4.0 TRANSMISSION FACILITIES

This section describes the project’s transmission facilities proposed to interconnect the power plant with the SCE transmission system at the Devers substation located west of the project site. A single-circuit 220 kV transmission line will be required to deliver the proposed project electrical output to the SCE transmission grid. SCE will prepare the final design documents, build, own and operate the transmission interconnection facilities between the CPVS switchyard and the Devers substation. The 220-kV single circuit will be designed and constructed in accordance with General Order 95 (GO-95), “Rules for Overhead Line Construction” and other applicable state and local codes.

4.1 TRANSMISSION INTERCONNECTION LINE LOCATION

The 220 kV single circuit line for this project is a direct intertie between CPVS and SCE’s 220 kV switchyard at Devers substation. A conceptual diagram showing the proposed interconnection is shown on Figure 4.1-1. The transmission line interconnection will be approximately 3,250 feet in length of which approximately 1,800 feet would be outside of the power plant or Devers substation boundaries. The proposed transmission line will leave the generating plant on the west side of the switchyard, turn south, and exit the power plant property on the southwest corner of the 37-acre property boundary. After immediately crossing under existing 220 kV lines, it will turn west toward the Devers substation and follow an existing 220 and 115 kV right-of-way until turning north into the Devers substation. An existing 220 kV position in the Devers substation will be equipped and the existing Devers – Coachella 220 kV line will be shifted into this position. The gentie will then be terminated in the position previously occupied by the Devers – Coachella line.

4.2 TRANSMISSION LINE CONFIGURATION

4.2.1 Conductors

The 220-kV circuit will use a bundle of two per phase 1,590 kcmil, Aluminum Conductor Steel Reinforced (ACSR) “Lapwing” conductor with a nominal ampacity rating of 2,760 amps (25 C ambient, 75 C conductor temperature, and 1.4 miles per hour wind speed).

4.2.2 Ground Wires

Two ground wires will be installed on the 220-kV structures. A 0.5-inch extra high strength (EHS), steel ground wire will be used, unless one of the ground wires is replaced by an optical ground wire (OPGW) of approximately the same diameter. The optical wire will be used, as necessary, for the communication requirement between the CPVS and the Devers substation.

4.2.3 Structures

The new 220-kV circuit line from the project switchyard to the SCE’s Devers substation will use approximately nine steel pole structures of various types. These will be weathered or galvanized steel. The structures will be bolted or slip fit design. The base case design calls for the nine structures to be 85 to 115 feet tall, with phase conductors that may be arranged horizontally, vertically, or in a delta configuration depending upon the requirements for particular structures. The delta configuration will be the predominant configuration type. Two shield wires will be used as necessary depending upon the type of structure. Figure 4.2-1 shows a typical structure.

The specified maximum mid-span line sag will be calculated at an ambient temperature of 130°F under maximum load conditions. These line sag values will be subtracted from the conductor heights at point of support on the poles and the resulting conductor heights used in the magnetic field models.
4.2.4 Foundations

All structures will have cast-in-place concrete foundations designed to support the imposed loads. The diameter and the depth of each foundation will be determined during detailed design and will be based on soil conditions and actual tower loads.

4.2.5 Access to Structures

The portion of the transmission line outside of the power plant and Devers substation will be accessed via existing unpaved access routes along Powerline Roads North and South.

4.3 TRANSMISSION INTERCONNECTION CONSTRUCTION

After SCE completes its final design of the transmission line interconnection, SCE would construct the interconnection. The transmission interconnection line is expected to be constructed in 8 months, from December 2008 to July 2009. Construction staff required for the installing the transmission line interconnection are included in Table 2.6-1. Equipment required for installation of the transmission interconnection is listed in Table 2.6-2. Equipment laydown would occur within the 75-foot-wide corridor along the transmission line corridor as well as on the 14-acre project construction laydown area.

4.4 TRANSMISSION SYSTEM OPERATION AND MAINTENANCE

SCE will own, operate and maintain the transmission line. Transmission system operation and maintenance are described below. Transmission line safety and nuisance is addressed in Section 4.5.3.

4.4.1 Right-of-Way Management

Land use activities within and adjacent to the transmission line right-of-way will be permitted within the terms of the easement. Incompatible uses of the right-of-way include buildings and tall trees that interfere with required line clearances, as well as storage of flammable materials or other activities that compromise the safe operation of the transmission line.

4.4.2 Inspections

Transmission line structures, access ways, and the right-of-way will be inspected on a routine, periodic basis in accordance with good utility practice.

4.4.3 Emergency/Safety Repairs

Emergency repairs will be made if the transmission line is damaged and requires immediate attention. Maintenance crews will use tools and other such equipment, as necessary, for repairing and maintaining insulators, conductors, structures, and access ways.

4.4.4 Insulator Washing

The buildup of particulate matter on ceramic insulators supporting the conductors on electric transmission lines increases the potential for flashovers, which affects the safe and reliable operation of the line. Structures with particulate matter buildup are identified for washing during routine inspections of the lines. Washing consists of spraying the insulators with deionized water through high-pressure equipment mounted on a truck.
4.5 TRANSMISSION SYSTEM EVALUATION

CPVS applied to SCE to interconnect a proposed generating plant and transmission line to the ISO Controlled Grid under the terms of SCE’s Transmission Owner (TO) Tariff. SCE performed a System Impact Study (SIS) in 2000 that examined the impact of a new 850-MW generation station in the Devers region. The SIS determined the impact on the SCE system based on power flows on the existing transmission lines and transformers, short circuit duties of the existing