions, but this underestimation is overcompensated by the apparently incorrect exhaust temperature data provided by the Applicant. Staff will determine plume dimension frequency using the CSVP model once the exhaust temperature data has been corrected/confirmed.

The MISTVUE modeling analysis visible plume dimension results provided by the Applicant using a one-year (1995) meteorological data set from the PG&E Kettleman City monitoring station are provided in Table 6.

Table 6
Applicant Results of Cooling Tower Visible Plume Dimensions

1995 Kettleman City Met Data				
(All dimensions in meters)	Total	Day	Night	Day No Rain/Fog
Maximum Plume Height	251			251
Average Plume Height	64	57	68	56
Maximum Plume Diameter	182			169
Average Plume Diameter	42	35	46	34
Average Plume Length	114	53	158	74
Dimensions for Plume of 90th percentile Height				
Mean Height	115			74
Mean Length	344			41
Mean Diameter	81			46

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 6, page 8).

Table 7 provides a comparison of the Applicant's MISTVUE modeling and Staff's CSVP modeling plume frequency results.

Table 7
Comparison of Predicted Hours with Cooling Tower Steam Plumes

	Staff CSVP Lemoore 1992-1995 and 1997			Applicant MISTVUE Kettleman City 1995
Hours with Plume (Percent,%)	**Peaking (All Hours)**	**Limited Peaking (Noon to 8 pm)**	**Baseload (All Hours)**	**Limited Peaking (Noon to 8 pm)**
All	71.2%	60.0%	55.7%	66.0%
Daylight	53.1%	44.4%	38.8%	53.3%
Nighttime	89.8%	76.0%	72.9%	78.7%
Daylight No Rain/Fog	46.6%	36.8%	30.7%	47.1%
Seasonal Daylight No Rain/Fog*	78.1%	70.3%	57.2%	N/A

*Seasonal conditions occur anytime from November through April.

A plume frequency of 10% of seasonal (November through April) daylight no rain/fog hours is used as a plume impact study threshold trigger. The CSVP model predicted plume frequencies greater then 10% of seasonal daylight no rain/fog hours, which would trigger a study of the visual impacts of the plume. The visual impact analysis for the cooling tower plumes is provided in the Visual Resources section of the Staff Assessment.

CHILLER COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

Staff evaluated the Applicant's AFC (TRC 2001a, AFC Section 6.13.3.6) and Data Response #126-130 (DENA 2002f, Exhibit 126-1) and performed an independent psychrometric analysis and dispersion modeling analysis to determine the frequency and dimensions of the project's proposed unabated chiller cooling towers.

CHILLER COOLING TOWER DESIGN PARAMETERS

Based on the stack exhaust parameters anticipated by the Applicant for the chiller cooling towers, the frequency and size of visual plumes can be estimated. The

operating data for the chiller cooling towers are provided in Table 8. A single set of parameters was assumed by the Applicant to apply to all operating conditions. The chiller cooling towers are not expected to operate at ambient temperatures of less than 60°F.

Table 8
Chiller Cooling Tower Exhaust Parameters

	Chiller Cooling Tower Exhaust Parameters
Number of Cells	4 towers - each 1 x 4 cells
Stack Height	16.15 meters (53 feet)
Stack Diameter	23.416 meters (1)
Tower Housing Length	19.20 meters (63 feet)
Tower Housing Width	9.45 meters (31 feet)
Design Liquid/Gas Flow Ratio	1.24
	All Cases
Heat Rejection Rate	12.625 MMBtu/hr
Ambient Temp	95°F
Ambient RH	Calculated for each hour modeled
Exhaust H_2O wt%	Saturated at the assumed exhaust temperature
Exhaust Flow, klb/hr	1,021
Exhaust MW, lb/lb-mol	28.8
Exhaust Gas Temp2	82°F @ 97°F/24% RH ambient

Source: AFC (TRC 2001a, page 6.13-12) and DR #126-130 (DENA 2002f, Exhibit 126-1, Table 3, page 5).
Note(s):
1. Cooling tower diameter from AFC (TRC 2001a, Table 6.2-1.4, page 6.2-1.4) of 11.708 feet. Equivalent diameter is for 4 cells.
2. For the CSVP analysis, values were interpolated/extrapolated using a heat balance at 63F and 54% RH to determine an exhaust temperature of 70°F for interpolation/extrapolation between ambient temperature data points.

Staff did not have adequate chiller heat load vs. ambient condition data to vary the heat rejection rate of the cooling tower. The heat rejection rate should be inversely proportional to the ambient temperature. Therefore, the staff's modeling analysis should overstate the likely plume frequency from the tower, assuming the operating conditions and variables provided by the Applicant.

CHILLER COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

Staff modeled the chiller cooling tower plumes using the CSVP model with a five-year meteorological data set, obtained from the National Climatic Data Center, from Lemoore. Table 9 provides the CSVP model visible plume frequency results.

Table 9
Staff Predicted Hours with Chiller Cooling Tower Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

	Available (hr)	**Plume (hr)**	**Percent**
All	43,824	6	0.01%
Daylight	22,177	4	0.02%
Nighttime	21,647	2	0.01%
Daylight No Rain/Fog	19,384	0	0%
Seasonal Daylight No Rain/Fog*	7,371	0	0%

*Seasonal conditions occur anytime from November through April.

These results indicate that the chiller cooling towers will not normally have visible plumes and these extremely infrequent plumes are well below the significance threshold of 10% seasonal daylight no rain/fog hours.

The MISTVUE modeling analysis visible plume frequency results and visible plume dimension results provided by the Applicant using a one-year (1995) meteorological data set from the PG&E Kettleman City monitoring station, and relative humidity, rain and fog data from Fresno are provided in Table 10 and Table 11, respectively.

Table 10
Applicant Results of Chiller Cooling Tower Visible Plume Frequencies

1995 Kettleman City Met Data				
Length	**Total**	**Percentile %**	**Day**	**Percentile %**
No Plume	8,235	94.01	4,139	94.50
<10 m (with plume)	284	3.24	160	3.65
10-60 m	217	2.48	78	1.78
60-100 m	21	0.24	2	0.05
100-400 m	3	0.03	1	0.02
>400 m	0	0.00	0	0.00
Reference Period	8,760 hrs	100	4,380 hrs	100
Length	**Night**	**Percentile %**	**Day No Rain/Fog**	**Percentile %**
No Plume	4,096	93.52	3,673	94.69
<10 m (with plume)	124	2.83	137	3.53
10-60 m	139	3.17	66	1.70
60-100 m	19	0.43	2	0.05
100-400 m	2	0.05	1	0.03
>400 m	0	0.00	0	0.00
Reference Period	4,380 hrs	100	3,879 hrs	100

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 9, page 11) with the Day No Rain/Fog Hours adjusted to exclude the Rain/Fog hours.

Table 11
Applicant Results of Chiller Cooling Tower Visible Plume Dimensions

1995 Kettleman City Met Data				
(All dimensions in meters)	Total	Day	Night	Day No Rain/Fog
Maximum Plume Height	61			57
Average Plume Height	29	27	30	29
Maximum Plume Diameter	32			30
Average Plume Diameter	10	10	11	10
Average Plume Length	18	11	24	19
Dimensions for Plume of 90th percentile Height				
Mean Height	40			34
Mean Length	53			16
Mean Diameter	8			7

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 10, page 12).

The Applicant modeled the 97°F ambient condition regardless of the actual ambient condition; therefore, staff believes that the Applicant's modeling results greatly overstate the plume frequency and plume dimensions.

A comparison of the chiller cooling tower plume frequency results are summarized in Table 12.

Table 12
Comparison of Predicted Hours
with Chiller Cooling Tower Steam Plumes

	Staff CSVP	Applicant MISTVUE
Hours with Plume (Percent,%)	**Lemoore Naval Air Station 1992-1995 and 1997**	**Kettleman City 1995**
All	0.01%	5.99
Daylight	0.02%	5.50
Nighttime	0.01%	6.48
Daylight No Rain/Fog	0%	5.31
Seasonal Daylight No Rain/Fog*	0%	N/A

*Seasonal conditions occur anytime from November through April.

A plume frequency of 10% of seasonal (November through April) daylight no rain/fog hours is used as a plume impact study threshold trigger. The CSVP model predicted plume frequencies well below 10% of seasonal daylight no rain/fog hours, which would not trigger a study of the visual impacts of the chiller cooling tower plume.

HRSG VISIBLE PLUME MODELING ANALYSIS

Staff evaluated the Applicant's AFC (TRC 2001a, AFC Section 6.13.3.6) and Data Response #126-130 (DENA 2002f, Exhibit 126-1) and performed an independent psychrometric analysis and dispersion modeling analysis. The Combustion Stack Visible Plume (CSVP) model was used to estimate the worst-case potential plume frequency, and provide data on predicted plume length, width, and height for each HRSG stack.

HRSG PARAMETERS

Based on the stack exhaust parameters anticipated by the Applicant for each HRSG stack, the frequency and size of visual plumes can be estimated. The operating data for these stacks at 100% turbine load are provided in Table 13. Cases 1 through 5 represent peaking operations, which would normally occur between the hours of noon and 8 pm. Cases 6 through 10 represent baseload operations, which would normally occur during all other time periods.

Table 13 –
HRSG Exhaust Parameters

	HRSG Exhaust Parameters									
Stack Ht	44.2 meters (145 feet)									
Stack Diameter	5.5 meters (18 feet)									
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Ambient Temp	115 °F	97 °F	63 °F	36 °F	14 °F	115 °F	97 °F	63 °F	36 °F	14 °F
Ambient RH	9%	24%	54%	85%	64%	9%	24%	54%	85%	64%
Duct Burners	On	On	On	On	On	Off	Off	Off	Off	Off
Exhaust H_2O wt%	6.32%	6.61%	6.36%	5.85%	5.32%	5.17%	5.49%	5.23%	4.96%	4.59%
Exhaust Flow klb/hr	3,613.460	3,669.042	3,543.583	3,666.725	3,803.059	3,594.133	3,599.194	3,594.738	3,651.051	3,789.272
Exhaust MW Lb/lb-mol	28.19	28.14	28.18	28.25	28.33	28.30	28.25	28.29	28.34	28.40
Exhaust Gas Temp	182 °F	182 °F	179 °F	178 °F	180 °F	195 °F	194 °F	190 °F	187 °F	189 °F

Source: AFC (TRC 2001a, page 6.13-12) and DR #126-130 (DENA 2002f, Exhibit 126-1, Table 2, page 4).
For the CSVP analysis, values were extrapolated or interpolated between data points as necessary. Average molecular weights of 28.2 for duct firing and 28.3 for no duct firing cases were used.

HRSG VISIBLE PLUME MODELING ANALYSIS

Staff modeled the HRSG plumes using the CSVP model with a five-year meteorological data set from the Lemoore Naval Air Station. Table 14 provides the CSVP model visible plume frequency results.

Table 14
Staff Predicted Hours with HRSG Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

		Duct Firing (All Hours)		Limited Duct Firing (Noon to 8 pm)		No Duct Firing (All Hours)	
	Available (hr)	**Plume (hr)**	**Percent**	**Plume (hr)**	**Percent**	**Plume (hr)**	**Percent**
All	43,824	6,280	14.33%	2,694	6.15%	2,078	4.74%
Daylight	22,177	1,625	7.33%	766	3.45%	505	2.28%
Nighttime	21,647	4,655	21.50%	1,928	8.91%	1,573	7.27%
Daylight No Rain/Fog	19,384	394	2.03%	98	0.51%	68	0.35%
Seasonal Daylight No Rain/Fog*	7,371	373	5.06%	93	1.26%	64	0.87%

*Seasonal conditions occur anytime from November through April.

For the proposed HRSGs, the maximum temperature where a visible plume is predicted when the relative humidity is 100% with duct firing at all hours is 59°F, with duct firing from noon to 8 pm is 57°F, and with no duct firing at all hours is 49°F.

The MISTVUE modeling analysis visible plume frequency results and visible plume dimension results provided by the Applicant using a one-year (1995) meteorological data set from the PG&E Kettleman City monitoring station, and relative humidity, rain and fog data from Fresno are provided in Table 15 and Table 16, respectively.

Table 15
Applicant Results of HRSG Visible Plume Frequencies

1995 Kettleman City Met Data				
Length	**Total**	**Percentile %**	**Day**	**Percentile %**
No Plume	8,100	92.47	4,252	97.08
<10 m (with plume)	0	0.00	0	0.00
10-60 m	14	0.16	4	0.09
60-100 m	52	0.59	18	0.41
100-400 m	217	2.48	25	0.57
>400 m	377	4.30	81	1.85
Reference Period	8,760 hrs	100	4,380 hrs	100
Length	**Night**	**Percentile %**	**Day No Rain/Fog**	**Percentile %**
No Plume	3,848	87.85	3,860	99.51
<10 m (with plume)	0	0.00	0	0.00
10-60 m	10	0.23	2	0.05
60-100 m	35	0.80	4	0.10
100-400 m	191	4.36	11	0.28
>400 m	296	6.76	2	0.05
Reference Period	4,380 hrs	100	3,879 hrs	100

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 7, page 9) with the Day No Rain/Fog Hours adjusted to exclude the Rain/Fog hours.

Table 16
Applicant Results of HRSG Visible Plume Dimensions

1995 Kettleman City Met Data				
(All dimensions in meters)	Total	Day	Night	Day No Rain/Fog
Maximum Plume Height	302			276
Average Plume Height	102	102	102	124
Maximum Plume Diameter	183			179
Average Plume Diameter	79	84	78	74
Average Plume Length	286	155	311	234
Dimensions for Plume of 90th percentile Height				
Mean Height	172			215
Mean Length	817			741
Mean Diameter	108			138

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 8, page 10).

As shown in Tables 14 and 15, staff's HRSG plume frequency results using CSVP and a five-year meteorological data set from Lemoore Naval Air Station are generally greater for daylight and daylight no rain/fog cases for limited duct firing operation than the Applicant's results using MISTVUE and a one-year meteorological data set from Kettleman City. The HRSG plume frequency results are summarized in Table 17.

Table 17
Comparison of Predicted Hours with HRSG Steam Plumes

	Staff CSVP			Applicant MISTVUE
Hours with Plume (Percent,%)	Lemoore Naval Air Station 1992-1995 and 1997			Kettleman City 1995
	Duct Firing (All Hours)	Limited Duct Firing (Noon to 8 pm)	No Duct Firing (All Hours)	
All	14.33	6.15	4.74	7.53
Daylight	7.33	3.45	2.28	2.92
Nighttime	21.50	8.91	7.27	12.1
Daylight No Rain/Fog	2.03	0.51	0.35	0.48
Seasonal Daylight No Rain/Fog*	5.06	1.26	0.87	N/A

*Seasonal conditions occur anytime from November through April.

A plume frequency of 10% of seasonal (November through April) daylight no rain/fog hours is used as a plume impact study threshold trigger. The CSVP model predicted plume frequencies less then 10% of seasonal daylight no rain/fog hours for all cases, which would not trigger a study of the visual impacts of the HRSG plume.

AUXILIARY BOILER VISIBLE PLUME MODELING ANALYSIS

Staff evaluated the Applicant's AFC (TRC 2001a, AFC Section 6.13.3.6) and Data Response #126-130 (DENA 2002f, Exhibit 126-1) and performed an independent psychrometric analysis and dispersion modeling analysis. The Combustion Stack Visible Plume (CSVP) model was used to estimate the worst-case potential plume frequency, and provide data on predicted plume length, width, and height for the auxiliary boiler stack.

AUXILIARY BOILER PARAMETERS

Based on the stack exhaust parameters anticipated by the Applicant for the auxiliary boiler stack, the frequency and size of visual plumes can be estimated. The operating

data for the auxiliary boiler are provided in Table 18. A single set of parameters is assumed to apply to all operating conditions.

Table 18
Auxiliary Boiler Exhaust Parameters

	Auxiliary Boiler Exhaust Parameters
Stack Height	11.3 meters (37 feet)
Stack Diameter	0.81 meters (2.7 feet)
	All Cases
Ambient Temp	Calculated for each hour modeled
Ambient RH	Calculated for each hour modeled
Exhaust H_2O wt%	10.41%
Exhaust Flow, lb/hr	35,689
Exhaust MW, lb/lb-mol	27.80
Exhaust Gas Temp	398 °F

Source: AFC (TRC 2001a, page 6.13-12) and DR #126-130 (DENA 2002f, Exhibit 126-1, Table 4, page 5).
For the CSVP analysis, values were extrapolated or interpolated between data points as necessary.

AUXILIARY BOILER VISIBLE PLUME MODELING ANALYSIS

Staff modeled the auxiliary boiler plumes using the CSVP model with a five-year meteorological data set, obtained from the National Climatic Data Center, from Lemoore. Table 19 provides the CSVP model visible plume frequency results.

Table 19
Staff Predicted Hours with Auxiliary Boiler Steam Plumes
Lemoore 1992-1995 and 1997 Meteorological Data

	Available (hr)	Plume (hr)	Percent
All	43,824	1,226	2.80%
Daylight	22,177	298	1.34%
Nighttime	21,647	928	4.29%
Daylight No Rain/Fog	19,384	33	0.17%
Seasonal Daylight No Rain/Fog*	7,371	29	0.39%

*Seasonal conditions occur anytime from November through April.

These results confirm that the visible plume formation will mainly occur during the cold weather months, with the majority of plume formation occurring at night or early morning. For the proposed auxiliary boiler, the maximum temperature where a visible plume is predicted is 45°F when the relative humidity is 100%.

The MISTVUE modeling analysis visible plume frequency results and visible plume dimension results provided by the Applicant using a one-year (1995) meteorological data set from the PG&E Kettleman City monitoring station, and relative humidity, rain and fog data from Fresno are provided in Table 20 and Table 21, respectively.

Table 20
Applicant Results of Auxiliary Boiler Visible Plume Frequencies

1995 Kettleman City Met Data				
Length	**Total**	**Percentile %**	**Day**	**Percentile %**
No Plume	8,375	95.61	4,294	98.04
<10 m (with plume)	11	0.13	1	0.02
10-60 m	45	0.51	6	0.14
60-100 m	21	0.24	5	0.11
100-400 m	17	0.19	1	0.02
>400 m	291	3.32	73	1.67
Reference Period	8,760 hrs	100	4,380 hrs	100
Length	**Night**	**Percentile %**	**Day No Rain/Fog**	**Percentile %**
No Plume	4,081	93.17	3,871	99.79
<10 m (with plume)	10	0.23	1	0.03
10-60 m	39	0.89	3	0.08
60-100 m	16	0.37	1	0.03
100-400 m	16	0.37	1	0.03
>400 m	218	4.98	2	0.05
Reference Period	4,380 hrs	100	3,879 hrs	100

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 11, page 13) with the Day No Rain/Fog Hours adjusted to exclude the Rain/Fog hours.

Table 21
Applicant Results of Auxiliary Boiler Visible Plume Dimensions

1995 Kettleman City Met Data				
(All dimensions in meters)	Total	Day	Night	Day No Rain/Fog
Maximum Plume Height	56			50
Average Plume Height	18	18	18	20
Maximum Plume Diameter	63			57
Average Plume Diameter	29	28	29	23
Average Plume Length	70	59	71	41
Dimensions for Plume of 90th percentile Height				
Mean Height	31			50
Mean Length	108			101
Mean Diameter	35			43

Source: DR #126-130 (DENA 2002f, Exhibit 126-1, Table 12, page 14).

As shown in Tables 19 and 20, staff's auxiliary boiler plume frequency results using CSVP and a five-year meteorological data set from Lemoore Naval Air Station are slightly lower than the Applicant's results using MISTVUE and a one-year meteorological data set from Kettleman City. The auxiliary boiler plume frequency results are summarized in Table 22.

Table 22
Comparison of Predicted Hours with Auxiliary Boiler Steam Plumes

	Staff CSVP	**Applicant MISTVUE**
Hours with Plume (Percent,%)	**Lemoore Naval Air Station 1992-1995 and 1997**	**Kettleman City 1995**
All	2.80	4.39
Daylight	1.34	1.97
Nighttime	4.29	6.83
Daylight No Rain/Fog	0.17	0.21
Seasonal Daylight No Rain/Fog*	0.39	N/A

*Seasonal conditions occur anytime from November through April.

A plume frequency of 10% of seasonal (November through April) daylight no rain/fog hours is used as a plume impact study threshold trigger. The CSVP model predicted

plume frequencies less then 10% of seasonal daylight no rain/fog hours, which would not trigger a study of the visual impacts of the auxiliary boiler plume. It should be noted that these results are based on auxiliary boiler operation at all hours. The auxiliary boiler, however, will operate for a maximum of 2,500 hours per year, thereby further reducing the probability of plume formation.

CONCLUSIONS

Visible plumes generally occur during periods of cold weather or cool wet weather. The actual frequency of occurrence is weather dependent and will vary from year to year. Additionally, visible plume formation can occur during the daytime or nighttime; however, the meteorological data reviewed indicates that conditions for visible plume formation and maximum plume dimensions are more prevalent during nighttime and early morning hours.

Visible plumes from the proposed AEP wet cooling tower exhaust would occur frequently and occur greater than 10% of seasonal daylight no rain/fog hours. Therefore, a plume impact analysis of the cooling tower plumes will be included in the Visual Resources section of the Final Staff Assessment. However, the cooling tower plume frequency and plume dimension results will need to be remodeled after the Applicant's responds to staff's determination that the Applicant's cooling exhaust temperature data is flawed.

Visible plumes from the AEP chiller cooling towers, HRSGs, and auxiliary boiler will occur with less than 10% frequency for seasonal daytime no rain/fog hours. Therefore, unabated chiller cooling tower, HRSG, and auxiliary boiler plumes do not cause significant visual impacts under the expected operating conditions.

REFERENCES

DENA (Duke Energy North America/Cochran). 2002f. Response to CEC January 24, 2002 Data Request to the Avenal Energy Project. Submitted to the California Energy Commission, February 25, 2002.

DENA (Duke Energy North America/Cochran). 2002g Response to CEC March 25, 2002 Second Data Requests to the Avenal Energy Project. Submitted to the California Energy Commission, April 25, 2002.

TRC (TRC/Stenger). 2001a. Application for Certification for the Duke Energy Avenal Project. Submitted to the California Energy Commission, October 9, 2001.

WASTE MANAGEMENT

Alvin J. Greenberg, Ph.D.

INTRODUCTION

This Preliminary Staff Assessment presents an assessment of issues associated with managing wastes generated from constructing and operating the proposed Avenal Energy Project as proposed by Duke Energy Avenal, LLC (Duke Avenal). Staff evaluated the proposed waste management plans and mitigation measures designed to reduce the risks and environmental impacts associated with handling, storing, and disposing of project-related hazardous and nonhazardous wastes. The technical scope of this analysis encompasses wastes generated during facility construction and operation except wastewater discharged pursuant to National Pollutant Discharge Elimination System (NPDES) permits. Wastewater is discussed in the **Soil and Water Resources** section of this document.

Energy Commission staff's objectives in its waste management analysis are to ensure that:

- management of the wastes will be in compliance with all applicable laws, ordinances, regulations, and standards (LORS). Compliance with LORS ensures that wastes generated during the construction and operation of the proposed project will be managed in an environmentally safe manner; and
- disposal of project wastes will not result in significant adverse impacts to existing waste disposal facilities.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

Resource Conservation and Recovery Act (42 U.S.C. § 6922)

RCRA establishes requirements for the management of hazardous wastes from the time of generation to the point of ultimate treatment or disposal. Section 6922 requires generators of hazardous waste to comply with requirements regarding:

- record keeping practices which identify quantities of hazardous wastes generated and their disposition;
- labeling practices and use of appropriate containers;
- use of a manifest system for transportation; and
- submission of periodic reports to the U. S. Environmental Protection Agency (EPA) or authorized state agency.

Title 40, Code of Federal Regulations, part 260

These sections contain regulations promulgated by the EPA to implement the requirements of RCRA as described above. Characteristics of hazardous waste are

described in terms of ignitability, corrosivity, reactivity, and toxicity; and specific types of wastes are listed.

STATE

California Health and Safety Code §25100 et seq. (Hazardous Waste Control Act of 1972, as amended).

This act creates the framework under which hazardous wastes must be managed in California. It mandates the State Department of Health Services (now the Department of Toxic Substances Control (DTSC) under the California Environmental Protection Agency, or Cal EPA) to develop and publish a list of hazardous and extremely hazardous wastes, and to develop and adopt criteria and guidelines for the identification of such wastes. It also requires hazardous waste generators to file notification statements with Cal EPA and creates a manifest system to be used when transporting such wastes.

Title 14, California Code of Regulations, §17200 et seq. (Minimum Standards for Solid Waste Handling and Disposal)

These regulations set forth minimum standards for solid waste handling and disposal, and guidelines to ensure conformance of solid waste facilities with county solid waste management plans; as well as enforcement and administrative provisions.

Title 22, California Code of Regulations, §66262.10 et seq. (Generator Standards)

These sections establish requirements for generators of hazardous waste. Under these sections, waste generators must determine if their wastes are hazardous according to either specified characteristics or lists of wastes. As in the federal program, hazardous waste generators must obtain EPA identification numbers, prepare manifests before transporting the waste off-site, and use only permitted treatment, storage, and disposal facilities. Additionally, hazardous waste must only be handled by registered hazardous waste transporters. Generator requirements for record keeping, reporting, packaging, and labeling are also established.

Title 22, California Code of Regulations, §67100.1 et seq. (Hazardous Waste Source Reduction and Management Review)

These sections establish reporting requirements for generators of certain hazardous and extremely hazardous wastes in excess of specified limits. The required reports must indicate the generator's waste management plans and performance over the reporting period.

LOCAL

The Kings County Department of Public Health, Division of Environmental Health Services administers the California Laws and Regulations for both non-hazardous and hazardous wastes in the proposed project area. The City of Avenal Fire Department has additional regulatory responsibilities with respect to hazardous wastes. The Avenal Project must comply with applicable City of Avenal Zoning Ordinances (Section 6.2) that are enforced by the Avenal Public Works Department.

SETTING

PROJECT AND SITE DESCRIPTION

The proposed project site is located in the northeast corner of the City of Avenal in Kings County, California, near its border with Fresno County. While the site is legally within the City limits it is physically separated from the residential and commercial districts of Avenal by about six miles and the intervening topography of the Kettleman Hills. The site area has been zoned for the development of an industrial park due to its proximity with Interstate 5 (approximately 2 miles away), and the PG&E Kettleman natural gas compressor station (approximately 7,000 feet away). The site can be accessed from Avenal Cutoff Road. The City of Avenal is the nearest population center, with the City of Huron approximately 8 miles to the north of the project site and the City of Coalinga approximately 16 miles to the west.

The site for the proposed project is located within an agricultural region lying along the western edge of the San Joaquin Valley. As a result, all site soils and most surrounding area soils have been disturbed for active crop production. The exception to this is the northeast corner of the site, which is bordered by the San Luis Canal of the California Aqueduct, and the City of Avenal Water Treatment Plant. The site itself has been used to grow potatoes, cotton, barley, melons and onions since 1951. Prior to that time it was covered by native sagebrush and used to graze sheep. There are no natural surface waters in or around the proposed site. The topography of the area is relatively flat, sloping from approximately 360 to 320 feet above sea level.

The proposed Avenal Project will occupy most of the northeast quarter of Section 19, Township 21 South, Range 18 East, Mt. Diablo Base and Meridian, on a parcel owned by Duke Avenal. It will be comprised of two new Combustion Turbine Generators (CTG), two Heat Recovery Steam Generators (HRSG), and one Steam Turbine Generator (STG), along with accompanying water treatment and cooling facilities, control and administration facilities, a natural gas pipeline, water supply pipelines, electrical transformers and switchgear, a short electric transmission line, and other related equipment. As proposed, the combined cycle system will have a nominal generating capacity of approximately 600 megawatts (MW). Raw water for the project will be supplied primarily from the San Luis Canal with several nearby agricultural wells serving as backup sources.

A Phase I Environmental Site Assessment of the proposed project site was performed by TRC during the year 2001 in accordance with methods prescribed by the American Society for Testing and Materials (ASTM) guideline E 1527-00. The report of this effort dated August 3, 2001 is included as Appendix 6.14-1 of the AFC, and indicates no evidence or record of contamination or adverse recognized environmental condition other than historical agricultural use for crop production. Agricultural chemicals in the forms of pesticides and fertilizers have been applied to the subject property thus presenting the possibility that elevated concentrations of these materials may be found in the site soils. The presence of pesticides could cause a potential for an increased risk to workers and/or the off-site public during site preparation activities. Therefore, staff proposes that either the applicant conduct definitive sampling and analysis to

demonstrate that the risks and hazards are insignificant or that precautions be taken as proposed in Condition of Certification **Waste-8**.

IMPACTS

PROJECT SPECIFIC IMPACTS

Construction

Site preparation and construction of the proposed generating plant and associated facilities will last approximately 20 months and generate both nonhazardous and hazardous wastes in solid and liquid forms.

Nonhazardous solid wastes anticipated to be generated during construction are detailed in Section 6.14.2.1.1 of the AFC and summarized in Table 6.14-2. Approximately 40 cubic yards of wastes per week comprised of minimal vegetation debris, lumber, excess concrete, metal, glass, empty non-hazardous chemical containers, paper, cardboard, plastics and insulating materials are anticipated during the 20 months of construction activities. These wastes will be the responsibility of the construction contractor, and will be segregated and either recycled or disposed of in one of three nearby Class III disposal facilities.

Nonhazardous liquid wastes will be generated during construction, including sanitary wastes and runoff from pipe hydrotesting, equipment washing, and stormwater. These wastes are listed in Table 6.14-2 of the AFC and discussed in the **Soil and Water Resources** section of this document.

Hazardous wastes anticipated to be generated during construction are discussed in Section 6.14.2.1.2 of the AFC and are also summarized in Table 6.14-2. *Solid* hazardous wastes may include spent welding materials (approximately 200 pounds per month), waste oil filters (approximately 200 pounds per month), oily rags and absorbent (one 55-gallon drum per month), spent batteries, and empty hazardous materials containers. In total, approximately one cubic yard of solid hazardous waste per week is anticipated to be generated during construction. Additionally, during site preparation, soil containing harmful levels of pesticides may be generated.

Liquid hazardous wastes would include unused or spent chemicals including waste oil (estimated 20 gallons per month and an additional 11,000 gallons of construction flush oil); flushing and cleaning fluids (estimated 150,000 to 350,000 total gallons); and waste solvents, oils, paints, and adhesives (estimated 165 gallons per month). The treatment method of choice for the waste oils, batteries, and oily rags will be recycling at a permitted facility. The water used for hydro-testing and the cleaning and flushing and liquids will be sampled and analyzed to determine whether or not they possess any hazardous characteristics, and disposed of accordingly. Any non-recyclable hazardous wastes would be properly disposed of in a permitted Class I facility, most probably the Kettleman Hills facility because of its close proximity to the proposed project.

By contract, Duke Avenal will require its individual construction subcontractors to be responsible for the proper handling and disposal of hazardous wastes and therefore responsible for compliance with all applicable LORS regarding these wastes.

Operation

The proposed Avenal Energy Project will generate both nonhazardous and hazardous wastes in solid and liquid forms under normal operating conditions as described in Section 6.14.2.2 of the AFC. Table 6.14-3 in the AFC lists these wastes by hazard class and physical state (solid or liquid), along with their respective amounts, frequency of generation, and proposed management methods.

Nonhazardous solid wastes

Nonhazardous solid wastes generated during plant operation are expected to be similar to those typical of functioning power-generating facilities, including broken and worn parts, wood pallets, spent air filters and packaging materials. Large roll-off containers will be provided for the collection of recyclable materials such as steel and aluminum. The administrative functions and worker activities at the proposed project will generate waste paper, cardboard and some food wastes. An annual total of approximately 50 tons of these wastes is anticipated.

The exhaust gas treatment system will result in the generation of solid, nonhazardous waste in the form of spent CO Oxidation catalyst. Approximately 4.5 tons of this waste material will be returned to the manufacturer every 3 years for metals reclamation and/or disposal.

zero liquid discharge system

As part of its mitigation to minimize the use of fresh water, and reduce wastewater, Avenal Energy Project will install a zero liquid discharge system. This system consists of a two stage process: brine concentrator (or evaporator), and a salt-cake crystallizer.

The cooling tower blowdown flows into the evaporator feed tank where sulfuric acid and scale inhibitor chemicals are added to control pH and scale and to prevent silica precipitation on the downstream heat exchanger surfaces. The water from the feed tank is pumped through a plate heat exchanger and a deaerator where CO_2 and other non-condensibles are stripped before entering the evaporator. In the crystallizer, the brine becomes supersaturated in salts, which then precipitate from solution as crystals. These crystals are continuously removed by filtration and discharged from the system.

The operation of the Avenal Zero Liquid Discharge Facility (ZLDF) and raw water softener clarifier (RWSC) will result in the annual generation of approximately 3,400 to 8,300 tons of salt cake waste from the crystallizer and dewatered clarifier sludge (Duke 2001a, Page 6.14-10). Testing was done for similar ZLDF systems in support of the Three Mountain Project and Pastoria Energy Facility siting cases in order to determine if the wastes might be classified as hazardous. Analyses of the solid wastes similar to those that would be generated from the softener as well as the crystallizer indicated that all metals of concern were below California regulatory limits that define hazardous waste (Ogden 2000a and PEF/Thompson 2000f). In order to ensure the correct classification of such wastes from the proposed project, however, staff proposes

Conditions of Certification WASTE-6 and –7, which would require testing of the brine concentrator effluent and salt cake.

Although the solid waste generated from the crystallizer may not be classified as hazardous, it might be considered a California designated waste due to its high salt content. The category of designated waste includes nonhazardous waste that contains pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations that could exceed applicable water quality objectives or affect the beneficial uses of waters of the state (Cal. Code Regs., tit. 27, § 20210). Designated wastes are required to be disposed of at Class I or Class II disposal sites.

The effluent from the brine concentrator is subsequently routed to the crystallizer for further concentration. If the effluent were to contain hazardous levels of any constituent, such concentration could be considered hazardous waste treatment, a process which would require a permit from the Department of Toxic Substances Control. However, since the effluent water is reused in the plant, a recycling exemption provided for in Health and Safety Code section 25132.2(c)(2) would apply as long as the following conditions are met:

1. The wastewater must be recycled at the same facility at which it was generated.
2. The wastewater must be recycled within generator waste accumulation time limits.
3. The wastewater must be managed in accordance with all applicable requirements for generators of hazardous wastes under Health and Safety Code Chapter 6.5 and regulations adopted by DTSC.

Staff proposed Condition of Certification WASTE-7 requires testing of the effluent from the brine concentrator as a hazardous waste. If it is determined to be hazardous, Avenal Energy would have to apply for a recycling exemption from DTSC.

Construction and operation of the zero liquid discharge system would not have any significant effects on any of the other waste streams generated at Avenal Energy Project.

Nonhazardous liquid wastes

Nonhazardous liquid wastes will be generated during facility operation, and are discussed in the **Soil and Water Resources** section of this document. It should be noted here that Duke Avenal proposes the implementation of an NPDES Stormwater Pollution Prevention Program and the ZLDF system noted above as a means of eliminating the offsite discharge of project wastewater, thereby eliminating potential impacts to offsite water resources and wastewater management facilities. Project sanitary waste will be handled via an on-site septic system and leach field.

Hazardous wastes

Hazardous wastes anticipated to be generated during routine project operation include materials contaminated with petroleum products, used containers, sandblast sands, batteries, boiler bottom ash, waste oil and oily water, spent cleaning solvents, ethylene glycol, spent Selective Catalytic Reduction (SCR) catalyst and turbine/generator

chemical cleaning wastes. Approximately 10 tons of solid hazardous wastes and 3,000 gallons of liquid hazardous wastes would be generated annually (some of the liquid wastes can be recycled). In addition, 1,300 gallons of waste oil would be generated each year. The spent Selective Catalytic Reduction (SCR) emission control catalysts containing heavy metals would require regeneration every six years resulting in approximately 50 tons of waste materials. The spent catalyst would be returned to the manufacturer for reclamation and/or disposal.

The CTGs will be cleaned once annually, resulting in the generation of approximately 42 tons of waste cleaning products. The HRSGs will be cleaned every 5 years, resulting in the generation of approximately 210 tons of waste cleaning products with each cleaning. These efforts will be conducted by a licensed contractor who will be responsible to temporarily store these waste products onsite and analyze them to determine if they possess any hazardous characteristics. The contractor will then be responsible for appropriate offsite disposal.

IMPACT ON EXISTING WASTE DISPOSAL FACILITIES

Table 6.14-1 of the AFC lists three Class III facilities that will accept nonhazardous solid wastes from the Avenal project. The closest facility is the City of Avenal Landfill located approximately 2 miles from the project site. This landfill has a remaining capacity of 6.6 million cubic yards and an estimated closure date in the year 2050. In aggregate, the three listed facilities possess a total of approximately 12.4 million cubic yards of remaining capacity, an *actual annual* disposal rate of 214,000 tons/year, and a *permitted daily* disposal rate of 1,150 tons/day. The annual quantity of solid nonhazardous waste from the Avenal Project requiring off-site disposal during operation would increase the current annual aggregate disposal rate by a small percentage. Overall, the project would not significantly impact the capacity or remaining life of these facilities.

Section 6.14.1.2 of the AFC discusses the three Class I landfills in California that are permitted to accept hazardous waste: Kettleman Hills in King's County, Buttonwillow in Kern County, and Westmorland in Imperial County. The applicant indicates that, in total, these facilities possess an excess of 17.1 million cubic yards of remaining hazardous waste disposal capacity, with remaining operating lifetimes up to the year 2050. The amount of hazardous waste transported to these landfills has decreased in recent years due to source reduction efforts by generators, and the transport of waste out of state that is hazardous under California law, but not federal law. In addition, the applicant indicates that oily debris may be disposed of at the Forward Landfill in Manteca, California, a Class II facility with a 12.9 million cubic yard capacity. Waste oil service companies, hazardous waste transporters, and treatment, storage and disposal (TSD) facilities that may be used by the Avenal facility are listed by the applicant.

Much of the hazardous waste generated during facility construction and operation will be recycled, such as used oil and spent catalysts. The volume of hazardous waste from the proposed project requiring off-site disposal would be a very small fraction of the existing combined capacity of the three Class I landfills, and would not significantly impact the capacity or remaining life of any of these facilities.

CUMULATIVE IMPACTS

As proposed, the quantities of nonhazardous and hazardous wastes generated during construction and operation of the Avenal Energy project will add to the total quantities of waste generated in Kings County and the State of California. This facility will generate an estimated 3,200 cubic yards of solid waste during construction and approximately 8,250 tons per year during operation. Additionally, it will produce approximately 4,300 gallons of waste oil and hazardous liquid wastes each year, 42 tons of CTG wash waste each year, 210 tons of HRSG cleaning waste once every 5 years, 4.5 tons of CO catalyst every 3 years, and 50 tons of SCR catalyst once every 6 years.

The Applicant recognizes other projects that are expected to be constructed and operated within the same timeframe as the proposed Avenal project, and that will generate similar types and quantities of wastes (Duke 2001a, AFC Section 6.14.2.4 and Table 6.1-1). With one exception, the listed projects will use other solid waste landfills than those noted for the Avenal project, so no cumulative impacts will be experienced. With respect to the remaining project, a water turnout relocation for the City of Avenal, the wastes generated are expected to be minimal and result in no significant cumulative impacts.

Capacity is available in a variety of disposal facilities to accommodate the increase of wastes resulting from the Avenal project. In addition, recycling efforts will be prioritized wherever practical to minimize the quantities of waste requiring disposal. Consequently, if Duke Avenal can mitigate the disposal rate of the salt cake waste matter discussed above, the added quantities of wastes will not result in significant waste management impacts.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is greater than fifty percent within a six-mile radius of the proposed Avenal Energy Project (please refer to **Socioeconomics Figure 1** in this Staff Assessment), and Census 1990 information that shows the low-income population is less than fifty percent within the same radius. Although the minority population within the six-mile radius is greater than 50 percent, the actual number of people living within the six mile radius (331) is very small and widely dispersed. Staff has concluded that since there will be no significant direct or cumulative waste-related impacts, there will also be no significant impact to any minority or low-income populations. Therefore, there are no environmental justice issues related to waste management.

FACILITY CLOSURE

During any type of facility closure (see staff's General Conditions section which discusses planned, unexpected temporary, and unexpected permanent closure), the primary waste management related concern is that project wastes not pose any potentially significant problem to the public, workers, or the environment. Staff believes that conditions of certification in the General Conditions section will adequately address waste management issues related to closure.

In the case of unexpected temporary closure, waste management practices normally required by LORS and already in-place (such as limiting hazardous waste accumulation time to 90 days and requiring proper containment) would be adequate to avoid significant problems. In addition, staff's General Conditions for Facility Closure requires preparation of an on-site contingency plan, which shall provide for removal of hazardous wastes and draining of all chemicals from storage tanks and other equipment for temporary closures exceeding 90 days.

An approved on-site contingency plan is also required to protect public health and safety in the case of unexpected permanent closure. As above, the plan must provide for the removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment.

For planned permanent closure, Duke Avenal will develop a facility closure plan at least twelve months prior to commencement of closure and is committed to complying with LORS which are applicable at the time of closure.

COMPLIANCE WITH APPLICABLE LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Energy Commission staff concludes that Duke Avenal will be able to comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during facility construction and operation once approvals are received for the solid waste disposal plans. The applicant is required to dispose of hazardous and non-hazardous wastes at facilities approved by the various departments within the California Environmental Protection Agency (CalEPA). Because hazardous wastes will be produced during project construction and operation, both Duke Avenal and its construction contractor(s) will be required to obtain hazardous waste generator identification numbers from the California Department of Toxic Substances Control (DTSC). Accordingly, each of these entities will be required to properly store, package and label waste, use only approved transporters, prepare hazardous waste manifests, keep detailed records, and appropriately train their employees. Pursuant to California Code of Regulations, Title 22, section 67100.1 et seq., a hazardous waste Source Reduction and Evaluation Review and Plan must be prepared by Duke Avenal, which meets the requirements of SB-14.

MITIGATION

In section 6.14.2 of the AFC and in data responses Duke Avenal discusses overall efforts intended to minimize and mitigate the impacts of waste generation. Section 6.14.2.2 indicates that the proposed project will establish four plans to guide the management of hazardous waste:

- Business Plan / Contingency Plan
- Spill Prevention Control and Countermeasures Plan
- Stormwater Pollution Prevention Plan
- Best Management Practices Plan

These plans will detail measures to be employed in responding to spills and leaks, as well as employee training processes and periodic inspection and release prevention measures.

Section 6.14.2.3 discusses waste minimization efforts to be employed at the proposed facility, including commitments to operational and production improvements, and administrative controls and employee incentives. The prioritization of recycling, the establishment of alternatives to disposal, and the selection of nonhazardous materials and processes are also mentioned.

Section 6.14.2.5 notes that construction contractors will be responsible for the generation and disposal of all construction wastes, and that a ZLDF process will be employed to minimize operational liquid wastes.

Staff has proposed standard Conditions of Certification **WASTE-1, 2, 3, 4, and 5** which require that: **1**) the project owner notify the CEC Compliance Project Manager whenever the owner becomes aware of any impending waste management-related enforcement action; **2**) the project owner and/or its construction contractor obtain a hazardous waste generator identification number from the Department of Toxic Substances Control (DTSC) in accordance with DTSC regulatory authority; **3**) the project owner prepare and submit waste management plans for all wastes generated during construction and operation of the facility and submit them to the CPM and the local agency; **4**) the project owner have an experienced Registered Professional Engineer or Geologist available for consultation during soil excavation and grading activities in the event that contaminated soils are encountered; and **5**) if potentially contaminated soil is unearthed during excavation at either the proposed site or linear facilities, the Registered Professional Engineer or Geologist shall inspect the site, determine the need for sampling nature, file a written report, and seek guidance from the CPM and the appropriate regulatory agencies.

Proposed Conditions of Certification **WASTE-6 and 7** address the salt cake and effluent from the brine concentrator. The presence of pesticides could cause a potential for an increased risk to workers and/or the off-site public during site preparation activities and therefore staff proposes that either the applicant conduct definitive sampling and analysis to demonstrate that the risks are insignificant or that precautions be taken as proposed in Condition of Certification **Waste-8**.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

None received.

CONCLUSIONS AND RECOMMENDATIONS

Management of the wastes generated during construction and operation of the Avenal Energy Project will not result in any significant adverse impacts if Duke Avenal implements the waste management measures proposed in the Application for Certification and the proposed conditions of certification.

CONDITIONS OF CERTIFICATION

WASTE-1 Upon becoming aware of any impending waste management-related enforcement action, the project owner shall notify the CPM of any such action taken or proposed to be taken against it, or against any waste hauler or disposal facility or treatment operator with whom the owner contracts.

Verification: The project owner shall notify the CPM in writing within 10 days of becoming aware of an impending enforcement action.

WASTE-2 Both the project owner and, if necessary, its construction contractor(s), shall each obtain hazardous waste generator identification numbers from the Department of Toxic Substances Control (DTSC) in accordance with DTSC regulatory authority.

Verification: The project owner and its construction contractors shall keep copies of the identification numbers on file at the project site and notify the CPM via the monthly compliance report of their receipt.

WASTE-3 Prior to the start of construction and operation activities, the project owner shall prepare and submit to the Kings County Department of Public Health, Division of Environmental Health Services and the City of Avenal Fire Department for review and comment, and to the CPM for review and approval, waste management plans for all wastes generated during construction and operation of the facility, respectively. The plans shall contain, at a minimum, the following:

- a description of all expected waste streams, including hazard classifications and projections of quantity and frequency;
- methods of managing each waste, including treatment methods and companies contracted with for treatment services, waste testing methods to assure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/reduction plans;
- a stated goal that not less than 50 percent of all construction and operation wastes will be recycled. Measures that will allow that goal to be achieved should be identified; and
- a statement that the project owner will participate in the local recycling program to the extent that the local program is consistent with state law.

Verification: No less than 30 days prior to the start of site mobilization , the project owner shall submit the construction waste management plan to the Kings County Department of Public Health, Division of Environmental Health Services and the City of Avenal Fire Department for review and comment, and to the CPM for review and approval. The operation waste management plan shall be submitted no less than 30 days prior to the start of project operation. The project owner shall submit any required revisions within 20 days of notification by the CPM (or mutually agreed upon date). In the Annual Compliance Reports, the project owner shall document the actual waste

management methods used during the year compared to planned management methods and the actual quantities of material recycled and disposed of.

WASTE-4 The project owner shall have a Registered Professional Engineer or Geologist, with experience in remedial investigation and feasibility studies, available for consultation during soil excavation and grading activities. The Registered Professional Engineer or Geologist shall be given full authority to oversee any earth moving activities that have the potential to disturb contaminated soil.

Verification: 30 days prior to the start of site mobilization , the project owner shall submit the qualifications and experience of the Registered Professional Engineer or Geologist contracted for consultation to the CPM for approval.

WASTE-5 If potentially contaminated soil is unearthed during excavation at either the proposed site or linear facilities as evidenced by discoloration, odor, detection by handheld instruments, or other signs, the Registered Professional Engineer or Geologist shall inspect the site, determine the need for sampling to confirm the nature and extent of contamination, and file a written report to the project owner and the CPM stating the recommended course of action. Depending on the nature and extent of contamination, the Registered Professional Engineer or Geologist shall have the authority to temporarily suspend construction activity at that location for the protection of workers or the public. If, in the opinion of the Registered Professional Engineer or Geologist, significant remediation may be required, the project owner shall contact representatives of the Kings County Department of Public Health, Division of Environmental Health Services, DTSC, the Regional Water Quality Control Board (RWQCB) (if appropriate), and the local Air Quality Management District (if appropriate) for guidance and possible oversight.

Verification: The project owner shall submit any final reports filed by the Registered Professional Engineer or Geologist to the CPM within five days of their receipt. The project owner shall notify the CPM within 24 hours of any orders to halt construction.

WASTE-6 The project owner shall test the salt cake product from the crystallizer for the presence of hazardous levels of metals. If levels are below ten times the Soluble Threshold Level Concentration as listed in Title 22, California Code of Regulations, section 66261.24, then future testing is not required unless there is a substantial change in the wastewater treatment process. If not classified as a hazardous waste, the project owner shall manage the salt cake product appropriately as a nonhazardous or designated waste unless it is sold as a commercial product.

Verification: As soon as practicable but no later than 30 days after the initial generation of salt cake, the project owner shall notify the CPM of the test results and the planned disposal method.

WASTE-7 The project owner shall test representative samples of the effluent from the brine concentrator for the presence of hazardous levels of metals. If test results indicate that the effluent is classified as hazardous, then the project owner shall apply to DTSC for a recycling exemption for hazardous waste treatment as provided for in Health and Safety Code section 25132.2(c)(2).

Verification: Within 60 days of beginning commercial operation, the project owner shall notify the CPM of the test results for the brine concentrator effluent. If applicable, the project owner shall include a copy of the DTSC application, and shall notify the CPM upon receipt of the exemption from DTSC.

WASTE-8 The applicant shall either conduct definitive sampling and analysis to demonstrate that the risk or hazard to workers and the public posed by the possible presence of pesticides in soils at the site are insignificant or ensure that no fugitive dust emissions leave the site and that all workers involved in activities involving disturbing soil be thoroughly trained and prepared to encounter soils containing hazardous wastes. Training shall include, but not be limited to, Hazardous Waste Operations (8 CCR 5192) and Hazard Communication (Title 8, Cal. Code of Regs., §5194).

Verification: Not later than 30 days prior to commencement of site preparation, the applicant shall provide to the CPM for review and approval either the results of a sampling and analysis plan to the CPM demonstrating insignificant risk and hazard or a copy of the fugitive dust mitigation plan (see Air Quality section) and worker instructions and training programs that will be implemented.

REFERENCES

Duke Avenal 2001a. Application for Certification for the Avenal Energy Project (01-AFC-20). October 2001.

Duke Avenal 2002a. Applicant's response to Data Requests February 25, 2002.

Ogden 2000a. Detailed Mitigation Plan and Analysis of Impact Assessments in Resource Areas Affected by the Mitigation Plan. Three Mountain Power, LLC. AFC-99-02. Submitted to the California Energy Commission. August 21.

PEF (Pastoria Energy Facility/Thompson) 2000f. Applicant's Data Request Responses (Third Data Response Submittal). Submitted to the California Energy Commission on April 3, 2000.

SOILS AND WATER RESOURCES

Kristine Uhlman, John Kessler, and Lorraine White

INTRODUCTION

This section analyzes potential effects on soil and water resources by the Avenal Energy Project (AEP), as proposed by Duke Energy North America, LLC (Applicant). The analysis specifically focuses on the potential for the project to cause impacts in the following areas:

- Whether construction or operation would lead to accelerated wind or water erosion and sedimentation.
- Whether the project would exacerbate flood conditions in the vicinity of the project.
- Whether the project's demand for water would adversely affect surface or groundwater supplies.
- Whether project construction or operation would lead to degradation of surface or groundwater quality.
- Whether the project would comply with all applicable laws, ordinances, regulations and standards.

Where the potential for impacts is identified, staff has proposed mitigation measures to reduce the significance of the impact and, as appropriate, has recommended conditions of certification.

Solid waste disposal is also discussed in the **Waste Management** section, as are land use effects in the **Land Use** section of this Staff Assessment.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL

Clean Water Act (CWA)

The Clean Water Act (33 U.S.C. Section 1251 et seq.) was enacted with the intent of restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States. The CWA requires states to set standards to protect, maintain, and restore water quality through the regulation of point source and certain non-point source discharges to surface water. Those discharges are regulated by the National Pollutant Discharge Elimination System (NPDES). In California, NPDES permitting authority is delegated to, and administered by, the nine Regional Water Quality Control Boards (RWQCB).

Section 401 of the Clean Water Act requires that any activity that may result in a discharge into a water body must be certified by the RWQCB. This would apply to stream crossings during pipeline construction. This certification ensures that the proposed activity will not violate state and federal water quality standards.
Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (ACOE) to regulate the discharge of dredged or fill material within the waters of the U.S. and adjacent wetlands. The ACOE issues individual site-specific or general (nationwide) permits for such discharges.

Reclamation Reform Act

Public Law 97-293 (43 U.S.C. section 390aa et seq.) Title II, Reclamation Reform Act of 1982 (following on the establishment of Reclamation Services by the Reclamation Act of 1902) allows for the management, development, and protection of water and related resources by the Bureau of Reclamation. The Bureau also serves as the second largest wholesale water supplier in the nation. Water management within the region of the proposed plant site is regulated under the Central Valley Project (CVP), which was authorized in the mid-1920's to oversee flood control, power generation, and water service for municipal, industrial, and irrigation supply.

The Central Valley Project Improvement Act of 1992 (Pub. L. No. 102-575, title 34, 106 Stat. 4706) reauthorized the CVP but added fish and wildlife to the responsibilities of the Bureau (in addition to some constraints on the generation of new water service contracts pending system improvements addressed in a Record of Decision (ROD) signed in 1999). Water supply provided by tie-in to the California Aqueduct, Mile Post 164.66 of Rayment Reach 7 (San Louis Canal) will be subject to the Bureau's construction guidelines, and includes a requirement to comply with environmental regulations. The Bureau of Reclamation will serve as the Lead Agency under NEPA for the proposed construction of the new City of Avenal turnout, which will also serve water to the proposed AEP.

STATE

California Constitution, Article X, Section 2

This section requires that the water resources of the State be put to beneficial use to the fullest extent possible and states that the waste, unreasonable use, or unreasonable method of use of water is prohibited. The conservation of such waters is to be exercised with a view to the reasonable and beneficial use in the interest of the people and for the public welfare. This section is self-executing.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1967, Water Code Section 13000 et seq., requires the State Water Resources Control Board (SWRCB) and the nine RWQCBs to adopt water quality criteria to protect state waters. These criteria include the identification of beneficial uses, narrative and numerical water quality standards and implementation procedures. The criteria that apply to AEP are contained in the Central Valley Regional Water Quality Control Plan. These standards are typically applied to the proposed project through the Waste Discharge Requirements (WDRs) permit. The Porter-Cologne Water Quality Control Act also requires the SWRCB and nine RWQCBs to ensure the protection of water quality through the regulation of waste discharges to

land. Such discharges are regulated under Title 23, California Code of Regulations, Chapter 15, Division 3.

California Water Code

Section 13552.6 of the Water Code specifically identifies that the use of potable domestic water for cooling towers, if suitable reclaimed water is available, is a waste or unreasonable use of water. The availability of reclaimed water is determined based on criteria listed in Section 13550 by the SWRCB. Those criteria include provisions that the quality and quantity of the reclaimed water are suitable for the use, the cost is reasonable, the use is not detrimental to public health, and will not impact downstream users or biological resources.

Section 13552.8 of the Water Code states that any public agency may require the use of reclaimed water in cooling towers if reclaimed water is available, meets the requirements set forth in Section 13550, that there will be no adverse impacts to any existing water right, and that if public exposure to cooling tower mist is possible, appropriate mitigation or control is provided.

Water Code Section 13146

State offices, departments and boards in carrying out activities which affect water quality, shall comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the state board in writing their authority for not complying with such policy.

California Department of Water Resources

The California Department of Water Resources (DWR) will need to enter into a three-party Point of Delivery Agreement with Kern County Water Agency (KCWA) and Kings County to exchange local KCWA's water for a like amount of KCWA's SWP water delivered via the Rayment Reach 7 of California Aqueduct to the proposed AEP. (AEP 2001b, Response to Data Adequacy Comments) The purpose of this Agreement among DWR, KCWA, and Kings County is to set forth provisions governing the delivery of the KCWA's local water to AEP by exchanging the KCWA's local water for a like amount of KCWA's SWP water delivered to the proposed new turnout at approximately Mile Post 164.66 of the California Aqueduct. DWR shall not be obligated to convey such water at times when such delivery would adversely impact SWP operations or facilities, or other SWP contractors' water deliveries or costs, as determined by DWR.

State Water Resources Control Board (SWRCB) Resolution 75-58

The SWRCB has adopted policies that provide guidelines for water quality protection. The principal policy of the SWRCB, which specifically addresses the siting of energy facilities, is the Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling (adopted by the Board on June 19, 1975 as Resolution 75-58). This policy states that use of fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. This SWRCB policy requires that power plant cooling water should come from, in order of priority: wastewater being discharged to the ocean, ocean water, brackish water from natural sources or irrigation return flow, inland waste waters of low total dissolved solids, and other inland waters. This policy also includes cooling water discharge prohibitions such as land application.

SWRCB Resolution 77-1

State Water Resources Control Board Resolution 77-1 encourages and promotes reclaimed water use for non-potable purposes.

Recycling Act of 1991

The California legislature's Water Recycling Act of 1991 (Water Code § 13575 et seq.). This Act makes the following findings and declarations.

- The State is subject to periodic drought conditions;
- The development of traditional water resources in California has not kept pace with the State's population which is growing at the rate of over 700,000 per year and is anticipated to reach 36 million by the year 2010;
- There is a need for a reliable source of water for uses not related to the supply of potable water to protect investments in agriculture, green belts, recreation, to replenish groundwater basins, and to protect and enhance fisheries, wildlife habitat, and riparian areas;
- The environmental benefits of reclaimed water include a reduced demand for water in the Sacramento-San Joaquin Delta, reduced discharge of waste into the ocean, and the enhancement of groundwater basins, recreation, fisheries, and wetlands;
- The use of reclaimed water has proven to be safe, and the State DHS is updating regulations for its use;
- The use of reclaimed water is a cost-effective, reliable method of helping to meet California's water supply needs;
- The development of the reclaimed water infrastructure will provide jobs and enhance the economy of the state;
- Retail water suppliers and reclaimed water producers and wholesalers should promote the substitution of reclaimed water for potable and imported water in order to maximize the appropriate cost-effective use of reclaimed water in California;
- Reclaimed water producers, retail water suppliers, and entities responsible for groundwater replenishment should cooperate in joint technical, economic, and environmental studies, as appropriate, to determine the feasibility of providing reclaimed water service;
- Retail water suppliers and reclaimed water producers and wholesalers should be encouraged to enter into contracts to facilitate the service of reclaimed and potable water by the retail water suppliers in their service areas in the most efficient and cost-effective manner; and
- Reclaimed water producers, wholesalers and entities responsible for groundwater replenishment should be encouraged to enter into contracts to facilitate the use of reclaimed water for groundwater replenishment if reclaimed water is available and the authorities having jurisdiction approve its use.

Wholesale prices set by reclaimed water producers and reclaimed water wholesalers should reflect an equitable sharing of the costs and benefits associated with the development and use of reclaimed water.

SWRCB Resolution 68-16

SWRCB Resolution No. 68-16 (the "Anti-Degradation Policy") declares that it is the State's policy for maintaining existing high quality waters to the maximum extent possible. The existing high water quality must be maintained until demonstrated to the State that any proposed change will be consistent with the maximum benefit to the people of the state and will not unreasonably affect present or future beneficial uses. Any activity which discharges a waste to existing high quality waters will be required to provide the best practicable treatment necessary to assure that pollution or nuisance will not occur and that the highest water quality, consistent with maximum benefit to the people of the State, will be maintained.

LOCAL

Kings County

Kings County Code of Building Regulations (Appendices 2-1 and 2-2) sets forth grading requirements. Kings County is also a long-term SWP contractor and must consent to the delivery of KCWA's SWP water to King's County service area.

Kings County Water Commission

The Kings County Water Commission generates guidance policy to Kings County addressing the protection and appropriate management of local water resources. It is the written position of the Commission that the County is currently in a ground water overdraft condition; any increase in pumping will deplete the resource and exacerbate land subsidence. The Commission's policy is that any further development in the County must not result in a net increase in ground water usage (Eymil, April 2002).

City of Avenal

The City of Avenal reviews and approves septic system designs and installation for compliance with the Kings County Building Department Code, Code of Building Regulations Appendices 2-1 and 2-2. The City also reviews and provides comments on the Grading and Erosion/Sediment Control Plans (also documented in Appendices 2-1 and 2-2).

ENVIRONMENTAL SETTING

REGIONAL AND VICINITY DESCRIPTION

The Avenal Energy Project area is located on the west side of the San Joaquin Valley, about 200 miles north of Los Angeles and 200 miles south of San Francisco, and is accessed from the Avenal Cutoff Road east of the Avenal turnoff on Interstate 5. The area is characterized by rolling hills (Kettleman Hills) to the west and the plains of the San Joaquin Valley to the east. The climate is cool in the winter, and hot and dry in the summer. Average rainfall is between 6 and 7 inches per year.

The Avenal Energy Project will produce a nominal electrical power output of 600 MW for delivery to the California grid system, and consists of the construction and operation of a natural gas-fired combined-cycle electric power generating plant and ancillary facility. The project will occupy 53 acres (25 acres for the plant and 28 acres for associated landscaping) of an approximately 148-acre irrigated parcel in the northeast corner of the City of Avenal, Kings County, California. The parcel is used for farming and is surrounded by open farmland except for the City of Avenal water treatment facility. Annual irrigation rates for the project site is 3 acre-feet a year per acre (AFY/A) (AEP 2002c, Data Request #77).

The San Joaquin Valley is one of the most productive agricultural regions in the world. Agricultural productivity has been achieved by the development of water from ground and surface sources, irrigation facilities, and an engineered system of water storage and conveyance. Several water districts manage the distribution of water in the Valley, with the Westland's Water District responsible for the area within Kings County.

Historic ground water development in the Valley for agricultural use has been responsible for overdraft of the aquifer, with ground water elevations reported to have dropped by as much as 400 feet. Land subsidence has been reported throughout the Valley due to this overdraft, with up to 29 feet of subsidence reported in the central portion of the Valley, to the northeast of the proposed AEP. Ground water elevation recovery has been reported to have been achieved by offsetting ground water production with the importation of fresh surface water for irrigation (AFC Appendix 6.5-2). In the Project area, agricultural water supply is obtained primarily from the California Aqueduct that passes adjacent to the site, and from deep ground water supply wells. Lands surrounding the site are predominantly in agricultural use, which is typical of the region.

The project site is zoned industrial and is located within the City of Avenal, close to existing gas, water, and electrical transmission infrastructure with several new linear facilities required for tie-in. The Project will be part of the City's planned industrial park that has been sited, in part, to take advantage of access to nearby Interstate 5 and the Kettleman Compressor Station (AEP 2001a, AFC Section 1.0).

Several new linear facilities will also be required. Please refer to the project description section for illustrations describing these facilities and mapped proposed routes. The preferred routes for each are described as follows:

1) The natural gas pipeline, consisting of approximately 2.5 miles of 20-inch diameter pipeline, would tie-in to an existing PG&E gas line at the Kettleman compressor station. The compressor station facility boundary is as near as approximately 7,000 feet southwest of the site. The pipeline would run primarily along Avenal Cutoff Road.

2) The transmission line, consisting of approximately 1.3 miles of 230 kV double circuit line, would interconnect with PG&E's Gates-ARCO 230 kV line. The new transmission line would extend south from the AEP switchyard along the parcel

boundary, veering southwest across the corner of the parcel, and then west to the point of interconnection with PG&E.

3) The raw water pipeline, serving as the primary source of water supply for the project, will consist of approximately 0.5 miles of pipeline. The pipeline would extend to the west along the access road from the City of Avenal's Water Treatment Plant (Water Way), supplied from and located adjacent to the California Aqueduct, and would then run to the south onto the AEP site. In conjunction with supply to AEP, the City of Avenal is relocating its turnout from the California Aqueduct approximately 1/8th of a mile upstream of its existing location, in order to move its diversion of surface water upstream of a gated regulating structure, Checkgate No. 20, on the California Aqueduct, which will achieve improved water quality. The new turnout will be located on the right bank at Mile Post 164.66 of California Aqueduct, and designed for a capacity of 60 cubic feet per second (cfs).

4) The raw water pipelines, serving ground water from three existing wells as the secondary source of water supply for the project, will consist of a total of approximately 1.6 miles of pipeline. The 0.8 miles of pipeline supplying ground water from Wells 18-1 and 18-4 located north of the AEP site, would follow a route to the southeast and then south parallel to the California Aqueduct, and then west along Water Way to the proposed AEP site. The pipeline supplying ground water from Well 24-5 located to the southwest of the AEP site, would follow a route north through a field, northeast along Avenal Cutoff Road, and then east into the proposed AEP site.

(AEP 2001a, Section 1.5 & Figures 2.1-3A & 2.1-3B) & (AEP 2001c, Data Request # 65)

SOILS

The San Joaquin Valley is a major agricultural region of California, with cropland, orchards, and vineyards comprising most of the land in the site area. The 148-acre site area is farmed with row crops within the boundaries of Kochergen Farms, with adjacent lands consisting of mostly first-year orchards with trees generally 3 to 5 feet in height. Kochergen Farms comprises more than 2,000 acres along the west side of the California Aqueduct and includes prime farmlands outside of the City of Avenal industrial zone. Williamson Act contract lands also occur in these areas beyond the site boundary. The only project feature that will occur on prime farmland or Williamson Act contract land is the water pipeline to existing ground water supply wells located north of the site. There are no farmlands of statewide importance in the site vicinity. For further discussion of the related impacts and recommended mitigation associated with the proposed changes in land use, please refer to the **Land Use** section of this PSA.

The Project is located in an area of gently sloping and relatively featureless topography at an approximate elevation of 320 to 360 feet above mean sea level. The entire site and much of the surrounding land is Wasco sandy loam, sloping to the northeast towards the center of the San Joaquin Valley (see **Soils & Water Table 1**). A second

type of soil, Milham sandy loam, occurs within linear corridors planned for water pipeline and natural gas interconnections.

TABLE 1
SOILS & WATER
Soil Types Affected & Characteristics

Project Element	Soil Name	% Slope	Depth (inches)	USDA Texture	USCS Classifi-cation (1)	Erosion Factors	Permeability	Drainage	Erosion Hazard Rating
Linear Features	Milham Sandy Loam	0-2	0-14 14-32 32-60	Sandy Loam Loam, Sandy Clay, Loam Silty Clay Loam	SM CL, SC CL, ML	low	slow	Well Drained	Slight
Site Area	Wasco Sandy Loam	0-5	0-20 20-60	Sandy Loam Sandy Loam, Fine Sandy Loam	SM SM	low	Moderately Rapid	Well Drained	Moderate

(AEP 2001a, Section 6.4 & Table 6.4-1)
(1) Unified Soil Classification System based on laboratory soil grain size analysis and visual classification. CL= clay, ML = silt, etc.

The Wasco sandy loam is a very deep, well-drained soil with moderately rapid permeability and available water capacity of low to moderate. This soil unit has the characteristics of silty sand, with moderately rapid permeability and good drainage. This soil covers the entire site, has been re-worked during agricultural development, and does not present any significant hazard to site development

The Milham sandy loam is also a very deep, well-drained soil with a slow permeability and available water capacity of high to very high. This soil has the characteristic of silty sand in the upper horizon, with clayey sand, silty sand and clay in the lower horizons. This soil type does not present any significant hazard to the development of the linear facilities that will occur within this soil unit, and has also been re-worked during agricultural development (AEP 2001a, Section 6.4).

SOIL AND GROUND WATER CONTAMINATION

A Phase I Environmental Site Assessment was performed for the proposed AEP site, and identified the following potential sources of contamination:

- chromium from historical surface impoundments at the Kettleman Compressor Station has impacted ground water approximately 1.3 miles southwest of the proposed AEP site.

- pesticides, including historical use of DDT, have been used at the proposed AEP site in support of farming activities from 1951 to the present.
- the City of Avenal Water Treatment Plant stores up to 6,000 pounds of chlorine gas as well as large quantities of other water treatment chemicals in above ground storage tanks.
- Kochergen Farms operates an equipment storage facility and a grease trap disposal area within 1 mile west of the proposed AEP site.
  (AEP 2001a, App. 6.14, Phase I ESA)

GROUND WATER

The San Joaquin Valley is the largest ground water basin in California. The watershed area of the Valley encompasses more than 35,000 square miles, and ground water is stored in the sedimentary basin of the valley, which encompasses approximately 13,500 square miles. The maximum thickness of the aquifer is approximately 4,400 feet with the storage capacity between land surface and a depth of 1,000 feet estimated at more than 570 million acre-feet. The aquifer consists of layers of sedimentary material that vary in water-yielding capacity, and portions of the aquifer contain water of variable quality, but the entire sedimentary basin system is considered one hydraulically interconnected aquifer. The aquifer is a prolific water producer, with well yields up to 3,200 gallons per minute (gpm) and averaging 1,100 gpm (DWR, 1995).

The California Department of Water Resources has divided the San Joaquin Valley into 15 separate subbasins for purposes of managing ground water and data collection. The site is located in the Westside Basin and consists mainly of lands within the Westland's Water District. Well yields in the Westside Basin range from 400 to more than 2,000 gpm, and is produced from wells as deep as 3,000 feet. Water is extracted almost exclusively for agricultural use. Beneath the site, the regional aquifer extends throughout the Basin, with ground water elevations approximately 250 to 300 feet below land surface.

The aquifer extends eastward below a regional confining unit (aquitard) mapped as the Corcoran Clay, which is encountered to the east of the portion of the California Aqueduct system designated as the San Louis Canal, and east of the site. Ground water is perched on this clay aquitard, with a limited saturated thickness (at most a few tens of feet) found in the more central part of the valley, and depths to ground water within a few feet of land surface. The water quality of this perched aquifer has been degraded by the infiltration of leached salts and irrigation tail water. B oth water quality and availability limit the ability to use this water resource. This shallow perched aquifer is not encountered in the area of the site.

Land subsidence due to ground water overdraft has been a problem throughout much of the regional aquifer in the San Joaquin Valley. More than 29 feet of subsidence has been reported near Mendota, which is located nearly 50 miles north of the proposed site in this same aquifer. Approximately 0.4 feet of land subsidence has occurred at the California Aqueduct Mile 165.03 (adjacent to the Avenal Energy Site) between 1970 and

1978 (Ireland, et al, 1984). The completion of the California Aqueduct and resulting availability of surface water supply have reduced severe ground water overdraft and the related subsidence issues that had been prevalent in the Valley prior to the 1970s (Ireland, 1986). However, the regional aquifer is still considered in an overdraft condition and susceptible to subsidence if ground water usage were to increase. Because of these concerns, the Kings County Water Commission does not support a net increase in ground water extraction rates from historic baseline pumping (Kings County, 2002). The Water Commission's position is to limit the ground water pumping from the regional aquifer to only the historical crop usage of those lands that had been farmed (Kings County Water Commission, 2002).

Kochergen Farms is a diversified farming operation that has access to both surface water and ground water supply to support its farming operations. To meet irrigation demand, Kochergen Farms requires approximately 7,800 AF of water per year, with a surface water right of approximately 1.3 AFY/A, and the remainder provided by ground water extraction from the regional aquifer. Actual surface water deliveries to Kochergen Farms are based upon the yearly supply to Westlands Water District that serves the area (AEP 2002c, Data Request #77). Only three of the numerous Kochergen wells have been reported by the applicant in the site vicinity, and these wells are reported to have a production capacity of 1,100 to 2,320 gpm. The Kochergen Farms has used groundwater from all of its wells as necessary at any time of the year.

SURFACE HYDROLOGY

Surface water features in the vicinity of the proposed power plant site include ephemeral arroyos draining the Kettleman Hills to the west of the site, but none of these features extend to the vicinity (within a mile) of the site. There are no natural surface water features except immediately following larger than average rainstorms, during which time temporal flow may be observed within the arroyos. The California Aqueduct, an engineered and concrete lined water delivery system, is approximately 200 feet to the northeast of the boundary of the site.

The canal is part of the California Aqueduct system and is used to import water to the southwestern San Joaquin Valley under the Federal Central Valley Project (CVP) and the SWP. The City of Avenal receives CVP water and proposes that the AEP will receive the delivery of SWP water for facility water supply from a new turnout. Design, construction, and operation of the physical components of the water delivery system (turnout from the canal) is under the jurisdiction of the Bureau of Reclamation, while delivery and monitoring of the water is under the jurisdiction of the DWR.

The site and project liner facilities are located outside of the 100-year flood zone (FEMA, 2000).

The City of Avenal operates a water turnout on the California Aqueduct that provides raw water for the City treatment plant located near the northeast corner of the site. The treatment plant processes potable-quality water, which is piped over the Kettleman Hills to the developed area of the City and the Avenal State Prison (AEP 2001a, Section 6.5.1). Currently the City of Avenal plans to relocate the water turnout to a section of

the Canal that will provide water with significantly reduced turbidity, and allow for greater delivery capacity.

PROJECT WATER SUPPLY

Average daily water consumption is stated to vary between 1,393 to 3,146 gpm, depending on plant operations and cooling efficiencies. Reductions in water requirements are achieved by the implementation of 12 to 16 cycles of cooling water recirculation, which is expected to result in a 10% reduction in water use. Backup water supply and water needed during the construction and pipeline testing phases of the project are proposed to be provided from nearby existing ground water wells, 18-1, 18-4, and 24-5, specifically. The plant will remove 53 acres (25 acres for the permanent facility) from agricultural production currently under irrigation. After construction, acreage disturbed during development will be landscaped and irrigated with water included in the total volume of water allocated to the plant (AEP 2002c, Data Request 58, and see discussion of Backup Supply). Of the 53 acres disturbed during plant development, a portion will be returned to agricultural production (AEP 2001a, AFC Section 6.13).

Raw water for cooling and steam processes will be provided by the City of Avenal via a proposed new turnout from the California Aqueduct. Potable water will be provided from the adjacent City of Avenal water treatment facility, and bottled water will be provided for drinking.

The following summarizes the annual, and daily average and maximum demands projected for water supply to the AEP:

TABLE 2 SOILS & WATER
Annual and Daily Project Water Demands

Water Use	Annual Use (1)	Average Daily Use (2)	Maximum Daily Use (3)
Clarified Water to Plant Cooling Tower Makeup (4)	2,149 AFY	1,332 gpm	2,869 gpm
Clarified Water to Auxiliary Cooling Tower Makeup (4)	80 AFY	50 gpm	262 gpm
Clarified Water to Service Water System	14 AFY	9 gpm	13 gpm
City of Avenal Potable Water Supply	3 AFY	2 gpm	3 gpm
Total Plant Water Usage Requirements (5)	**2,246 AF/Y**	**1,393 gpm**	**3,146 gpm**

(1) Annual use requirements are estimated from weighted daily requirements and plant operations at expected load conditions based on continuous plant consumption at average annual operating conditions of 63°F and 54% relative humidity unfired, using a capacity factor of 80%, with 25% duct firing assuming 8,000 hours of plant availability. Both combustion turbine generator (CTG) inlet air mechanical chillers are in service.
(2) Average Daily Use requirements are the Annual Use requirements converted to an average daily value.
(3) Maximum Daily Use requirements are based on water consumption at hot summer operating conditions of 97°F and 23.7% relative humidity. Both CTG inlet air mechanical chillers are in service with supplemental duct firing in the HRSG's.
(4) Includes credit for the recycled high purity distillate from the ZLD System, lowering raw water makeup and providing demineralized water makeup demand as outlined in the water balance diagram and water balances in Appendix 2-8 of the AFC.
(5) Total Plant Water Usage includes landscape irrigation and all plant water needs.
Source: AEP 2001a, Section 2.3.7.2 & Table 2.3-1.

The proposed physical means for providing primary supply of water to the AEP is via the City of Avenal's proposed new turnout from the California Aqueduct. The portion of the California Aqueduct downstream of San Luis Reservoir is referred to as the San Luis Canal, and can convey both SWP and CVP water supplies from San Luis Reservoir. The City of Avenal proposes to construct the new turnout with a design capacity of 15,000 gpm (24,192 AFY peak), with 6,500 gpm (10,483 AFY peak) allocated for the proposed AEP, and 8500 gpm (13,709 AFY peak) allocated for the City of Avenal. This allocation significantly exceeds the project's anticipated peak demand of 3,146 gpm (5,074 AFY peak), and is available for future expansion capacity (Workshop comments, March 6, 2002). The Bureau of Reclamation reviews and approves the design and construction of the turnout, verifying the capacity of the design to meet the anticipated flow volumes. The DWR coordinates water delivery via the canal.

The City's existing demands peak at about 3,500 gpm currently during summer, based on an existing customer base comprised of about 8,800 residents in the City of Avenal, and a 6,900-bed prison operated by the California Department of Corrections. City of Avenal anticipates higher demands in the future for its water supply from increased prison demands, expansion of the industrial park in the vicinity of the proposed AEP, and future population growth (AEP 2001c, Data Request #85).

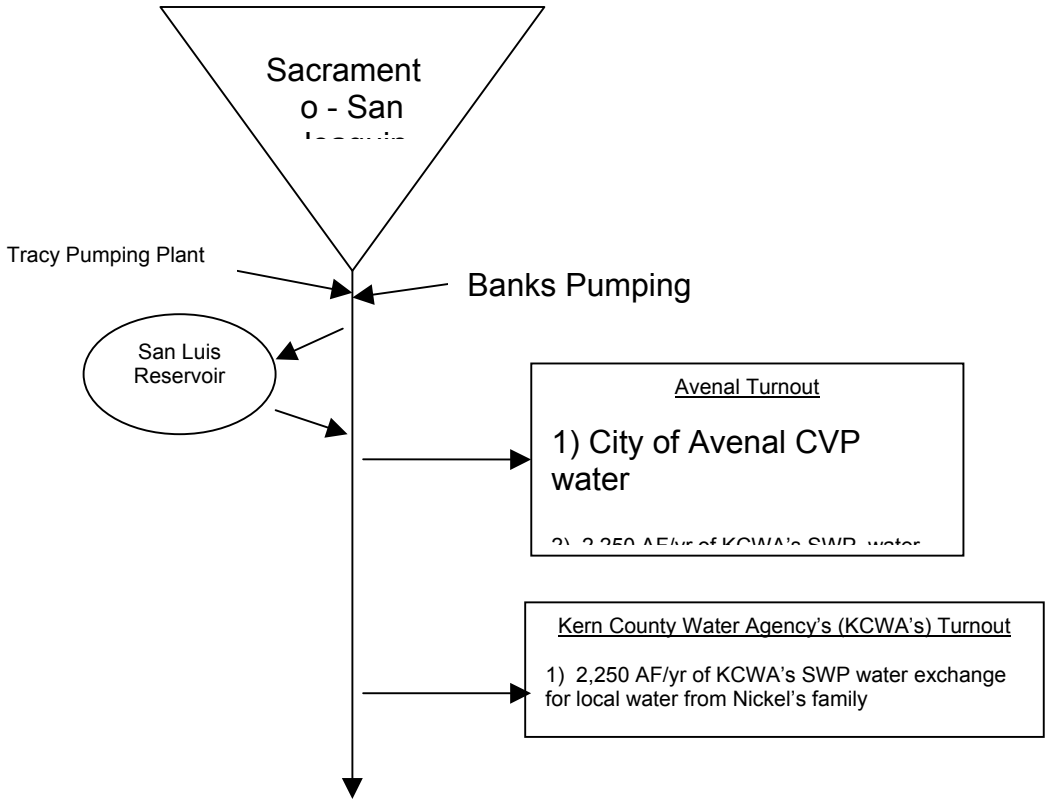
The quality of the primary water supply proposed from the California Aqueduct is listed in Soil & Water Resources Table 3. The proposed physical arrangement for serving the primary water supply to AEP from the California Aqueduct is as shown in Soil & Water Figure 1.

TABLE 3
SOILS & WATER RESOURCES
Primary Supply Water Quality

Constituents	**Concentration at Avenal September, 1999**
Cations	(mg/l)
Calcium	15-20
Magnesium	10-13
Sodium	36-50
Iron Total	0.11-0.28
Potassium	2-3
Barium	0.0318-0.0381
Anions (mg/l)	
Sulfate	19-24
Chloride	48-73
Fluoride	ND
Nitrite	1.7-2.0
Bicarbonate	90
Carbonate	ND
Hydrate	ND
Metals (mg/l)	
Aluminum	0.05-0.34
Cadmium	ND
Copper	ND
Lead	0.005-0.0191
Other	
Turbidity (NTU)	1.4-4.0
pH (SU)	7.8-8.1
Sp. Conductance	356-430

Source: City of Avenal Water Treatment Plant, 1999 (AEP 2001a, Table 6.5-1, as confirmed by DWR)
NTU - Nephelometric Turbidity Unit; SU – Standard Units; ND – none detected; mg/l – milligrams/liter

Soil & Water Figure 1
Physical Arrangement of Water Supply



As can be observed from Figure 1, the Applicant proposes that up to 2,250 AFY of KCWA's existing SWP water pursuant to it's long term water supply contract, which will be delivered to a point upstream in the California Aqueduct at City of Avenal's proposed new turnout. Historically, long-term contract water was delivered to the KCWA's turnout for use within Kern County. In 1968, KCWA signed the long-term water supply contract with DWR to receive water from the SWP. The contract runs until year 2035 and specifies the maximum amount of SWP water that KCWA is able to request each year. Under this contract, KCWA has now reached its maximum amount of SWP water, 1,000,949 acre-feet per year, that may be requested. KCWA, however, may not receive its full annual SWP water in any one year due to hydrological conditions, SWP operational constraints, and total SWP contractors' demands.

Under this exchange, the SWP contract water lost to the county is being replaced with Kern County local water from the Nickel's family rights, allowing for the delivery of a like amount of KCWA's SWP water to the City of Avenal turnout. When there is no delivery to KCWA under that contract in the unlikely event that SWP water were not available, no other surface water arrangements have been proposed.

The contractual basis for availability of the proposed surface water to AEP originates from utilization of flood flows from the Lower Kern River during years when natural runoff conditions are typically 120% or greater of average annual runoff (historically averaging about one out of every four years, even though actual patterns of availability can be more or less frequent). Pre-1914 rights to these flood flows were originally

under the control of the Hacienda/Garces right holders, and more recently the Nickel Family until they sold their water right to KCWA in 2000. The sale arrangement between KCWA and the Nickel Family provides that the Nickel Family retains rights to 10,000 acre-feet/year for sale to others, marketed within or outside KCWA's service area. The Nickel Family is selling 2,250 acre-feet/year of its water entitlements for supply to the proposed AEP.

Unlike the Nickel Family, who did not have the means to dependably store and utilize the flood flows from the Lower Kern River, KCWA has the ability to divert these flows and store them as ground water as part of the Kern River Restoration Project and Water Supply Program. KCWA's actual diversions for direct use and ground water banking of the flood flows from Lower Kern River, does not occur annually, but instead, only during wet years when flood flows are available. During wet years, KCWA actually diverts significantly greater volumes of flood flows, which after direct use and diversion to storage, yields an average annual available supply of about 50,000 acre-feet/year, including the 10,000 acre-feet/year reserved for supply to or marketing for the Nickel Family.

Staff notes the distinction that previously the Nickel Family "directly exported" its water out of Kern county. KCWA, in the case of serving AEP, seeks to make available a portion of its SWP long-term contract water for delivery to AEP through City of Avenal's turnout on the California Aqueduct. KCWA will makeup the reduction in its own SWP supply to its service area from "transfer" of a portion of the Lower Kern River flows banked in the Pioneer Ground Water Recharge and Recovery Project or from other local banking facilities. At the March 6, 2002 Data Response Workshop, the Applicant informed staff that the DWR purchased (under short-term contract) in 2001 and 2002 the 10,000 acre-feet/year of banked Lower Kern River Water being marketed by KCWA for the Nickel Family on behalf of the environmental water account (AEP 2001a, Section 6.5.1.1).

KCWA's maximum SWP long-term contract water is about 1,000,949 acre-feet/year, with 119,600 acre-feet allocated to municipal and industrial use, and 881,349 acre-feet allocated to agricultural use (KCWA 2002f). KCWA's SWP allocation is second only to the Metropolitan Water District, which serves much of Southern California with an allocation of more than 2 million acre-feet/year. Normal maximum contract obligations to all 29 SWP contractors are about 4.2 million acre-feet/year. The most extreme shortages in deliveries from the SWP occurred in 1991 during the fifth consecutive year of drought, when agricultural contractors received no water while urban customers were provided only 30% of normal supply (KCWA 2002g). KCWA's ability to supply the proposed AEP is subject to receiving a SWP allocation every year. When no SWP water is available, the applicant proposes to use ground water supplies as a back-up. KCWA, by way of its September 27, 2001 Will-Serve Letter to the Applicant, has apparently provided the assurance that its water supply to AEP is firm, and not subject to being curtailed (AEP 2001a, Appendix 6.5-3). Water allocated for the project consists of 2,250 of the first 10,000 acre-feet/year of the total average annual available water, with KCWA's customers receiving the balance of the available water.

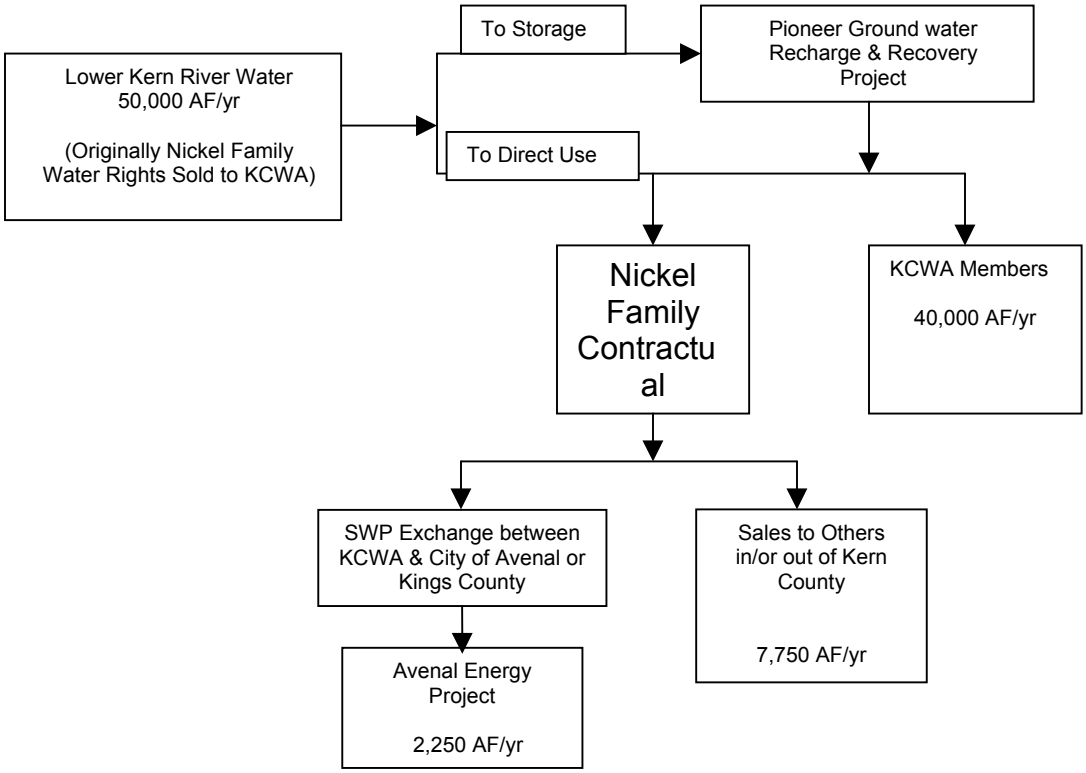
Lower Kern River flood flows diverted to storage by KCWA allow recovery of stored flood flows during dry years from KCWA's Pioneer Ground Water Recharge and

Recovery Project and other ground water banking programs. The ability to store these high flows allows KCWA to provide 10,000 acre-feet/year as a firm supply to the Nickel Family, or for marketing on behalf of the Nickel Family (AEP 2001a, Section 6.5.1.1 and AEP 2001b, Responses to Data Adequacy Comments).

Prior to the development of the facilities to capture the Kern flood water, the flow would enter the California Aqueduct at the intertie. If the volume of flood flow exceeded the intertie capacity, the flow would then be directed north, ultimately discharging to the Tulare Lake area, flooding agricultural lands.

The proposed contractual arrangement for serving the primary water supply to AEP from the California Aqueduct is as shown in Soil & Water Figure 2.

Soil & Water Figure 2
Contractual Arrangement of Ground and Surface Water Supply



The 10,000 ac-ft of water physically comes from banked Kern River flood flows. As part of the water transfer contractual obligation, DWR is currently reviewing the water rights associated with the transfer. DWR will then draft the contract to change the point of delivery and transfer of SWP contract water with the KCWA. Included in DWR's responsibility in developing the contract is the review of the approved CEQA documentation that allows KCWA to bank the flood flows by removing it from the river and transferring it to the ground water storage facility. Because the DWR relies on the Commission's Final Staff Assessment (FSA) for documentation of CEQA compliance, the water transfer contract will not be initiated until publication and review by DWR of

this FSA. Staff is working closely with DWR throughout this process, and anticipates receipt of DWR comments to the PSA during development of the FSA.

Back-up Supply

Ground water will be used for construction water needs (including pipeline testing) and for backup water, and will be supplied by the nearby existing Kochergen Farms ground water wells 18-1, 18-4, and 24-5. Back-up water, limited to delivery by these three existing wells, will be required at "times of an annual increase in power demand, interrupted canal flow or events of elevated canal turbidity" (see AFC Section 2.3.7.1). To date, the applicant has failed to provide staff with annual estimates of its anticipated back-up ground water demand or the frequency of such conditions. In the applicant's responses to staff's Data Request #69-71, the applicant provided the following clarifications on potential ground water demands:

a) Since 1968 the Canal has had infrequent outages due to maintenance of SWP facilities and therefore the DWR shall not be obligated to convey such water at times when such delivery would adversely impact SWP operation or facilities, or other SWP contractors' water deliveries or costs, as determined by DWR. Ground water pumping is expected for back-up supply as a result of interruption of canal delivery. Back-up supply will be limited to the extraction of ground water from Kochergen Farms wells 18-1, 18-4, and 24-5.

b) The applicant's operational forecast is very conservative, and the applicant expects that the surface supply is "more than adequate" to meet conditions on an annual or daily basis *and maximum annual use could be as high as 2,358 acre-feet year; and,*

c) Events of high turbidity have been extremely limited in recent history. In addition, the City is moving its turnout to reduce these events even more.

Based on this information staff assumes the applicant's need for back-up supplies will be rare. Infrastructure to supply back-up groundwater needs to be capable of delivering 3,146 gpm (estimated peak daily demand) for a short time. Information available on the proposed ground water supply wells suggests they are of sufficient capacity to meet this peak daily demand.

Ground water quality is summarized in Table 4 below, and was obtained from samples collected by the applicant from the three wells noted. Section 1.8.3 of the AFC states that "Water conservation measures will be implemented by the owner/operator of the surrounding lands (Kochergen Farms) to offset ground water that will be pumped from wells for the Project backup water supply." Mr. Kochergen owns approximately 2,590 acres of active orchard and row crop agricultural land and several irrigation wells. Less than half of the Kochergen Farms is in crop rotation and the information reported during the March 6th, 2002 Workshop indicates that Mr. Kochergen is already using mechanized irrigation and water conservation methods across the farm. In addition, Mr. Kochergen has stated that he intends to continue pumping to the capacity of his wells.

The applicants' February 25, 2002 responses to the CEC Data Requests (AEP 2002c, Data Request #77) included a Draft Ground Water Conservation Plan. After review, staff determined that this draft plan did not satisfy the initial request and staff discussed

these deficiencies with the applicant during the March Workshop. The applicant then submitted a revised Draft Ground Water Conservation Plan in response to staff's March 25th, 2002 Data Requests and Workshop comments. After review, staff determined that this draft plan also did not satisfy the data request. Specifically, the Conservation Plan identified a baseline of 6,000 AFY against which no-net increase in ground water pumping would be measured (Section 5.4, Exhibit 151-1, April 25, 2002 Response to Data Requests). The proposed Water Conservation Plan also includes an example ground water monitoring and accounting plan that measures water use by crop water duty (known uptake of water by specific plants as reported in the literature). For example, a tomato crop would require three AF/Acre of water. The Water Conservation Plan proposes tracking water use by crop duty and not by actual measurement of water application.

Baseline conditions are expected to include quantifiable rates and volumes of ground water extraction from the historic operation of the project wells, and a method of assurance that the depth to ground water during 'baseline' conditions is protective of aquifer conditions. A baseline extraction rate of 6,000 AFY from the three project wells does not seem applicable, and is likely representative of extraction from all wells supporting Kochergen Farms. Staff has not been provided with information as to the capacity, location, or number of wells supporting the Farm, and only three wells have been identified to support the AEP facility. Staff has no assurance or evidence that any pumping from the three backup wells identified would in fact be offset by decreases in pumping from other wells servicing the Kochergen Farms. In addition, the plan does not:

- characterize the proposed conservation practices and quantify how these practices could be assured, measured, monitored, and reported. For example, staff has no assurance that the landscape irrigation need during the operation of the plant has been offset in advance of plant operation by the implementation of conservation practices.
- identify where these practices would be implemented.
- identify the schedule of conservation implementation. For example, seasonal pumping to meet irrigation needs should not exceed baseline seasonal pumping. Excessive ground water pumping for a portion of the year cannot be offset by reduced pumping later in the year because the aquifer is non-elastic; once dewatered the aquifer reservoir cannot recover its previous capacity.
- verify that reduced pumping from the three project wells would not be offset by increased pumping from other wells owned and operated by Mr. Kochergen in the operation of his farm.
- provide an example ground water conservation monitoring report identifying a quantifiable method of data collection, and the data analysis proposed to assure compliance. As an example, tomato crop duty requires three AF/Acre to sustain growth through harvest. Use of water in excess of crop duty can occur, and without a means of measuring the actual application, an accurate accounting of water use cannot be made.
- provide the enforceable and binding agreement between Mr. Kochergen (the owner and operator of the wells) and the Applicant assuring the implementation of the Ground Water Conservation Plan for the duration of project operation.

It should be noted that during the March Workshop, Mr. Kochergen stated that he intends to make maximum use of his wells for irrigation and/or for sale. Therefore, staff has no evidence, as provided by the applicant, that any conservation will occur as a result of changes in irrigation practices by Mr. Kochergen. In addition, Mr. Kochergen stated that he has been implementing water conservation methods prior to contact by the applicant, calling into question whether they count as mitigation for the proposed project. Insufficient data are available for staff to fully assess the backup water supply, other than to acknowledge that the conversion of 53 acres of agricultural land to non-irrigated use will reduce some water consumption. Noting that the current annual irrigation rate for the 53 acres is 3 AFY/A, the maximum possible reduction in water use resulting from the land use conversion is 159 AFY if no water was to be used for any purpose during plant construction or operation.

TABLE 4
SOILS & WATER RESOURCES Backup Supply Water Quality

Constituents	Concentration Well 18-1 1,176 feet deep (1) 1,275 gpm (2)	Well 18-4 1,140 feet deep 2,320 gpm	Well 24-5 1,140 feet deep 1,100 gpm
Cations (mg/l)			
Calcium	84.8-88.0	93.2-100	87.5-90
Magnesium	38.30	44.60	26.80
Sodium	120.00	120.00	170.00
Potassium	3.70	0.90	1.90
Ammonia	<0.68	<0.68	<0.68
Barium	0.40	0.06	0.02
Anions (mg/l)			
Bicarbonate	106.56	101.93	73.89
Chloride	43.20	54.50	73.50
Sulfate	410-763	460-700	420-620
Nitrate	12.30	16.80	32.80
Fluoride	0.20	0.20	0.10
Phosphate (as Ortho)	<0.1	<0.01	<0.1
Total Phosphorous (Valance 3)	0.5	0.16	0.22
Borate	1.40	6.30	6.30
Bromide	0.10	0.30	0.50
Metals (mg/l)			
Aluminum	<0.03	0.15	<0.03
Arsenic	<0.1	<0.01	<0.1
Boron	0.40	0.50	0.50
Cadmium	0.006	<0.005	<0.005
Copper (cupric)	ND	ND	ND
Chromium	0.30	<0.015	<0.015
Iron (ferrous)	ND	ND	ND
Iron (ferric)	ND	ND	ND
Iron (total)	ND	ND	ND
Lead	ND	ND	ND
Lithium	ND	ND	ND
Manganese (manganous)	ND	ND	ND
Mercury	ND	ND	ND
Molybdenum	ND	ND	ND
Nickel	ND	ND	ND
Selenium	ND	ND	ND
Silver	ND	ND	ND
Strontium	1.30	1.50	1.50
Thallium (thallic)	ND	ND	ND
Tin	ND	ND	ND
Titanium	ND	ND	ND
Vanadium	ND	ND	ND

Zinc	<0.1	<0.1	<0.1
Other			
Dissolved Silica (ppm)	13	13	13
Colloidal Silica (ppm)	35	35	35
Total Alkalinity	87.4	83.6	60.6
Calcium Hardness (ppm)	210	210	240
Turbidity (NTU)	2.0	1.15	1.0
TDS (ppm)	920	992	954
Sp. Conductance	1,150	1,245	1,265
Magnesium Hardness	160	180	110
Carbon Dioxide	ND	ND	ND
pH (SU)	8.0	7.9	7.9
Total Suspended Solids	14	9	2
TOC	ND	ND	ND
Color	10	10	10

Source: Duke / Flour Daniel, 2001, AFC Table 6.5-3
(1) These deep wells draw water from the regional aquifer, and are the only wells available for backup.
(2) These concentration variations are not significant for plant water input.
NTU - Nephelometric Turbidity Unit SU – Standard Units

Possible Alternatives to the Proposed Water Supply

The applicant provided seven possible alternatives to the proposed water supply. Staff narrowed these alternatives to two categories of water, as discussed below.

Brackish Ground water

Brackish shallow ground water occurs in the shallow perched aquifer system located in the topographically lower portion of the valley, approximately 6 miles east of the site. This aquifer is not found in the area of the site, and is perched above and separated from the regional aquifer. The ground water quality of the perched aquifer has been degraded by leaching of salts and irrigation tail water, with water salinity in the range of 10,000 to 20,000 micro siemens per centimeter (uS/cm). Molybdenum, arsenic and other metals are dissolved in this water at elevated concentrations, and these constituents could impact plant operation if the project were to use this source of ground water for supply. If AEP were to use this brackish groundwater, staff believes a large array of shallow wells would be needed to provide a reliable volume of water due to the limited saturated thickness of the brackish water-bearing zone.

Recycled Wastewater

A number of potential sources of recycled wastewater were investigated by the Applicant. Soils & Water Resources Table 5 summarizes their respective availability and characteristics.

Although the potential supply from Lemoore Naval Air Station approaches a quantity that would be nearly sufficient for the water supply demands of AEP, the Applicant informed staff during the March 6, 2002 Data Response Workshop that it was highly discouraged by the representative of the Air Station from investigating this potential source further due to the lack of precedence for offsite disposal associated with other

military bases. In addition, use of recycled wastewater would require the construction of a treatment facility for tertiary treatment prior to plant use.

Table 5
Soils and Water Resources Potential Sources of Recycled Wastewater

Site	Distance from AEP (miles)	Plant Capacity (mgd)	Current Plant Avg. Output (mgd)	Estimated Annual Plant Output (AF/year)	Current Disposition of Wastewater	Estimated Potentially Available Quantity (AF/year)
City of Avenal	10	1.75	1.25	1390	Not Available – Delivered to Avenal State Prison	0
City of Coalinga	18	1.2	0.9	980	95% sold for farming; 5% sent to evaporation/ percolation ponds	50
City of Huron	8	0.5	0.5	550	100% sent to evap./ percolation ponds	550
City of Lemoore	22	2.5	2.5	2,800	100% sold to farming	0
Lemoore NAS	17	2.12	1.75	1,970	100% sent to evap./ percolation ponds	1,970
City of Corcoran	26	1.8	1.2	1,350	80% sent to evap./ percolation ponds; 20% sold to prison	1,080
City of Hanford	32	5.5	4.85	5,430	100% used for farming;	0

Source: (AEP 2001a, Section 5.4.1.2 – Table 5.4-1)

Wastewater

Wastewater streams from the project's cooling tower blowdown, boiler (HRSG) blowdown, water treatment system, chemical feed area drains, and general plant drains will be routed to the project's Zero Liquid Discharge (ZLD) system. As these wastewater streams are concentrated in the ZLD system, water suitable for reuse will be recovered and returned to either the demineralizer for reuse in the steam cycle or to the cooling towers. The remaining process waste streams are concentrated in the rotary drum dryer, with the eventual product being a solid cake (AEP 2001a, Section 2.3.7 & Appendix 2-8).

Sanitary waste water from the facility washrooms and other potable water use will be routed to a septic system tank and drainfield.

Storm Water

The site naturally drains gently to the northwest. Outside of the power plant boundaries, storm water runoff will be directed to the storm water retention basin either directly, or via drainage swales around the upper perimeter of the site. The retention basin will also serve as a sedimentation basin during construction. Within the plant developed site, all non-contact runoff will be directed by a network of berms, drainage pipes and culverts

into the grass-lined retention pond which will allow storm water to diminish by evaporation and percolation. As proposed, no storm water will be directed for plant process or cooling use as a means of accomplishing further water conservation. The sedimentation/retention basin will be designed, in accordance with applicable laws, to handle the runoff from a 25-year, 24-hour rainfall. Contact runoff from areas inside the plant footprint will be directed to the oil/water separator if it is not contaminated and then routed to the ZLD system. If contaminated, the applicant proposes to store the stormwater in localized containment and then remove it by truck for off-site treatment and disposal.

ANALYSIS OF PROJECT RELATED IMPACTS

DIRECT AND INDIRECT IMPACTS

Soil

Accelerated wind and water-induced erosion may result from earthmoving activities associated with construction of the proposed project, associated linear features, and the new turnout. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Prolonged periods of precipitation, or high intensity and short duration runoff events coupled with earth disturbance activities can result in on-site erosion eventually increasing the sediment load within nearby receiving waters.

As proposed, 53 acres of land will be disturbed during construction of the facility. At that time, the surface will be void of vegetation and there will be the highest potential for erosion. Best Management Practices (BMPs) for erosion control are proposed to be implemented and were generally described in the draft Sediment and Erosion Control Plan and the Storm Water Pollution Prevention Plan (SWPPP) submitted in response to staff's Data Request #52 and #53. These plans should be site specific and address the entire project including ancillary facilities, linear features, and the new turnout. Staff is recommending that final plans be provided by the applicant, and approved by the Energy Commission Compliance Project Manager, prior to the approval of any earthmoving activities. Approval and implementation of these plans will mitigate erosion and sedimentation impacts to less than significant levels and will be consistent with the Clean Water Act, Kings County, and the City of Avenal LORS. Please refer to the **Mitigation** discussion and the **Conditions of Certification** for more information.

Soil and Ground Water Contamination

The following is a discussion of the potential for contamination to the AEP site as a result of conditions identified and evaluated in the Phase I Environmental Site Assessment (AEP 2001a, App. 6.14, Phase I ESA).

- Potential for the presence of chromium contamination to ground water in the vicinity of the proposed AEP – Available ground water sampling data indicate that ground water wells in the vicinity of the proposed AEP have historically been affected by past surface impoundments and ground water contamination at the Kettleman Compressor Station. Chromium 6 had been used at the Compressor Station as a corrosion inhibitor, and was discharged to surface impoundments at the facility. The 1.3-mile distance from the AEP site, the direction of ground water flow and mixing

within the aquifer due to irrigation pumping, suggest the chromium plume has either migrated beyond or attenuated in the area of the AEP site. Recent ground water sampling results from the Kochergen irrigation wells do not indicate a ground water quality concern due to past discharges of chromium at the Kettleman Compressor Station (Responses to January 24, 2002 Data Requests).

- Potential for significant concentrations of pesticides – Historical use of pesticides appear to have been solely in support of farming activities, and not involving other activities such as storage, mixing or accidental releases. There is no evidence that suggests pesticides are present in significant concentrations in the subsurface of the AEP site.
- Potential for chemical releases from the City of Avenal Water Treatment Plant – Based on the lack of any identified releases from the adjacent water treatment plant, the storage of large quantities of water treatment chemicals does not appear to have caused subsurface impacts to the AEP site.
- Potential for contamination from Kochergen Farms' equipment storage facility and a grease trap disposal area – Based on the 1-mile distance from the proposed AEP site, and the minimal hazardous material usage at the storage facility and grease trap disposal area, it appears unlikely that these activities would have caused subsurface impacts to the AEP site.

Ground Water

Surface water supplies are estimated to support 80% of available operating hours and an additional 2,000 hours of duct firing. Supplemental or back-up water supplies to be provided by local ground water resources have been proposed with no net increase in historic ground water pumping as to avoid additional ground water overdraft. Staff is in agreement with the use of ground water as a supplemental and backup water supply if the applicant can assure no net increase in ground water pumping.

Unfortunately, the proposed ground water conservation plan is incomplete and unenforceable, fails to establish base line conditions from which to measure ground water conservation measures, and relies heavily on a private third party which is not bound by any legal agreement to assure operation of ground water conservation measures. As a result, staff strongly recommends limiting the volume of ground water available as back-up to the AEP. Information provided by the applicant (Exhibit 77-1 of Response to January 24, 2002 Data Requests, Draft Ground Water Conservation Plan) states that 53 acres of agricultural land will be taken out of production with the construction of the plant, saving an estimated 3 AFY/A, or roughly 159 AFY. Staff is in agreement with this estimate. Therefore, staff recommends that ground water extraction to serve AEP be limited to no more than 159 AFY. This will provide ample amounts of back-up supplies based on the applicant's estimates to operate even at its peak annual demand of 2,358 AF/Y (this amount accounts for 5 percent variability as described in the applicant's Data Response #68 February 2002). **Condition of Certification SOILS & WATER - 6** requires the applicant to meter the volume of ground water used and limit the total volume of ground water extracted so as to avoid any further aquifer overdraft, consistent with the Kings County Water Commission Policy and the applicant's stated intent. If the proposed mitigation measures and conditions of certification are

implemented, no significant net impact to ground water resources are expected. Please see the **Mitigation** discussion of this section for more information.

Surface Hydrology

The project site is not located near any natural surface water features, nor within the 100-year floodplain, and will not alter its delineation so as to place other structures in the 100-year floodplain. The plant site will be graded to promote drainage and minimize on- and off-site flooding. The structures will be designed to accommodate floods and in accordance with the Kings County Building Code. The applicant proposes to construct a sedimentation/retention basin to prevent storm water runoff from leaving the site. Staff has reviewed the Draft SWPPP and proposed drainage plan. With revisions to address staff's comments and full implementation of these plans and proposed mitigation, staff determined no significant impacts are expected (AEP 2001a, Section 6.6.2.2.2).

The City must obtain Bureau of Reclamation approval for the construction and operation of the new turnout and comply with the requirements of the Reclamation Reformation Act. At this time, the applicant has not provided, nor has staff reviewed a proposed design for the new turnout in order to verify compliance with applicable requirements or evaluate potential environmental impacts.

Project Water Supply

The design capacity of the new turnout at Mile Post 164.66 of California Aqueduct will deliver approximately 15,000 gpm with 6,500 gpm allocated to the AEP and 8,500 gpm allocated to the City of Avenal. The City is in the process of designing the turnout relocation consistent with design guidance provided by the Bureau of Reclamation, Reclamation Reform Act. The City will also initiate environmental review, with the City of Avenal serving as the Lead Agency under CEQA and the Bureau of Reclamation serving as the Lead Agency under NEPA. (AEP 2002c, Data Request # 85) In order to allow the project to use the turnout, the City must comply with CEQA and NEPA prior to construction. Prior to Certification, the project owner shall provide written evidence that the new turnout meets all applicable construction and operation requirements from the Bureau of Reclamation as specified in **Condition of Certification SOILS & WATER 8.** Staff recognizes that the proposed turnout capacity allocated to the proposed AEP is 6,500 gpm, more than double the 3,146 gpm maximum instantaneous demand proposed for AEP. This suggests that AEP's use of fresh water could easily exceed the maximum proposed use of 2,250 acre-feet/year. Staff is recommending **Condition of Certification SOILS & WATER 5** to assure use of fresh surface water does not exceed 2,250 acre-feet/year consistent with the quantities assessed by staff. Please refer to the **Mitigation** discussion for more information.

The availability of surface water for use by the AEP is made possible as a result of three previous analyses and one pending analysis and action under CEQA. The first completed CEQA action was the November 13, 1996 certification by KCWA of a Negative Declaration for the Pioneer Ground Water Recharge and Recovery Project. This action created one of several opportunities to store water supply as ground water

when available in excess of demands, and to recover it later when needed to serve demands. The second completed CEQA action was the September 7, 2000 certification

of a Negative Declaration by KCWA for the Kern River Restoration Project and Water Supply Program. A component of the program was the acquisition of the water rights to the flood flows of the Lower Kern River as previously held by the Nickel Family. The third completed CEQA action was the November 13, 2001 certification by KCWA of a Negative Declaration for the Transfer of 10,000 acre-feet/year of Banked Lower Kern River Water. Based on the analysis performed by KCWA staff, it was determined that historically the Nickel Family had exported at least 10,000 acre-feet/year out of the county, and that during 1992-2001, approximately 13,000 acre-feet/year had been exported. As a result of this November 13, 2001 action, it was concluded that there would be no significant adverse impact by KCWA continuing to transfer up to 10,000 acre-feet/year of banked Lower Kern River water on behalf of the Nickel Family (AEP 2001b, Exhibit Water-1). The one pending CEQA analysis, other than the Energy Commissions review, is the consideration by City of Avenal for relocating its turnout for receiving SWP water from the California Aqueduct.

CEQA documentation previously prepared by Kern County Water Agency (KCWA) and the AFC prepared by the Applicant refers to an average annual volume of about 40,000 acre-feet/year available from flood flows of the Lower Kern River. Staff, however, was advised by the Applicant and KCWA that the average annual flood flows available for diversion by KCWA are on the order of about 50,000 acre-feet/year (KCWA 2002e). Prior to KCWA's acquisition of the Lower Kern River flood flows; flood flows that could not be captured by facilities in the Kern area would discharge to the Tulare Lake basin, causing flooding and temporary loss of irrigateable lands. Capture of these flows is perceived as a benefit within the basin area by reducing the frequency of flooding in the region.

Information and estimates provided by the applicant suggest that water use by this facility will be efficient for a project its size. Based on information provided to staff by the applicant, there appears to be no feasible alternatives to the use of raw water other than dry cooling. Possible alternatives to the use of raw water are limited to brackish ground water and/or recycled wastewater. In addition to considering the quantity of these two potential alternative water sources, other considerations include the environmental impacts and costs associated with the piping and pretreatment of the water. Staff's preliminary conclusion is that there may be no feasible or reasonable alternative to the proposed water supply , however, the feasibility of alternative water supply needs further analysis, as discussed below.

Possible Alternatives to the Proposed Water Supply

At the March 6, 2002 Data Response Workshop in Avenal, the Applicant was requested to provide additional information comparing the proposed water supply with two alternatives, including use of brackish ground water, and a combined recycled water supply from City of Corcoran and Corcoran State Prison. The comparison is to include: 1) capital investments for infrastructure and treatment systems; 2) operating costs for water purchase, treatment chemicals, pumping and ZLD solids handling/disposal; and 3) an overview of other related plant process effects and environmental impacts. Staff expects the Applicant to compare the AEP's dependency on fresh water and the availability of reclaimed or brackish ground water based on average and peak water demands, and to include an economic comparison of initial capital and annual operation costs. To date, the Applicant has failed to provide this additional information, and staff

awaits Applicant's complete response to DR# 83 (AEP 2002c) and DR# 153 (AEP 2002e). Staff will require a complete assessment of the possible alternatives to the proposed water supply prior to the issuance of the FSA. In the interim, staff is continuing to independently analyze the feasibility of possible alternatives to the fresh, raw water supply.

Process Wastewater

Wastewater disposal can lead to soil, surface water, and ground water degradation and impairment of beneficial uses. Wastewater streams from the project's combustion turbine generator evaporative coolers, HRSGs, water treatment system, chemical feed area drains, and general plant drains will be routed to the project's ZLD system. Sanitary wastewater and stormwater, as proposed, will be directed to separate systems. As these wastewater streams are concentrated in the ZLD system, water suitable for reuse will be recovered and returned to either the cooling towers or the demineralizer for reuse in the steam cycle. The remaining waste streams are concentrated in the rotary drum dryer, with the eventual product being a solid cake. Therefore, no liquid process waste will be discharged off-site to water bodies by the project. (AEP 2001a, Section 2.3.7 and Appendix 2-8) At this time, however, no back-up systems have been proposed in the event of an outage of the ZLD system. As a result, staff is proposing **Condition of Certification SOILS & WATER 11** to assure no adverse impacts occur to soil or water quality as a result of possible disruptions in the operation of the ZLD system.

Periodic cleaning of the compressors and heat recovery steam generators may generate flows of wash and chemical cleaning wastewater that may contain elevated concentrations of constituents of concern. This wastewater is to be contained on-site in a sump with the contents of the sump periodically pumped out by a vacuum truck and transported off-site to be disposed of at a licensed facility. For more discussion of off-site liquid and solid waste disposal, please refer to the **Waste Management** section of this document. To address concerns regarding proper storage and disposal of this wastewater, staff is recommending **Condition of Certification SOILS & WATER 9**. With the implementation of proposed mitigation and conditions of certification, no water quality impacts are expected to result from process wastewater activities.

Sanitary wastewater will be managed and discharged via an on-site septic system and drain field to be designed according to applicable county laws (see recommended **Condition of Certification SOILS & WATER 4**). With the implementation of proposed mitigation (refer to the **Mitigation** discussion for more information) and compliance with the proposed condition of certification, no water quality impacts are expected from operation of the drain field.

Storm Water

Development of roads, buildings, and other paved or impermeable surfaces constructed as part of the project will increase the amount of runoff at the site. This may increase storm water flows and may increase the chances for sediment and contaminants to enter storm water flows and be carried off-site. The proposed AEP will prevent increases in the volume of storm water runoff following development by constructing a 17 acre-foot storm water retention basin. The retention basin is not only sized in accordance with the required 25-year, 24-hour criteria, which would develop inflow

volume calculated to be approximately 14.0 acre-feet, but is also sized to retain the 100-year, 24-hour storm which would develop an inflow volume calculated to be approximately 16.7 acre-feet.

A variety of BMP's are planned as part of the storm water system. All non-contact runoff (water that has not been in contact with potential contaminants) from the site will be directed by a network of berms, drainage pipes and culverts into a grass-lined evaporation / percolation basin located northwest of the power plant site. Contact runoff from areas inside the plant footprint will be directed from contained areas to the oil/water separator. If it is not contaminated, it then will be routed to the ZLD. If contaminated, it will be stored in its localized containment and then removed by truck for off-site treatment and disposal. Although the capacity of the retention basin may be exceeded by natural precipitation events in excess of the 100-year, 24-hour storm, drainage would only temporarily flow onto agricultural lands. Please refer to the **Mitigation** discussion for further information.

The AEP will be required to comply with both the general NPDES requirements that regulate storm water effluent limitations and monitoring and reporting requirements for construction activities storm water, low-threat or short duration discharge, and with the industrial activities (operational) storm water general permit. AEP will supply a Notice of Intent to the SWRCB to operate under both General NPDES Storm Water Permits for Construction and Industrial Activities. **Condition of Certification SOILS & WATER 1** requires the applicant to submit copies of the accepted notices for construction and operational storm water discharge prior to site mobilization and prior to operation, respectively.

The project will also be required to incorporate a Storm Water Pollution Prevention Plan (SWPPP) for both construction and operation into its design to insure that storm water discharges from the project are handled properly with respect to both volume and water quality. The SWPPP is required under NPDES regulations and this requirement is contained in **Condition of Certification SOILS & WATER-3.**

This design and mitigation should result in an insignificant increase in runoff, so that the project will have no significant impacts on downstream flooding. See the **Surface Hydrology** discussion below. These measures will also provide protection of water quality. If the proposed mitigation measures and conditions of certification are implemented, no significant storm water runoff impacts are expected. Please see the **Mitigation** discussion of this section for more information.

CUMULATIVE IMPACTS

Surface Hydrology

Cumulative impacts to surface waters could result from the development of AEP and the City's planned water turnout relocation on the California Aqueduct. At this time, the applicant has not provided, nor has staff reviewed a proposed design for the new turnout in order to verify compliance with applicable requirements or evaluate potential environmental impacts. The City water turnout relocation will be required to include engineering controls to prevent flooding and control run-on and run-off. The applicant

will need to coordinate with USBR and DWR for the delivery modification to schedule the construction of the turnout. This relocation should not disrupt canal flow or take the existing facility out of operation. Normally, there is no disruption of surface drainage for construction and operation of the turnout because the California Aqueduct dike precludes surface drainage. The existing City of Avenal turnout will remain in place as a backup, and will continue to serve Westlands Water District.

With implementation of appropriate BMPs, staff does not expect that the project linear facilities will alter existing surface drainage. As proposed, the gas and water supply pipelines will be underground, and ground surface will be returned to existing contours and revegetated as needed. The electrical interconnection line towers identified to this date should not impact surface drainage with the implementation of appropriate BMPs. As a result, no significant cumulative impacts are expected from the construction or operation of the proposed linear facilities.

Ground Water

Increases in ground water pumping above historical levels may cause significant adverse impacts by exacerbating ground water overdraft and incidences of subsidence in the area. Based on the applicant's proposal for no net increase in ground water pumping and staff's recommendations to limit ground water pumping for AEP to no more than 159 AFY, no significant cumulative impacts to ground water are expected. Because the Project will have no net increase in ground water pumping in the basin, there will be no cumulative impact related to subsidence.

Soil Erosion and Sedimentation

Construction and operational activities related to the AEP project may cause an increase in cumulative wind and water erosion. However, implementation of the RWQCB and Kings County permit requirements will ensure the AEP project will not result in significant cumulative erosion and sedimentation impacts.

Water Supply

By recirculating cooling water (12-16 cycles of concentration), the AEP appears to be an efficient consumer of water in comparison to other water-cooled facilities. The use of 2,250 AF of water per year is considered a water conservation-oriented facility, and a low volume of water for a power plant of this size. Further water savings in the plant would be gained from the proposed design of the ZLD system, which reuses waste streams when possible. With the zero-liquid discharge system, there is no wastewater discharge from the generating process. Recycling the water purified from blowdown using this system will reduce water consumption by an additional 10 percent. Staff is recommending that back-up water supplies be limited annually to assure no net increase in ground water withdrawal during project operation. Due to the project's conservation technologies and the relatively low amount of water use, staff does not expect any significant cumulative water supply impacts from the AEP.

FACILITY CLOSURE

The AEP is expected to operate for a minimum of 30 years. Closure options range from "mothballing," with the intent of a restart at some time, to the removal of all equipment and facilities.

The facility closure plan will be submitted to the California Energy Commission for approval prior to decommissioning. Compliance with all applicable LORS, and any local and/or regional plans will be required. The plan will address all concerns regarding soil and water resources.

COMPLIANCE WITH LORS

The project as proposed will comply with all applicable LORS if the proposed mitigation and recommended Conditions of Certification are adopted.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments on the Application for Certification within the topic area of **Soils and Water Resources** were received from the public or from public agencies.

MITIGATION

APPLICANT PROPOSED MITIGATION

Soils

The applicant proposes to incorporate standard BMPs into the project design for construction and operation to mitigate erosion and sedimentation impacts.

Ground water

The applicant has generally described proposed BMPs for spill prevention and control within their draft Storm Water Pollution Prevention Plan (SWPPP). These measures are intended to minimize the potential for ground water contamination. The applicant has also proposed no net increase in ground water withdrawal with the implementation of a ground water back-up water supply. As discussed above, the ground water conservation plan is incomplete, fails to establish baseline conditions from which to measure ground water conservation measures, and lacks an enforceable, legally binding agreement to assure operation of ground water conservation measures.

Surface Hydrology

All storm water not routed to the zero-liquid-discharge (ZLD) system is to be directed to the sedimentation/detention pond.

Storm Water

The applicant has submitted a draft SWPPP that generally addresses BMPs that may be used at AEP. More site specific BMPs that will reduce erosion and sedimentation impacts and their possible impacts to surface water quality will be required in the project design for construction and operation. Measures established within the SWPPP regarding spill control would also protect surface water resources. Areas where there is a possibility for runoff to encounter contaminants will be curbed or bermed. The runoff from these portions of the site will be routed through an oil/water separator and then to

the ZLD system, eliminating this potential source of polluted runoff. The applicant will be required to meet general storm water requirements of the NPDES permit.

Wastewater Disposal

To reduce water requirements and eliminate wastewater discharges for the project, the applicant has proposed a ZLD system with a crystallizer. Sanitary wastewater is to be directed to a septic system and drain field.

STAFF PROPOSED MITIGATION

Soils

Staff recommends that the applicant be required to meet general storm water requirements of the NPDES permit. As required by Central Valley RWQCB Order 99-08-DWQ (Storm water during construction) and Order 5-00-175 (discharge of short duration or low threat), a Storm Water Pollution Prevention Plan (SWPPP) would be implemented to minimize erosion from construction and operation activities. The Applicant will be required to develop and implement site specific Erosion and Sedimentation Control and Storm Water Management Plans for the entire project (including ancillary facilities) that address standard erosion runoff and sedimentation impacts for construction, post-construction, and operational phases. These requirements are addressed in **Conditions of Certification SOILS & WATER-1** and **SOILS & WATER-2.** The applicant needs to provide a complete, site-specific Erosion and Sediment Control Plan and SWPPP that addresses all staff's and other agencies' comments. The applicant must revise the draft plans to provide the following amendments and additions to the plans for the entire proposed AEP project. The plans shall include:

- The topographic features of the proposed project including areas involving all proposed pipeline construction, laydown (staging) area, transmission upgrades, and stockpile location(s). The mapping scale shall be at least 1"= 100' (1"=50' recommended). Include not less than 1000 feet of the surrounding area of the sites (topography and existing features) on the drawings.
- A construction schedule that addresses all BMP installation, maintenance and removal sequences of events from initial site mobilization to final stabilization (i.e. vegetation/asphalt) and plant operation.
- Proposed contours shall be shown tying in with existing ones. All proposed utilities including storm water facilities should be shown on the plan drawings. All erosion and sedimentation control facilities should be shown on the drawings. The drawings should contain a complete mapping symbols legend that identifies all existing and proposed features including the soil boundary and a limit of construction. The limit of construction boundary should include the project facility, pipeline areas, stockpile areas, laydown areas, and any off-site staging areas. The limit of construction boundariesensures all work is confined to the proposed AEP project in order to protect all surrounding areas not involved in construction or operation of the proposed project.
- Silt fencing and sandbags shall be used to trap sediment, and not as runoff conveyance facilities. Earthen berms or channels can be substituted to intercept

sediment-laden runoff and direct it into the sediment retention basin/trap. A sediment trap should be used for drainage areas less than five acres and a sediment basin should be used for drainage areas greater than five acres.

- All excavated material shall be kept away from active flows. Site specific BMPs shall be included in narrative and drawing portions of the erosion and sediment control plan. The soil shall be covered via a liner or anchored mulch. Areas disturbed during construction shall be stabilized via permanent vegetation upon completion of the process.
- Appropriate BMPs shall be employed for all project-related construction including, but not limited, to access roads, directional drilling / tunneling, linear facilities, and any off-site staging areas. All BMPs shall be shown on legible drawings of appropriate scale.
- Revegetated or landscaped areas and a description of revegetation procedures shall be included on the drawings.
- Soil stockpile management BMPs shall be included for water and wind erosion control.
- Maintenance and monitoring protocol for erosion/storm water control shall be clearly described.

Ground Water

Ground water has been proposed for use as a back-up supply for AEP. After review of the proposed groundwater conservation plan, staff finds it inadequate for the protection of groundwater resources. In addition, the Energy Commission can not require a private third party (Kochergen Farms) to mitigate for the potential impacts associated with the use of groundwater by AEP. The Applicant cannot be held responsible for Kochergen's operation and cannot assure that Kochergen will not increase pumping from other wells to compensate for the reduction in pumping. Thus, to avoid an increase in ground water pumping and to assure extraction rates are not exceeded, staff recommends that the use of ground water wells be limited to wells 18-1, 18-4, and 25-4, and delivery of this water to the project be metered. In addition, use of ground water by AEP will be limited to the volume of water saved by taking 53 acres out of agricultural irrigation, calculated to be 159 AFY (see **Condition of Certification SOILS & WATER-5**).

Surface Hydrology

As proposed, the AEP would be operated as a 'zero-liquid discharge' facility thereby eliminating the need to obtain a NPDES permit other than for storm water discharges.

AEP shall be required to comply with the general NPDES requirements that regulate storm water discharges. The AEP shall supply all information required by the Regional Water Quality Control Board (RWQCB) and Energy Commission staff to determine compliance with the NPDES requirements for storm water discharge. This includes the required SWPPPs. The applicant shall be responsible for all monitoring and reporting guidelines and other provisions included in the general storm water permits. This requirement is contained in **Condition of Certification SOILS & WATER-3**.

This process also requires the submittal of a SWPPP. **Condition of Certification SOILS & WATER-1** requires that this plan be approved by the Energy Commission Compliance Project Manager (CPM). Implementation of the approved plan will mitigate any storm water impacts from the project.

Process and Sanitary Wastewater

If approved, the project will operate with a zero-liquid-discharge system that will eliminate all process wastewater discharge. Since the applicant has proposed no back-up for the ZLD system, staff recommends monitoring of the ZLD system and on-site storage facilities (**Condition of Certification SOILS & WATER-10**) as well as facility shut-down in the event of a disruption to the operation of the ZLD system (**Condition of Certification SOILS & WATER-11**). Compliance with these conditions would ensure proper handling, storage and disposal of wastewater generated at the AEP.

The on-site septic system and drainfield shall be designed according to applicable county laws in order to prevent any significant impacts to water quality. **Condition of Certification SOILS & WATER-4** requires review of the final design plans by the CPM and Kings County for the protection of water quality. The plans must be approved by the Energy Commission before the start of septic system construction activities.

Storm Water

As stated in the **Surface Hydrology** mitigation discussion above, AEP shall be required to comply with the NPDES requirements. These requirements regulate storm water by establishing effluent limitations and monitoring and reporting requirements for construction activities storm water, low-threat or short duration discharge, and the industrial activities (operational) dictated by the storm water general permit. The draft SWPPP shall be revised to be site specific and comply with the guidelines provided in RWQCB's Water Quality Order 99-08-DWQ and 97-03-DWQ.

CONCLUSIONS AND RECOMMENDATIONS

Staff commends the AEP for selecting and proposing ZLD technologies that incorporate water conservation measures that minimize unreasonable use of fresh waters. The proposed AEP will comply with applicable LORS and have no unmitigated significant impacts if the Conditions of Certification recommended are incorporated into the final decision.

PROPOSED CONDITIONS OF CERTIFICATION

The following conditions have been developed for this project:

SOILS & WATER 1: The project owner shall comply with all of the requirements of the General NPDES Permit for Discharges of Storm Water Associated with Construction Activity. The project owner, as required, shall develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for the construction of the entire project. Prior to beginning any site mobilization associated with any project element, the project owner shall submit to the Energy Commission CPM a copy of the Notice of Intent for Construction accepted by the

RWQCB and obtain Energy Commission CPM approval of the construction activity SWPPP for AEP.

Verification: No later than sixty days prior to the start of site mobilization for any project element, the project owner shall submit a copy of the SWPPP required under the General NPDES Permit for Discharges of Storm Water Associated with Construction Activity to the Compliance Project Manager (CPM) for review and approval. The SWPPP shall include copies of the Notice of Intent for Construction accepted by the RWQCB and any permits for AEP that specify requirements for the protection of stormwater or water quality. Approval of the SWPPP by the CPM must be received prior to start of any site mobilization activities for any project element.

SOILS & WATER 2: Prior to beginning any site mobilization activities for any project element, the project owner shall obtain Energy Commission CPM approval for a site-specific Drainage, Erosion and Sedimentation Control Plan that addresses all project elements. The plan shall address revegetation and be consistent with the grading and drainage plan as required by **Condition of Certification CIVIL-1 (Facility Design Section)**.

Verification: No later than sixty days prior to the start of any site mobilization activities associated with any project element, the project owner shall submit the Drainage, Erosion and Sedimentation Control Plan to the CPM for review and approval. The plan shall include verification from the CBO that the plan conforms to all applicable City and County requirements. The plan must be approved by the CPM prior to start of any site mobilization activities.

SOILS & WATER 3: The project owner shall comply with all of the requirements of the General NPDES Permit for Discharges of Storm Water Associated with Industrial Activity for AEP. The project owner, as required, shall develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for the operation of AEP. The project owner shall submit to the Energy Commission CPM a copy of the Notice of Intent for Operation accepted by the RWQCB and obtain approval of the General Industrial Activities SWPPP from the Energy Commission CPM prior to commercial operation of the AEP.

Verification: No later than sixty days prior to the start of commercial operation, the project owner will submit to the CPM a copy of the SWPPP required under the General NPDES Permit for Discharges of Storm Water Associated with Industrial Activity to the CPM for review and approval. The operational SWPPP shall include copies of the Notice of Intent for Operation accepted by the RWQCB and any permits for AEP that specify requirements for the protection of stormwater or water quality. Approval of the SWPPP by the CPM must be received prior to start of commercial operation.

SOILS & WATER 4: The on-site septic system shall be designed and operated to prevent any adverse impacts to water quality. Prior to construction of the on-site domestic wastewater treatment facility (septic system), the project owner will obtain Energy Commission CPM approval for this system.

Verification: No later than sixty days prior to construction of the on-site domestic wastewater treatment facility for AEP, the project owner shall submit to the detailed engineering drawings for this system and a detailed description to the CPM, Kings County and the City of Avenal Engineering Department for review. The detailed description shall include information on infiltration rates, existing groundwater quality

and depth to groundwater. Prior to construction activities associated with this system, the project owner shall provide to the CPM written confirmation from the City of Avenal and Kings County that the design meets all applicable County and City requirements.

SOILS & WATER 5: Total water use by the project owner for the operation of AEP and associated landscape irrigation of the project's 53 acres shall not exceed 2,409 acre-feet annually. Fresh surface water to be used by the project owner shall be limited to and not exceed 2,250 acre-feet a year of the Lower Kern River Flood Flow water exchanged by Kern County Water Agency (KCWA) for State Water Project (SWP) water and delivered via the California Aqueduct. Ground water use by AEP shall not exceed 159 acre-feet in any calendar year and be restricted to only that groundwater extracted from Wells 18-1, 18-4, and 24-5. The project owner shall not exceed these amounts without prior approval by the CPM.

An annual summary of water use by AEP, differentiating between ground water and surface water and the uses at AEP of each, shall be submitted to the Energy Commission in the annual compliance report.

Verification: The project owner shall submit a water use summary report to the CEC CPM in the annual compliance report for the life of the project. The annual summary report shall be based on and shall distinguish recorded use of ground water and SWP water for all project uses, including landscape and agriculture irrigation. The report will include calculated monthly range, monthly average, and annual use by the project in both gallons per minute and acre-feet. For subsequent years this information shall also include the yearly range and yearly average water used by the project. Daily data for AEP ground water use shall be collected and reported consistent with Soils & Water 6.

SOILS & WATER 6: Prior to the use of any ground water by the project, the project owner shall install totalizing metering devices on Kochergen wells 18-1, 18-4, 24-5 and the associated water conveyance systems to AEP. During ground water use by the project, including landscape and agriculture irrigation, meter readings shall be recorded on a daily basis. During periods when AEP is not using ground water, meter readings shall be recorded on a monthly basis. The metering devices shall provide a daily report of 1) total volume extracted, 2) volume used for other uses including irrigation (excluding irrigation of the 53 acres associated with the AEP), and, 3) volume used by the AEP (including landscape irrigation associated with the AEP), in gallons. These metering devices shall be operational for the life of the project. This information shall be submitted annually to the CEC CPM and the Kings County Water Commission. At no time shall ground water be used by the project when the meters are not functioning properly and recording water extraction.

Verification: No less than 30 days prior to the use of ground water by AEP, the project owner shall submit evidence that metering devices have been installed and are operational on the Kochergen wells 18-1, 18-4, and 24-5 and the associated water conveyance systems to AEP. These metering devices shall be capable of recording the quantities in gallons of water extracted and differentiate between water used by AEP (including landscape irrigation) and for agricultural irrigation as to comply with the requirements of **Condition of Certification SOILS & WATER 5**. The project owner

shall provide a report on the metering devices' maintenance schedule and operation in the annual compliance report.

SOILS & WATER 7: Prior to AEP commercial operation, the project owner shall provide written evidence from the California Department of Water Resources (DWR) that DWR has approved the exchange of State Water Project (SWP) water between Kern County Water Agency and City of Avenal. The evidence shall be in the form of a three-party Point of Delivery Agreement with DWR, Kern County Water Agency (KCWA) and Kings County (or City of Avenal) to exchange local water for a portion of water delivered via the California Aqueduct to AEP.

Verification: No later than 30 days prior to the start of commercial operation, the project owner shall submit to the CPM an executed copy of the three-party Point of Delivery Agreement with DWR, Kern County Water Agency (KCWA) and Kings County (or City of Avenal) to exchange local water for a portion of water delivered via the California Aqueduct to AEP.

SOILS & WATER 8: Prior to delivery of fresh water to AEP from the City of Avenal's new water supply turnout on the California Aqueduct, the project owner shall provide written evidence from the Bureau of Reclamation that the new turnout meets all applicable construction and operation requirements.

Verification: No later than 30 days prior to delivery of fresh water to AEP from the City of Avenal's new California Aqueduct turnout, the project owner shall submit to the Energy Commission CPM written evidence from the Bureau of Reclamation that the construction and operation of the new turnout (at approximately Mile Post 164.66) conforms to all applicable requirements.

SOILS & WATER –9 Wash wastewater resulting from periodic cleaning of the compressors and heat recovery steam generators shall be contained on-site in a sump with the contents of the sump periodically pumped out by a vacuum truck and transported off-site for disposal at an appropriately licensed facility.

Verification: The project owner, in the annual compliance report, shall provide an accounting summary of the quantity and quality of wash and chemical cleaning water contained on-site, including the frequency of pumping, and the volume of water transported off-site for disposal. The accounting shall include documentation of the analytical reports required for disposal, and pre-treatment processing, if required for disposal, and the appropriately licensed facilities in which the wastewater is disposed.

SOILS & WATER-10: Following the commencement of commercial operation, the project owner shall submit the final design of the zero liquid discharge system and results of the Waste Extraction Test of the residual cake solid waste from the system.

Verification: Within 60 days following the commencement of commercial operation, the project owner shall submit to the CPM the final design of the zero liquid discharge system, including schematic, narrative of operation, maintenance schedules, on-site storage facilities, containment measures and influent water quality. This information shall also include the results of the Waste Extraction Test of the residual cake solid waste from the zero liquid discharge system.

SOILS & WATER-11: Surface or subsurface disposal of process wastewater or contaminated stormwater from AEP is prohibited. The project owner shall treat

all appropriate wastewater streams with a zero liquid discharge (ZLD) system that results in a residual cake solid waste. In the event of ZLD system shutdown or any maintenance affecting the ability for AEP to continue treatment at the rate of AEP's production of wastewater, AEP shall cease operation.

Verification: In the annual compliance report, the project owner shall submit a status report on operation of the zero liquid discharge system, including disruptions, maintenance, volumes of interim wastewater streams stored on-site, volumes of residual cake solids generated and the landfill(s) used for disposal.

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WORKER SAFETY AND FIRE PROTECTION

Alvin J. Greenberg, Ph.D.

INTRODUCTION

Worker safety and fire protection is legislated by laws, ordinances, regulations, and standards (LORS), and enforced through regulations codified at the Federal, State, and local levels. Worker safety is of utmost priority at the project location and is documented through worker safety practices and training. Industrial workers at the facility operate process equipment and handle hazardous materials daily and may face hazards that can result in accidents and serious injury. Protection measures are employed to either eliminate these hazards or minimize the risk through special training, protective equipment or procedural controls.

The purpose of this analysis is to assess the worker safety and fire protection measures proposed by the Avenal Energy Project and to determine whether the applicant has proposed adequate measures to:

- comply with applicable safety LORS;
- protect the workers during construction and operation of the facility;
- protect against fire; and
- provide adequate emergency response procedures.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL

In December 1970 Congress enacted Public Law 91-596, the Federal Occupational Safety and Health (OSH) Act of 1970. This Act mandates safety requirements in the workplace and is found in Title 29 of the United States Code, § 651 (29 U.S.C. §§ 651 through 678). Implementing regulations are codified at Title 29 of the Code of Federal Regulations, under General Industry Standards §§ 1910.1 - 1910.1500 and clearly define the procedures for promulgating regulations and conducting inspections to implement and enforce safety and health procedures to protect workers, particularly in the industrial sector. Most of the general industry safety and health standards now in force under this OSH Act represent a compilation of materials from existing federal standards and national consensus standards. These include standards from the voluntary membership organizations of the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA) which publishes the National Fire Codes.

The purpose of the Occupational Safety and Health Act is to “assure so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources,” (29 USC § 651). The Federal Department of Labor promulgates and enforces safety and health standards that are applicable to all businesses affecting interstate commerce. The Department of Labor established the

Occupational Safety and Health Administration (OSHA) in 1971 to discharge the responsibilities assigned by the OSH Act.

Applicable Federal requirements include:

- 29 U.S.C. § 651 et seq. (Occupational Safety and Health Act of 1970);
- 29 CFR §1910.1 - 1910.1500 (Occupational Safety and Health Administration Safety and Health Regulations);
- 29 CFR §1952.170 – 1952.175 (Federal approval of California's plan for enforcement of its own Safety and Health requirements, in lieu of most of the Federal requirements found in 29 CFR §1910.1 – 1910.1500).

STATE

California passed the Occupational Safety and Health Act of 1973 ("Cal/OSHA") as published in the California Labor Code § 6300. Regulations promulgated as a result of the Act are codified at Title 8 of the California Code of Regulations, beginning with §337-560 and continuing with §1514 through 8568. The California Labor Code requires that the Cal/OSHA Standards Board adopt standards at least as effective as the federal standards (Labor Code § 142.3(a)) and thus all Cal/OSHA health and safety standards meet or exceed the Federal requirements. Hence, California obtained federal approval of its State health and safety regulations, in lieu of the federal requirements published at 29 CFR §1910.1 - 1910.1500. The Federal Secretary of Labor, however, continually oversees California's program and will enforce any federal standard for which the State has not adopted a Cal/OSHA counterpart.

The State of California Department of Industrial Relations is charged with responsibility for administering the Cal/OSHA plan. The Department of Industrial Relations is further split into six divisions to oversee, among other activities: industrial accidents, occupational safety and health, labor standards enforcement, statistics and research, and the State Compensation Insurance Fund (workers compensation).

Employers are responsible for informing their employees about workplace hazards, potential exposure and the work environment (Labor Code § 6408). Cal/OSHA's principal tool in ensuring that workers and the public are informed is the Hazard Communication standard first adopted in 1981 (8 CCR §5194). This regulation was promulgated in response to California's Hazardous Substances Information and Training Act of 1980. It was later revised to mirror the Federal Hazard Communication Standard (29 CFR §1910.1200) which established on the federal level an employee's "right to know" about chemical hazards in the workplace, but added the provision of applicability to public sector employers. A major component of this regulation is the required provision of Material Safety Data Sheets (MSDSs) to workers. MSDSs provide information on the identity, toxicity, and precautions to take when using or handling hazardous materials in the workplace.

Finally, 8 CCR §3203 requires that employers establish and maintain a written Injury and Illness Prevention Program to identify workplace hazards and communicate them to its employees through a formal employee-training program.
Applicable State requirements include:

- 8 CCR §339 - List of hazardous chemicals relating to the Hazardous Substance Information and Training Act;
- 8 CCR §337, et seq. Cal/OSHA regulations;
- 24 CCR § 3, et seq. - incorporates the current edition of the Uniform Building Code;
- Health and Safety Code § 25500, et seq. - Risk Management Plan requirements for threshold quantity of listed acutely hazardous materials at the facility;
- Health and Safety Code § 25500 - 25541 - Hazardous Material Business Plan detailing emergency response plans for hazardous materials emergency at the facility.

LOCAL

The California Building Standards Code published at Title 24 of the California Code of Regulations § 3 et seq is comprised of eleven parts containing the building design and construction requirements relating to fire and life safety and structural safety. The Building Standards Code includes the electrical, mechanical, energy, and fire codes applicable to the project. Local planning/building & safety departments enforce the California Uniform Building Code.

National Fire Protection Association (NFPA) standards are published in the California Fire Code. The fire code contains general provisions for fire safety, including but not restricted to: 1) required road and building access; 2) water supplies; 3) installation of fire protection and life safety systems; 4) fire-resistive construction; 5) general fire safety precautions; 6) storage of combustible materials; 7) exits and emergency escapes; and 8) fire alarm systems. The California Fire Code reflects the body of regulations published at Part 9 of Title 24 (Health and Safety Code §18901 et seq.) pertaining to the California Fire Code.

Similarly, the Uniform Fire Code (UFC) Standards, a companion publication to the California Fire Code, contains standards of the American Society for Testing and Materials and the NFPA. It is the United State's premier model fire code. It is updated annually as a supplement and published every third year by the International Fire Code Institute to include all approved code changes in a new edition.

The proposed Avenal Energy Project is located within the jurisdiction of the Kings County Fire Department, and applicable local (or locally enforced) requirements include:

- 1998 Edition of California Fire Code and all applicable NFPA standards (24 CCR Part 9);
- California Building Code Title 24, California Code of Regulations (24 CCR § 3, et seq.).
- Uniform Fire Code, 1997 (Dawson 2002)

SETTING

The proposed Avenal Energy Project would be a natural gas-fired, combined-cycle facility, with a nominal generating capacity of 600 megawatts (MW). The facility would be comprised of two new Combustion Turbine Generators (CTG), two Heat Recovery Steam Generators (HRSG), one Steam Turbine Generator (STG), and other related equipment. The Avenal Energy Project would be located on a parcel owned by Duke Avenal located in the northeast corner of the City of Avenal in Kings County, California, near its border with Kings County. The City of Avenal is the nearest population center, with the City of Huron approximately 8 miles to the north of the project site and the City of Coalinga approximately 16 miles to the west. Please refer to the **Project Description** section for more detail.

The Kings County Fire Department (KCFD) will provide fire support services to the site. The nearest Station is located in the City of Avenal, manned by two fire-fighters, and assigned as the off-site first responder to the Project. Response time is estimated to be under 5 minutes (Dawson 2002). Backup fire suppression support will be provided by the Kettleman City Station with estimated response time of less than 10 minutes (Dawson 2002).

The county does not have a Hazardous Materials Response (hazmat) team. However, they have an agreement with the City of Visalia Fire Department, which has a Hazmat team to provide response to spills. Additionally, the City of Hanford Fire Department and the Lemoore Naval Air Station have Hazmat teams and can also be called upon in the event of a spill (Fillmore 2002). While there are no estimated response times from these locations, the Lemoore NAS is the closest (~17 miles distant), Hanford is ~26 miles distant, and Visalia is ~41 miles away. Thus, hazmat response time could vary between 15 and 40 minutes. This hazmat response time is consistent with that of other power plants which have been certified by the CEC. On-site workers would be trained and equipped to respond to and remediate a small hazardous materials spill or contain a larger one.

IMPACTS

WORKER SAFETY

Industrial environments are potentially dangerous, during construction and operation of facilities. Workers at the proposed project will be exposed to loud noises, moving equipment, trenches, and confined space entry and egress problems. The workers may experience falls, trips, burns, lacerations, and numerous other injuries. They have the potential to be exposed to falling equipment or structures, chemical spills, hazardous waste, fires, explosions, and electrical sparks and electrocution. It is important for the Avenal Energy Project to have well-defined policies and procedures, training, and hazard recognition and control at their facility to minimize such hazards and protect workers. If the facility complies with all LORS, workers will be adequately protected from health and safety hazards.

The construction phase is expected to last approximately 20 months and will include site preparation, foundation work, installation of major equipment, and installation of major structures.

FIRE HAZARDS

During construction and operation of the proposed Avenal Energy Project there is the potential for both small fires and major structural fires. Electrical sparks, combustion of fuel oil, natural gas or flammable liquids, explosions, and over-heated equipment, may cause small fires. Major structural fires may develop from uncontrolled fires or be caused by large explosions of natural gas or other flammable gasses or liquids. Compliance with all LORS will be adequate to assure protection from all fire hazards.

FIRE PROTECTION

Staff reviewed the information provided in the AFC regarding available fire protection services and equipment (Duke 2001a AFC Sections 2.3.11.5, 6.10.1.6.2 and 6.17.2.2.6.2) to determine if the project would adequately protect workers and if it would affect the fire protection services in the area. The project will rely on both onsite fire protection systems and local fire protection services. The onsite fire protection system provides the first line of defense for small fires. In the event of a major fire, fire support services including trained firefighters and equipment for a sustained response would be required by the Kings County Fire Department (Dawson 2002).

The information in the AFC indicates that the project intends to meet the applicable fire protection and suppression requirements. Elements include both fixed and portable fire extinguishing systems. Fire-water will be supplied from a dedicated 240,000-gallon portion of the raw water/fire water stored tank located on site (Duke 2001a, Section 2.3.11.5). This fire water supply and an on-site electric fire-water pumping system (with diesel generator back-up) will provide more than an adequate quantity of fire-fighting water to yard hydrants, hose stations, and water spray and sprinkler systems.

Fire hydrants with hose stations must be spaced at 300-foot intervals around the facilities, in accordance with NFPA 24 and local fire codes. Sprinkler and fixed spray systems must be designed and installed according to NFPA 13 and 15. Hand held portable fire extinguishers of the appropriate size and rating must be located in accordance with NFPA 10 throughout the facility.

The combustion turbine, generator, and accessory equipment will be protected by a CO_2 fire protection system. This system will include a CO_2 storage tank, piping and nozzles, fire detection sensors and a control system.

The applicant will be required to provide the final Fire Protection and Prevention Program to staff and to the Kings County Fire Department, prior to construction and operation of the project, to confirm the adequacy of the proposed fire protection measures. Staff finds that the proposed fire protection systems comply with NFPA guidelines and the California Fire Code and that fire department response times are normal for a rural area.

CUMULATIVE IMPACTS

Staff reviewed the potential for the construction and operation of Avenal Energy Project, combined with existing industrial facilities, to result in impacts on the fire and emergency service capabilities of the Kings County Fire Department and found that cumulative impacts were insignificant.

APPLICANT'S PROPOSED MITIGATION

WORKER SAFETY

A Safety and Health Program will be prepared by the applicant to minimize worker hazards during construction and operation. Staff uses the phrase "Safety and Health Program" to refer to the measures that will be taken to ensure compliance with the applicable LORS during the construction and operational phases of the project.

Construction Safety and Health Program

The Avenal Energy Project encompasses construction and operation of a natural gas fired facility with ancillary facilities such as transmission lines and pipelines. Workers will be exposed to hazards typical of construction and operation of a gas-fired combined cycle facility.

Construction Safety Orders are published at 8 CCR § 1502, et seq. These requirements are promulgated by Cal/OSHA and are applicable to the construction phase of the project. The Construction Safety and Health Program will include the following:

- Construction Injury and Illness Prevention Program (8 CCR § 1509);
- Construction Fire Protection and Prevention Plan (8 CCR § 1920);
- Personal Protective Equipment Program (8 CCR §§ 1514 - 1522); and
- Emergency Action Program.

Additional programs under General Industry Safety Orders (8 CCR §§ 3200 - 6184), Electrical Safety Orders (8 CCR §§2299 - 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 - 544) will include:

- Motor Vehicle and Heavy Equipment Safety Program
- Forklift Operation Program;
- Excavation/Trenching Program;
- Fall Prevention Program;
- Scaffolding/Ladder Safety Program;
- Articulating Boom Platforms Program;
- Crane and Material Handling Program;
- Hazardous Waste Program

- Housekeeping and Material Handling and Storage Program;
- Hot Work Safety Program;
- Respiratory Protection Program;
- Employee Exposure Monitoring Program;
- Confined Space Entry Program;
- Hand and Portable Power Tool Safety Program;
- Hearing Conservation Program;
- Back Injury Prevention Program;
- Hazard Communication Program;
- Heat and Cold Stress Monitoring and Control Program; and
- Pressure Vessel and Pipeline Safety Program.

The AFC includes adequate outlines of each of the above programs (Duke 2001a, Appendix 6.17-1). Prior to the construction of the Avenal Energy Project, detailed programs and plans will be provided pursuant to condition of certification **WORKER SAFETY-1**.

Operations and Maintenance Safety and Health Program

Upon completion of construction and prior to operations at the Avenal Energy Project, the Operations and Maintenance Safety and Health Program will be prepared. This operational safety program will include the following programs and plans:

- Injury and Illness Prevention Program (8 CCR § 3203);
- Emergency Action Plan (8 CCR § 3220);
- Plant Operation Safety Program;
- Fire Protection and Prevention Program (8 CCR § 3221); and
- Personal Protective Equipment Program (8 CCR §§ 3401-3411).

In addition, the requirements under General Industry Safety Orders (8 CCR §§ 3200 - 6184), Electrical Safety Orders (8 CCR §§2299 - 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 - 544) will be applicable to the project. Written safety programs, which the applicant will develop, for the Avenal Energy Project will ensure compliance with the above-mentioned requirements.

The AFC includes outlines of the Operations Safety Program and the Injury and Illness Prevention Program (Duke 2001a, Section 6.17.2.2.). Prior to operation of the Avenal Energy Project, all detailed programs and plans will be provided pursuant to condition of certification **WORKER SAFETY-2**.

Safety and Health Program Elements

The Applicant provided the proposed outlines for both a Construction Safety and Health Program and an Operation Safety and Health Program. The measures in these plans

are derived from applicable sections of state and federal law. The major items required in both Safety and Health Programs are as follows:

Injury and Illness Prevention Program (IIPP)

The Applicant will submit an expanded Construction and Operations Illness and Injury Prevention Program to Cal/OSHA for review and comment 30 days prior to construction and operation of the project.

The IIPP will include the following components:

- Identity of person(s) with authority and responsibility for implementing the program;
- Safety and health policy;
- Work rules and safe work practices;
- System ensuring employees comply with safe work practices;
- Employee communications;
- Procedures identifying and evaluating workplace hazards;
- Methods for correcting unhealthy/unsafe conditions, work practices, and work procedures in a timely manner;
- Specific safety procedures;
- Training and instruction.

Emergency Action Plan

California regulations require an Emergency Action Plan (8 CCR § 3220). The AFC describes a proposed emergency response plan (Duke 2001a, Appendix 6.17-4); the Emergency Action Plan should include the following features:

- Purpose and Scope of Emergency Action Plan;
- Personnel Responsibilities during Emergencies;
- Specific Response Procedures;
- Evacuation Plan;
- Emergency Equipment Locations;
- Fire Extinguisher Locations;
- Site Security;
- Accident Reporting and Investigation;
- Lockout/Tagout;
- Hazard Communication;
- Spill Containment and Reporting;
- First Aid and Medical Response;
- Respiratory Protection;

- Personal Protective Equipment;
- Sanitation; and
- Work Site Inspections.

Fire Prevention Plan

California Code of Regulations requires an Operations Fire Prevention Plan (8 CCR § 3221). The AFC describes briefly the contents of the proposed fire prevention plan (Duke 2001a, Section 6.17.2.2.2). The final plan must include the following topics:

- General requirements;
- Fire hazard inventory, including ignition sources and mitigation;
- Procedures for fire control;
- Fixed and Portable fire-fighting equipment;
- Housekeeping and proper material storage;
- Employee alarm/communication system;
- Servicing and refueling areas;
- Training;
- Flammable and combustible liquid storage and use;
- Dispensing and disposal of liquids;
- Identity of personnel to contact for information on plan contents.

Staff proposes that the Applicant submit a final Fire Protection and Prevention Plan to the California Energy Commission Compliance Project Manager (CPM) and the Kings County Fire department for review and approval to satisfy proposed conditions of certification **WORKER SAFETY 1** and **2**.

Personal Protective Equipment Program

California regulations require Personal Protective Equipment (PPE) and first aid supplies whenever hazards are encountered which, due to process, environment, chemicals or mechanical irritants can cause injury or impair bodily function as a result of absorption, inhalation or physical contact (8 CCR § 3380-3400). The Avenal Energy Project operational environment will likely require PPE.

Information provided in the AFC indicates that all employees required to use PPE will be checked for proper fit and trained in inspection and care of the equipment (Duke 2001a, Section 6.17.2.2.4). All safety equipment must meet NIOSH or ANSI standards and must carry markings, numbers, or certificates of approval. Respirators must meet NIOSH and California Department of Health and Human Services Standards. Each employee must be provided with the following information pertaining to the protective clothing and equipment:

- Proper use, maintenance, and storage;

- When the protective clothing and equipment are to be used;
- Benefits and limitations; and
- When and how the protective clothing and equipment are to be replaced.

The PPE Program ensures that employers comply with the applicable requirements for PPE and provide employees with the information and training necessary to implement the program.

Operations and Maintenance Written Safety Program

In addition to the specific plans listed above, there are additional LORS applicable to the project, which are called "safe work practices". Both the Construction and the Operations Safety Programs will address safe work practices under a variety of programs. The components of these programs include the following:

- Fall Protection Program;
- Hot Work Safety Program;
- Confined Space Entry;
- Hearing Conservation Program;
- Hazard Communication Program;
- Process Safety Management (PSM) Program; and
- Contractor Safety Program.

Operations and Maintenance Safety Training Programs

Employees will be trained in the safe work practices described in the above-reference safety programs.

FACILITY CLOSURE

The project owner/operator is responsible for maintaining an operational fire protection system during closure activities. The project must also stay in compliance with all applicable health and safety LORS during that time. A facility closure plan will be developed prior to closure to incorporate these requirements.

CONCLUSION AND RECOMMENDATIONS

If the Applicant for the proposed Avenal Energy Project provides a Project Construction Injury and Illness Prevention Program and a Project Operations Safety and Health Program as required by conditions of certification **WORKER SAFETY 1** and **2**, staff believes that the project will incorporate sufficient measures to ensure adequate levels of industrial safety, and comply with applicable LORS. Staff also concludes that the proposed project will not have significant impacts on local fire protection services. The proposed facility is located within an area that is currently served by the local fire department. The fire risks of the proposed facility are similar to those of existing facilities in the immediate vicinity and thus pose no significant added demands on local

fire protection services. The applicant will be required to provide a Fire Protection and Prevention Program to staff and to the Kings County Fire Department, prior to construction and operation of the project, to confirm the adequacy of the proposed fire protection measures. Staff finds that the proposed fire protection systems comply with NFPA guidelines and the California Fire Code and that fire department response times are normal for a rural area.

If the Commission certifies the project, staff recommends that the Commission adopt the following proposed conditions of certification. The proposed conditions of certification provide assurance that the Construction Injury and Illness Prevention Program and the Operations Safety and Health Program proposed by the applicant will be reviewed by the appropriate agencies before implementation. The conditions also require verification that the proposed plans adequately assure worker safety and fire protection and comply with applicable LORS.

PROPOSED CONDITIONS OF CERTIFICATION

WORKER SAFETY-1 The project owner shall submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program containing the following:

- A Construction Safety Program;
- A Construction Personal Protective Equipment Program;
- A Construction Exposure Monitoring Program;
- A Construction Emergency Action Plan; and
- A Construction Fire Protection and Prevention Plan.

The Safety Program, the Personal Protective Equipment Program, and the Exposure Monitoring Program shall be submitted to the CPM for review and comment concerning compliance of the program with all applicable Safety Orders. The Construction Fire Protection and Prevention Plan and Emergency Action Plan shall be submitted to the Kings County Fire Department for review and comment prior to submittal to the CPM.

Verification At least 30 days prior to the start of construction, the project owner shall submit to the CPM for review and approval a copy of the Project Construction Safety and Health Program. The project owner shall provide a letter from the Kings County Fire Department stating that they have reviewed and commented on the Construction Fire Protection and Prevention Plan Emergency Action Plan.

WORKER SAFETY-2 The project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety and Health Program containing the following:

- An Operation Injury and Illness Prevention Plan;
- An Emergency Action Plan;
- Hazardous Materials Management Program;
- Operations and Maintenance Safety Program;

- Fire Protection and Prevention Program (8 CCR § 3221); and;
- Personal Protective Equipment Program (8 CCR §§ 3401-3411).

The Operation Injury and Illness Prevention Plan, Emergency Action Plan, and Personal Protective Equipment Program shall be submitted to the Cal/OSHA Consultation Service, for review and comment concerning compliance of the program with all applicable Safety Orders. The Operation Fire Protection Plan and the Emergency Action Plan shall also be submitted to the Kings County Fire Department for review and comment.

Verification At least 30 days prior to the start of operation, the project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety & Health Program.

REFERENCES

1998 California Fire Code. Published by the International Fire Code Institute comprised of the International Conference of Building Officials, the Western Fire Chiefs Association, and the California Building Standards Commission. Whittier, Ca.

Dawson, Doug. Fire Chief, Kings County Fire Department, personal communications April 9, 2002.

Duke Avenal 2001a. Application for Certification for the Avenal Energy Project (01-AFC-20). October 2001.

Fillmore, Tim. Supervising Sanitarian, Kings County Department of Health, Division of Environmental Health Services. personal communication April 9, 2002.

1997 Uniform Fire Code, Vol. 1. Published by the International Fire Code Institute comprised of the International Conference of Building Officials and the Western Fire Chiefs Association, Whittier, Ca.

ENGINEERING ASSESSMENT

FACILITY DESIGN

Brian Payne

INTRODUCTION

Facility Design encompasses the civil, structural, mechanical and electrical engineering design of the project. The purpose of the Facility Design analysis is to:

- verify that the laws, ordinances, regulations and standards (LORS) applicable to the engineering design and construction of the project have been identified;
- verify that the project and ancillary facilities have been described in sufficient detail, including proposed design criteria and analysis methods, to provide reasonable assurance that the project can be designed and constructed in accordance with all applicable engineering LORS, and in a manner that assures public health and safety;
- determine whether special design features should be considered during final design to deal with conditions unique to the site which could influence public health and safety; and
- describe the design review and construction inspection process and establish Conditions of Certification that will be used to monitor and ensure compliance with the intent of the engineering LORS and any special design requirements.

FINDINGS REQUIRED

The Warren Alquist Act requires the commission to "prepare a written decision ….which includes…(a) Specific provisions relating to the manner in which the proposed facility is to be designed, sited and operated in order to protect environmental quality and assure public health and safety [and] (d)(1) Findings regarding the conformity of the proposed site and related facilities…with public safety standards…and with other relevant local, regional, state and federal standards, ordinances, or laws…" (Pub. Resources Code, §25523).

SUBJECTS DISCUSSED

Subjects discussed in this analysis include:

- identification of the engineering LORS applicable to facility design;
- evaluation of the applicant's proposed design criteria, including the identification of those criteria that are essential to ensuring public health and safety;
- proposed modifications and additions to the Application for Certification (AFC) that are necessary to comply with applicable engineering LORS; and
- conditions of Certification proposed by staff to ensure that the project will be designed and constructed to assure public health and safety and comply with all applicable engineering LORS.

SETTING

Duke Energy Avenal, LLC (Duke) proposes to construct and operate a nominally rated 600 megawatt combined cycle electric power generating plant known as the Avenal Energy Project. The project will be located on a portion of an approximately 148 acre site in a planned industrial park in the City of Avenal, Kings County, California. It is located in an agricultural region along the western edge of the San Joaquin Valley, approximately two miles east of Interstate 5, near Avenal Cutoff Road. (The residential area of Avenal is located approximately six miles to the southwest. The City of Huron is located approximately 8 miles to the north.) For more information on the site and related project description, please see the **Project Description** section of this document.

The site lies in seismic zone 4, the zone of greatest seismic shaking in the United States. Additional engineering design details are contained in the Application for Certification (AFC), Appendices 2-1 through 2-5 (AEP 2001a).

References to “the City” and “the County” designate the City of Avenal and Kings County, respectively.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical and electrical) are described in the AFC (AEP 2001a, Tables 2.5-1, 6.3-3, and 6.5-6 and Appendices 2-1 through 2-5). Some of these LORS include; California Building Code (CBC), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM) and American Welding Society (AWS).

ANALYSIS

The basis of this analysis is the applicant’s proposed analysis and construction methods and list of engineering LORS and design criteria set forth in the AFC.

SITE PREPARATION AND DEVELOPMENT

Staff has evaluated the proposed design criteria for grading, flood protection, erosion control, site drainage and site access. Staff has assessed the criteria for designing and constructing linear support facilities such as a 2.5 mile, 20” diameter natural gas pipeline; 1.6 mile water pipeline; and 1.3 mile electric transmission line. The applicant proposes to use accepted industry standards (see AFC Appendices 2-1 through 2-5 for a representative list of applicable industry standards), design practices and construction methods in preparing and developing the site. Staff concludes that the project, including its linear facilities, will likely comply with all applicable site preparation LORS, and proposes Conditions of Certification (see below and the **Geology and Paleontology** section of this document) to ensure compliance.

MAJOR STRUCTURES, SYSTEMS AND EQUIPMENT

Major structures, systems and equipment are defined as those structures and associated components or equipment that are necessary for power production and are costly to repair or replace, that require a long lead time to repair or replace, or that are used for the storage, containment, or handling of hazardous or toxic materials. Major structures and equipment will be identified through compliance with proposed Condition of Certification **GEN-2** (below).

The AFC contains lists of the civil, structural, mechanical and electrical design criteria that demonstrate the likelihood of compliance with applicable engineering LORS, and that staff believes are essential to ensuring that the project is designed in a manner that protects public health and safety.

The project shall be designed and constructed to the 1998 edition of the California Building Code (CBC) and other applicable codes and standards in effect at the time design and construction of the project actually commence. In the event the initial designs are submitted to the Chief Building Official (CBO) for review and approval when the successor to the 1998 CBC is in effect, the 1998 CBC provisions, identified herein, shall be replaced with the applicable successor provisions.

Certain structures in a power plant may be required, under the CBC, to undergo dynamic lateral force (structural) analysis; others may be designed using the simpler static analysis procedure. In order to ensure that structures are analyzed using the appropriate lateral force procedure, staff has included Proposed Condition of Certification **STRUC-1** (below), which in part requires review and approval by the CBO of the project owner's proposed lateral force procedures prior to the start of construction.

NATURAL GAS PIPELINE

A new 2.5 mile, 20" diameter natural gas pipeline will be constructed to provide fuel to the proposed facility. The line will be owned, operated and maintained by Duke Avenal, in accordance with U.S. Department of Transportation (DOT), Title 49, Code of Federal Regulations (CFR) Chapter 1, Part 192 "Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards," and the California Public Utilities Commission, General Order 112-E (CPUC GO 112-E). Compliance with these requirements will help reduce the potential for pipeline rupture by ensuring proper operation and maintenance of the line. Therefore, no mitigation beyond a pipeline operated and maintained to applicable regulations is necessary.

PROJECT QUALITY PROCEDURES

The AFC (AEP 2001a, § 2.3.15.6 and 2.3.15.7) describes a Project Quality Control Program that will be used on the project to maximize confidence that systems and components will be designed, fabricated, stored, transported, installed and tested in accordance with the technical codes and standards appropriate for a power plant. Compliance with design requirements will be verified through an appropriate program of inspections and audits. Employment of this Quality Assurance/Quality Control (QA/QC)

program will ensure that the project is actually designed, procured, fabricated and installed as contemplated in this analysis.

COMPLIANCE MONITORING

Under Section 104.2 of the CBC, the building official is authorized and directed to enforce all the provisions of the CBC. For all energy facilities certified by the Energy Commission, the Energy Commission is the building official and has the responsibility to enforce the code. In addition, the Energy Commission has the power to render interpretations of the CBC and to adopt and enforce rules and supplemental regulations to clarify the application of the CBC's provisions.

The Energy Commission's design review and construction inspection process is developed to conform to CBC requirements and ensure that all facility design Conditions of Certification are met. As provided by Section 104.2.2 of the CBC, the Energy Commission appoints experts to carry out the design review and construction inspections and act as delegate CBO on behalf of the Energy Commission. These delegates typically include the local building official and/or independent consultants hired to cover technical expertise not provided by the local official. The applicant, through permit fees as provided by CBC Sections 107.2 and 107.3, pays the costs of the reviews and inspections. While building permits in addition to the Energy Commission certification are not required for this project, in lieu permit fees are paid by the applicant consistent with CBC Section 107, to cover the costs of reviews and inspections.

Engineering and compliance staff will invite the local building authority, either the City or the County, or a third party engineering consultant, to act as CBO for the project. When an entity has been identified to perform the duties of CBO, Energy Commission staff will complete a Memorandum of Understanding (MOU) with that entity that outlines its roles and responsibilities and those of its subcontractors and delegates.

Staff has developed proposed Conditions of Certification to ensure public health and safety and compliance with engineering design LORS. Some of these conditions address the roles, responsibilities and qualifications of the applicant's engineers responsible for the design and construction of the project (proposed Conditions of Certification **GEN-1** through **GEN-8**). Engineers responsible for the design of the civil, structural, mechanical and electrical portions of the project are required to be registered in California, and to sign and stamp each submittal of design plans, calculations and specifications submitted to the CBO. These conditions require that no element of construction subject to CBO review and approval shall proceed without prior approval from the CBO. They also require that qualified special inspectors be assigned to perform or oversee special inspections required by the applicable LORS.

While the Energy Commission and delegate CBO have the authority to allow some flexibility in scheduling construction activities, these conditions are written to require that no element of construction of permanent facilities subject to CBO review and approval, which would be difficult to reverse or correct, may proceed without prior approval of plans by the CBO. For those elements of construction that are not difficult to reverse and are allowed to proceed without approval of the plans, the applicant shall bear the

responsibility to fully modify those elements of construction to comply with all design changes that result from the CBO's plan review and approval process.

FACILITY CLOSURE

The removal of a facility from service, or decommissioning, as a result of the project reaching the end of its useful life, may range from "mothballing" to removal of all equipment and appurtenant facilities and restoration of the site. Future conditions that may affect the decommissioning decision are largely unknown at this time.

In order to assure that decommissioning of the facility will be completed in a manner that is environmentally sound, safe and will protect public health and safety, the applicant shall submit a decommissioning plan to the Energy Commission for review and approval prior to the commencement of decommissioning. The plan shall include a discussion of the following items:

- proposed decommissioning activities for the project and all appurtenant facilities constructed as part of the project;
- all applicable LORS, local/regional plans and the conformance of the proposed decommissioning activities to the applicable LORS and local/regional plans;
- the activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities; and
- decommissioning alternatives, other than complete site restoration.

The above requirements should serve as adequate protection, even in the unlikely event of project abandonment. Staff has proposed general conditions (see **General Conditions**) to ensure that these measures are included in the Facility Closure plan.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The laws, ordinances, regulations and standards (LORS) identified in the AFC and supporting documents are those applicable to the project.
2. Staff has evaluated the proposed engineering LORS, design criteria and design methods in the record, and concludes that the design, construction and eventual closure of the project are likely to comply with applicable engineering LORS.
3. The Conditions of Certification proposed will ensure that the proposed facilities are designed and constructed in accordance with applicable engineering LORS. This will occur through the use of design review, plan checking and field inspections, which are to be performed by the CBO or other Energy Commission delegate. Staff will audit the CBO to ensure satisfactory performance.
4. Whereas future conditions that may affect decommissioning are largely unknown at this time, it can reasonably be concluded that if the project owner submits a decommissioning plan as required in the **General Conditions** portion of this

document prior to the commencement of decommissioning, the decommissioning procedure is likely to occur in compliance with all applicable engineering LORS.

RECOMMENDATIONS

Energy Commission staff recommends that:

1. the Conditions of Certification proposed herein be adopted to ensure that the project is designed and constructed to assure public health and safety, and to ensure compliance with all applicable engineering LORS;

2. the project be designed and built to the 1998 CBC (or successor standard, if such is in effect when the initial project engineering designs are submitted for review); and

3. the CBO shall review the final designs, conduct plan checking and perform field inspections during construction, and Energy Commission staff shall audit and monitor the CBO to ensure satisfactory performance.

CONDITIONS OF CERTIFICATION

GEN-1 The project owner shall design, construct and inspect the project in accordance with the 1998 California Building Code (CBC) and all other applicable engineering LORS in effect at the time initial design plans are submitted to the CBO for review and approval. (The CBC in effect is that edition that has been adopted by the California Building Standards Commission and published at least 180 days previously.) All transmission facilities (lines, switchyards, switching stations and substations) are handled in Conditions of Certification in the **Transmission System Engineering** section of this document.

Protocol: In the event that the initial engineering designs are submitted to the CBO when a successor to the 1998 CBC is in effect, the 1998 CBC provisions identified herein shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

Verification: Within 30 days after receipt of the Certificate of Occupancy, the project owner shall submit to the CPM a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation and inspection requirements of the applicable LORS and the Energy Commission's Decision have been met in the area of facility design. The project owner shall provide the CPM a copy of the Certificate of Occupancy within 30 days of receipt from the CBO [1998 CBC, Section 109 – Certificate of Occupancy].

GEN-2 Prior to submittal of the initial engineering designs for CBO review, the project owner shall furnish to the CPM and to the CBO a schedule of facility design submittals, a Master Drawing List and a Master Specifications List. The schedule shall contain a list of proposed submittal packages of designs, calculations and

specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM when requested.

Verification: At least 60 days (or project owner and CBO approved alternative timeframe) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, the Master Drawing List and the Master Specifications List of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures and equipment listed in Table 1 below. Major structures and equipment shall be added to or deleted from the Table only with CPM approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

Table 1
Major Structures and Equipment List

Equipment/System	Quantity (Plant)
Combustion Turbine (CT) Foundation and Connections	2
CT Mechanical Accessories (e.g. lube oil cooler, static motor starter, No_x control system, compressor wash system, fire detection system, fuel heating system, etc.) Foundation(s) and Connections	2
CT Structure Shell and Façade Foundation and Connections	2
CT Inlet Air Plenum and Filter Structure, Foundation and Connections	2
CT Inlet Air Mechanical Chiller Foundation and Connections	2
180 MW Combustion Turbine Generator (CTG) Foundation and Connections	2
Heat Recovery Steam Generator (HRSG) Structure, Foundation and Connections	2
HRSG Exhaust Stack, Foundation and Connections	2
HRSG Transition Duct Burner and Forced Draft Structure, Foundations and Connections	2
Selective Catalytic Reduction Unit Foundation and Connections	2
Steam Turbine (ST) Foundation and Connections	1
ST Structure Shell and Façade Foundation and Connections	1
300 MW Steam Turbine Generator (STG) Foundation and Connections	1
STG Lube Oil Skid Foundation and Connections	1
STG Hydraulic Control System Foundation and Connections	1
Mechanical Draft Evaporative Cooling Towers, Support Structures, Foundations and Connections	1 Lot
Pipe and Cable Way Structures, Foundations and Connections	1 Lot
Electrical MCC, Foundation and Connections	1 Lot
18KV Auxiliary Step-Down Transformer Foundation and Connections	2
230KV Step-Up Transformer Foundation and Connections	3
Transformer (4,160 to 480 Volt) Foundation(s) and Connections	1 Lot
Electrical Power Supply System	1 Lot
Electrical Control Centers, Switchgear and Switchyard Equipment Foundations and Connections	1 Lot
Power Distribution Center Foundation and Connections	1 Lot
Generator – Foundation and Connections	1
Natural Gas Filter/Scrubber/Separator Foundation and Connections	1 Lot

Equipment/System	Quantity (Plant)
Natural Gas Separator/Heater Foundation and Connections	1 Lot
Natural Gas Metering and Regulating Station Foundations and Connections	1 Lot
All Building Structures, Foundations and Connections (e.g. Administrative, Control Room, Fire Water, Pump House, Water Treatment, Warehouse, etc.)	1 Lot
Skid – Amonia Blower Injection Foundation and Connections	1 Lot
Tank – Ammonia Storage, Foundation and Connections	2
Tank – Raw/Fire Water, Foundation and Connections	1
Tank – Oily Water Separator, Foundation and Connections	1 Lot
Tank – Demineralized Water, Foundation and Connections	1
Tank – Boiler Blowdown, Foundation and Connections	1 Lot
Tanks – Water Treatment Facilities Foundation and Connections (as required by CBC)	1 Lot
Pump – Fire Water Pump Skid Foundation and Connections	1 Lot
Pump – HSRG Feedwater Foundation and Connections	1 Lot
Pump – HP/IP Boiler Water Feed Pump Foundation and Connections	1 Lot
Pump – Demineralized Water Transfer Pump Foundation and Connections	1 Lot
Pump – Condensate Pump Foundation and Connections	1 Lot
Pump – Closed Loop Cooling Water	1 Lot
Pump – Circulating Cooling Water Foundation and Connections	1 Lot
Pumps – Water Treatment and Cooling Systems Foundation and Connections (as required by CBC)	1 Lot
Cooling Tower/Air Cooled Condenser Structure, Foundation and Connections	1 Lot
Boiler – Auxiliary, Stack, Foundation and Connections	1 Lot
Auxiliary Boiler SCR System Foundation and Connections	1 Lot
Ammonia Injection Skid Foundation and Connections	1 Lot
Compressors – Air Foundation(s) and Connections	1 Lot
Compressors – Fuel Gas Foundation(s) and Connections	1 Lot
ZLDF Water Treatment System Foundation(s) and Connections	1 Lot
Pipeline – Backup Water Supply	1
Pipeline – Water Supply	1
Pipeline – Natural Gas	1
Potable Water Systems	1 Lot
Chemical Containment Systems	1 Lot
Fire Suppression Systems	1 Lot
Drainage Systems (including sanitary, storm drain, and waste)	1 Lot
Storm Water Evaporation/Cooling Basin	1 Lot
Building Energy Conservation Systems	1 Lot
Temperature Control and Ventilation Systems (including water and sewerconnections)	1 Lot
High Pressure Piping	1 Lot
HVAC and Refrigeration Systems	1 Lot

GEN-3 The project owner shall make payments to the CBO for design review, plan check and construction inspection based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. These fees may be

consistent with the fees listed in the 1998 CBC [Chapter 1, Section 107 and Table 1-A, Building Permit Fees; Appendix Chapter 33, Section 3310 and Table A-33-A, Grading Plan Review Fees; and Table A-33-B, Grading Permit Fees], adjusted for inflation and other appropriate adjustments; may be based on the value of the facilities reviewed; may be based on hourly rates; or may be as otherwise agreed by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. The project owner shall send a copy of the CBO's receipt of payment to the CPM in the next Monthly Compliance Report indicating that the applicable fees have been paid.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California registered architect, structural engineer or civil engineer, as a resident engineer (RE), to be in general responsible charge of the project [Building Standards Administrative Code (Cal. Code Regs., tit. 24, § 4-209, Designation of Responsibilities)]. All transmission facilities (lines, switchyards, switching stations and substations) are handled in Conditions of Certification in the **Transmission System Engineering** section of this document.

The RE may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project respectively. A project may be divided into parts, provided each part is clearly defined as a distinct unit. Separate assignment of general responsible charge may be made for each designated part.

Protocol: The RE shall:

1. Monitor construction progress of work requiring CBO design review and inspection to ensure compliance with LORS;
2. Ensure that construction of all the facilities subject to CBO design review and inspection conforms in every material respect to the applicable LORS, these Conditions of Certification, approved plans, and specifications;
3. Prepare documents to initiate changes in the approved drawings and specifications when directed by the project owner or as required by conditions on the project;
4. Be responsible for providing the project inspectors and testing agency(ies) with complete and up-to-date set(s) of stamped drawings, plans, specifications and any other required documents;
5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and
6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests as not conforming to the approved plans and specifications.

The RE shall have the authority to halt construction and to require changes or remedial work, if the work does not conform to applicable requirements.

If the RE or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the RE and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the RE and other delegated engineer(s) within five days of the approval.

If the RE or the delegated engineer(s) are subsequently reassigned or replaced, the project owner has five days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-5 Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: A) a civil engineer; B) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering; C) a design engineer, who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; D) a mechanical engineer; and E) an electrical engineer. [California Business and Professions Code section 6704 et seq., and sections 6730 and 6736 requires state registration to practice as a civil engineer or structural engineer in California.] All transmission facilities (lines, switchyards, switching stations and substations) are handled in Conditions of Certification in the **Transmission System Engineering** section of this document.

The tasks performed by the civil, mechanical, electrical or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (e.g., proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer.

Protocol: The project owner shall submit to the CBO for review and approval, the names, qualifications and registration numbers of all responsible engineers assigned to the project [1998 CBC, Section 104.2, Powers and Duties of Building Official].

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name,

qualifications and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

Protocol: A: The civil engineer shall:

1. Design, or be responsible for design, stamp, and sign all plans, calculations and specifications for proposed site work, civil works and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading, site preparation, excavation, compaction, construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and
2. Provide consultation to the RE during the construction phase of the project and recommend changes in the design of the civil works facilities and changes in the construction procedures.

Protocol: B: The geotechnical engineer or civil engineer, experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports and prepare final soils grading report;
2. Prepare the soils engineering reports required by the 1998 CBC, Appendix Chapter 33, Section 3309.5, Soils Engineering Report; and Section 3309.6, Engineering Geology Report;
3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the 1998 CBC, Appendix Chapter 33; Section 3317, Grading Inspections;
4. Recommend field changes to the civil engineer and RE;
5. Review the geotechnical report, field exploration report, laboratory tests and engineering analyses detailing the nature and extent of the site soils that may be susceptible to liquefaction, rapid settlement or collapse when saturated under load; and
6. Prepare reports on foundation investigation to comply with the 1998 CBC, Chapter 18 section 1804, Foundation Investigations.

   This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform with predicted conditions used as a basis for design of earthwork or foundations [1998 CBC, section 104.2.4, Stop orders].

Protocol: C: The design engineer shall:

1. Be directly responsible for the design of the proposed structures and equipment supports;

2. Provide consultation to the RE during design and construction of the project;
3. Monitor construction progress to ensure compliance with engineering LORS;
4. Evaluate and recommend necessary changes in design; and
5. Prepare and sign all major building plans, specifications and calculations.

Protocol: D: The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform with all of the mechanical engineering design requirements set forth in the Energy Commission's Decision.

Protocol: E: The electrical engineer shall:

1. Be responsible for the electrical design of the project; and
2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of all the responsible engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, the project owner shall assign to the project, qualified and certified special inspector(s) who shall be responsible for the special inspections required by the 1998 CBC, Chapter 17 [Section 1701, Special Inspections; Section 1701.5, Type of Work (requiring special inspection)]; and Section 106.3.5, Inspection and observation program. All transmission facilities (lines, switchyards, switching stations and substations) are handled in Conditions of Certification in the **Transmission System Engineering** section of this document.

Protocol: The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;

2. Observe the work assigned for conformance with the approved design drawings and specifications;
3. Furnish inspection reports to the CBO and RE. All discrepancies shall be brought to the immediate attention of the RE for correction, then, if uncorrected, to the CBO and the CPM for corrective action [1998 CBC, Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector]; and
4. Submit a final signed report to the RE, CBO, and CPM, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans and specifications and the applicable provisions of the applicable edition of the CBC.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on-site requiring special inspection (including structural, piping, tanks and pressure vessels).

Verification: At least 15 days (or project owner and CBO approved alternative timeframe) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, with a copy to the CPM, the name(s) and qualifications of the certified weld inspector(s), or other certified special inspector(s) assigned to the project to perform one or more of the duties set forth above. The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next Monthly Compliance Report.

If the special inspector is subsequently reassigned or replaced, the project owner has five days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within five days of the approval.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend the corrective action required [1998 CBC, Chapter 1, Section 108.4, Approval Required; Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector; Appendix Chapter 33, Section 3317.7, Notification of Noncompliance]. The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this Condition of Certification and, if appropriate, the applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next Monthly Compliance Report. If any corrective action is disapproved, the project owner shall advise the CPM, within five days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. When the work and the "as-built" and "as graded" plans conform to the approved final plans, the project owner shall notify the CPM regarding the CBO's final approval. The marked up "as-built" drawings for the construction of structural and architectural work shall be submitted to the CBO. Changes approved by the CBO shall be identified on the "as-built" drawings [1998 CBC, Section 108, Inspections]. The project owner shall retain one set of approved engineering plans, specifications and calculations at the project site or at another accessible location during the operating life of the project [1998 CBC, Section 106.4.2, Retention of Plans].

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM in the next Monthly Compliance Report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing final approved engineering plans, specifications and calculations as described above, the project owner shall submit to the CPM a letter stating that the above documents have been stored and indicate the storage location of such documents.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;
2. An erosion and sedimentation control plan;
3. Related calculations and specifications, signed and stamped by the responsible civil engineer; and
4. Soils report as required by the 1998 CBC [Appendix Chapter 33, Section 3309.5, Soils Engineering Report; and Section 3309.6, Engineering Geology Report].

Verification: At least 15 days (or project owner and CBO approved alternative timeframe) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next Monthly Compliance Report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible geotechnical engineer or civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area [1998 CBC, Section 104.2.4, Stop orders].

Verification: The project owner shall notify the CPM within 24 hours, when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil

conditions. Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.

CIVIL-3 The project owner shall perform inspections in accordance with the 1998 CBC, Chapter 1, Section 108, Inspections; Chapter 17, Section 1701.6, Continuous and Periodic Special Inspection; and Appendix Chapter 33, Section 3317, Grading Inspection. All plant site-grading operations for which a grading permit is required shall be subject to inspection by the CBO.

Protocol: If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer, the CBO and the CPM [1998 CBC, Appendix Chapter 33, Section 3317.7, Notification of Noncompliance]. The project owner shall prepare a written report detailing all discrepancies and non-compliance items, and the proposed corrective action, and send copies to the CBO and the CPM.

Verification: Within five days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO and the CPM a Non-Conformance Report (NCR) and the proposed corrective action. Within five days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO and the CPM. A list of NCRs, for the reporting month, shall also be included in the following Monthly Compliance Report.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage facilities, the project owner shall obtain the CBO's approval of the final "as-graded" grading plans and final "as-built" plans for the erosion and sedimentation control facilities [1998 CBC, Section 109, Certificate of Occupancy].

Verification: Within 30 days of the completion of the erosion and sediment control mitigation and drainage facilities, the project owner shall submit to the CBO the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans, and that the facilities are adequate for their intended purposes. The project owner shall submit a copy of this report to the CPM in the next Monthly Compliance Report.

STRUC-1 Prior to the start of any increment of construction of any major structure or component listed in **Table 1** of Condition of Certification **GEN-2**, above, the project owner shall submit to the CBO for design review and approval the proposed lateral force procedures for project structures and the applicable designs, plans and drawings for project structures. Proposed lateral force procedures, designs, plans and drawings shall be those for the following items (from **Table 1**, above):

1. Major project structures;
2. Major foundations, equipment supports and anchorage;
3. Large field fabricated tanks; and

4. Turbine/generator pedestal.

Construction of any structure or component shall not commence until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

Protocol: The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;
2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (i.e., highest loads, or lowest allowable stresses shall govern). All plans, calculations and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations and specifications [1998 CBC, Section 108.4, Approval Required];
3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations and other required documents of the designated major structures at least 60 days (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of on-site fabrication and installation of each structure, equipment support, or foundation [1998 CBC, Section 106.4.2, Retention of plans; and Section 106.3.2, Submittal documents]; and
4. Ensure that the final plans, calculations and specifications clearly reflect the inclusion of approved criteria, assumptions and methods used to develop the design. The final designs, plans, calculations and specifications shall be signed and stamped by the responsible design engineer [1998 CBC, Section 106.3.4, Architect or Engineer of Record].

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of any increment of construction of any structure or component listed in Table 1 of Condition of Certification GEN-2 above, the project owner shall submit to the CBO, with a copy to the CPM, the responsible design engineer's signed statement that the final design plans, specifications and calculations conform with all of the requirements set forth in the Energy Commission's Decision.

If the CBO discovers non-conformance with the stated requirements, the project owner shall resubmit the corrected plans to the CBO within 20 days of receipt of the non-conforming submittal with a copy of the transmittal letter to the CPM.

The project owner shall submit to the CPM a copy of a statement from the CBO that the proposed structural plans, specifications and calculations have been approved and are in conformance with the requirements set forth in the applicable engineering LORS.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);
2. Concrete pour sign-off sheets;
3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);
4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing (NDT) procedure and results, welder qualifications, certifications, qualified procedure description or number (ref: AWS); and
5. Reports covering other structural activities requiring special inspections shall be in accordance with the 1998 CBC, Chapter 17, Section 1701, Special Inspections; Section 1701.5, Type of Work (requiring special inspection); Section 1702, Structural Observation and Section 1703, Nondestructive Testing.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within five days, prepare and submit an NCR describing the nature of the discrepancies to the CBO, with a copy of the transmittal letter to the CPM [1998 CBC, Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector]. The NCR shall reference the Condition(s) of Certification and the applicable CBC chapter and section. Within five days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO and the CPM.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall advise the CPM, within five days, the reason for disapproval, and the revised corrective action to obtain CBO's approval.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the 1998 CBC, Chapter 1, Section 106.3.2, Submittal documents and Section 106.3.3, Information on plans and specifications, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes, and shall give the CBO prior notice of the intended filing.

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes, and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the Monthly Compliance Report, when the CBO has approved the revised plans.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in Chapter 3, Table 3-E of the 1998 CBC shall, at a minimum, be designed to comply with Occupancy Category 2 of the 1998 CBC.

Verification: At least 30 days (or project owner and CBO approved alternate timeframe) prior to the start of installation of the tanks or vessels containing the above specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications and calculations, including a copy of the signed and stamped engineer's certification.

The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following Monthly Compliance Report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the Monthly Compliance Report following completion of any inspection.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations for each plant major piping and plumbing system listed in Table 1, Condition of Certification GEN 2, above. Physical layout drawings and drawings not related to code compliance and life safety need not be submitted. The submittal shall also include the applicable QA/QC procedures. Upon completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of said construction [1998 CBC, Section 106.3.2, Submittal Documents; Section 108.3, Inspection Requests; Section 108.4, Approval Required; 1998 California Plumbing Code, Section 103.5.4, Inspection Request; Section 301.1.1, Approval].

Protocol: The responsible mechanical engineer shall stamp and sign all plans, drawings and calculations for the major piping and plumbing systems subject to the CBO design review and approval, and submit a signed statement to the CBO when the said proposed piping and plumbing systems have been designed, fabricated and installed in accordance with all of the applicable laws, ordinances, regulations and industry standards [Section 106.3.4, Architect or Engineer of Record], which may include, but not be limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);
- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- Specific City/County code.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency [1998 CBC, Section 104.2.2, Deputies].

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of any increment of major piping or plumbing construction listed in Table 1, Condition of Certification GEN-2 above, the project owner shall submit to the CBO for design review and approval the final plans, specifications and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the applicable LORS, and shall send the CPM a copy of the transmittal letter in the next Monthly Compliance Report.

The project owner shall transmit to the CPM, in the Monthly Compliance Report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration (Cal-OSHA), prior to operation, the code certification papers and other documents required by the applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO and/or Cal-OSHA inspection of said installation [1998 CBC, Section 108.3, Inspection Requests].

Protocol: The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and

2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval, the above listed documents, including a copy of the signed and stamped engineer's certification, with a copy of the transmittal letter to the CPM.

The project owner shall transmit to the CPM, in the Monthly Compliance Report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal-OSHA inspection approvals.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations and quality control procedures for any heating, ventilating, air conditioning (HVAC) or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

Protocol: The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of said construction. The final plans, specifications and calculations shall include approved criteria, assumptions and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications and calculations conform with the applicable LORS [1998 CBC, Section 108.7, Other Inspections; Section 106.3.4, Architect or Engineer of Record].

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration calculations, plans and specifications, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes, with a copy of the transmittal letter to the CPM.

ELEC-1 Prior to the start of any increment of electrical construction for electrical equipment and systems 480 volts and higher, listed below, with the exception of underground duct work and any physical layout drawings and drawings not related to code compliance and life safety, the project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations [CBC 1998, Section 106.3.2, Submittal documents]. Upon approval, the above listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS [1998 CBC, Section 108.4, Approval Required, and Section 108.3, Inspection Requests]. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in Conditions of Certification in the **Transmission System Engineering** section of this document.

Protocol: A. Final plant design plans to include:

1. one-line diagrams for the 13.8 kV, 4.16 kV and 480 V systems; and
2. system grounding drawings.

Protocol: B. Final plant calculations to establish:

1. short-circuit ratings of plant equipment;
2. ampacity of feeder cables;

3. voltage drop in feeder cables;
4. system grounding requirements;
5. coordination study calculations for fuses, circuit breakers and protective relay settings for the 13.8 kV, 4.16 kV and 480 V systems;
6. system grounding requirements; and
7. lighting energy calculations.

Protocol: C. The following activities shall be reported to the CPM in the Monthly Compliance Report:

1. Receipt or delay of major electrical equipment;
2. Testing or energization of major electrical equipment; and
3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission Decision.

Verification: At least 30 days (or project owner and CBO approved alternative timeframe) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS, and shall send the CPM a copy of the transmittal letter in the next Monthly Compliance Report.

REFERENCES

AEP. 2001 a. Application for Certification, California Energy Commission, Avenal Energy (01-AFC-20). Submitted to the California Energy Commission, October 9, 2001.

GEOLOGY AND PALEONTOLOGY

Testimony of Dr. Dal Hunter

INTRODUCTION

The geology and paleontology section discusses the projects potential impacts regarding geological hazards, geological and paleontological resources, and surface water hydrology. The purpose of this analysis is to verify that the applicable laws, ordinances, regulations, and standards (LORS) have been identified and that the project can be designed and constructed in accordance with all applicable LORS, and in a manner that protects environmental quality and assures public health and safety. Energy Commission staff's objective is to assure that there will be no significant adverse impacts to important geological and paleontological resources, and surface water hydrology, during project construction, operation and closure. The section concludes with staff's proposed monitoring and mitigation measures with respect to geological hazards, geological, and paleontological resources and surface water hydrology, with the inclusion of Conditions of Certification.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

The applicable LORS are listed in the AFC, in sections 6.3.5 and 6.8.5 (TRC, 2001a). A description of the LORS for surface water hydrology is presented in the **Water Resources** section of the staff assessment. A brief description of the LORS for paleontological resources, and geological hazards and resources follows.

FEDERAL

The proposed Avenal Energy power plant is not located on Federal property. There are no federal LORS for geological hazards and resources or grading for the proposed project. The Federal Antiquities Act of 1906, in part, protects paleontological resources from vandalism and unauthorized collection on federal land (PL 59-209; 16 United States Code 431 *et seq*.; 34 Stat. 25). The National Environmental Policy Act of 1968, as amended, requires analysis of potential environmental impacts to important historic, cultural and natural aspects of our national heritage (United States Code, Section 4321-4327; 40 Code of Federal Regulations, Section 1502.25).

STATE AND LOCAL

The California Building Code (CBC) 1998 edition is based upon the *Uniform Building Code* (*UBC*), 1997 edition, which was published by the International Conference of Building Officials. The *CBC* is a series of standards that are used in project investigation, design (Chapters 16 and 18) and construction (including grading and erosion control; Appendix Chapter 33). The *CBC* supplements the grading and construction requirements of the *UBC*.

The California Environmental Quality Act (CEQA) Guidelines Appendix G provides a checklist of questions that a lead agency should normally address if relevant to a project's environmental impacts.

- Section (V) (c) asks if the project will directly or indirectly destroy a unique paleontological resource or site or unique geological feature.

- Sections (VI) (a), (b), (c), (d), and (e) pose questions that are focused on whether or not the project would expose persons or structures to geological hazards.
- Sections (X) (a) and (b) pose questions about the project's effect on mineral resources.

The Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontologic Resources is a set of procedures and standards for assessing and mitigating impacts to vertebrate paleontological resources (Society of Vertebrate Paleontologists 1995). These guidelines were developed by a committee of the Society of Vertebrate Paleontologists (SVP), a national organization.

The Kings County General Plan provides a brief discussion of geologic hazards in Section II, under the heading "Safety Element" (Kings County Board of Supervisors, 1983).

GOAL 36: Minimize loss of life and personal property caused by geologic hazards.

Objective 36.1: Regulate new construction to achieve acceptable levels of risk posed by geologic hazards.

Policy 36a: Prevent structural failure caused by ground shaking and other geologic hazards by adopting the latest version of the *Uniform Building Code*.

Policy 36b: Consider seismic hazards in the environmental review process. Include landslides, subsidence, liquefaction, flooding, local soils, and geologic conditions.

Policy 36c: To further reduce possible damage in case of earthquake, require open space land uses in areas identified for hazardous activities.

Policy 36d: Use the Uniform Code for the Abatement of Dangerous Buildings and the Uniform Housing Code to further assure safe construction and rehabilitation.

Policy 36e: Prohibit new construction directly astride known faults or fault zones. Allow only nonstructural land uses in such zones.

In addition, the discussion states: "There are no areas within Kings County in which a particular land use should be prohibited because of seismic conditions. Construction in the more critical seismic zones, however, would probably require additional reinforcement to offset increased, expected seismic forces."

ENVIRONMENTAL SETTING

The Avenal Energy Power Plant (AEPP) will be located in the southwestern San Joaquin Valley on the western edge of the Great Valley geomorphic province at approximately *36.091 degrees north latitude by 120.061 degrees west longitude*. The project site is in western Kings County, near the Fresno County border, and east of the Kettleman Hills. The 148-acre site is in a planned industrial park in the city of Avenal, situated west of 33D Avenue and southeast of Avenal Cutoff Road. While the site is located within the City limits of Avenal, it is separated from the residential and

commercial districts of the City by the Kettleman Hills and a distance of about 6 miles. The site is presently undeveloped and sits on land that has been extensively disturbed by agricultural activities.

The project will involve the design, construction and operation of a 600 MW combined-cycle electric power generating plant and ancillary facilities. The project design incorporates advanced combustion turbine technology and state-of-the-art emission control systems to provide California electric customers with additional electric capacity. The project will deliver electric power to the PG&E transmission grid through a new, on-site 230-kV switchyard by constructing approximately 7,000 feet of new, double circuit 230-kV line to loop the existing PG&E Gates-ARCO 230-kV line into the site. Natural gas for the facility will be provided via an underground pipeline interconnection to the PG&E Kettleman compressor station located approximately 7,000 feet southwest of the site. The primary source of raw water for the project will be surface water supply delivered via the San Luis Canal located northeast of the site (TRC, 2001a).

The project is not crossed by any known active faults. Surfical soil materials are thought to be comprised of a permeable sandy loam (USDA, 1986). The depth to ground water can vary from 200 to 250 feet below existing grade (Westlands Water District, 2001). Site near-surface geology consists of alluvial fan deposits of Holocene age underlain by Pliocene-Pleistocene aged nonmarine clastic sediments of the Tulare Formation. Beneath the site, these units together extend to depths of 2,000 to 2,800 feet below the surface (Bertoldi, et. al., 1991;Jennings and Strand, 1992).

The project site lies at an elevation of approximately 320 to 360 feet above mean sea level, with the finished power block elevation of 340-feet. Existing grade at the power plant site slopes approximately one percent to the northeast (USGS, 1978). The existing site drainage is sheet flow in nature. A more complete discussion of on-site drainage is included in the **Water Resources** section of this staff assessment

ANALYSIS AND IMPACTS

GEOLOGICAL HAZARDS

Faulting and Seismicity

The project is located within Seismic Zone 4 as delineated on Figure 16-2 of the 1998 edition of the *CBC.* Energy Commission staff reviewed *the Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions*, (CDMG 1994), *Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada* (International Conference of Building Officials, 1998) and the *Fault Activity Map of California and Adjacent Areas* (Jennings, 1994). No active faults have been identified within the power plant footprint or along its proposed linear facilities. A number of active faults lie within a 30-mile radius of the site. All of these faults, except the San Andreas, are classified as Type B seismic sources. The San Andreas Fault is Type A, as defined in the 1997 *UBC* and the *CBC* (1998). These codes define three seismic source types: A, B, and C. Type A faults, such as the San Andreas Fault System, are those with an average annual slip rate greater than 5 mm per year and the potential to generate a moment magnitude (M_w) earthquake of at least

7.0. Type C faults are those with a slip rate of 2 mm or less per year and a maximum moment earthquake of less than 6.5. Type B faults, the largest grouping, are all active faults not defined as Type A or C.

The closest active faults to the project are the San Andreas Fault Zone (24 miles southwest) and the Great Valley Blind Thrust (4 miles SW). The San Andreas Fault is the dominant active tectonic feature of the Coast Ranges and represents the boundary of the North American and Pacific plates. Right-lateral strike-slip motion occurs along the San Andreas Fault at an average rate of 2.5 centimeters per year. The San Andreas Fault is divided into several segments in this region. The Parkfield segment is closest to the site at about 24 miles and is capable of a moment magnitude earthquake of 6.7. The Cholame segment of the San Andreas Fault ruptured in 1857 (Fort Tejon Earthquake) with an estimated magnitude 7.9. The Cholame segment has been assigned a maximum moment magnitude of 7.8, and the northern end of the segment extends to within about 25 miles southwest of the AEPP. The Great Valley Blind Thrust is a blind ramp thrust fault system that occurs at depth throughout the site vicinity. At the site, the ramp thrust fault is approximately 7.2 km below the ground surface, with the surface projection 3 to 4 miles to the southwest. This segment of the Great Valley Blind Thrust has been assigned a maximum moment magnitude of 6.4 (ICBO, 1998) Three earthquakes in the magnitude range of 5.9 to 6.7 have occurred along this fault zone between 1983 and 1985. This includes the 5.9 magnitude Kettleman Hills earthquake (1985) with an epicenter 6 miles north of the AEPP.

Because blind thrust faults do not intersect the surface, there is no known hazard related to surface rupture. Strong ground shaking can occur due to movement along these deeply buried faults. The CBC will require that project structures be designed with adequate strength to withstand the lateral dynamic displacements induced by the Design Basis Ground Motion, which the CBC defines as the earthquake ground motion that has 10 percent chance of being exceeded in 50 years. Mapping by the California Division of Mines and Geology (1999) indicates that there is a 10 percent probability that a bedrock ground acceleration of 0.30 to 0.40 g (30 to 40 percent of the acceleration of gravity) will be exceeded in any 50-year interval. This is based on movement along the Great Valley Blind Thrust Fault, which is much closer to the site than the San Andreas Fault. The applicant estimates that the peak horizontal ground acceleration for the design earthquake (with a 10 percent probability in 50 year return interval) is 0.47g (TRC, 2001a, page 6.3-16). This is based on an M 6.4 earthquake on the ramp thrust fault that occurs below the site. A peak horizontal ground acceleration of this intensity could cause instability of the Avenal Energy power plant foundation soils, depending on the soil conditions actually present. Seismic concerns will be addressed as a result of proposed Condition of Certification **GEN-1**. Proper design in accordance with this condition should adequately mitigate seismic hazards to the current standards of practice.

Liquefaction, Hydrocompaction, Subsidence, and Expansive Soils

Liquefaction is a condition in which a cohesionless or even slightly plastic soil may lose shear strength due to a sudden increase in pore water pressure caused by ground shaking during an earthquake. Four of the parameters used to assess the potential for liquefaction are soil density, soil texture, depth to groundwater, and the peak horizontal ground acceleration estimated for the site. The depth to ground water at the project is approximately 200 to 250 feet below existing grade (Westlands Water District, 2001).

Consequently, liquefaction cannot be a hazard to the Project. Geotechnical studies will be conducted as part of Project siting design to confirm the low potential for liquefaction.

Hydrocompaction is the process of the loss of soil volume upon the application of water. The potential for significant compaction due to hydrocompaction is considered remote because the area has been cultivated extensively.

Subsidence of surficial and near surface soil units may be induced at the site by strong ground shaking due to a large nearby earthquake, by consolidation of loose or soft soils due to heavy loading of the soils by large structures, or by the extraction of fluids from the subsurface. Earthquake and load induced consolidation will be addressed by the project geotechnical investigation, as required by Conditions of Certification **GEN-5** and **CIVIL-1.** Subsidence due to ground water withdrawal was a problem throughout much of the San Joaquin Valley in the decades prior to the 1970's (Ireland, Poland, and Riley, 1984; USGS, 2000). Since that time, the availability of a surface water supply and decrease in groundwater pumping has reduced groundwater overdraft and water levels in the aquifer have recovered, stabilizing the primary subsidence mechanism. The project will not increase groundwater withdrawal and, consequently, will not result in subsidence. The Applicant has stated that no known subsidence problems exist in the project area, though the presence of loose or soft soils at the site has not yet been determined.

Soils that contain a high percentage of expansive clay minerals are prone to expansion, if subjected to an increase in water content. Expansive soils are usually measured with an index test such as the expansive index potential. In order for a soil to be a candidate for testing, the soil must have high clay content and the clay must have a high shrink-swell potential and a high plasticity index**.** Soils in the project vicinity are expected to consist of a sandy loam, which would not pose any expansive soil hazard (USDA, 1986). The project geotechnical study will verify that expansive soils are not present, or provide recommendations to mitigate their effects, if such soils are found.

Conditions of Certification **GEN-1, GEN-5** and **CIVIL-1** should mitigate the above hazards to a less than significant level.

landslides

The (AEPP) Site is essentially flat except a gentle slope towards the northeast, and is located approximately two miles from the nearest mountain. This subdued site topography is not susceptible to landslides or other forms of slope instability. Since no significant excavation is planned during site construction, the potential for impact from landslides at the site is considered nonexistent.

GEOLOGICAL AND PALEONTOLOGICAL RESOURCES

There are no geologic resources of recreational, commercial or scientific value that might be affected by the project. The site is located in featureless terrain in an agricultural area. Soils are thick, bedrock is deep, and there are no unique geologic or landform features in the site vicinity. No mineral resources have been identified at the present site and there are no significant sand or gravel mines in the area (CDMB, 1999; CDOG 2001)

Paleontological analysis was conducted by LSA Associates, Inc. (LSA, 2001), to determine the sensitivity of the project area with regard to paleontological resources and the potential for important resources to occur, in accordance with the Rules of Practice and Procedure & Power Plant Site Certification. There are no known fossil localities in the alluvium sediments in the site vicinity, and field surveys of the site and liner facilities showed no evidence that significant paleontological resources occur there. The only evidence of fossils observed by LSA Associates was several scatters of marine invertebrate shells observed on the plowed surface of the agricultural field at the site. These shells cannot be considered significant paleontological recourses, in part because they are not within their stratigraphic context. Significant paleontological resources have been discovered near Fresno, approximately 50 miles north of the Site approximately 15 feet below the surface. The paleontological resources discovered in Fresno demonstrate that the potential for paleontological resources to occur within alluvium at relatively shallow depths cannot be ruled out. Therefore, the sensitivity of the alluvium that underlies the Site and linear facilities was classified by LSA Associates, Inc. as indeterminate. While there no known evidence of significant fossils in the Project vicinity, there is potential for Pleistocene land mammal fossils to occur at relatively shallow depths in the alluvial fan deposits of the region (i.e., deeper than 5-feet). Vertebrate fossils of Irvingtonian Land Mammal Age (deposited prior to 150,000 years ago) were discovered 15 feet below the surface during construction of the Fairmead Landfill near Fresno, about 50 miles north of the Site. Fossils from late Pleistocene time (11,000 years ago) might occur at depths as shallow as 7 feet below the surface in the middle of the San Joaquin Valley (LSA, 2001).

SURFACE WATER HYDROLOGY

The site is located in the dry climate of the southwest San Joaquin Valley, in an area that has no natural surface water except immediately following larger than average rainstorms. The rainy season extends from November through March. Summer months are typically dry with occasional thunderstorms and minor rain sometimes occurring during the spring and fall. The average annual precipitation for the site is about 8 inches (Weather.com,2002).

The Site and Project linear facilities are located outside the 100-year flood zone as designated by the Federal Emergency Management Agency (FEMA, 2000). The Site vicinity is not subject to tsunami run-up because it is separated from the coast by a distance of approximately 65 miles and the intervening topography of the Coast Ranges.

Soil at and adjacent to the site consists of the Wasco and Milham Sandy Loams that are characteristically well drained with moderately rapid permeability (USDA, 1986). Lands on and adjacent to the site are in active agriculture, and periodic tilling, combined with the sandy soil, results in infrequent runoff. On the infrequent occasions when surface drainage occurs, it flows generally northeast and either infiltrates or evaporates where it ponds in shallow topographic depressions along the west side of the San Luis Canal. There are no natural drainages located in the vicinity of the site. The closest perennial stream is Arroyo Largo, which terminates more than 1 mile east of the site.

Following construction, storm water will drain to a storm water retention basin via a system of drains, channels, and pipes. Disposal will occur through a combination of

infiltration and evaporation. The applicant has proposed the use of Best Management Practices (BMPs) for erosion and sediment control during construction. Condition of Certification **CIVIL-1,** along with specific conditions presented under **Water Resources**, are expected to mitigate surface water impacts to less than significant levels.

SITE SPECIFIC IMPACTS

No known geological resources will be impacted by the construction and operation of the project, including its linear facilities. The (confidential) **Paleontological Resources Assessment Program** (LSA, 2001; TRC, 2001a) assigns ratings of "Indeterminate" to the geologic units that may underlie the cultivated surface soils at this site. No vertebrate fossils have been found at the project site, but since there is to be considerable grading, Energy Commission staff believes there is at least some possibility of encountering paleontological resources. The recommended Conditions of Certification **PAL-1 through PAL-7** are expected to mitigate potential geologic/paleontologic impacts to less than significant levels.

CUMULATIVE IMPACTS

The AEPP lies in an area of no known or likely geologic resources such as minerals, aggregates, oil or natural gas. In the event that paleontological resources are revealed during grading, a mitigation plan will be in place to assure proper protection and recovery. Increased surface water from construction of impermeable surfaces can be handled by a properly designed surface water drainage system.

As a consequence of the above factors, it is staff's opinion that the potential for a significant adverse cumulative impact on paleontological resources, geological resources, or surface water hydrology is very low, if the project is constructed according to the recommended Conditions of Certification.

FACILITY CLOSURE

A definition and general approach to closure is presented in the **General Conditions** section of this document. Facility closure activities are not anticipated to impact geological or paleontological resources. This is due to the fact that no paleontological or geological resources are known to exist at the power plant location. In addition, decommissioning and closure of the power plant should not negatively affect geological or paleontological resources since the majority of the ground disturbed in plant decommissioning and closure would have been disturbed in the construction and operation of the plant. Surface water hydrology impacts will depend upon the closure activities proposed.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

Energy Commission staff have received no comments regarding geology, paleontology or surface water from City, County, State, or Federal agencies at this time.

MITIGATION

As mitigation for potential impacts to geological hazards, surface water hydrology and paleontological resources staff proposes the Conditions of Certification presented below.

CONCLUSIONS AND RECOMMENDATIONS

The project should have no adverse impact on geological and paleontological resources and surface water hydrology. Staff proposes to assure compliance with applicable LORS for geological hazards and surface water hydrology, with implementation of the Conditions of Certification listed below.

PROPOSED CONDITIONS OF CERTIFICATION

General Conditions of Certification with respect to geology/geologic hazards are covered under Conditions of Certification **GEN-1**, **GEN-5**, and **CIVIL-1** in the **FACILITY DESIGN** section. Conditions of Certification related to paleontological resources are presented below:

PAL-1 The project owner shall provide the CPM with the resume and qualifications of its Paleontological Resource Specialist (PRS) and Paleontological Resource Monitors (PRMs) for review and approval. If the approved PRS or one of the PRMs is replaced prior to completion of project mitigation and report, the project owner shall obtain CPM approval of the replacement.

The resume shall include the names and phone numbers of contacts. The resume shall also demonstrate to the satisfaction of the CPM, the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate Paleontologists (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1) institutional affiliations or appropriate credentials and college degree;

2) ability to recognize and recover fossils in the field;

3) local geological and biostratigraphic expertise;

4) proficiency in identifying vertebrate and invertebrate fossils;

5) publications in scientific journals; and

6) the PRS shall have at least three years of paleontological resource mitigation and field experience in California, and at least one year of experience leading paleontological resource mitigation and field activities.

The PRS shall obtain qualified paleontological resource monitors to monitor as necessary on the project. Paleontologic resource monitors (PRMs) shall have the equivalent of the following qualifications:

1) BS or BA degree in geology or paleontology and one year experience monitoring in California; or

2) AS or AA in geology, paleontology or biology and four years experience monitoring in California; or

3) Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification: At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project and stating that the identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM for approval. The letter shall be provided to the CPM no later than one week prior to the monitor beginning on-site duties.
Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant and all linear facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and the plan and profile drawings for the utility lines would normally be acceptable for this purpose. The plan drawings should show the location, depth, and extent of all ground disturbances and can be 1 inch = 40

feet to 1 inch = 100 feet range. If the footprint of the power plant or linear facility changes, the project owner shall provide maps and drawings reflecting these changes to the PRS and CPM.

If construction of the project will proceed in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Prior to work commencing on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the PRS shall consult weekly with the project superintendent or construction field manager to confirm area(s) to be worked during the next week, until ground disturbance is completed.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings.

If there are changes to the footprint of the project, revised maps and drawings shall be provided at least 15 days prior to the start of ground disturbance.

If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within 5 days of identifying the changes.

PAL-3 The PRS shall prepare, and the project owner shall submit to the CPM for review and approval, a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting and sampling activities and may be modified with CPM approval. This document shall be used as a basis for discussion in the event that on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of the Vertebrate Paleontologists (SVP, 1995) and shall include, but not be limited to, the following:

1) Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking; construction monitoring; mapping and data recovery; fossil preparation and recovery; identification and inventory; preparation of final reports; and transmittal of materials for curation will be performed according to the PRMMP procedures;
2) Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and all conditions for certification;

3) A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4) An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained beds;

5) A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed schedule for the monitoring;

6) A discussion of the procedures to be followed in the event of a significant fossil discovery, including notifications;

7) A discussion of equipment and supplies necessary for recovery of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8) Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meets the Society of Vertebrate Paleontologists standards and requirements for the curation of paleontological resources; and

9) Identification of the institution that has agreed to receive any data and fossil materials recovered, requirements or specifications for materials delivered for curation and how they will be met, and the name and phone number of the contact person at the institution; and,

10) A copy of the paleontological conditions of certification.

Verification: At least thirty (30) days prior to ground disturbance, the project owner shall provide a copy of the PRMMP. The PRMMP shall include an affidavit of authorship by the PRS, and acceptance of the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance and for the duration of construction, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for all project managers, construction supervisors and workers who operate ground disturbing equipment or tools. Workers to be involved in ground disturbing activities in sensitive units shall not operate equipment prior to receiving worker training. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or any other areas of interest or concern.

The Worker Environmental Awareness Program (WEAP) shall address the potential to encounter paleontological resources in the field, the sensitivity and importance of these resources, and the legal obligations to preserve and protect such resources. In-person training shall be provided for each new employee involved with ground disturbing activities, while these activities are

occurring in highly sensitive geologic units, as detailed in the PRMMP. The in-person training shall occur within four days following a new hire for highly sensitive sites and as established by the PRMMP for sites of moderate, low, and zero sensitivity. Provisions will be made to provide the WEAP training to workers not fluent in English.

The training shall include:

1) A discussion of applicable laws and penalties under the law;

2) For training in locations of high sensitivity, the PRS shall provide good quality photographs or physical examples of vertebrate fossils that may be expected in the area;

3) Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;

4) Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;

5) An informational brochure that identifies reporting procedures in the event of a discovery;

6) A Certification of Completion of WEAP form signed by each worker indicating that they have received the training; and

7) A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification: At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP including the brochure with the set of reporting procedures the workers are to follow.

At least 30 days prior to ground disturbance, the project owner shall submit the script and final video to the CPM for approval if the project owner is planning on using a video for interim training.

If an alternate paleontological trainer is requested by the owner, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval. Alternate trainers shall not conduct training prior to CPM authorization.

The project owner shall provide in the Monthly Compliance Report the WEAP copies of the Certification of Completion forms with the names of those trained and the trainer for each training offered that month. The Monthly Compliance Report shall also include a running total of all persons who have completed the training to date.

PAL-5 The PRS and PRM(s) shall monitor consistent with the PRMMP, all construction-related grading, excavation, trenching, and augering in areas where potentially fossil-bearing materials have been identified. In the event

that the PRS determines full time monitoring is not necessary in locations that were identified as potentially fossil-bearing in the PRMMP, the PRS shall notify and seek the concurrence of the CPM.

The PRS and PRM(s) shall have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1) Any change of monitoring different from the accepted schedule presented in the PRMMP shall be proposed in a letter from the PRS and the project owner to the CPM prior to the change in monitoring. The letter shall include the justification for the change in monitoring and submitted to the CPM for review and approval.

2) PRM(s) shall keep a daily log of monitoring of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3) The PRS shall immediately notify the project owner and the CPM of any incidents of non-compliance with any paleontological resources conditions of certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the conditions of certification.

4) For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM immediately (no later than the following morning after the find, or Monday morning in the case of a weekend) of any halt of construction activities.

   The PRS shall prepare a summary of the monitoring and other paleontological activities that will be placed in the Monthly Compliance Reports. The summary will include the name(s) of PRS or monitor(s) active during the month; general descriptions of training and construction activities and general locations of excavations, grading, etc. A section of the report will include the geologic units or subunits encountered; descriptions of sampling within each unit; and a list of fossils identified in the field. A final section of the report will address any issues or concerns about the project relating to paleontologic monitoring including any incidents of non-compliance and any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the project shall include a justification in summary as to why monitoring was not conducted.

Verification: The PRS shall submit the summary of monitoring and paleontological activities in the Monthly Compliance Report.

PAL-6 The project owner, through the designated PRS, shall ensure the recovery, preparation for analysis, analysis, identification and inventory, the preparation for curation, and the delivery for curation of all significant paleontological

resource materials encountered and collected during the monitoring, data recovery, mapping, and mitigation activities related to the project.

Verification: The project owner shall maintain in their compliance file copies of signed contracts or agreements with the designated PRS and other qualified research specialists. The project owner shall maintain these files for a period of three years after completion and approval of the CPM-approved PRR. The project owner shall be responsible to pay curation fees for fossils collected and curated as a result of paleontological monitoring and mitigation..

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following completion of the ground disturbing activities. The PRR shall include an analysis of the recovered fossil materials and related information and submitted to the CPM for review and approval.

The report shall include, but not be limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; determinations of sensitivity and significance; and a statement by the PRS that project impacts to paleontological resources have been mitigated.

Verification: Within ninety (90) days after completion of ground disturbing activities, including landscaping, the project owner shall submit the Paleontological Resources Report under confidential cover.

Certification of Completion of Worker

Environmental Awareness Program

POWER PLANT NAME (DOCKET #)

This is to certify these individuals have completed a mandatory California Energy Commission-approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on Cultural, Paleontology & Biology Resources for all personnel (i.e. construction supervisors, crews and plant operators) working on-site or at related facilities. By signing below, the participant indicates that they understand and shall abide by the guidelines set forth in the Program materials. Please include this completed form in your Monthly Compliance Report.

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Cul Trainer: _____ Signature:_____ Date: ___/___/____

PaleoTrainer: _____ Signature:_____ Date: ___/___/____

Bio Trainer: _____ Signature:_____ Date: ___/___/____

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POWER PLANT EFFICIENCY

Brian Payne

INTRODUCTION

The Energy Commission makes findings as to whether energy use by the Avenal Energy Project (AEP) will result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA). If the Energy Commission finds that the AEP's consumption of energy creates a significant adverse impact, it must determine whether there are any feasible mitigation measures that could eliminate or minimize the impacts. In this analysis, staff addresses the issue of inefficient and unnecessary consumption of energy.

In order to support the Energy Commission's findings, this analysis will:

- determine whether the facility will likely present any adverse impacts upon energy resources;
- determine whether these adverse impacts are significant; and if so,
- determine whether feasible mitigation measures exist that would eliminate the adverse impacts, or reduce them to a level of insignificance.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

No federal laws apply to the efficiency of this project.

STATE

California Environmental Quality Act Guidelines

CEQA Guidelines state that the environmental analysis "…shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy" (Cal. Code Regs., tit. 14, § 15126.4(a)(1)). Appendix F of the Guidelines further suggests consideration of such factors as the project's energy requirements and energy use efficiency; its effects on local and regional energy supplies and energy resources; its requirements for additional energy supply capacity; its compliance with existing energy standards; and any alternatives that could reduce wasteful, inefficient and unnecessary consumption of energy (Cal. Code regs., tit. 14, § 15000 et seq., Appendix F).

LOCAL

No local or county ordinances apply to power plant efficiency.

SETTING

Duke Energy North America (DENA) proposes to construct and operate the 600 MW (nominal gross output) combined cycle merchant AEP power plant to generate baseload and load following power, selling energy to the California deregulated electric power market (DENA 2001a, AFC §§ 1.1 and 2.0). (Note that this nominal rating is based upon preliminary design information and generating equipment manufacturers' guarantees. The project's actual maximum generating capacity may differ from this figure.) The AEP will consist of two General Electric (GE) Power Systems PG7241 "7FA" class combustion turbine generators (CTGs) with mechanical inlet air chilling systems producing approximately 180 MW each, two multi-pressure heat recovery steam generators (HRSGs) with duct burners, and one steam turbine generator (STG) producing a maximum of 280 MW (with duct burners), arranged in a two-on-one combined cycle train, totaling approximately 600 MW. The gas turbines and HRSGs will be equipped with dry low-NOx combustors and selective catalytic reduction to control air emissions (DENA 2001a, §§ 2.3.5.1, 2.3.6.1, 2.3.6.2, 2.3.6.3, and 2.3.9.1). Natural gas will be delivered by the existing Pacific Gas & Electric (PG&E) natural gas lines 300 A/B, at PG&E's Kettleman Compressor Station via a new 20" diameter, 2.5 mile natural gas pipeline (DENA 2001a, §§ 1.5.4 and 2.3.14.1). Power from the AEP will be transmitted by "looping" the existing PG&E Gates-ARCO 230-kV line. This new transmission line will consist of approximately 1.3 miles of new double circuit 230-kV line (DENA 2001a, §§ 1.5.3 and 2.4.1).

ANALYSIS

ADVERSE IMPACTS ON ENERGY RESOURCES

The inefficient and unnecessary consumption of energy, in the form of non-renewable fuels such as natural gas and oil, constitutes an adverse environmental impact. An adverse impact can be considered significant if it results in:

- adverse effects on local and regional energy supplies and energy resources;
- a requirement for additional energy supply capacity;
- noncompliance with existing energy standards; or
- the wasteful, inefficient and unnecessary consumption of fuel or energy.

Project Energy Requirements And Energy Use Efficiency

Any power plant large enough to fall under Energy Commission siting jurisdiction will consume large amounts of energy. The AEP will burn natural gas at a nominal rate of about 90 billion Btu per day LHV (lower heating value) (DENA 2001a, Appendix 2.6). This is a substantial rate of energy consumption, and holds the potential to impact energy supplies. Under expected project conditions, electricity will be generated at a full load efficiency of approximately 53 percent LHV, with inlet air chillers and without duct burners (DENA 2001a, Appendix 2-6); this compares to the average fuel efficiency of a typical utility company baseload power plant at approximately 35 percent LHV.

Adverse Effects On Energy Supplies And Resources

The AEP will burn natural gas from the PG&E system. Gas will be transmitted to the plant, via a new 20 inch diameter pipeline connection to PG&E's lines 300 A/B at PG&E's Kettleman Compressor Station. This PG&E natural gas system represents a resource of considerable capacity. PG&E's Kettleman Compressor Station can receive gas from both directions (Malin, Oregon or Topock, Arizona) if necessary. This source represents far more gas than would be required for a project this size (DENA 2001a, §§ 2.14.1 and 2.3.15.4). It is therefore highly unlikely that the project could pose a substantial increase in demand for natural gas in California.

Additional Energy Supply Requirements

As noted above, natural gas fuel will be supplied to the project by PG&E's existing lines 300 A/B, via a new 20 inch diameter, 2.5-mile pipeline (DENA 2001a, §§ 2.14.1 and 2.3.15.4). PG&E claims that this line should provide adequate access to natural gas fuel. There is no real likelihood that the AEP will require the development of additional energy supply capacity.

Compliance With Energy Standards

No standards apply to the efficiency of the AEP or other non-cogeneration projects.

Alternatives To Reduce Wasteful, Inefficient And Unnecessary Energy Consumption

The AEP could be deemed to create significant adverse impacts on energy resources if alternatives existed that would reduce the project's use of fuel. Evaluation of alternatives to the project that could reduce wasteful, inefficient or unnecessary energy consumption first requires examination of the project's energy consumption. Project fuel efficiency, and therefore its rate of energy consumption, is determined by the configuration of the power producing system and by the selection of equipment used to generate power.

Project Configuration

The AEP will be configured as a combined cycle power plant, in which electricity is generated by two gas turbines, and additionally by a reheat steam turbine that operates on heat energy recuperated from the gas turbines' exhaust (DENA 2001a, § 2.3.2). By recovering this heat, which would otherwise be lost up the exhaust stacks, the efficiency of any combined cycle power plant is increased considerably from that of either gas turbines or steam turbines operating alone. Such a configuration is well suited to the large, steady loads met by a baseload plant, intended to supply energy efficiently for long periods of time.

DENA proposes to use two mechanical inlet air chillers, two HRSG duct burners (re-heaters), two HRSGs, and one steam turbine, with circulating water system (DENA 2001a, §2.3.2). Staff believes these features contribute to meaningful efficiency enhancement to the AEP. The two-train CT/HRSG configuration also allows for high efficiency during unit turndown because one CT can be shut down, leaving one fully loaded, efficiently operating CT instead of having two CTs operating at an inefficient 50 percent load.

The AEP includes HRSG duct burners, partially to replace heat to the steam cycle during high ambient temperatures when CT capacity drops, and partially as added power. Duct firing also provides a number of operational benefits, such as load following and balancing and optimization of the steam cycle.

Equipment Selection

Modern gas turbines embody the most fuel-efficient electric generating technology available today. Currently available, large combustion turbine models can be grouped into three categories including conventional, advanced and next generation. Advanced combustion turbines include steam-injected gas turbines (SIGT), intercooled steam recuperated gas turbines (ISRGT), the chemically recuperated gas turbine (CRGT) and the humid air turbine (HAT). With the exception of the SIGT, none of the advanced combustion turbines are currently available. The SIGT is marginally commercially available, but operates at a reportedly lower efficiency than conventional combined cycle technology. Conventional combined cycle machines offer proven technology with numerous installations and extensive run time in commercial operation (DENA 2001a, § 5.6.2.6). Emission levels are also proven, and guaranteed emission levels have been reduced based on operational experience and design optimization by the manufacturers. In comparison, environmental performance and thermal efficiencies of next generation turbines have not been demonstrated in commercial operation. Therefore, the AEP will employ the conventional model turbines instead of the advanced or the next generation models. The F-class gas turbines to be employed in the AEP represent some of the most modern and efficient such machines now available. The applicant will employ two large conventional model General Electric (GE) Power Systems natural gas fired model PG7241 “7FA” class gas turbine generators in a two-on-one combined cycle power train (DENA 2001a, §§ 2.3.2 and 2.3.6.1). This configuration is nominally rated at 530 MW and 56.5 percent efficiency LHV at ISO[1] conditions (GTW 2000). Except for the very slight increase in efficiency, this machine is functionally equivalent to the Siemens Westinghouse 501FD.

One possible alternative machine is the Alstom Power ABB KA24, a gas turbine nominally rated at 260 MW with a slightly higher efficiency rated at 56.5 percent LHV at ISO conditions (GTW 2000).

Another alternative is the Siemens Westinghouse 501FD (W501FD) Phase 2 gas turbine generator. This configuration is nominally rated at 550 MW and 55.8 percent efficiency LHV at ISO conditions (GTW 2000).

Any differences among the GE 7FA, ABB KA24, and W501FD in actual operating efficiency will be insignificant. Selecting among these machines is thus based on other factors, such as generating capacity, cost, commercial availability, and ability to meet air pollution limitations. The ABB machine, for instance, is available only in one-on-one power trains, with one gas turbine and one steam turbine paired on a single shaft, generating a nominal 260 MW. The GE and Siemens-Westinghouse machines, which can be configured more flexibly, offer an advantage.

[1] International Standards Organization standard conditions are 59°F (15°C), 60 percent relative humidity, and air pressure equivalent to sea level.

Efficiency Of Alternatives To The Project

The project objectives include generating efficient energy for California's electricity market and locating the generating station near existing infrastructure (e.g. transmission lines, cooling water supply, natural gas supply, etc.) (DENA 2001a, § 5.0). DENA proposes to accomplish these objectives by employing the most efficient technologies available today that are feasible for the project and by locating the generating center near existing infrastructure. The primary reasons for choosing the proposed technologies to be employed in the AEP in lieu of the alternatives include higher efficiency, commercial availability, the ability to reduce air emissions, desirable generating capacity and cost. Staff believes that combined cycle technology utilizing F-class CTGs, dry low NOx combustors and SCR, and mechanical inlet air chillers are the most efficient technologies for large power plants wishing to compete in the power market (DENA 2001a, § 2.3).

Alternative Generating Technologies

Alternative generating technologies for the AEP are considered in the AFC (DENA 2001a, § 5.6). Conventional boiler and steam turbine, supercritical boiler and steam turbine, simple cycle combustion turbine, conventional combined cycle, Kalina combined cycle, advanced combustion turbines, natural gas, coal, oil, solar, fuel cells, nuclear, wind, hydroelectric, biomass, municipal solid waste, and geothermal technologies are all considered. One of the project's stated objectives is to generate efficient energy near the required infrastructure. Given the project objectives, location and air pollution control requirements, staff agrees with the applicant that only natural gas-burning technologies are feasible.

Natural Gas-Burning Technologies

Fuel consumption is one of the most important economic factors in selecting an electric generator; fuel typically accounts for over two-thirds of the total operating costs of a fossil-fired power plant (Power 1994). Under a competitive power market system, where operating costs are critical in determining the competitiveness and profitability of a power plant, the plant owner is thus strongly motivated to purchase fuel-efficient machinery.

Capital cost is also important in selecting generating machinery. Recent progress in the development of large, stationary gas turbines, aided by the incorporation into these machines of technological advances made in the development of aircraft (jet) engines, has created a situation in which several large manufacturers compete vigorously to sell their machines. This, combined with the cost advantages of assembly line manufacturing, has driven down the prices of these machines. Thus, the power plant developer can purchase a turbine generator that not only offers the lowest available fuel costs, but at the same time sells for the lowest per-kilowatt capital cost.

One possible alternative to an F-class gas turbine is a G-class machine, such as the Siemens-Westinghouse 501G gas turbine generator, which employs partial steam cooling to allow slightly higher temperatures, yielding slightly greater efficiency. The 501G is still relatively new; the first such machine only recently began operation at a site in Florida owned by Lakeland Electric and Water, and at PG&E Generating's Millennium

project in Charlton, Massachusetts (Power 1999). Given the minor efficiency improvement promised by the G-class turbine and the lack of a proven track record for the 501G, the applicant's decision to purchase F-class machines is a reasonable one.

Another possible alternative to the F-class gas turbine is an H-class machine with a claimed fuel efficiency of 60 percent LHV at ISO conditions (GTW 1999b). This high efficiency is achieved through a higher-pressure ratio and higher firing temperature, made possible by cooling the initial turbine stages with steam instead of air. This first Frame 7H application is not expected to enter service until the end of 2002. Given the lack of proven performance staff agrees with the applicant's decision to employ F-class machines.

A further choice of alternatives involves the selection of gas turbine inlet air cooling methods. The two commonly used techniques are the evaporative cooler or fogger, and the chiller; both devices increase power output by cooling the gas turbine inlet air. A mechanical chiller can offer greater power output than the evaporative cooler on hot, humid days, but consumes electric power to operate its refrigeration process, thus slightly reducing overall net power output and, thus, overall efficiency. An absorption chiller uses less electric power, but necessitates the use of a substantial inventory of ammonia. An evaporative cooler or a fogger boosts power output best on dry days; it uses less electric power than a mechanical chiller, possibly yielding slightly higher operating efficiency. The difference in efficiency among these techniques is relatively insignificant.

The applicant proposes to employ mechanical inlet air chillers (DENA 2001a, § 2.3.2). Given the climate at the project site and the relative lack of clear superiority of one system over the other, staff agrees that the applicant's approach will yield no significant adverse energy impacts.

In conclusion, the project configuration (combined cycle) and generating equipment (F-class gas turbines) chosen appear to represent the most efficient feasible combination to satisfy the project objectives. There are no alternatives that could significantly reduce energy consumption.

CUMULATIVE IMPACTS

There are no nearby power plant projects that hold the potential for cumulative energy consumption impacts when aggregated with the project. Staff knows of no other projects that could result in cumulative energy impacts.

Staff believes that construction and operation of the project will not bring about indirect impacts, in the form of additional fuel consumption, that would not have occurred but for the project. The older, less efficient power plants consume more natural gas to operate than the new, more efficient plants such as the AEP. Since natural gas will be burned by the power plants that are most competitive on the spot market, the most efficient plants will run the most. The high efficiency of the proposed AEP should allow it to compete very favorably, running at a high capacity factor, replacing less efficient power generating plants in the market, and therefore not impacting or even reducing the cumulative amount of natural gas consumed for power generation.

FACILITY CLOSURE

Closure of the facility, whether planned or unplanned, will not influence, nor will it be influenced by, project efficiency. Any efficiency impacts due to closure of the project would be on the electric system as a whole. Yet the vast size of the electric system serving California, the number of generating plants offering to sell power into it, and the existence of the California Independent System Operator to ensure the efficient management of the system, all lend assurance that closure of this facility will not produce significant adverse impacts on efficiency.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The project, if constructed and operated as proposed, would generate a nominal 600 MW of electric power at an overall project fuel efficiency around 53 percent LHV. While it will consume substantial amounts of energy, it will do so in the most efficient manner practicable. It will not create significant adverse effects on energy supplies or resources, will not require additional sources of energy supply, and will not consume energy in a wasteful or inefficient manner. No energy standards apply to the project. Staff therefore concludes that the project would present no significant adverse impacts upon energy resources.

No cumulative impacts on energy resources are likely. Facility closure would not likely present significant impacts on electric system efficiency.

RECOMMENDATION

No Conditions of Certification are proposed.

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POWER PLANT RELIABILITY

Brian Payne

INTRODUCTION

In this analysis, Energy Commission staff addresses the reliability issues of the project to determine if the power plant is likely to be built in accordance with typical industry norms for reliability of power generation. Staff uses this level of reliability as a benchmark because it ensures that the resulting project would likely not degrade the overall reliability of the electric system it serves (see **Setting** below).

The scope of this power plant reliability analysis covers:

- equipment availability;
- plant maintainability;
- fuel and water availability; and
- power plant reliability in relation to natural hazards.

Staff examined the project design criteria to determine if the project is likely to be built in accordance with typical industry norms for reliability of power generation. While Duke Energy North America (DENA) has predicted a 92 to 96 percent availability for Avenal Energy Project (AEP) (see below), staff uses the benchmark identified above, rather than DENA's projection, to evaluate the project's reliability.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Presently, there are no laws, ordinances, regulations or standards (LORS) that establish either power plant reliability criteria or procedures for attaining reliable operation. However, the commission must make findings as to the manner in which the project is to be designed, sited and operated to ensure safe and reliable operation (Cal. Code Regs., tit. 20, § 1752(c)). Staff takes the approach that a project is acceptable if it does not degrade the reliability of the utility system to which it is connected. This is likely the case if the project exhibits reliability at least equal to that of other power plants on that system (see **Setting** below).

SETTING

In the regulated monopoly electric industry of past decades, the utility companies assured overall system reliability, in part, by maintaining a "reserve margin." This amounted to having on call, at all times, sufficient generating capacity, in the form of standby power plants, to quickly handle unexpected outages of generating or transmission facilities. The utilities generally maintained a seven- to ten-percent reserve margin, meaning that sufficient capacity was on call to quickly replace from seven to ten percent of total system resources. This margin proved adequate, in part because of the reliability of the power plants that constituted the system.

Now, in the newly restructured competitive electric power industry, the responsibility for maintaining system reliability falls largely to the California Independent System Operator (Cal-ISO), an entity that purchases, dispatches and sells electric power throughout the state. How Cal-ISO will ensure system reliability is still being determined; protocols are being developed and put in place that will, it is anticipated, allow sufficient reliability to be maintained under the competitive market system. "Must-run" power purchase agreements and "participating generator" agreements are two mechanisms being employed to ensure an adequate supply of reliable power (Mavis 1998, pers. comm.).

The Cal-ISO also requires those power plants selling ancillary services, as well as those holding reliability must-run contracts, to fulfill certain requirements, including:

- filing periodic reports on plant reliability;
- reporting all outages and their causes; and
- scheduling all planned maintenance outages with the Cal-ISO (Detmers 1999, pers. comm.).

The Cal-ISO's mechanisms to ensure adequate power plant reliability apparently have been devised under the assumption that the individual power plants that compete to sell power into the system will each exhibit a level of reliability similar to that of power plants of past decades. However, there is cause to believe that, under free market competition, financial pressures on power plant owners to minimize capital outlays and maintenance expenditures may act to reduce the reliability of many power plants, both existing and newly constructed (McGraw-Hill 1994). It is possible that, if significant numbers of power plants exhibit individual reliability sufficiently lower than this historical level, the assumptions used by Cal-ISO to ensure system reliability will prove invalid, with potentially disappointing results. Until the restructured competitive electric power system has undergone a shakeout period, and the effects of varying power plant reliability are thoroughly understood and compensated for, staff deems it wise to encourage power plant owners to continue to build and operate their projects to the level of reliability to which all in the industry are accustomed.

DENA proposes to operate the 600 MW (nominal output) Avenal Energy Project (AEP), selling energy and capacity to the California deregulated electric power market (DENA 2001a, §§ 1.1 and 2.0). The project is expected to operate at an overall availability in the range of 92 to 96 percent (DENA 2001a, § 2.3.15.1). The capacity factor, over the life of the plant, will depend on the demand for electricity and ancillary services (DENA 2001a, § 1.6).

ANALYSIS

The availability factor for a power plant is the percentage of the time that it is available to generate power; both planned and unplanned outages subtract from its availability. Measures of power plant reliability are based on its actual ability to generate power when it is considered available and are based on starting failures and unplanned, or forced, outages. For practical purposes, reliability can be considered a combination of these two industry measures, making a reliable power plant one that is available when called upon to operate. Throughout its intended 30-year life, the AEP will be expected

to perform reliably. Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability is accomplished by ensuring adequate levels of equipment availability, plant maintainability with scheduled maintenance outages, fuel and water availability, and resistance to natural hazards. Staff examines these factors for the project and compares them to industry norms. If they compare favorably, staff can conclude that the AEP will be as reliable as other power plants on the electric system, and will therefore not degrade system reliability.

EQUIPMENT AVAILABILITY

Equipment availability will be ensured by use of appropriate quality assurance/ quality control (QA/QC) programs during design, procurement, construction and operation of the plant, and by providing for adequate maintenance and repair of the equipment and systems (discussed below).

Quality Control Program

The AFC (DENA 2001a, §§ 2.3.15.6 and 2.3.15.7) describes a Project Quality Control Program typical of the power industry. The objective of this Program will be to "maximize confidence that systems and components will be designed, fabricated, stored, transported, installed and tested in accordance with applicable technical codes and standards." Staff expects implementation of this program to yield typical reliability of design and construction. To ensure such implementation, staff has proposed appropriate conditions of certification under the portion of this document entitled **Facility Design**.

PLANT MAINTAINABILITY

Equipment Redundancy

A generating facility called on to operate in baseload service for long periods of time must be capable of being maintained while operating. A typical approach for achieving this is to provide redundant examples of those pieces of equipment most likely to require service or repair.

DENA plans to provide appropriate redundancy of function for the combined cycle portion of the project (DENA 2001a, § 2.3.15.2 and Appendix 2-7). The fact that the project consists of two trains of gas turbine generators/HRSGs provides inherent reliability. Failure of a non-redundant component of one train should not cause the other train to fail, thus allowing the plant to continue to generate (at reduced output). Further, the plant's distributed control system (DCS) will be built with typical redundancy. An emergency diesel engine generator will provide power to the essential service AC system in the event of grid failure or loss of outside power to the plant (DENA 2001a, §§ 2.3.13.4 and 2.3.13.5). The DC power system provides power for critical control circuits, control of the 4,160V and 480V switchgear, and for DC emergency backup systems. The DC power system will be supplied by redundant batteries, chargers and inverters (DENA 2001a, § 2.3.13.3). Other balance of plant equipment will be provided with redundant examples, thus:

- Two 100 percent boiler feed water pumps per heat recovery steam generator (HRSG);

- three 100 percent vacuum condensate pumps;
- two 100 percent closed cooling water pumps;
- two 50 percent circulating water pumps;
- two 100 percent capacity closed loop cooling water heat exchangers;
- two 100 percent raw water softener clarifiers;
- two 100 percent service and instrument air compressors; and
- two 100 percent raw water canal pumps.

With this opportunity for continued operation in the face of equipment failure, staff believes that equipment redundancy will be sufficient for a project such as this.

Maintenance Program

DENA proposes to establish a plant maintenance program typical of the industry (DENA 2001a, § 2.3.15). This program will be in compliance with Cal-ISO Executive Order D-23-01, including the requirements for coordination. The program will encompass preventive and predictive maintenance techniques. Maintenance outages will be planned for periods of low regional electricity demand. In light of these plans, staff expects that the project will be adequately maintained to ensure acceptable reliability.

FUEL AND WATER AVAILABILITY

For any power plant, the long-term availability of fuel and of water for cooling or process use is necessary to ensure reliability. The need for reliable sources of fuel and water is obvious; lacking long-term availability of either source, the service life of the plant may be curtailed, threatening the supply of power as well as the economic viability of the plant.

Fuel Availability

The AEP will burn natural gas from the Pacific Gas and Electric Company (PG&E) system. Gas will be transmitted to the plant, via a new 20 inch diameter pipeline connection to PG&E's lines 300 A/B at PG&E's Kettleman Compressor Station. This PG&E natural gas system represents a resource of considerable capacity. PG&E's Kettleman Compressor Station can receive gas from both directions (Malin, Oregon or Topock, Arizona) if necessary. This capability offers increased reliability from redundant sources of supply through the PG&E natural gas pipeline system. This system offers access to adequate supplies of gas (DENA 2001a, §§ 2.14.1 and 2.3.15.4). Staff agrees with the applicant's prediction that there will be adequate natural gas supply and pipeline capacity to meet the project's needs.

Water Supply Reliability

The AEP will obtain water from the Kern County Water Agency (KCWA) through the San Luis Canal. The surface water will be delivered to the City of Avenal turnout adjacent to the site. This source will be connected to the project site by a short pipeline. A backup water supply from nearby agricultural wells will also be provided. This water source will be connected to the site by a new 1.6 mile pipeline. An onsite raw water/firewater storage tank will be provided. This tank will be sized to meet water needs for up to 9 hours of interruption in the primary and backup water supplies (DENA

2001a, §§ 1.5.5, 2.3.7, 2.3.18.4, and 6.5.1.1). Staff believes these sources yield sufficient likelihood of a reliable supply of water. (For further discussion of water supply, see that portion of this document entitled **Water Resources**.)

POWER PLANT RELIABILITY IN RELATION TO NATURAL HAZARDS

Natural forces can threaten the reliable operation of a power plant. High winds, tsunamis (tidal waves) and seiches (waves in inland bodies of water) will not likely represent a hazard for this project, but flooding and seismic shaking (earthquake) present credible threats to reliable operation.

Flooding

The site is essentially flat, with an average elevation of about 350 feet above mean sea level. The site and linear facilities are outside the 100 year flood zone. The site is not subject to tsunami run-up, because it is separated from the coast by the intervening topography of the Coastal Range. Combined with a proper grading and drainage plan, there should be no credible threat of flooding (DENA 2001a, § 6.5.1.2 and Figures 2.3-9, 6.5-1 and 6.5-2). For further discussion, see that portion of this document entitled **Soil and Water Resources**.

Seismic Shaking

The site lies within Seismic Zone 4 (DENA 2001a, § 6.3.1.5.2); see that portion of this document entitled **Geology and Paleontology**. The project will be designed and constructed to the latest appropriate LORS (DENA 2001a, Tables 2.5-1, 6.3-3, and 6.5-6 and Appendices 2-1 through 2-5). Compliance with current LORS applicable to seismic design represents an upgrading of performance during seismic shaking compared to older facilities, due to the fact that these LORS have been periodically and continually upgraded. By virtue of being built to the latest seismic design LORS, this project will likely perform at least as well as, and perhaps better than, existing plants in the electric power system. Staff has proposed conditions of certification to ensure this; see that portion of this document entitled **Facility Design**. In light of the historical performance of California power plants and the electrical system in seismic events, staff believes there is no special concern with power plant functional reliability affecting the electric system's reliability due to seismic events.

COMPARISON WITH EXISTING FACILITIES

Industry statistics for availability factors (as well as many other related reliability data) are kept by the North American Electric Reliability Council (NERC). NERC continually polls utility companies throughout the North American continent on project reliability data through its Generating Availability Data System (GADS), and periodically summarizes and publishes the statistics on the Internet (http://www.nerc.com). NERC reports the following summary generating unit statistics for the years 1994 through 1998 (NERC 1999):

For Combined Cycle units (All MW sizes)

Availability Factor = 91.49 percent

The gas turbines that will be employed in the project have been on the market for several years now, and can be expected to exhibit typically high availability. The applicant's prediction of an annual availability factor in the 92 to 96 percent range

(DENA 2001a, §2.3.15.1) appears reasonable compared to the NERC figure for similar plants throughout North America (see above). In fact, these new, large machines can well be expected to outperform the fleet of various (mostly older and smaller) gas turbines that make up the NERC statistics. Further, since the plant will consist of two parallel gas turbine generating trains, maintenance can be scheduled during those times of year when the full plant output is not required to meet market demand, typical of industry standard maintenance procedures. The applicant's estimate of plant availability therefore appears realistic. The stated procedures for assuring design, procurement and construction of a reliable power plant appear to be in keeping with industry norms, and staff believes they are likely to yield an adequately reliable plant.

FACILITY CLOSURE

Closure of the facility, whether planned or unplanned, cannot impact power plant reliability. Reliability impacts on the electric system from facility closure, should there be any, are dealt with in that portion of this document entitled **Transmission System Engineering**.

CONCLUSION

DENA predicts an equivalent availability factor in the 92 to 96 percent range, which staff believes is achievable in light of the industry norm of 91.5 percent for this type of plant. Based on a review of the proposal, staff concludes that the plant will be built and operated in a manner consistent with industry norms for reliable operation. This should provide an adequate level of reliability. No Conditions of Certification are proposed.

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TRANSMISSION SYSTEM ENGINEERING

Ajoy Guha P.E. and Richard Minetto P.E.

INTRODUCTION

The Transmission System Engineering (TSE) analysis provides the basis for the findings in the Energy Commission's decision. This staff assessment indicates whether or not the transmission facilities associated with the proposed project conform to all applicable laws, ordinances, regulations and standards (LORS) required for safe and reliable electric power transmission and assesses whether or not the applicant has accurately identified all interconnection facilities required for addition of the project to the electric grid.

Staff's analysis evaluates the power plant switchyard, outlet line, termination and downstream facilities identified by the applicant. Staff's analysis provides proposed conditions of certification to ensure the project complies with applicable LORS during the design review, construction, operation and potential closure of the project.

The California Independent System Operator (Cal-ISO) is responsible for ensuring electric system reliability for all participating transmission owning utilities and determines both the standards necessary to achieve reliability and whether the proposed project conforms to those standards. The Cal-ISO will provide testimony at the Energy Commission hearings.

Additionally, under the California Environmental Quality Act (CEQA), the Energy Commission must conduct an environmental review of the "whole of the action," which may include facilities not licensed by the Energy Commission (California Code of Regulations, title 14, §15378). Therefore, the Energy Commission must identify and evaluate the environmental effect of construction and operation of any new or modified transmission facilities required for the project's interconnection to the electric grid and also beyond the project's interconnection with the existing transmission system that are required as a result of the power plant addition to the California transmission system.

Duke Energy Avenal, LLC (applicant) filed an Application for Certification to the California Energy Commission to construct a nominal 600 megawatt (MW) natural gas-fired combined cycle generating facility to be located in the City of Avenal, Kings County. The applicant proposes to connect their project, Avenal Energy Project (AEP), to the existing Pacific Gas and Electric (PG&E) Gates-Arco 230 kilovolt (kV) transmission line. The plant is expected to be on-line in September 2004 (DUKE 2001a, AFC page 1-10).

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), "Rules for Overhead Electric Line Construction," formulates uniform requirements for construction of overhead lines. Compliance with this order ensures adequate

service and safety to persons engaged in the construction, maintenance and operation or use of overhead electric lines and to the public in general.

- California Public Utilities Commission (CPUC) General Order 128(GO-128), “Rules for Construction of Underground Electric Supply and Communications Systems,” formulates uniform requirements and minimum standards to be used for underground supply systems to ensure adequate service and safety to persons engaged in the construction, maintenance and operation or use of underground electric lines and to the public in general.
- The National Electric Safety Code, 1999 provides electrical, mechanical, civil and structural requirements for overhead electric line construction and operation.
- North American Reliability Council (NERC)/Western Systems Coordinating Council (WSCC) Planning Standards merge the WSCC Planning Standards into the NERC Planning Standards and provide the system performance standards used in assessing the reliability of the interconnected system. Certain aspects of the NERC/WSCC standards are either more stringent or more specific than the NERC standards. These standards allow the Cal-ISO and the Transmission Owners (TO) to plan electric systems so as to withstand the more probable forced and maintenance outage system contingencies at projected customer demand and anticipated electricity transfer levels, while continuing to operate reliably within equipment and electric system thermal, voltage and stability limits. These standards include the reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration. Analysis of the WSCC system is based to a large degree on Section I.A of the standards, “NERC and WSCC Planning Standards with Table I and WSCC Disturbance-Performance Table” and on Section I.D, “NERC and WSCC Standards for Voltage support and Reactive Power”. These standards require that the results of power flow and stability simulations verify defined performance levels. Performance levels are defined by specifying the allowable variations in thermal loading, voltage and frequency, and loss of load that may occur on systems during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (loss of load or a single transmission element out of service) to a level that seeks to prevent system cascading and the subsequent blackout of islanded areas during a major disturbance (such as loss of multiple 500 kV lines in a right of way and/or multiple generators). While controlled loss of generation, or load, or system separation is permitted in certain circumstances, their uncontrolled loss is not permitted (WSCC 2001).
- NERC Planning Standards provides national policies, standards, principles and guidelines to assure the adequacy and security of the electric transmission system. The NERC planning standards provide for system performance levels under normal and contingency conditions. With regard to power flow and stability simulations, while these Planning Standards are similar to WSCC Standards, certain aspects of the WSCC standards are either more stringent or more specific than the NERC standards for Transmission System Contingency Performance. The NERC planning standards apply not only to interconnected system operation but also to individual service areas (NERC 1998).

- Cal-ISO Grid Planning Standards also provide standards, and guidelines to assure the adequacy, security and reliability in the planning of the Cal-ISO transmission grid facilities. The Cal-ISO Grid Planning Standards incorporate the WSCC and NERC Planning Standards. With regard to power flow and stability simulations, these Planning Standards are similar to WSCC and the NERC Planning Standards for Transmission System Contingency Performance. However, the Cal-ISO Standards also provide some additional requirements that are not found in the WSCC or NERC Planning Standards. The Cal-ISO Standards apply to all participating transmission owners interconnecting to the Cal-ISO controlled grid. It also applies when there are any impacts to the Cal-ISO grid due to facilities interconnecting to adjacent controlled grids not operated by the Cal-ISO (Cal-ISO 2002a).

EXISTING FACILITIES AND RELATED SYSTEMS

The existing bulk transmission facilities in the vicinity of the AEP project area include:

- Gates 500/230 kV Substation: This substation is located approximately five miles northwest of the project site.
- Los Banos-Midway 500 kV and Gates-Midway 500 kV lines: These lines are built along a transmission corridor approximately three thousand feet southwest of the project site. The Los Banos-Midway 500 kV line is a part of the Path 15 bulk transmission system.
- Gates-Arco-Midway 230 kV transmission line: This transmission line occupies the same transmission corridor as the Los Banos-Midway and Gates-Midway 500 kV lines. The Gates-Arco 230 kV line is proposed for the interconnection of this project.

The proposed interconnection of the project to the 230 kV system that is parallel to and underlying the major 500 kV lines, has the potential for overloads on the 230 kV system and underlying lower voltage systems, especially during heavy power transfers between southern and northern California and/or major disturbances in 500 kV lines.

PROJECT DESCRIPTION

SWITCHYARD AND INTERCONNECTION FACILITIES

The AEP site will be located approximately five miles southeast of Gates Substation in the City of Avenal, Kings County near the edge of the Fresno-Kings county line (DUKE 2001a, AFC Section 1.5.1). The AEP will consist of two combustion turbine generators (CTG1, CTG2) (each 172.6 MW gross capacity) and one steam turbine generator (STG) (283 MW gross capacity), with a total nominal output of 600 MW (DUKE 2001a, AFC Section 2.3.5.1). Each of the generating units will be connected to a dedicated 18/230 kV step-up transformer and the high voltage terminals of each transformer will be connected to the new AEP 230 kV switchyard by overhead conductors through a dedicated 1200 ampere 230 kV circuit breaker as part of the generating unit.

AEP Switchyard

The new AEP 230 kV switchyard will have a ring bus arrangement which will include four 230 kV circuit breakers with 4000 ampere continuous rating and 63 kiloampere (kA) interrupting capacity. The switchyard will have four switch bays, each with a double breaker arrangement. According to the present interconnection plan of the generating units to the AEP switchyard (DUKE 2001a, AFC Section 2.4.1, Figure 2.4.3,), one switch bay will be connected by overhead conductor to the 230 kV breakers of generating units CTG1 and STG together. Another switch bay will be connected separately by overhead conductor to the 230 kV breaker of generating unit CTG2. The remaining two switch bays will be used for interconnection of the transmission facilities to the electric grid by looping the existing Gates-Arco 230 kV line through the AEP switchyard. The AEP switchyard will be built within the fenced yard of the AEP plant, and will be designed, built, owned and operated by PG&E (DUKE 2002f, SIS Section 4 Page 4).

Transmission Interconnection Facilities

To loop the existing Gates-Arco 230 kV line through the AEP switchyard, about 1.3 mile of a new double circuit line will be built on steel structures. The preferred route for the new transmission line will extend from the eastside of the Gates-Arco 230 kV line to the AEP switchyard through existing farmland with a 120 foot right of way (DUKE 2001a, AFC Sections 1.5.3 & 2.4.1).

This configuration for the interconnection and switchyard is in accordance with good utility practices and is considered acceptable.

ANALYSIS AND IMPACTS

SYSTEM RELIABILITY

Introduction

A System Impact Study (SIS) for connecting a new power plant to the existing power system grid is performed to determine the alternate and preferred interconnection facilities to the grid, downstream transmission system impacts and their mitigation measures in conformance with system performance levels as required in Utility reliability criteria, NERC planning standards, WSCC reliability criteria and Cal-ISO reliability criteria. The SIS determines both positive and negative impacts, and for the reliability criteria violation cases (for the negative impacts) determines the alternate and preferred additional transmission facilities or other mitigation measures. The SIS is conducted with and without the new generation project and its interconnection facilities by using the computer model base case for the year the generator project will come on-line. The SIS normally includes a Load Flow study, Transient Stability study, Post-transient Load Flow study and Short Circuit study. The SIS is focused on thermal overloads, voltage deviations, system stability (excessive oscillations in the generators and transmission system, voltage collapse, loss of loads or cascading outages) and short circuit duties. The SIS must be conducted under the normal condition (N-0) of the system and also for all credible contingency/emergency conditions, which includes the loss of a single system element (N-1) such as a transmission line, transformer or a generator and the simultaneous loss of two system elements (N-2), such as two transmission lines or a

transmission line and a generator or the simultaneous loss of multiple system elements. In addition to the above analysis, the studies may be performed to verify whether sufficient active or reactive power is available in the area system or area sub-system to which the new generator project will be interconnected. The SIS is followed by supplemental studies conducted by the participating transmission owner with details provided in a Detailed Interconnection Facility Study (DIFS) or a Facility Cost Report (FCR).

Any new transmission facilities such as the power plant switchyard, the outlet line, and downstream facilities required for connecting a project to the grid are considered part of the project and are subject to the Application for Certification review process.

Scope of System Impact Study (SIS)

The SIS was performed by PG&E for the proposed project. The SIS included a Power Flow Study, Short Circuit Study, and Dynamic Stability Analysis (DUKE 2002f, SIS). The study modeled the proposed AEP with a net maximum output of 600 MW. The Power flow studies were conducted using 2004 Summer Peak, 2004-05 Winter, and 2005 Heavy Spring base Cases (DUKE 2002f, SIS Sections 3.1 & 5) under normal and Cal-ISO Category B (outage of a single transmission facility or one line and one generator) and Category C (outage of multiple transmission facilities) contingency conditions. Dynamic stability studies were conducted using 2004-05 Winter and 2005 Heavy Spring base cases to determine whether the AEP would create instability following certain selected outages (DUKE 2002f, SIS Sections 3.2 & 8). Short circuit studies were conducted to determine if the AEP would result in overstressing existing substation facilities (DUKE 2002f, SIS Sections 3.3, 9 & 10). The base cases included all approved PG&E transmission projects, modeled major transmission system path flows, and the proposed queue generation projects before the on-line date of the AEP. The transfer limits in the California-Oregon Intertie (Path 66), Midway-Gates-Los Banos transmission path (Path 15), and the Northern-Southern California Intertie (Path 26) were not increased from current limits to accommodate the AEP. It was assumed that the AEP could be accommodated within the transfer capabilities of Path 66, Path 15 and Path 26. The detailed study assumptions, path flows and critical hydro generation have been described in the SIS (DUKE 2002f, SIS Sections 4 & 5). The conclusions and conditions contained herein apply to the study results submitted. The results of the analysis provide assessment of the overloads that violate reliability criteria under normal and contingency conditions of the system.

Power Flow Study Results

Based on the SIS results, there are some adverse impacts on the electrical grid due to interconnection of the AEP as proposed. The SIS provides a detailed summary of the overload violations under the required criteria in Section 7.1, Tables 7-1 through 7-9 (DUKE 2002f, SIS Section 7). The results indicate the following overload violations of reliability criteria:

Normal (N-0) Conditions

- There are ten overload violations under 2004 summer peak normal (N-O) conditions. Three overloads are new as a result of the AEP and seven overloads are identified as increasing the pre-project existing normal overloads.

- The most severe overload is identified in the Avenal-Gates 230 kV line and the loading in this line increases from 16 percent to 177 percent of the normal rating due to addition of the AEP.
- Other post-project overloads range from 101 percent to 150 percent of the normal rating (DUKE 2002f, SIS Section 7.1.1, and Table 7-1).
- There are two overload violations under 2004-05 Winter normal (N-O) conditions. One overload is new as a result of the AEP and the other overload is a marginal increment to pre-project existing normal overload.
- The most severe overload is found in the Avenal-Gates 230 kV line whose loading increases from 35 percent to 144 percent of the normal rating due to addition of the AEP.
- Other post-project overload is found in the Table Mountain 500/230 kV transformer as 102 percent of the normal rating (DUKE 2002f, SIS Section 7.1.2, Table 7-4).
- There were nine overload violations under 2005 heavy spring normal (N-O) conditions. Two overloads are new as a result of the AEP and seven of the overloads are identified as increasing the pre-project existing normal overloads.
- The most severe overload is identified in the Avenal-Gates 230 kV line and the loading in this line increases from 23 percent to 187 percent of the normal rating due to addition of the AEP.
- Other post-project overloads ranges from 103 percent to 145 percent of the normal rating (DUKE 2002f, SIS Section 7.1.3, Table 7-7).

Contingency (N-1)/CAL-ISO Category B) Conditions

- There were thirty-six emergency overload violations under 2004 summer peak conditions for Cal-ISO Category B or single contingencies (N-1). Thirteen overloads are new violations as a result of the AEP and twenty-three overloads are increments to pre-project existing emergency overloads.
- The most severe new emergency overload is identified in the Avenal-Gates 230 kV line for outage of the Midway 500/230 kV transformer #12. For this contingency, the line loading increases from 50 percent to 194 percent of its emergency rating. The other new emergency overloads are identified on the Arco-Avenal 230 kV line and the Arco-Midway 230 kV line for outage of the Gates- Avenal 230 kV line (pre-project Gates-Arco 230 kV line).
- The most severe post-project emergency overload which is due to an incremental pre-project existing overload in the Midway 500/230 kV transformer #11 for outage of the Midway 500/230kV Transformer #12. For this contingency, the transformer loading increases from 210 percent to 223 percent of its rating due to addition of the AEP.
- Other post-project overloads ranges between 101% to 199% of the emergency ratings (DUKE 2002f, SIS Section 7.1.1, and Table 7-2).
- There were five emergency overload violations under 2004 Winter conditions for Cal-ISO Category B or single contingencies (N-1). Four overloads are new as a

result of the AEP and one overload is an increment to an existing pre-project emergency overload.

- The most severe new emergency overload is found in the Avenal-Gates 230 kV line for outage of the Los Banos-Midway 500kV line. For this contingency, the line loading will increase from 14 percent to 161 percent of its emergency rating. The other new emergency overloads are identified in the Arco-Avenal 230 kV line and the Arco-Midway 230 kV line for outage of the Gates- Avenal 230 kV line (pre-project Gates-Arco 230 kV line).
- Other post-project overloads ranges from 103 percent to 138 percent of the emergency ratings (DUKE 2002f, SIS Section 7.1.2, Table 7-5).
- There were seventeen emergency overload violations under 2004 Heavy Spring conditions for Cal-ISO Category B or single contingencies (N-1). Four overloads are new as a result of the AEP and thirteen overloads are due to aggravating pre-project existing emergency overloads.
- The most severe new emergency overload is found in the Avenal-Gates 230 kV line for outage of the Midway 500/230 kV transformer#12. For this contingency, the line loading will increase from 64 percent to 208 percent of its emergency rating. The other new emergency overloads are identified in the Arco-Avenal 230 kV line and the Arco-Midway 230 kV line for outage of the Gates- Avenal 230 kV line (pre-project Gates-Arco 230 kV line).
- The most severe post-project emergency overload which is due to an incremental pre-project existing overload in the Midway 500/230 kV Transformer #11 for outage of the Midway 500/230kV Transformer #12. For this contingency, the transformer loading increases from 240 percent to 253 percent of its rating due to addition of the AEP.
- Other post-project overloads ranges from 111 percent to 203 percent of the emergency ratings (DUKE 2002f, SIS Section 7.1.3, and Table 7-8).

Contingency (N-2)/CAL-ISO Category C) Conditions

- There were twenty-nine emergency overload violations under 2004 Summer Peak Conditions for Cal-ISO Category C or multiple contingencies (N-2) (DUKE 2002f, SIS Section 7.1.1, Table 7-3). The most affected overloaded lines are Avenal-Gates, Avenal-Arco and Arco-Midway 230 kV lines due to a Gates substation 230 kV Section E Bus fault.
- There were two emergency overload violations under 2004 Winter Conditions for Cal-ISO Category C or multiple contingencies (N-2) (DUKE 2002f, SIS Section 7.1.2, Table 7-6). The affected overloaded lines are Avenal-Arco and Arco-Midway 230 kV lines due to a Gates substation 230 kV Section E Bus fault.
- There were twenty-one emergency overload violations under 2004 Heavy Spring Conditions for Cal-ISO Category C or multiple contingencies (N-2) (DUKE 2002f, SIS Section 7.1.3, Table 7-9). The most affected overloaded lines are Avenal-Gates, Avenal-Arco and Arco-Midway 230 kV lines due to a Gates substation 230 kV Section E Bus fault.

MITIGATION

The number of overload violations requires a comprehensive mitigation plan in order to ensure adequate transmission capacity for interconnection of the proposed AEP. The SIS recognizes that some of the overloads are impacts directly caused by the interconnection of the AEP, while other overloads are impacts due to incremental overloads caused by multiple planned generation projects in the area including the AEP and due to the load growth in the area. The mitigation measures for overloaded facilities are, therefore, separated into two groups, one for the direct impact of the AEP and the other for multiple project impacts (DUKE 2002f, SIS Section 11).

Mitigation of Overloaded Facilities Resulting Directly From the AEP

The mitigation plans as determined in the SIS for overloads that are due to direct impact of the interconnection of the project, are as follows:

- Overloaded Component: Avenal-Gates 230 kV line.
- Overloaded Conditions*:*
- Normal (N-0) spring, summer, winter.
- Single Contingency (N-1): Loss of Midway 500/230 kV Bank #1 (spring, summer, winter).
- **Mitigation:** To eliminate the normal overload, adding a second 795 ACSR conductor or reconductoring to an equivalent 2x795 ACSR conductor for about an 1.0 mile length from Gates substation to Tower 137/626B would be required, as this existing 1.0 mile length of the line has only one 795 ACSR conductor and the rest of the line has two 795 ACSR conductors. However, this mitigation is not adequate to eliminate higher overloading of the line under single contingency(s). Therefore, the identified mitigation measure is to reconductor the existing 795 ACSR conductor(s) to a minimum size of 1113 SSAC conductor to meet the emergency loading for the entire length of the line
- Overloaded Component: Arco-Avenal 230 kV line
- Overload condition:
- Single Contingency (N-1): Loss of Avenal-Gates 230 kV line (spring, summer, winter).
- **Mitigation:** The identified mitigation measure is to add a second 795 ACSR conductor or to reconductor the existing 795 ACSR conductor to an equivalent 2x795 ACSR conductor for about an 8 mile length from the Arco Tap-ARCO substation.
- Overloaded Component: Arco-Midway 230 kV line
- Overload Condition:
- Single Contingency (N-1): Loss of Avenal-Gates 230 kV line (spring, summer, winter)
- **Mitigation:** The identified mitigation measure is to add a second 795 ACSR conductor or to reconductor the existing 795 ACSR conductor to an equivalent

2x795 ACSR conductor for about an 8 mile length from the Arco Tap-ARCO substation and for about an 16 mile length between Midway and Arco Tap.

Mitigation of overloaded facilities resulting from multipe projects

The SIS recognizes the following major generating projects ahead of the AEP in the queue that have contributed to incremental overloads:

1. Project H: 1000 MW in the Fresno area in 2004.
2. Project R: 1000 MW interconnected at the 230 kV bus at Los Banos Substation in 2004.
3. Project T: 1000 MW interconnected at the 500 kV bus at Los Banos Substation in 2005.

The SIS also identified the following project that is behind Avenal in the queue, but also a contributor to the incremental overloads:

4. Project Y: 1367 MW interconnected at the 230 kV bus at Los Banos Substation in 2004.

The above projects R, T and Y have not filed AFCs with the Commission and have not yet engaged in pre-filing meetings with the staff. It is, therefore, uncertain that these projects[1] could be on-line in 2004 to cause any cumulative incremental overloads.

The SIS recognizes that each generation project is responsible for mitigating its own incremental overload and suggests adequate mitigation by either one of the following two means:

- A comprehensive single mitigation plan paid for by multiple projects.
- Each project selects a mitigation plan to resolve individual project incremental overloads.

The mitigation plans as determined in the SIS for overloads that are due to multiple projects, are as follows:

- Overloaded Component: Panoche-PanocheJ 115 kV line
- Overload Condition:
- Normal (N-0) (summer).
- **Mitigation:** The mitigation measure is identified as the PG&E Project T646 which proposes to reconductor the line to 1113 Aluminum conductor by June, 2002.
- Overloaded Component: Moss Landing 2-Panoche 230 kV line
- Overload Condition:
- Normal (N-0) (spring)

[1] In the latest Data Requests to the applicant, Staff has requested to remove these three projects from the base cases for conducting the supplementary studies.

- **Mitigation:** The mitigation measure is identified in the Project Y SIS which proposes to reconductor a 70 mile length of the line. The AEP would be responsible for the mitigation of 6 percent incremental overload that it would contribute.
- Overloaded Component: Los Banos-Westley 230 kV line
- Overload Conditions:
- Normal (N-0) (summer, spring).
- Single Contingency (N-1): Loss of Los Banos 5000/230 kV line (summer, spring)
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project R and Project T SISs which propose to reconductor a 20 mile length of the line. The AEP would be responsible for the mitigation of 14 percent incremental overload that it would contribute.
- Overloaded Component: Gregg-Storey 1 230 kV line
- Overload Conditions:
- Normal (N-0) (summer).
- Single Contingency (N-1): Loss of Exchequer generation (summer)
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project H and Project R SISs. which propose to reconductor a 1 mile length of the line. The AEP would be responsible for the mitigation of 7 percent incremental overload that it would contribute.
- Overloaded Component : Gregg-Borden 230 kV line
- Overload Conditions:
- Normal (N-0) (summer)
- Single Contingency (N-1): Loss of Exchequer generation (summer)
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project H and Project R SISs. which propose to reconductor an 8 mile length of the line. The AEP would be responsible for the mitigation of its 12 percent incremental overload.
- Overloaded Component: Vaca Dixon 500/230 kV transformer bank
- Overload Conditions:
- Normal (N-0) (summer).
- Single Contingency (N-1): Loss of Tesla 500/230 kV Bank (summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project T SIS which proposes to add a second Vaca Dixon 500/230 kV transformer bank with an emergency rating of 1518 MVA. The AEP would be responsible for the mitigation of its 11 percent incremental overload.
- Overloaded Component: Midway 500/230 kV transformer bank #12
- Overload Conditions:

- Normal (N-0) (summer, spring).
- Single Contingency (N-1): Loss of the Midway 500/230 kV bank #11 (summer, winter, spring)
- **Mitigation**: The mitigation measure has been identified in the PG&E Project T765 which proposes to add a third Midway 500/230 kV transformer bank with a minimum emergency rating of 2279 MVA by October 2002.
- Overloaded Component: Midway 500/230 kV transformer bank #11
- Overload Conditions:
- Normal (N-0) (summer, spring).
- Single Contingency: Loss of the Midway 500/230 kV bank #12 (summer, winter, spring.
- **Mitigation**: The mitigation measure has been identified in the PG&E Project T765 which proposes to add a third Midway 500/230 kV transformer bank with a minimum emergency rating of 2279 MVA by October 2002.
- Overloaded Component: Bellota-CottleB-Warnerville 230 kV line
- Overload Condition:
- Normal (N-0) (spring).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y SIS. which proposes to reconductor a 23 mile length of the line. The AEP would be responsible for the mitigation of its 6 percent incremental overload.
- Overloaded Component: Helm-Panoche #1 230 kV line.
- Overload Conditions:
- Normal (N-0) (spring.
- Single Contingency (N-1): Loss of Helm-Panoche #2 230 kV line (spring, summer)
- **Mitigation:** The mitigation measure has been identified in the prior Project H and Project R SISs. which propose to reconductor a 25 mile length of the line for an emergency rating of 1199 amperes. The AEP would be responsible for the mitigation of its 5 percent incremental overload.
- Overloaded Component: Le Grand-Wilson B 115 kV line
- Overload Condition:
- Normal (N-0) (spring, summer).
- Single Contingency (N-1): Loss of Wilson-Gregg 230 kV line and Exchequer generation (summer, spring).
- **Mitigation:** The mitigation measure has been identified in the PG&E Project T855, which proposes to reconductor the line by May 2003.
- Overloaded Component: Los Banos 500/230 kV transformer bank
- Overload Condition:

- Single Contingency (N-1): Loss of Los Banos-Westley 230 kV line (summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y and Project R SIS. which propose to add a second Los Banos 500/230 kV transformer. The AEP would be responsible for the mitigation of its 7 percent incremental overload.
- Overloaded Component: Mendota-Panoche Tap 115 kV line
- Overload Condition:
- Single Contingency (N-1): Loss of Wilson-Gregg 230 kV line and Exchequer generation (summer*)*
- **Mitigation:** The mitigation measure has been identified in the prior Project R and Project Y SIS. which propose to reconductor a 10 mile length of the line for a rating of 486 amperes. The AEP would be responsible for the mitigation of its 4 percent incremental overload.
- Overloaded Component: El Nido-Oro Loma 115 kV line
- Overload Condition:
- Single Contingency (N-1): Loss of Wilson-Gregg 230 kV line and Exchequer generation (summer)
- **Mitigation:** The mitigation measure has been identified in the prior Project Y SIS which proposes to reconductor a 25 mile length of the line for a rating of 529 amperes. The AEP would be responsible for the mitigation of its 4 percent incremental overload.
- Overloaded Component: Tesla 500/230 kV transformer bank #6
- Overload Condition:
- Single Contingency (N-1): Loss of Tesla 500/230 kV transformer bank #2 (summer).
- **Mitigation:**. Overload has been identified in the prior Project Y, Project T, and Project R SISs. The mitigation measure is identified as system reconfiguration in conjunction with minimum “Delta” area generation dispatch for which operational study will need to be completed prior to interconnection of the project. The AEP would be responsible for the mitigation of its 4% incremental overload.
- Overloaded Component: Metcalf-Moss Landing #1 & #2 230 kV lines.
- Overload Condition:
- Single Contingency (N-1): Loss of Metcalf-Moss Landing 500 kV line (summer, spring)
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project H, Project T and Project R SISs which propose to reconductor a 36 mile length of the line for an emergency rating of 1351 amperes. The AEP would be responsible for the mitigation of its 10 percent incremental overload.
- Overloaded Component: Kearney-McMullin 230 kV line.

- Overload Condition:
- Single Contingency (N-1): Loss of Gates-Gregg 230 kV line and 1 Helms unit generation (summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project R, Project T and Project H SISs which propose to reconductor a 13 mile length of the line for an emergency rating of 1307 amperes. The AEP would be responsible for the mitigation of its 4 percent incremental overload.
- Overloaded Component: Helm-McMullin 230 kV line.
- Overload Condition:
- Single Contingency (N-1: Loss of Gates-Gregg 230 kV line and 1 Helms unit generation (summer).
- **Mitigation:** The mitigation measure has been identified the prior Project Y, Project R, Project T and Project H SISs which propose to reconductor a 10 mile length of the line for an emergency rating of 1337 amperes. The AEP would be responsible for the mitigation of its 4 percent incremental overload.
- Overloaded Component: Herndon-Kearney 230 kV line.
- Overload Condition:
- Single Contingency (N-1): Loss of Gates-Gregg 230 kV line and 1 Helms unit generation (summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y, Project R, Project T and Project H SISs which propose to reconductor an 11 mile length of the line for an emergency rating of 1182 amperes. The AEP would be responsible for the mitigation of its 4 percent incremental overload.
- Overloaded Component: Panoche--Oro Loma 115 kV line.
- Overload Condition:
- Single Contingency (N-1: Loss of Wilson-Gregg 230 kV line and Exchequer generation (summer*)*
- **Mitigation:** The mitigation measure has been identified in the prior Project Y SIS which propose to reconductor the line to meet post-project emergency loading. The AEP would be responsible for the mitigation of its 6 percent incremental overload
- Overloaded Component: Helm-Panoche #2 230 kV line.
- Overload Condition:
- Single Contingency (N-1): Loss of Helm-Panoche #1 230 kV line (spring, summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y and Project H SISs which propose to reconductor a 25 mile length of the line for an emergency rating of 1159 amperes. The AEP would be responsible for the mitigation of its 5 percent incremental overload.
- Overloaded Component: Tesla-Tracy Pump #1 and #2 230 kV lines.

- Overload Condition:
- Single Contingency (N-1): Loss of Tesla-Tracy 500 kV line (spring, summer).
- **Mitigation:** The mitigation measure has been identified in the prior Project Y and Project H and Project T SISs which propose to reconductor a 6 mile length of the line to meet post-project emergency loading of 1159 amperes. The AEP would be responsible for the mitigation of its 18 percent incremental overload.
- Overloaded Component: Warnerville 230/115 kV #1,2, and 3 transformer banks.
- Overload Condition:
- *Single Contingency (N-1): Loss of Westley-Los Banos 230 kV line (summer).* **Mitigation:** This is a third party facility. The applicant is required to seek a mitigation agreement with the City and/or County of San Francisco. Overload of the Warnerville transformers has been identified in the Project H, Project Y, and Project R SISs. The AEP would be responsible for the mitigation of its 4% incremental overload.In addition to the overloaded facilities listed above, the AEP may cause increase in overloadings on the Borden-Storey-Warneville 230 kV transmission line, Certain T-Le Grand, Le Grand Jct-Wilson, Wilson-El Capitan, Newhall-Dairyland, Newhall-Capcotap-Mendota 115 kV lines.

Mitigation of Overloaded Facilities for multiple contingencies

The mitigation plans or options to eliminate overloading in transmission facilities due to multiple (N-2) or Cal-ISO Category C contingencies are listed in the SIS (DUKE 2002f, SIS Section 11.3, Pages 32 and 33). It shows that the mitigation plans as described above to offset overloading in transmission facilities under single (N-1) or Cal-ISO Category B contingencies will also be adequate to eliminate overloading in transmission facilities under multiple or Cal-ISO Category C contingencies.

Transient Stability Study Results

Dynamic stability studies were conducted by PG&E using 2004 Winter and 2004 Heavy Spring base cases to determine if the AEP would create any adverse impact on the stable operation of the transmission grid following selected Cal-ISO category B (N-1) & C (N-2) outages (DUKE 2002f, SIS Sections 3.2 & 8). The results indicate there are no transient stability concerns on the transmission system following the selected disturbances for integration of the AEP project.

Short Circuit Study Results and Mitigation

The short circuit study performed by PG&E evaluated the impact of the AEP project on the fault duties within PG&E facilities (DUKE 2002f, SIS Sections 3.3, 9 & 10). The study shows the following results for addition of the AEP:

- Five 230 kV circuit breakers at Gates Substation are overstressed.
- **Mitigation:** According to PG&E policy, the applicant is responsible for the replacement of the five breakers.
- One 115 kV circuit breaker at Gates Substation is overstressed.

- **Mitigation:** According to PG&E policy, the applicant is responsible for the replacement of the breaker.
- Four disconnect switches (#221,223,227,229) at Arco 230 kV will be overstressed for a Category B condition.
- **Mitigation:** According to PG&E policy, the applicant is responsible for the replacement of the four disconnect switches.
- The fault current for nine 230 kV breakers at Midway substation will exceed the 63 kilo ampere (kA) threshold interrupting value after the project.
- **Mitigation:** According to PG&E policy, the applicant is responsible for reducing the fault current below 63 kA. A separate study will address the technical feasible options available, such as the installation of fault current limiting reactors.

Path 15 Upgrade and System Impact

The PG&E Path 15 upgrade plan includes upgrading the existing Gates-Arco-Midway 230 kV line with reconductoring or reconfiguring options so that an upgraded double circuit 230 kV line will be available between Gates and Midway, one circuit will under consideration in the California Public Utility Commission (CPUC), there is no certainty that the plan will be approved by the CPUC and implemented in time. The target date for implementing the plan is June 2004. The modifications in the Gates-Arco-Midway 230 kV line are expected to have impact on the AEP or vice-a-versa. The applicant may elect to anticipate the future system changes due to the Path 15 upgrade and modify the proposed interconnection or may select a different alternative of interconnection to minimize system impacts (DUKE 2002f, SIS Section 11.4, Page 33).

CAl-ISO Review

The Cal-ISO has reviewed the results of the SIS and has not issued a preliminary approval for the AEP. The Cal-ISO issued the following conclusions and recommendations (Cal-ISO 2002b, Cal-ISO Letter):

- Based on the information provided in the SIS and system configuration assumed in the studies, the facility upgrades to ensure system reliability have been identified.
- Additional Studies are necessary to evaluate the impact of the Path 15 upgrade project.
- Additional studies are necessary to identify system impacts for high Path 15 flow and transmission facility flows limited by summer ratings.
- Additional Power Flow studies for the 500 kV double line outages should be conducted to determine if the AEP should be included in Special Protection Systems (SPS).
- The system model did not include an approved plan for the third Midway 500/230 kV transformer bank. This addition may have significant impact on the project and should be included in the Supplemental SIS.
- Additional mitigation alternatives should be studied for reinforcement of the Gates-Avenal-Arco-Midway 230 kV lines.

- SPS should be developed or system upgrades may be required to mitigate overload impacts on the 70 kV Arco-Gates system.
- The Cal-ISO will grant approval for the AEP after the Supplemental System Impact Studies are completed and the final alternative for system configuration and project interconnection is selected.

The Cal-ISO's final interconnection approval will assure conformance with NERC/WSCC, NERC and Cal-ISO planning standards and reliability criteria. The Cal-ISO will provide testimony at the Energy Commission's hearing on the SIS and any supplemental studies, and will provide conclusions and recommendations in the hearings.

Comments on Mitigation

Staff concurs with the results of the SIS and planned mitigation measures to the extent that the studies provide system impacts based on the system configurations used in the studies. It is necessary that the applicant select a mitigation plan for each criteria violation, and present that plan and identify all environmental impacts and environmental mitigation measures.

Staff further concurs that the supplemental SIS (including some sensitivity studies) and/or Facility Cost Report (FCR) studies as requested by the Cal-ISO are necessary to determine a feasible alternative for interconnection of the AEP considering the Path 15 upgrade and high/low Path flows, full system impacts, appropriate mitigation measures and/or Special Protection Systems. Staff has also requested that three of the queue generators that contributed to incremental overloads be removed from the base cases for the supplemental SIS. Staff's final recommendation, therefore, will be based on the results of supplemental System Impact Studies and final selection for system configuration and project interconnection. These study reports and selection of mitigation measures including system upgrades required for the project interconnection must be provided at least one month before publishing a Final Staff Assessment.

New Transmission Line and System Modifications

Besides the interconnection transmission facilities and switchyard as proposed by the applicant as discussed above, accommodating the power output of the AEP will not require any other new transmission facilities.

System modifications include reconductoring of the Avenal-Gates, Avenal-Arco and Arco-Midway 230 kV lines as described above in the sub-section, "Mitigation of overloaded facilities resulting directly from the AEP".

Cumulative Impacts

The SIS study shows that multiple planned generation projects in the area including the AEP have incremental system impacts and also shows direct impacts related to the AEP. Considering the location of the project in the grid underlying the major 500 kV transmission Path 15 between northern and southern California, which is also under consideration for upgrade, staff believes that the project will have some cumulative impacts in the interconnected transmission system. The cumulative impacts due to the

AEP, as identified in the SIS and as will be identified in the supplemental studies, will be mitigated.

ALTERNATIVE TRANSMISSION ROUTES

The applicant did not consider transmission interconnection alternatives other than the proposed interconnection of the plant with the Gates-Arco 230 kV line. The applicant, however, did provide three alternative route assessments for the proposed interconnection (DUKE 2001a, AFC Section 5.5 Pages 5-16 to 5-19).

1. Route A alternative is similar to the selected interconnection route, but requires a crossing of the Avenal Cutoff Road. This routé alternative is inconsistent with the City of Avenal's desires not to place large electric transmission structures and wires near this road and was rejected.
2. Route B alternative provides a direct tie-in to the Gates substation. Use of this route alternative would generally require the same amount of new line construction, but would require an additional four miles of transmission line. This route alternative also crosses the Avenal Cutoff Road. The alternative was rejected due to the same concerns as for alternative Route A and the additional line work required.
3. Route C alternative is similar to alternative Route B. Because this alternative represents approximately five times the length of new line construction and disruption to local farmers, this alternative was not selected.

These interconnection alternatives, when compared to the preferred one were not selected by the applicant on the basis of environmental impacts, longer routes, right-of-way issues, increased costs, contractual issues and visual concerns. The preferred alternative route for looping the Gates-Arco 230 kV line is acceptable from the transmission system engineering (TSE) perspective.

COMPLIANCE WITH LORS

The SIS complies with NERC/WSCC, Cal-ISO, and NERC planning standards and reliability criteria. However, there are significant uncertainties regarding acceptable mitigation measures. These measures can not be resolved until the additional system studies are provided, criteria violation mitigation is identified, and environmental impacts, if any, are identified. The proposed AEP switchyard will be located within the fenced yard of the project site. The proposed switchyard will be designed, built and owned by PG&E. The proposed overhead 230 kV interconnection line between the AEP switchyard and the Gates-Arco 230 kV line will be entirely through existing farmland and a 120 foot right of way would be provided by current land owners. According to the present mitigation plans which are subject to change upon completion of supplementary studies, reconductoring of existing lines would be done within the existing PG&E right of ways and substation modification work will be done within the fenced boundary of individual substation. Staff concludes at this stage that all facilities are acceptable and will comply with LORS assuming the Conditions of Certification are met.

Since PG&E will design, construct, own and operate the AEP power plant switchyard and outlet line, the recommended Conditions of Certifications are not the same as those typically recommended by staff for facilities owned by a private developer. PG&E has special expertise and experience conforming with industry standards and regulations, and would, therefore, meet the safety and reliability requirements of the California Public Utility Commission (CPUC).

FACILITY CLOSURE

PLANNED CLOSURE

This type of closure occurs in a planned and orderly manner such as at the end of its useful economic or mechanical life or due to gradual obsolescence. Under such circumstances, the owner is required to provide a closure plan 12 months prior to closure, which in conjunction with applicable LORS, is considered sufficient to provide adequately for safety and reliability. For instance, a planned closure provides time for the owner to coordinate with the Transmission Owner (TO), in this case PG&E, to assure (as one example) that the TO's system will not be closed into the outlet thus energizing the project substation. Alternatively, the owner may coordinate with the TO to maintain some power service via the outlet line to supply critical station service equipment or other loads.

Unexpected Temporary Closure

An unplanned closure occurs when the facility is closed suddenly and/or unexpectedly for a short term due to unforeseen circumstances such as a natural or other disaster or emergency. During such a closure the facility cannot insert power into the utility system. Closures of this sort can be accommodated by establishing an on-site contingency plan (see **General Conditions Including Compliance Monitoring and Closure Plan**).

Unexpected Permanent Closure

This unplanned closure occurs when the project owner abandons the facility. This is considered to be a permanent closure. This includes unexpected closure where the owner remains accountable for implementing the on-site contingency plan. It can also include unexpected closure where the project owner is unable to implement the contingency plan, and the project is essentially abandoned. An on-site contingency plan, that is in place and approved by the Energy Commission's Compliance Project Manager (CPM) prior to the beginning of commercial operation of the facilities, will be developed to assure safety and reliability (see **General Conditions Including Compliance Monitoring and Closure Plan**).

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE discipline have been referred to TSE staff for this case.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Staff concludes as follows:

1. After reviewing the SIS, staff finds that the AEP will have some adverse impacts on the transmission system. Based on the system configuration used in the SIS, there will be reliability criteria violations in several transmission facilities for interconnection of the AEP plant under normal and emergency conditions of the electrical grid during various seasons. The current mitigation plans as determined in the SIS are very preliminary and completion of the supplemental studies are required before staff could find them adequate.
2. The AEP switchyard and interconnection facilities to the PG&E grid, by looping the Gates-Arco 230 kV line through the AEP switchyard, will be adequate and reliable. To accommodate interconnection of the AEP and to offset direct downstream adverse impacts, it will be essential to reinforce the Avenal-Gates, Arco-Avenal, and Arco-Midway 230 kV transmission lines with the present system configuration. Upon completion of the supplemental studies, the interconnection facilities and reinforcement plans for the aforesaid lines may change.
3. The Cal-ISO has reviewed the SIS and has requested supplemental studies to further determine project impacts on the transmission system for Path 15 upgrade plan. The Cal-ISO has not issued a preliminary interconnection approval for the AEP and staff concurs that significant additional information is required. The Cal-ISO will grant final approval for the AEP upon completion of the supplementary SIS and the Facility Cost Report on selection of final alternative for the system configuration and project interconnection. The issuance of the Cal-ISO's final interconnection approval will assure conformance with NERC/WSCC, NERC and Cal-ISO planning standards and reliability criteria.
4. Staff concurs with the Cal-ISO review and recommendations that supplemental SIS or Facility Cost Report (FCR) studies including some sensitivity studies are necessary to determine a preferred feasible alternative for interconnection of the AEP in consideration of the proposed Path 15 upgrade plan and high/low Path flows, potential system impacts, alternative mitigation measures and/or special protection schemes.
5. The Cal-ISO will provide testimony at the Commission's hearing on the System Impact Study and any supplemental studies, and will provide conclusions and recommendations.
6. The proposed power plant switchyard, outlet lines and terminations are in accordance with good utility practices and are acceptable. These facilities will be designed, built, owned and operated by PG&E. With implementation of the Conditions of Certifications recommended by staff, these facilities will comply with LORS.

RECOMMENDATIONS

Staff recommends all necessary studies be completed as outlined in the conclusions herein to provide additional support for staff recommendations in the Final Staff Analysis. Staff filed additional data requests on May 29, 2002 requesting that supplemental studies be completed, and the measures the applicant would propose and accept to mitigate the overloads. If the mitigation measures include reconductoring certain line segments, the data requests include a general level of review and environmental information on those line segments.

CONDITIONS OF CERTIFICATION FOR TSE

TSE-1 The project owner shall ensure that the design, construction and operation of the proposed transmission facilities will conform to all applicable LORS including the requirements 1a) through 1i) listed below. The substitution of Compliance project manager (CPM) approved "equivalent" equipment and an equivalent substation configuration is acceptable.

a) The project 230 kV switchyard shall be configured in a ring bus arrangement with four switch bays, out of which there will be two bays for the transmission line interconnection, one bay for connection of CTG1 and STG1, and one bay for connection of CTG2.

b) The power plant switchyard and outlet line shall meet or exceed the electrical, mechanical, civil and structural requirements of PG&E interconnection standards, CPUC General Orders 95 (GO-95) and 128 (GO-128) or National Electric Safety Code (NESC), Title 8 of the California Code and Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders", National Electric Code (NEC) and related industry standards.

c) Breakers and buses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

d) Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards.

e) Termination facilities at the plant switchyard shall comply with applicable PG&E interconnection standards.

f) The project conductors shall be sized to accommodate the full output from the project.

g) The reinforcement of the Gates-Avenal-Arco-Midway 230 kV lines shall comply with a PG&E mitigation plan along with interconnection of the AEP plant to the existing Gates-Arco 230 kV line by looping the line through the AEP plant switchyard.

h) A letter stating that the mitgation measures or projects selected by PG&E for each criteria violation are acceptable.

i) the project owner shall provide:

1) Any Detailed Facility Interconnection Study (DFIS) or Facility Cost Report including a description of facility upgrades, operational mitigation measures, and/or Remedial Action Scheme (RAS) or Special Protection System (SPS) sequencing and timing if applicable.

2) Executed Generator Facility Interconnection Agreement with PG&E.

3) A copy of the Notice to Cal-ISO prior to Synchronization of the facility with the California Transmission grid.

Verification: At least 60 days prior to the start of rough grading of transmission facilities, the project owner shall submit to the CPM for approval:

a) Electrical one line diagrams signed and sealed by a registered professional electrical engineer in responsible charge (or other approval acceptable to the CPM), a route map, and an engineering description of equipment and the configurations covered by the requirements 1a) through 1i) above.

b) The Detailed Facilities Study and the Interconnection Agreement (if either one are not otherwise provided to the Commission previously) and a signed letter from the applicant stating that the mitigation measures are acceptable. Substitution of equipment and substation configurations shall be identified and justified by the project owner for CPM approval.

TSE-2 The project owner shall inform the CPM of any impending changes that may not conform to the requirements 1a) through 1i) of **TSE-1**, and have not received CPM approval, and request approval to implement such changes. A detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change shall accompany the request. Construction involving changed equipment or substation configurations shall not begin without prior written approval of the changes by the CPM.

Verification: At least 30 days prior to the construction of transmission facilities, the project owner shall inform the CPM of any impending changes that may not conform to requirements 1a) through 1i) of **TSE-1** and request approval to implement such changes.

TSE-3 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM approved changes thereto, to ensure conformance with CPUC GO-95 and GO-128 or NESC, Title 8 of the California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders", PG&E's interconnection standards, NEC, related industry standards and these conditions. In case of non-conformance, the project owner shall inform the CPM in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project to the grid, the project owner shall transmit to the CPM an engineering description(s) and one-line diagrams of the "as built" facilities signed and sealed by the registered electrical engineer in responsible charge (or other verification acceptable to the CPM). A

statement attesting to conformance with CPUC GO-95 and GO-128 or NESC, Title 8 of the California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders", PG&E's interconnection standards, NEC, related industry standards and these conditions shall be provided.

REFERENCES

Cal-ISO (California Independent System Operator). 1998a. Cal-ISO Tariff Scheduling Protocol posted April 1998, Amendments 1,4,5,6, and 7 incorporated.

Cal-ISO (California Independent System Operator). 1998b. Cal-ISO Dispatch Protocol posted April 1998.

Cal-ISO (California Independent System Operator). 2002a. Cal-ISO Grid Planning Standards, February 7, 2002.

Cal-ISO (California Independent System Operator). 2002b. Cal-ISO Review of the System Impact Study, Cal-ISO letter of March 20, 2002 to Duke Energy.

CEC (California Energy Commission) 2002c, Data Requests. Dated and docketed January 24, 2002.

DUKE (TRC/Stenger). 2001a. Application for Certification for the Duke Energy Avenal Project. Submitted to the California Energy Commission, October 9, 2001.

DUKE (Sierra Research/Mattews). 2002d. Materials in support of the first set of Data Responses – Data Response AQ-9. Submitted to the California Energy Commission, February 26, 2002.

DUKE (Duke Energy Avenal). 2002f. System Impact Study. Submitted to the California Energy Commission, March 4, 2002.

NERC (North American Electric Reliability Council) 1998. NERC Planning Standards, September 1997.

WSCC (Western Systems Coordinating Council) 2001. NERC/WSCC Planning Standards, June 2001.

DEFINITION OF TERMS

ACSR Aluminum Conductor Steel-Reinforced.

SSAC Steel-Supported Aluminum Conductor.

AAC All Aluminum conductor.

Ampacity Current-carrying capacity, expressed in amperes, of a conductor at specified ambient conditions, at which damage to the conductor is nonexistent or deemed acceptable based on economic, safety, and reliability considerations.

Ampere The unit of current flowing in a conductor.

Kiloampere (kA) 1,000 Amperes

Bundled Two wires, 18 inches apart.

Bus Conductors that serve as a common connection for two or more circuits.

Conductor The part of the transmission line (the wire) that carries the current.

Congestion Management
Congestion management is a scheduling protocol, which provides that dispatched generation and transmission loading (imports) will not violate criteria.

Emergency Overload
See Single Contingency. This is also called an L-1.

Kcmil or kcm
Thousand circular mil. A unit of the conductor's cross sectional area, when divided by 1,273, the area in square inches is obtained.

Kilovolt (kV)
A unit of potential difference, or voltage, between two conductors of a circuit, or between a conductor and the ground. 1,000 Volts.

Loop An electrical cul de sac. A transmission configuration that interrupts an existing circuit, diverts it to another connection and returns it back to the interrupted circuit, thus forming a loop or cul de sac.

Megavar One megavolt ampere reactive.

Megavars Megavolt Ampere-Reactive. One million Volt-Ampere-Reactive. Reactive power is generally associated with the reactive nature of motor loads that must be fed by generation units in the system.

Megavolt ampere (MVA)
A unit of apparent power, equals the product of the line voltage in kilovolts, current in amperes, the square root of 3, and divided by 1000.

Megawatt (MW)
A unit of power equivalent to 1,341 horsepower.

Normal Operation/ Normal Overload

When all customers receive the power they are entitled to without interruption and at steady voltage, and no element of the transmission system is loaded beyond its continuous rating.

N-1 Condition

See Single Contingency.

Outlet Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.

Power Flow Analysis

A power flow analysis is a forward looking computer simulation of essentially all generation and transmission system facilities that identifies overloaded circuits, transformers and other equipment and system voltage levels.

Reactive Power

Reactive power is generally associated with the reactive nature of inductive loads like motor loads that must be fed by generation units in the system. An adequate supply of reactive power is required to maintain voltage levels in the system.

Remedial Action Scheme (RAS)

A remedial action scheme is an automatic control provision, which, for instance, will trip a selected generating unit upon a circuit overload.

SF6 Sulfur hexafluoride is an insulating medium.

Single Contingency

Also known as emergency or N-1 condition, occurs when one major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.

Solid dielectric cable

Copper or aluminum conductors that are insulated by solid polyethylene type insulation and covered by a metallic shield and outer polyethylene jacket.

Switchyard A power plant switchyard (switchyard) is an integral part of a power plant and is used as an outlet for one or more electric generators.

Thermal rating

See ampacity.

TSE Transmission System Engineering.

TRV Transient Recovery Voltage

Tap

A transmission configuration creating an interconnection through a sort single circuit to a small or medium sized load or a generator. The new single circuit line is inserted into an existing circuit by utilizing breakers at existing terminals of the circuit, rather than installing breakers at the interconnection in a new switchyard.

Undercrossing

A transmission configuration where a transmission line crosses below the conductors of another transmission line, generally at 90 degrees.

Underbuild

A transmission or distribution configuration where a transmission or distribution circuit is attached to a transmission tower or pole below (under) the principle transmission line conductors.

ALTERNATIVES

Susan V. Lee

INTRODUCTION

In this section, staff considers potential alternatives to the construction and operation of the proposed Avenal Energy Project (AEP). The purpose of this alternatives analysis is to comply with California's environmental laws by providing an analysis of a reasonable range of feasible alternatives that could substantially reduce or avoid any potentially significant adverse impacts of the proposed project (Cal. Code Regs., tit. 14, §15126.6; Cal. Code Regs., tit. 20, §1765). This section identifies potentially significant impacts of the proposed project and analyzes different technologies and alternative sites that may reduce or avoid significant impacts. Staff also analyzes the impacts that may be created by locating the project at alternative sites.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

The "Guidelines for Implementation of the California Environmental Quality Act," Title 14, California Code of Regulation §15126.6(a), provide direction by requiring an evaluation of the comparative merits of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project." In addition, the analysis must address the No Project Alternative (Cal. Code Regs., tit. 14, §15126.6(e)).

The range of alternatives is governed by the "rule of reason" which requires consideration only of those alternatives necessary to permit informed decision-making and public participation. The California Environmental Quality Act (CEQA) states that an environmental document does not have to consider an alternative of which the effect cannot be reasonably ascertained and of which the implementation is remote and speculative (Cal. Code Regs., tit. 14, §15125(d)(5)). However, if the range of alternatives is defined too narrowly, the analysis may be inadequate (City of Santee v. County of San Diego (4th Dist. 1989) 214 Cal. App. 3d 1438).

DESCRIPTION OF THE PROPOSED PROJECT

The proposed AEP would be a nominal 600-megawatt (MW) natural-gas-fired, generating facility located on approximately 25 acres within a 148-acre parcel. The site is located in the northeastern corner of the City of Avenal, just south of the Fresno County line and about two miles east of Interstate 5 (I-5). The parcel is currently zoned industrial (DUKE 2001a, Page 2-4). The City of Avenal's business and residential district is located approximately six miles southwest of the site and the nearest residence is more than one mile from the proposed site (DUKE 2001a, Page 6.10-2).

The AEP would be a combined-cycle generating plant consisting of two natural gas turbines equipped with heat recovery steam generators and one steam turbine (DUKE 2001a, Page 1-9). The proposed power plant will deliver electricity via a new, on-site 230 kilovolt (kV) switchyard and approximately 7,000 feet of new, double circuit 230 kV

transmission line. The existing PG&E Gates-ARCO 230 kV line will loop into the site (DUKE 2001a, Page 1-9). Natural gas for the facility would be delivered via an underground natural gas pipeline interconnection under the Kettleman Compressor Station, which is located approximately 7,000 feet southwest of the proposed project site (DUKE 2001a, Page 1-9). The Kern County Water Agency (KCWA) would supply roughly 2,250 acre-feet per year under a water supply contract delivered via the San Luis Canal (DUKE 2001a, Page 1-10). There will also be a new 1.6-mile water supply pipeline built to provide backup water supply from nearby agricultural wells (DUKE 2001a, Page 1-15).

SITE SELECTION

As stated in the AFC, the Applicant chose the proposed site for the following reasons (DUKE 2001a, Section 9):

- The site is close to an existing transmission substation with access to electrical markets
- Sufficient land is available (a 25-acre site plus construction laydown area)
- The site is accessible to a water supply that is able to support the project
- The site is close to a PG&E natural gas pipeline
- The site is located in a rural area with few nearby residences
- The project would be consistent with the existing land use designation and neighboring utility land uses (the Kettleman gas compressor station)

SCOPE AND METHODOLOGY OF THE ALTERNATIVES ANALYSIS

The purpose of staff's alternatives analysis is to provide a reasonable range of feasible alternatives that could substantially reduce or avoid any potentially significant adverse impacts of the proposed project. To accomplish this, staff must determine the appropriate scope of analysis. Consequently, it is necessary to identify and determine the potentially significant impacts of the proposed project and then focus on alternatives that are capable of reducing or avoiding the significant impacts of the proposed project. To prepare this alternatives analysis, staff used the following methodology:

- Identify the basic objectives of the project, provide an overview of the project, and describe its potentially significant adverse impacts
- Identify and evaluate technology alternatives to the project, including conservation and renewable sources
- Identify and evaluate alternative locations or sites by comparing the project site and its potential impacts against the potential impacts of the alternative sites
- Evaluate to determine whether the alternative sites would create any impacts of their own
- Evaluate the impacts of not constructing the project, known as the No Project Alternative under CEQA.

PROJECT OBJECTIVES

Based on analysis of the AEP Application for Certification (AFC), the Energy Commission staff has determined the project's objectives as follows:

- Construction and operation of a power plant of approximately 600 MW with access to California's electrical market
- To be located near an electrical substation and key infrastructure for natural gas and water supply
- To be online by approximately 2004.

POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS

Staff's assessment of environmental impacts is presented in detail in the individual sections of this Staff Assessment. No significant impacts are identified, assuming that all recommended mitigation is incorporated. Therefore, alternative sites are evaluated for potential impacts in the technical areas that are generally of most concern in power plant siting: land use, noise, biological resources, visual resources, and water and soils.

SITE ALTERNATIVES

Four sites are discussed in this analysis as potential alternatives to the proposed site. The applicant presented two sites in the AFC as part of its alternatives analysis: Plymouth Site and Lassen Road Site (DUKE 2001a, Page 5-6). Staff has identified two additional alternative sites: the Kearney Site and the Lodi Site. Please see **ALTERNATIVES Figures 1, 2, and 3** for maps of these four sites.

SCREENING CRITERIA USED TO SELECT SITE ALTERNATIVES

The following criteria were used to identify potential alternative sites:

1. The site should avoid or substantially lessen one or more of the potential significant effects of the project; and
2. The site should meet most of the project objectives:
    a. Location. In order to meet reliability objectives, the site should have access to California's electrical grid. No specific regional location is required.
    b. Site suitability. Sufficient land is needed to construct and operate a generating facility of this size. The proposed power plant would be located on 148 acres of land, however only 25 acres, not including laydown, is required for a generating facility using the proposed technology. (DUKE 2001a, Page 1-25). Therefore, staff used 25 acres as the minimum lot size needed to accommodate the facility.
    c. Availability of infrastructure. The site should be within a reasonable distance of natural gas and water supply, and transmission interconnections.
3. The site should be vacant.

4. The site should not be located adjacent to moderate or high density residential areas, sensitive receptors (such as schools and hospitals), or recreation areas.

ALTERNATIVES Figure 1

Map of Plymouth Site and Lassen Road Site

ALTERNATIVES Figure 2

Map of Kearney Site

ALTERNATIVES Figure 3

Map of Lodi Site

PLYMOUTH SITE

The Plymouth Site is on a 60-acre parcel located approximately one mile west of the proposed site, approximately one-half mile east of the intersection of Avenal Cutoff and Plymouth Avenue. The site is located on the north side of Plymouth Avenue between 34½ Avenue and 34th Avenue, one-half mile east of I-5 at an elevation of about 140 feet. Immediately south of the site (across Plymouth Avenue) is a PG&E natural gas compressor station, the Kettleman Compressor Station. A gas pipeline and a 500 kV transmission line pass the northeast corner of the parcel. The California Aqueduct is approximately 0.25 mile south of the site. The topography of the general area is slightly hilly, but the Plymouth Site is flat.

The site is currently used for agricultural purposes but is zoned M-Industrial (Avenal 2001). This site is not under Williamson Act contract (Kings 2001a). There are no California Natural Diversity Database (CNDDB) records of occurrences of sensitive biological species on this site (DUKE 2001a, Page 5-6). One potential benefit of this site is that it is farther from the San Luis Canal than the proposed site, which could lessen the impacts to species that use the canal as a movement corridor. Similar to the proposed site, this site is located within the City of Avenal's industrial park area and therefore a power plant would be consistent with existing land use designations. The nearest residence to the Plymouth Site is approximately 2,800 feet away (DUKE 2002c, Page 19). According to the Applicant, the site is currently owned by Chevron, and because of a pending merger with Texaco, Chevron may not be interested in selling the property (DUKE 2002c, Page 26).

Electrical transmission and natural gas interconnection would be shorter to the Plymouth Site than the proposed site, but the water supply pipeline would be longer (DUKE 2001a, Page 5-6). The Plymouth Site would require approximately 2,000 feet of electrical transmission line, a 12,000-foot water supply pipeline to connect to City of Avenal's turnout along the San Luis Canal and a 2,000-foot natural gas pipeline (DUKE 2002c, Page 18). According to the Applicant, the backup groundwater supply from Kochergen Farms was negotiated as a part of the land deal and may not be available for this alternative site (DUKE 2002c, Page 18).

Advantages

- **Infrastructure and Construction Access:** Natural gas is available from PG&E's Kettleman Compressor Station. Transmission interconnection is available. There is good construction access from I-5 and Plymouth Avenue.
- **Land Use**: This site is included in Avenal's industrial park, so a power plant would be an acceptable use. This site is currently under agricultural use but is not under Williamson Act contract. Also, the site is adjacent to existing industrial uses (gas compressor station), so a power plant at this location would be consistent with the surrounding uses.
- **Biological Resources**: According to the CNDDB, there are no records of sensitive species occurrence at this site. In addition, the site is farther from the San Luis Canal than the proposed site, which could lessen the impacts to species that use the canal as a movement corridor

Disadvantages

- **Site Control:** The Applicant states that it may not be able to obtain site control of this parcel. The site is currently owned by Chevron, and because of the pending merger with Texaco, Chevron may not be interested in selling the property (DUKE 2002c, Page 26).
- **Visual Resource:** While it would be located near another industrial facility (a gas compressor station), a power plant at this site would be highly visible to travelers on I-5.

LASSEN ROAD SITE

The Lassen Road Site is an 18-acre parcel located in Fresno County, east of Lassen Road and just north of Jayne Avenue. Immediately south of the site is an agricultural production yard, and north of the site is an AT&T Wireless communication tower. The parcel is approximately one mile east of PG&E's Gates Substation, which provides electricity at 500, 230, and 70 kV and is the southern terminus of Path 15, part of the state's transmission backbone. The site is surrounded by agricultural land and is zoned Agricultural (Kings 2001b). This parcel is under Williamson Act contract number 2267 (Fresno 2001). There are no CNDDB records of occurrences of sensitive biological species on this site (DUKE 2001a, Page 5-8). There are several transmission lines in the area; all connect to the Gates Substation. The site is about four miles south of central Huron. The closest resident is located 2,200 feet from the Lassen Road Site. This parcel is at 110 feet of elevation. A line of eucalyptus trees borders the site to the north, which would shield part of the project area from view from the north. The parcel has been graded and is currently fenced; no native vegetation is present.

This site would require a one-mile transmission line to connect to Gates Substation, a 2.5-mile natural gas pipeline, and approximately 10,000-foot water supply pipeline to connect to City of Avenal's turnout along the San Luis Canal (DUKE 2001a; DUKE 2002c, Page 18). According to the Applicant, the backup groundwater supply from Kochergen Farms that was negotiated as a part of the land agreement for the proposed site may not be available for this alternative site (DUKE 2002c, Page 18).

Advantages

- **Biological Resources:** The site is currently vacant and disturbed (graded), and according to the CNDDB, there are no records of sensitive species occurrence at this site. Therefore, no loss of valuable habitat is expected to occur at this site.
- **Infrastructure and Construction Access:** Natural gas is available from PG&E's major transmission pipeline. Transmission interconnection is available at the Gates Substation. There is good construction access from I-5 and Jayne Avenue.

Disadvantages

- **Construction Impacts:** A power plant at this site would require construction of 2.5 miles of gas pipeline and two miles of water line which would create additional short-term air emissions, disrupt traffic flows (if roadways were used), and disturb habitat (if roadways were not used), resulting in potentially greater temporary impacts in air quality, noise, cultural resources, and transportation than the proposed site.

- **Land Use**: This site is under Williamson Act contract, therefore a power plant at this location would not be consistent with the land use designation. Also, 25 acres are required for most efficient construction and operation of the proposed project design and the parcel for the Lassen Road Site is an 18-acre parcel.
- **Visual Resources**: While trees to the north would partially shield the plant from northern view, it would be highly visible from Jayne Avenue, which is a major roadway in the area.

KEARNEY SITE

The Kearney Site would be located adjacent to PG&E's Kearney Substation southwest of the City of Fresno. The Fresno-Clovis Waste Water Treatment Facility (WWTF) is immediately east of this alternative site. The Kearney Site is located on the west side of Cornelia Road and south of Jensen Avenue, with the southern border to the parcel along a canal that runs west to east through the sewage treatment plant. The site is 5.5 miles west of Highway 99 and about 22 miles east of the proposed site. The site sits at approximately 250 feet of elevation.

The site is located in unincorporated Fresno County. The site is currently used for agriculture and is zoned Exclusive Agriculture 20 (SJVEC 2002a, Page 16). This parcel has been disturbed due to agriculture use. Although this parcel would require a rezone, a power plant at this site would be compatible with surrounding industrial land uses (the sewage treatment plant) (SJVEC 2002a, Page 20).

The Kearney Substation may require substantial transmission upgrades in order to support a power plant (SJVEC 2001a, Page 9-3). It would also require an approximately 500-foot transmission connection into the Kearney Substation. Natural gas supply for this site would likely require an approximately 46-mile natural gas pipeline to interconnect to PG&E's backbone natural gas supply pipeline Line 300, which would interconnect at Panoche Road. It is unlikely that there would be sufficient natural gas supply to accommodate a 600 MW power plant via the smaller natural gas supply pipeline that runs along the Highway 99 corridor. The Kearney Site is located in the southwestern portion of the City of Fresno, where natural gas is less likely available (PG&E 2002). In order to determine the availability of natural gas supply, PG&E must be contracted to complete a System Impact Study (PG&E 2002).

Fresno-Clovis WWTF would supply roughly 7,000 gpd of reclaimed water for cooling at this site (SJVEC 2001a, Pages 9-5, 7-1). The cooling water would be supplied to the Kearney Site via a new approximately 2.5-mile pipeline, which would enter into the south side of the Fresno-Clovis WWTF (SJVEC 2001a, 9-5). The closest residence to the site is approximately 1,100 feet away and there are no other sensitive receptors identified within one mile of the site (SJVEC 2002a, Page 17).

Advantages

- **Infrastructure and Construction Access:** Reclaimed water for cooling is available from the adjacent wastewater treatment plant. There is good construction access from Highway 99 and Jensen Road.

- **Lands Use and Soils**: This land is also zoned for agriculture; however, a power plant at this location would be consistent with the surrounding industrial land uses. There are few nearby residences along Jensen Road within a mile of the Kearney Site.
- **Visual Resources**: A power plant at this location would not be visually inconsistent with the surrounding industrial land uses.

Disadvantages

- **Construction Impacts:** A power plant at this site would require construction of up to 46 miles of natural gas pipeline, resulting in potentially greater impacts in air quality, noise, cultural resources, and transportation.
- **Infrastructure Connections:** A power plant at this site could require construction of a new natural gas pipeline of approximately 46 miles in length. Also, a power plant at this location could require transmission upgrades to support a 600 MW power plant.

LODI SITE

The Lodi Site is located about 180 miles north of the proposed AEP site. This 52-acre-plus site is adjacent to the City of Lodi's White Slough Water Pollution Control Facility (WSWPCF) and the Northern California Power Authority's (NCPA) 50 MW Combustion Turbine No. 2 project. The City of Lodi currently owns approximately 1,000 acres in the area, 30 acres of which are used by the WSWPCF and 900 acres of which are leased to local farmers for agricultural uses.

The site is located off of North Thornton Road, southwest of the City of Lodi, in San Joaquin County and is 2,400 feet to the west of I-5. The site is zoned Public and is currently used for agriculture. However, the City of Lodi is willing to negotiate other options for the land (WSWPCF 2002).

The site is just east of the NCPA plant and is accessible via existing paved roads. However, upgrades or reinforcement of the existing roads would likely be required to support heavy load trucks during construction. The site has a flat topography, very shallow groundwater, and is at approximately zero feet of elevation. Therefore, substantial amounts of dirt fill would have to be imported to raise the site above the 100-year flood level. A 20-acre parcel used for agriculture is located between the alternative site and the White Slough Wildlife Area (WSWA). The WSWA is under the jurisdiction of the California Department of Water Resources but is managed by the California Department of Fish Game. The WSWA land adjacent to the City of Lodi property line contains unconnected canal ponds that are frequented by recreational fishermen. In addition, the WSWPCF evaporation ponds are located just east of the site and are frequented by birdwatchers throughout the year because the ponds are heavily used by migratory waterfowl (WSWPCF 2002).

The nearest residential sensitive receptors are more than a mile away, beyond the agricultural fields to the east. Ambient noise levels in the vicinity are relatively high due to traffic on I-5 and the operation of the NCPA turbine installation. Therefore, the nearest homes would not be expected to experience significant noise exposure from the power

plant. The regional landscape is defined by the flat landform of the San Joaquin Valley floor and is rural-agricultural in character. As a result, the site is highly visible from both north and southbound directions of travel on I-5 and from substantial distances in all directions from the project site.

Two existing 230 kV transmission lines running in a northwest to southeast direction cross the northeast corner of the Lodi Site. The eastern most line is a double-circuit transmission line owned by PG&E. The western most line is a single-circuit transmission line owned by Western Area Power Administration (WAPA). Both lines would be easily accessible by the power plant. The existing natural gas pipeline that serves the NCPA facility and the WSWPCF does not have sufficient capacity to handle any additional generation. PG&E Line 108 is approximately three and one-half miles east of the alternative site; however, the line would likely need to be reinforced to serve a power plant. Ground disturbance for construction of a natural gas transmission line to connect with Line 108 would increase the potential for impacts to archaeological and biological resources.

The WSWPCF could supply enough undisinfected secondary-treated recycled water to meet AEP's needs except during summer months when water is currently committed to agricultural use. However, plant management indicated that this commitment of water could be changed, depending on the agreements between the City of Lodi and a power plant developer.

Advantages

- **Infrastructure and Construction Access:** Gas could be provided by tapping into the new high-pressure gas pipeline constructed by Lodi Gas Storage Project. Transmission interconnection is available onsite. Reclaimed water is available from the wastewater treatment plant. There is good construction access from I-5.
- **Land Use**: This land is also zoned Public, and a power plant at this location would be consistent with the General Plan. The site is adjacent to existing industrial facilities (wastewater treatment plant and power plant).
- **Visual Resources**: A power plant at this location would not be within most scenic views but would be highly visible to motorists on I-5. While vegetative screening may be required to ensure that impacts would not be significant, a power plant at this site would be located in an industrial setting: adjacent to an existing (smaller) power plant, a large water treatment facility, and existing transmission lines. However, it should be noted that hunters and fishermen frequent the WSWA and birdwatchers frequent the evaporation ponds at the WSWPCF and these visitors would be affected by views of the power plant. In addition, the production of frequent and sizable plumes at this location would introduce prominent industrial features that would be visible from local and regional vantage points at substantial viewing distances. However, similar to the proposed project, effective implementation of staff's proposed mitigation measures and conditions of certification would reduce the visual impact of vapor plumes to a level that would not be significant.
- **Water Resources**: The project at this site would use recycled water from the City of Lodi's WSWPCF. Therefore, this site would eliminate the proposed use of fresh inland

water at the AEP. However, due to the flooding potential of the site, dirt fill would need to be imported to the site.

Disadvantages

- **Biological Resources**: Potential impacts on the species occupying the nearby WSWA would need to be evaluated for potential project effects during construction and operation. In addition, construction or operation may disturb the migratory waterfowl that use the water treatment ponds. Because trees are present along the slough just west of the site, any vegetative screening required to mitigate visual impacts would not present new predator perching opportunities in the region.
- **Construction Impacts:** The site has very shallow groundwater and a high flooding potential, so construction would require importing of a substantial amount of dirt fill to raise the site above the 100-year floodplain.

NO PROJECT ALTERNATIVE

The No Project Alternative under CEQA assumes that the project is not constructed. In the CEQA analysis, the No Project Alternative is compared to the proposed project and determined to be superior, equivalent, or inferior to it. The CEQA Guidelines state that "the purpose of describing and analyzing a no project alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project" (Cal. Code Regs., tit. §15126.6(i)). Toward that end, the No Project analysis considers "existing conditions" and "what would be reasonably expected to occur in the foreseeable future if the project were not approved…" (§15126.6(e)(2)).

If this facility were not constructed, the proposed site would remain in agricultural production and the construction and operational impacts of the AEP would not occur. The area would likely remain farmland and the water used by the plant would be available for other uses. On the other hand, although the area is completely rural at present, the fact that the City of Avenal has zoned the proposed parcel as industrial, the area will probably face future development.

However, if the project were not constructed, the proposed AEP would not contribute to California's electricity resources, increase competition, and help form a more reliable electric system that meets the goals of the deregulated energy market. Power plants would likely be constructed in other areas. Due to market forces, the proposed facility may also serve to replace older, inefficient facilities; this replacement may not occur in the absence of the plant's construction.

ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives that did not satisfy the screening criteria for inclusion in the more detailed analysis presented above, and include the following:

- Demand side management
- Distributed generation

- Renewable resources.

Each of these alternatives, and the reasons for their not being considered in detail in this analysis, is addressed below.

TECHNOLOGY ALTERNATIVES

Conservation and Demand-Side Management

Conservation and demand-side management (DSM) include a variety of approaches, including energy efficiency and conservation, building and appliance standards, load management and fuel substitution. Public Resources Code Section 25305(c) states that conservation, load management, or other demand reducing measures reasonably expected to occur shall be explicitly examined in the Energy Commission's energy forecasts and shall not be considered as alternatives to a proposed facility during the siting process. The forecast that will address this issue is the Commission's California Energy Outlook. Thus, such alternatives are not included in this analysis.

Since 1975, the displaced peak demand from all of these efforts has been roughly the equivalent of eighteen 500-MW power plants. The annual impact of building and appliance standards has increased steadily, from 600 MW in 1980 to 5,400 MW in 2000, as more new buildings and homes around the U.S. are built under increasingly efficient standards. Savings from energy efficiency programs implemented by utilities and state agencies have also increased (from 750 to 3,300 MW). Recent demand reducing proposals from the Governor and Legislature have proven to have an impact by reducing consumption by an average of 3,500 MW during the summer of 2001 (CEC 2001a). In addition, voluntary conservation measures adopted by residential and commercial/industrial users in response to the current energy situation led to a 7.5 percent drop in electricity use throughout the state as of August 2001, but that dropped to 1.5 percent in October 2001 (CEC 2001a). There was a 0.7 percent increase in energy used February 2002 compared to February 2001 (CEC 2002). However, in comparison to February 2000, there was a 5.5 percent decrease in energy consumption in February 2002 (CEC 2002).

GENERATION TECHNOLOGY ALTERNATIVES

Staff considered several alternative generation technologies that do not burn fossil fuels: solar, wind, biomass, geothermal, and hydropower.

Solar Generation

There are two types of solar generation: solar thermal power and photovoltaic (PV) power generation.

Solar thermal power generation involves the conversion of solar radiation to thermal energy, which is then used to run a conventional steam power system. Solar thermal is a viable alternative to conventional generation systems and, depending on the technology, is suited to either distributed generation on the kW scale or to centralized power generation on scales up to several hundred MW. Solar thermal systems utilize three designs to generate electricity: parabolic trough concentrating collectors, power tower/heliostat configurations, and parabolic dish collectors. Parabolic trough and power

tower systems typically run conventional power units, such as steam turbines, while parabolic dish systems power a small engine at the focal point of the collector.
PV power generation involves the direct conversion of light to electricity. PV is best suited to distributed generation uses rather than centralized power generation. PV is the most capital intensive of any alternative generation technology. PV power systems consist of solar electric modules (built from PV cells) assembled into arrays of varying sizes to produce electric power proportional to the area of the array and the intensity of the sunlight. PV arrays can be mounted on either the ground or on buildings. They can be installed on dual-purpose structures such as covered parking lots.

Solar resources would require large land areas in order to generate 600 MW of electricity. Specifically, assuming location in an area receiving maximum solar exposure (such as desert areas of San Bernardino County), central receiver solar thermal projects require approximately five acres per MW, so 600 MW would require approximately 3,000 acres, or over 120 times the amount of land area taken by the proposed plant site and linear facilities. At 10 percent sun conversion efficiency, PV generation requires one square kilometer (about 400 acres) to produce at least 100 MW of power and 600 MWh of energy per day. Although air emissions are significantly reduced or eliminated for solar facilities, they can have significant visual effects. Solar generation results in the absence or reduction in air pollutant emissions, and visible plumes. Water consumption for solar generation is substantially less than for a natural gas fired plant because there is no thermal cooling requirement.

Like all technologies generating power for sale into the State's power grid, solar thermal facilities and PV generation require near access to transmission lines. Large solar thermal plants must be located in desert areas with high direct normal insolation, and in these remote areas, transmission availability is limited. Additionally, solar energy technologies cannot provide full-time availability due to the natural intermittent availability of sunlight. Therefore, solar energy technologies do not meet the project need to supply baseload power on a continuous basis.

Wind Generation

Wind carries kinetic energy that can be utilized to spin the blades of a wind turbine rotor and an electrical generator, which then feeds alternating current (AC) into the utility grid. Most state-of-the-art wind turbines operating today convert 35 to 40 percent of the wind's kinetic energy into electricity. Modern wind turbines represent viable alternatives to large fossil power plants as well as small-scale distributed systems. The range of capacity for an individual wind turbine today ranges from 400 watts up to 3.6 MW. California's 1,700 MW of wind power represents 1.5 percent of the state's electrical capacity.

Although air emissions are significantly reduced or eliminated for wind facilities, they can have significant visual effects and wind turbines also cause bird mortality (especially for raptors) resulting from collision with rotating blades. Wind resources would require large land areas in order to generate 600 MW of electricity. Depending on the size of the wind turbines, wind generation "farms" generally can require between five and 17 acres to generate one megawatt (resulting in the need for between 3,000 and 10,200 acres to generate 600 MW) (CEC 2001b). Although 7,000 MW of new power wind capacity could cost-effectively be added to California's power supply, the lack of available transmission access is an important barrier to wind power development (Beck 2001, Page 17).

California has a diversity of existing and potential wind resource regions that are near load centers such as San Francisco, Los Angeles, San Diego, and Sacramento (CEC 2001e). However, wind energy technologies cannot provide full-time availability due to the natural intermittent availability of wind resources. Therefore, wind generation technology would not meet the project's goal, which is to provide baseload power on a continuous basis.

Biomass Generation

Biomass generation uses a waste vegetation fuel source such as wood chips (the preferred source) or agricultural waste. The fuel is burned to generate steam. Biomass facilities generate substantially greater quantities of air pollutant emissions than natural gas burning facilities. In addition, biomass plants are typically sized to generate less than 20 MW, which is substantially less than the capacity of the 600 MW AEP project. At the peak of the biomass industry, 66 biomass plants were in operation in California, but there are currently about 30 direct-combustion biomass facilities in operation (CEC 2001c).

In order to generate 600 MW, which is proposed for AEP, thirty 20 MW biomass facilities would be required. However, these power plants would have potentially significant environmental impacts of their own, particularly in the areas of land use, air quality, and soil and water resources.

Geothermal

Geothermal technologies use steam or high-temperature water (HTW) obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. There are vapor dominated resources (dry, super-heated steam) and liquid-dominated resources where various techniques are utilized to extract energy from the HTW. Geothermal is a commercially available technology, but it is limited to areas possessing geologic conditions resulting in high subsurface temperatures. There are no viable geothermal resources at the project location (DUKE 2001a, Page 5-25).

Hydropower

While hydropower does not require burning fossil fuels and may be available in California, this power source can cause significant environmental impacts due primarily to the inundation of many acres of potentially valuable habitat and the interference with fish movements during their life cycles. As a result of these impacts, it is extremely unlikely that new hydropower facilities could be developed and permitted in California within the next several years.

Conclusion Regarding Alternative Technologies

Alternative generation typically provides lower efficiencies, has specific resource needs, environmental impacts, permitting difficulties, and intermittent availability. Therefore, they do not fulfill a basic objective of this plant: to provide reliable baseload power in order to ensure reliability for electricity in California. Consequently, staff does not believe that these renewable technologies present feasible alternatives to the proposed project.

CONCLUSIONS

Staff does not believe that alternative technologies (geothermal, solar, wind, biomass, and hydroelectric) currently present feasible alternatives to the proposed project. While the No Project Alternative would eliminate all impacts of this project, the benefits of increasing in-state generation would also not be achieved and environmental impacts could be shifted to other locations.

All four of the alternative sites would be acceptable sites for a power plant; there are benefits and disadvantages to each site. One of the four alternative sites would be located on land designated for agricultural uses, one site is on land designated for industrial uses, and two sites are on land designated for use by public facilities.

The proposed project and two of the four alternative sites (Plymouth Site and Lassen Road Site) would require short transmission and gas line interconnections. Those two sites and the proposed project would require either the use of fresh inland water, which is discouraged by the State Water Resources Control Board, the use of dry cooling technology, or construction of a long water supply pipeline to available wastewater. The Kearney and Lodi Sites have the benefit of a reliable wastewater supply at the adjacent water treatment plants.

The four site alternatives considered in this section offer some advantages and disadvantages in comparison to the proposed project, but overall the proposed site has no identified significant impacts. Therefore, no alternative is recommended over the proposed project.

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GENERAL CONDITIONS
INCLUDING
COMPLIANCE MONITORING AND CLOSURE PLAN

INTRODUCTION

The project General Conditions Including Compliance Monitoring and Closure Plan (Compliance Plan) have been established as required by Public Resources Code section 25532. The plan provides a means for assuring that the facility is constructed, operated and closed in conjunction with air and water quality, public health and safety, environmental and other applicable regulations, guidelines, and conditions adopted or established by the California Energy Commission (Energy Commission) and specified in the written decision on the Application for Certification or otherwise required by law.

The Compliance Plan is composed of the following elements:

1. General conditions that:

- set forth the duties and responsibilities of the Compliance Project Manager (CPM), the project owner, delegate agencies, and others;
- set forth the requirements for handling confidential records and maintaining the compliance record;
- state procedures for settling disputes and making post-certification changes;
- state the requirements for periodic compliance reports and other administrative procedures that are necessary to verify the compliance status for all Energy Commission approved conditions; and
- establish requirements for facility closure plans.

2. Specific conditions of certification:

- Specific conditions of certification that follow each technical area contain the measures required to mitigate any and all potential adverse project impacts associated with construction, operation and closure to an insignificant level. Each specific condition of certification also includes a verification provision that describes the method of assuring that the condition has been satisfied.

GENERAL CONDITIONS OF CERTIFICATION

DEFINITIONS

To ensure consistency, continuity and efficiency, the following terms, as defined, apply to all technical areas, including Conditions of Certification:

SITE MOBILIZATION:

Moving trailers and related equipment onto the site, usually accompanied by minor ground disturbance, grading for the trailers and limited vehicle parking, trenching for utilities, installing utilities, grading for an access corridor, and other related activities. Ground disturbance, grading, etc. for site mobilization are limited to the portion of the site necessary for placing the trailers and providing access and parking for the occupants. Site mobilization is for temporary facilities and is therefore not considered construction.

GROUND DISTURBANCE:

Onsite activity that results in the removal of soil or vegetation, boring, trenching or alteration of the site surface. This does not include driving or parking a passenger vehicle, pickup truck, or other light vehicle, or walking on the site.

GRADING:

Onsite activity conducted with earth-moving equipment that results in alteration of the topographical features of the site such as leveling, removal of hills or high spots, or moving of soil from one area to another.

CONSTRUCTION:

[From section 25105 of the Warren-Alquist Act.] Onsite work to install permanent equipment or structures for any facility. Construction does **not** include the following:

a. The installation of environmental monitoring equipment.

b. A soil or geological investigation.

c. A topographical survey.

d. Any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility.

e. Any work to provide access to the site for any of the purposes specified in a., b., c., or d.

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, “commercial operation” is that phase of project development, which begins after the completion of start-up and commissioning, and the power plant has reached steady-state production of electricity with reliability at the rated capacity. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager.

COMPLIANCE PROJECT MANAGER (CPM) RESPONSIBILITIES

A CPM will oversee the compliance monitoring and shall be responsible for:

1. ensuring that the design, construction, operation, and closure of the project facilities is in compliance with the terms and conditions of the Energy Commission Decision;
2. resolving complaints;

3. processing post-certification changes to the conditions of certification, project description, and ownership or operational control;
4. documenting and tracking compliance filings; and,
5. ensuring that the compliance files are maintained and accessible.

The CPM is the contact person for the Energy Commission and will consult with appropriate responsible agencies and the Energy Commission when handling disputes, complaints and amendments.

All project compliance submittals are submitted to the CPM for processing. Where a submittal required by a condition of certification requires CPM approval the approval will involve all appropriate staff and management.

The Energy Commission has established a toll free compliance telephone number of **1-800-858-0784** for the public to contact the Energy Commission about power plant construction or operation-related questions, complaints or concerns.

Pre-Construction and Pre-Operation Compliance Meeting

The CPM may schedule pre-construction and pre-operation compliance meetings prior to the projected start-dates of construction, plant operation, or both. The purpose of these meetings will be to assemble both the Energy Commission's and the project owner's technical staff to review the status of all pre-construction or pre-operation requirements and milestones contained in the Energy Commission's conditions of certification to confirm that they have been met, or if they have not been met, to ensure that the proper action is taken. In addition, these meetings shall ensure, to the extent possible, that Energy Commission conditions will not delay the construction and operation of the plant due to oversight or inadvertence and to preclude any last minute, unforeseen issues from arising. Pre-construction meetings held during the certification process must be publicly noticed unless they are confined to administrative issues and processes.

Energy Commission Record

The Energy Commission shall maintain as a public record, in either the Compliance file or Docket file, for the life of the project (or other period as required):

1. all documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;
2. all monthly and annual compliance reports filed by the project owner;
3. all complaints of noncompliance filed with the Energy Commission; and,
4. all petitions for project or condition changes and the resulting staff or Energy Commission action .

PROJECT OWNER RESPONSIBILITIES

It is the responsibility of the project owner to ensure that the general compliance conditions and the conditions of certification are satisfied. The general compliance conditions regarding post-certification changes specify measures that the project owner

must take when requesting changes in the project design, compliance conditions, or ownership. Failure to comply with any of the conditions of certification or the general compliance conditions may result in reopening of the case and revocation of Energy Commission certification, an administrative fine, or other action as appropriate.

Access

The CPM, responsible Energy Commission staff, and delegate agencies or consultants, shall be guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on site, for the purpose of conducting audits, surveys, inspections, or general site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time.

Compliance Record

The project owner shall maintain project files on-site or at an alternative site approved by the CPM, for the life of the project. The files shall contain copies of all "as-built" drawings, all documents submitted as verification for conditions, and all other project-related documents for the life of the project, unless a lesser period is specified by the conditions of certification.

Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files.

Compliance Verifications

Each condition of certification is followed by a means of verification. The verification describes the Energy Commission's procedure(s) to ensure post-certification compliance with adopted conditions. The verification procedures, unlike the conditions, may be modified, as necessary by the CPM, and in most cases without full Energy Commission approval.

Verification of compliance with the conditions of certification can be accomplished by:

5. reporting on the work done and providing the pertinent documentation in monthly and/or annual compliance reports filed by the project owner or authorized agent as required by the specific conditions of certification;
6. appropriate letters from delegate agencies verifying compliance;
7. Energy Commission staff audits of project records; and/or
8. Energy Commission staff inspections of mitigation and/or other evidence of mitigation.

Verification lead times (e.g., 90, 60 and 30-days) associated with start of construction may require the project owner to file submittals during the certification process, particularly if construction is planned to commence shortly after certification.

A cover letter from the project owner or authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters. **The cover letter subject line shall identify the involved condition(s) of certification by condition number and include a brief description of the subject of the submittal**. The project

owner shall also identify those submittals **not** required by a condition of certification with a statement such as: “This submittal is for information only and is not required by a specific condition of certification.” When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal.

The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed by the project owner or an agent of the project owner.

All submittals shall be addressed as follows:

Compliance Project Manager
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814

If the project owner desires Energy Commission staff action by a specific date, they shall so state in their submittal and include a detailed explanation of the effects on the project if this date is not met.

Compliance Reporting

There are two different compliance reports that the project owner must submit to assist the CPM in tracking activities and monitoring compliance with the terms and conditions of the Commission Decision. During construction, the project owner or authorized agent will submit Monthly Compliance Reports. During operation, an Annual Compliance Report must be submitted. These reports, and the requirement for an accompanying compliance matrix, are described below. The majority of the conditions of certification require that compliance submittals be submitted to the CPM in the monthly or annual compliance reports.

Compliance Matrix

A compliance matrix shall be submitted by the project owner to the CPM along with each monthly and annual compliance report. The compliance matrix is intended to provide the CPM with the current status of all compliance conditions in a spreadsheet format. The compliance matrix must identify:

1. the technical area,
2. the condition number,
3. a brief description of the verification action or submittal required by the condition,
4. the date the submittal is required (e.g., 60 days prior to construction, after final inspection, etc.),
5. the expected or actual submittal date,
6. the date a submittal or action was approved by the Chief Building Official (CBO), CPM, or delegate agency, if applicable,
7. the compliance status for each condition (e.g., “not started”, “in progress” or “completed” [date]), and

8. the project's preconstruction and construction milestones, including dates and status.

Completed or satisfied conditions do not need to be included in the compliance matrix after they have been identified as completed/satisfied in at least one monthly or annual compliance report.

Pre-Construction Matrix

Prior to commencing construction a compliance matrix addressing only those conditions that must be fulfilled before the start of construction shall be submitted by the project owner to the CPM. This matrix will be included with the project owner's **first** compliance submittal. It will be in the same format as the compliance matrix referenced above.

Construction and Operation Security Plan

Prior to commencing construction, a site specific Security Plan for the construction phase shall be developed and maintained at the project site. Prior to commercial operation, a site specific Security Plan for the operational phase shall be developed and maintained at the project site. The plans may be reviewed at the site by the CPM during compliance inspections. The Security Plans should address the following measures:

Construction **S**ecurity **P**lan

1. Site fencing enclosing the construction area
2. Use of Security Guards
3. Check in procedure or tag system for construction personnel and visitors
4. Protocol for contacting law enforcement and CPM in the event of suspicious activity or emergency
5. Evacuation procedures

Operation Security Plan

1. Permanent site fencing and security gate
2. Security alarm for critical structures
3. Perimeter breach detectors and onsite motion detectors
4. Video/Camera monitoring system
5. Fire Alarm monitoring system

The CPM may authorize modifications to these measures, or may require additional measures.

Tasks Prior to Start of Construction

Construction shall not commence until the pre-construction matrix is submitted, all pre-construction conditions have been complied with, and the CPM has issued a letter to the project owner authorizing construction. Various lead times (e.g., 30, 60, 90 days) for submittal of compliance verification documents to the CPM for conditions of certification are established to allow sufficient staff time to review and comment, and if necessary, allow the project owner to revise the submittal in a timely manner. This will ensure that project construction may proceed according to schedule. Failure to submit compliance documents within the specified lead-time may result in delays in authorization to commence various stages of project development. Project owners frequently anticipate starting project construction as soon as the project is certified, and in those cases it may be necessary for the project owner to file compliance submittals prior to project certification if the required lead-time for a required compliance event extends beyond the date anticipated for start of construction. It is also important that the project owner understand that the submittal of compliance documents prior to project certification are at the owner's own risk, and any approval by Energy Commission staff could be subject to change based upon the final Decision

Monthly Compliance Report

The first Monthly Compliance Report is due the month following the Energy Commission business meeting date on which the project was approved, unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include an initial list of dates for each of the events identified on the Key Events List. The Key Events List is found at the end of this section.

During pre-construction and construction of the project, the project owner or authorized agent shall submit an original and five copies of the Monthly Compliance Report within 10 working days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The reports shall contain at a minimum:

1. a summary of the current project construction and milestones status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;
2. documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the transmittal letter, and should be submitted as attachments to the Monthly Compliance Report;
3. an initial, and thereafter updated, compliance matrix which shows the status of all conditions of certification and preconstruction and construction milestones (fully satisfied and/or closed conditions do not need to be included in the matrix after they have been reported as closed);
4. a list of conditions and milestones that have been satisfied during the reporting period, and a description or reference to the actions which satisfied the condition;
5. a list of any submittal deadlines that were missed accompanied by an explanation and an estimate of when the information will be provided;
6. a cumulative listing of any approved changes to conditions of certification;

7. a listing of any filings with, or permits issued by, other governmental agencies during the month;
8. a projection of project compliance activities scheduled during the next two months. The project owner shall notify the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification or milestones;
9. a listing of the month's additions to the on-site compliance file;
10. any requests to dispose of items that are required to be maintained in the project owner's compliance file; and
11. a listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the resolution of any complaints which have been resolved, and the status of any unresolved complaints.

Annual Compliance Report

After the air district has issued a Permit to Operate, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of commercial operation and are due to the CPM each year at a date agreed to by the CPM. Annual Compliance Reports shall be submitted over the life of the project unless otherwise specified by the CPM. Each Annual Compliance Report shall identify the reporting period and shall contain the following:

1. an updated compliance matrix which shows the status of all conditions of certification (fully satisfied and/or closed conditions do not need to be included in the matrix after they have been reported as closed);
2. a summary of the current project operating status and an explanation of any significant changes to facility operations during the year;
3. documents required by specific conditions to be submitted along with the Annual Compliance Report. Each of these items must be identified in the transmittal letter, and should be submitted as attachments to the Annual Compliance Report;
4. a cumulative listing of all post-certification changes approved by the Energy Commission or cleared by the CPM;
5. an explanation for any submittal deadlines that were missed, accompanied by an estimate of when the information will be provided;
6. a listing of filings made to, or permits issued by, other governmental agencies during the year;
7. a projection of project compliance activities scheduled during the next year;
8. a listing of the year's additions to the on-site compliance file;
9. an evaluation of the on-site contingency plan for unexpected facility closure, including any suggestions necessary for bringing the plan up to date [see General Conditions for Facility Closure addressed later in this section]; and

10. a listing of complaints, notices of violation, official warnings, and citations received during the year; a description of the resolution of any complaints which have been resolved, and the status of any unresolved complaints.

Confidential Information

Any information that the project owner deems confidential shall be submitted to the Energy Commission's Docket with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505(a). Any information, which is determined to be confidential, shall be kept confidential as provided for in Title 20, California Code of Regulations, section 2501 et. seq.

Department of Fish and Game Filing Fee

Pursuant to the provisions of Fish and Game Code Section 711.4, the project owner shall pay a filing fee in the amount of eight hundred and fifty dollars ($850). The payment instrument shall be provided to the Energy Commission's Project Manager at the time of project certification and shall be made payable to the California Department of Fish and Game. The Energy Commission's Project Manager will submit the payment to the Office of Planning and Research at the time of filing of the notice of decision pursuant to Public Resources Code Section 21080.5.

Reporting of Complaints, Notices, and Citations

Prior to the start of construction, the project owner must send a letter to property owners living within one mile of the project notifying them of a telephone number to contact project representatives with questions, complaints or concerns. If the telephone is not staffed 24 hours per day, it shall include automatic answering, with date and time stamp recording. All recorded inquiries shall be responded to within 24 hours. The telephone number shall be posted at the project site and made easily visible to passersby during construction and operation. The telephone number shall be provided to the CPM who will post it on the Energy Commission's web page at www.energy.ca.gov/sitingcases. Any changes to the telephone number shall be submitted immediately to the CPM who will update the web page.

In addition to the monthly and annual compliance reporting requirements described above, the project owner shall report and provide copies of all complaint forms, notices of violation, notices of fines, official warnings, and citations, within 10 days of receipt, to the CPM. Complaints shall be logged and numbered. Noise complaints shall be recorded on the form provided in the **NOISE** conditions of certification. All other complaints shall be recorded on the complaint form on the following page.

COMPLAINT REPORT/RESOLUTION FORM

PROJECT NAME:
AFC Number:

COMPLAINT LOG NUMBER _____
Complainant's name and address:

Phone number:

Date and time complaint received:

Indicate if by telephone or in writing (attach copy if written):
Date of first occurrence:

Description of complaint (including dates, frequency, and duration):

Findings of investigation by plant personnel:

Indicate if complaint relates to violation of a CEC requirement:
Date complainant contacted to discuss findings:

Description of corrective measures taken or other complaint resolution:

Indicate if complainant agrees with proposed resolution:
If not, explain:

Other relevant information:

If corrective action necessary, date completed:
Date first letter sent to complainant: _____(copy attached)
Date final letter sent to complainant: _____(copy attached)

This information is certified to be correct.
Plant Manager's Signature: _____ Date:

(Attach additional pages and supporting documentation, as required.)

FACILITY CLOSURE

At some point in the future, the project will cease operation and close down. At that time, it will be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made which allow for flexibility to deal with the specific situation and project setting that exist at the time of closure. LORS pertaining to facility closure are identified in the sections dealing with each technical area. Facility closure will be consistent with LORS in effect at the time of closure.

There are at least three circumstances in which a facility closure can take place, planned closure, unexpected temporary closure and unexpected permanent closure.

PLANNED CLOSURE

A planned closure occurs at the end of a project's life, when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence.

UNEXPECTED TEMPORARY CLOSURE

An unplanned unexpected temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster, or an emergency.

UNEXPECTED PERMANENT CLOSURE

An unplanned unexpected permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unexpected closure where the owner remains accountable for implementing the on-site contingency plan. It can also include unexpected closure where the project owner is unable to implement the contingency plan, and the project is essentially abandoned.

GENERAL CONDITIONS FOR FACILITY CLOSURE

PLANNED CLOSURE

In order to ensure that a planned facility closure does not create adverse impacts, a closure process that provides for careful consideration of available options and applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure, will be undertaken. To ensure adequate review of a planned project closure, the project owner shall submit a proposed facility closure plan to the Energy Commission for review and approval at least twelve months prior to commencement of closure activities (or other period of time agreed to by the CPM). The project owner shall file 120 copies (or other number of copies agreed upon by the CPM) of a proposed facility closure plan with the Energy Commission.
The plan shall:

1. identify and discuss any impacts and mitigation to address significant adverse impacts associated with proposed closure activities and to address facilities, equipment, or other project related remnants that will remain at the site.

2. identify a schedule of activities for closure of the power plant site, transmission line corridor, and all other appurtenant facilities constructed as part of the project;

3. identify any facilities or equipment intended to remain on site after closure, the reason, and any future use; and

4. address conformance of the plan with all applicable laws, ordinances, regulations, standards, local/regional plans in existence at the time of facility closure, and applicable conditions of certification.

In the event that there are significant issues associated with the proposed facility closure plan's approval, or the desires of local officials or interested parties are inconsistent with the plan, the CPM shall hold one or more workshops and/or the Energy Commission may hold public hearings as part of its approval procedure.

In addition, prior to submittal of the proposed facility closure plan, a meeting shall be held between the project owner and the Energy Commission CPM for the purpose of discussing the specific contents of the plan.

As necessary, prior to, or during the closure plan process, the project owner shall take appropriate steps to eliminate any immediate threats to public health and safety and the environment, but shall not commence any other closure activities, until Energy Commission approval of the facility closure plan is obtained.

UNEXPECTED TEMPORARY CLOSURE

In order to ensure that public health and safety and the environment are protected in the event of an unexpected temporary facility closure, it is essential to have an on-site contingency plan in place. The on-site contingency plan will help to ensure that all necessary steps to mitigate public health and safety, and environmental impacts, are taken in a timely manner.

The project owner shall submit an on-site contingency plan for CPM review and approval. The plan shall be submitted no less that 60 days (or other time agreed to by the CPM) prior to commencement of commercial operation. The approved plan must be in place prior to commercial operation of the facility and shall be kept at the site at all times.

The project owner, in consultation with the CPM, will update the on-site contingency plan as necessary. The CPM may require revisions to the on-site contingency plan over the life of the project. In the annual compliance reports submitted to the Energy Commission, the project owner will review the on-site contingency plan, and recommend changes to bring the plan up to date. Any changes to the plan must be approved by the CPM.

The on-site contingency plan shall provide for taking immediate steps to secure the facility from trespassing or encroachment. In addition, for closures of more than 90 days (unless other arrangements are agreed to by the CPM), the plan shall provide for removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment (also see specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management).

In addition, consistent with requirements under unexpected permanent closure addressed below, the nature and extent of insurance coverage, and major equipment warranties must also be included in the on-site contingency plan. In addition, the status of the insurance coverage and major equipment warranties must be updated in the annual compliance reports.

In the event of an unexpected temporary closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, e-mail, etc., within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the circumstances and expected duration of the closure.

If the CPM determines that a temporary closure is likely to be permanent, or for a duration of more than twelve months, a closure plan consistent with that for a planned closure shall be developed and submitted to the CPM within 90 days of the CPM's determination (or other period of time agreed to by the CPM).

UNEXPECTED PERMANENT CLOSURE

The on-site contingency plan required for unexpected temporary closure shall also cover unexpected permanent facility closure. All of the requirements specified for unexpected temporary closure shall also apply to unexpected permanent closure.

In addition, the on-site contingency plan shall address how the project owner will ensure that all required closure steps will be successfully undertaken in the unlikely event of abandonment.

In the event of an unexpected permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, e-mail, etc., within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the status of all closure activities.

A closure plan consistent with that for a planned closure shall be developed and submitted to the CPM within 90 days of the permanent closure (or other period of time agreed to by the CPM).

DELEGATE AGENCIES

To the extent permitted by law, the Energy Commission may delegate authority for

compliance verification and enforcement to various state and local agencies that have expertise in subject areas where specific requirements have been established as a condition of certification. If a delegate agency does not participate in this program, the Energy Commission staff will establish an alternative method of verification and enforcement. Energy Commission staff reserves the right to independently verify compliance.

In performing construction and operation monitoring of the project, the Energy Commission staff acts as, and has the authority of, the Chief Building Official (CBO). The Energy Commission staff retains this authority when delegating to a local CBO. Delegation of authority for compliance verification includes the authority for enforcing codes, the responsibility for code interpretation where required, and the authority to use discretion, as necessary, in implementing the various codes and standards.

Whenever an agency's responsibility for a particular area is transferred by law to another entity, all references to the original agency shall be interpreted to apply to the successor entity.

ENFORCEMENT

The Energy Commission's legal authority to enforce the terms and conditions of its Decision is specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke the certification for any facility, and may impose a civil penalty for any significant failure to comply with the terms or conditions of the Energy Commission Decision. The specific action and amount of any fines the Energy Commission may impose would take into account the specific circumstances of the incident(s). This would include such factors as the previous compliance history, whether the cause of the incident involves willful disregard of LORS, inadvertence, unforeseeable events, and other factors the Energy Commission may consider.

Moreover, to ensure compliance with the terms and conditions of certification and applicable laws, ordinances, regulations, and standards, delegate agencies are authorized to take any action allowed by law in accordance with their statutory authority, regulations, and administrative procedures.

NONCOMPLIANCE COMPLAINT PROCEDURES

Any person or agency may file a complaint alleging noncompliance with the conditions of certification. Such a complaint will be subject to review by the Energy Commission pursuant to Title 20, California Code of Regulations, section 1230 et. seq., but in many instances the noncompliance can be resolved by using the informal dispute resolution process. Both the informal and formal complaint procedure, as described in current State law and regulations, are described below. They shall be followed unless superseded by current law or regulations.

INFORMAL DISPUTE RESOLUTION PROCEDURE

The following procedure is designed to informally resolve disputes concerning interpretation of compliance with the requirements of this compliance plan. The project

owner, the Energy Commission, or any other party, including members of the public, may initiate this procedure for resolving a dispute. Disputes may pertain to actions or decisions made by any party including the Energy Commission's delegate agents.

This procedure may precede the more formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1230 et. seq., but is not intended to be a substitute for, or prerequisite to it. This informal procedure may not be used to change the terms and conditions of certification as approved by the Energy Commission, although the agreed upon resolution may result in a project owner, or in some cases the Energy Commission staff, proposing an amendment.

The procedure encourages all parties involved in a dispute to discuss the matter and to reach an agreement resolving the dispute. If a dispute cannot be resolved, then the matter must be referred to the full Energy Commission for consideration via the complaint and investigation process. The procedure for informal dispute resolution is as follows:

Request for Informal Investigation

Any individual, group, or agency may request the Energy Commission to conduct an informal investigation of alleged noncompliance with the Energy Commission's terms and conditions of certification. All requests for informal investigations shall be made to the designated CPM.

Upon receipt of a request for informal investigation, the CPM shall promptly notify the project owner of the allegation by telephone and letter. All known and relevant information of the alleged noncompliance shall be provided to the project owner and to the Energy Commission staff. The CPM will evaluate the request and the information to determine if further investigation is necessary. If the CPM finds that further investigation is necessary, the project owner will be asked to promptly investigate the matter and within seven (7) working days of the CPM's request, provide a written report of the results of the investigation, including corrective measures proposed or undertaken, to the CPM. Depending on the urgency of the noncompliance matter, the CPM may conduct a site visit and/or request the project owner to provide an initial report, within forty-eight (48) hours, followed by a written report filed within seven (7) days.

Request for Informal Meeting

In the event that either the party requesting an investigation or the Energy Commission staff is not satisfied with the project owner's report, investigation of the event, or corrective measures undertaken, either party may submit a written request to the CPM for a meeting with the project owner. Such request shall be made within fourteen (14) days of the project owner's filing of its written report. Upon receipt of such a request, the CPM shall:

1. immediately schedule a meeting with the requesting party and the project owner, to be held at a mutually convenient time and place;

2. secure the attendance of appropriate Energy Commission staff and staff of any other agency with expertise in the subject area of concern as necessary;

3. conduct such meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner; and,

4. after the conclusion of such a meeting, promptly prepare and distribute copies to all in attendance and to the project file, a summary memorandum which fairly and accurately identifies the positions of all parties and any conclusions reached. If an agreement has not been reached, the CPM shall inform the complainant of the formal complaint process and requirements provided under Title 20, California Code of Regulations, section 1230 et. seq.

FORMAL DISPUTE RESOLUTION PROCEDURE-COMPLAINTS AND INVESTIGATIONS

If either the project owner, Energy Commission staff, or the party requesting an investigation is not satisfied with the results of the informal dispute resolution process, such party may file a complaint or a request for an investigation with the Energy Commission's General Counsel. Disputes may pertain to actions or decisions made by any party including the Energy Commission's delegate agents. Requirements for complaint filings and a description of how complaints are processed are in Title 20, California Code of Regulations, section 1230 et. seq.

The Chairman, upon receipt of a written request stating the basis of the dispute, may grant a hearing on the matter, consistent with the requirements of noticing provisions. The Energy Commission shall have the authority to consider all relevant facts involved and make any appropriate orders consistent with its jurisdiction (Title 20, California Code of Regulations, sections 1232 - 1236).

POST CERTIFICATION CHANGES TO THE ENERGY COMMISSION DECISION: AMENDMENTS, INSIGNIFICANT PROJECT CHANGES AND VERIFICATION CHANGES

The project owner must petition the Energy Commission, pursuant to Title 20, California Code of Regulations, section 1769, to 1) delete or change a condition of certification; 2) modify the project design or operational requirements; and 3) transfer ownership or operational control of the facility.

A petition is required for **amendments** and for **insignificant project changes**. For verification changes, a letter from the project owner is sufficient. In all cases, the petition or letter requesting a change should be submitted to the Energy Commission's Docket in accordance with Title 20, California Code of Regulations, section 1209. The criteria that determine which type of change process applies are explained below.

AMENDMENT

A proposed change will be processed as an amendment if it involves a change to the requirement or protocol (and in some cases the verification) portion of a condition of certification, an ownership or operator change, or a potential significant environmental impact.

INSIGNIFICANT PROJECT CHANGE

The proposed change will be processed as an insignificant project change if it does not require changing the language in a condition of certification, have a potential for significant environmental impact, and cause the project to violate laws, ordinances, regulations or standards.

VERIFICATION CHANGE

As provided in Title 20, Section 1770 (d), California Code of Regulations, a verification may be modified by staff without requesting an amendment to the decision, if the change does not conflict with the conditions of certification.

KEY EVENT LIST

PROJECT: _____

DOCKET #: _____

COMPLIANCE PROJECT MANAGER: _____

EVENT DESCRIPTION	DATE
Certification Date	
Online Date	
POWER PLANT SITE ACTIVITIES	
Start Site Mobilization	
Start Ground Disturbance	
Start Rough Grading	
Start Construction	
First Combustion of Gas Turbine	
Start Commercial Operation	
Complete All Construction	
TRANSMISSION LINE ACTIVITIES	
Start T/L Construction	
SYNCHRONIZATION WITH GRID	
COMPLETE T/L CONSTRUCTION	
FUEL SUPPLY LINE ACTIVITIES	
Start Fuel Supply Line Construction	
COMPLETE FUEL SUPPLY LINE CONSTRUCTION	
WATER SUPPLY LINE ACTIVITIES	
START WATER SUPPLY LINE CONSTRUCTION	
COMPLETE WATER SUPPLY LINE CONSTRUCTION	

AVENAL DUKE ENERGY
PREPARATION TEAM

Executive Summary…… Lance Shaw

Introduction……Lance shaw

Project Description……Lance Shaw

Air Quality…… Brewster Birdsall

Biological Resources……Melinda Dorin

Cultural Resources……Judy Mckeehan and Gary Reinoehl

Hazardous Materials……...Alvin J. Greenberg, Ph.D. and Rick Tyler

Land Use……Tamblyn Borton and Amanda Stennick

Noise and Vibration……Bill Thiesen

Public Health……Alvin J. Greenberg, Ph.D.

Socioeconomics……Negar Vahidi

Soil and Water……..Kristine Uhlman, John Kessler and Lorraine White

Traffic and Transportation……David Young

Transmission Line Safety and Nuisance……..Obed Odoemelam, Ph.D

Visual Resources……Christa Fay, Eric Knight and William Walters

Waste Management……Alvin J. Greenberg, Ph.D.

Worker Safety and Fire Protection……Alvin J. Greenberg, Ph.D.

Facility Design……..Brain Payne

Geology and Paleontology……..Dr. Dal Hunter

Power Plant Efficiency……Brain Payne

Power Plant Reliability……Brain Payne

Transmission System Engineering……..Ajoy Guha, P.E. and Richard Minetto, P.E.

Alternatives……..Susan V. Lee

Conditions……Nancy Trounas

Project Assistant…… .Raquel Rodriguez /Keith Muntz/ Luz Manriquez

Support Staff…… Adrian Gilbreath / Sean Byant Angie Hockaday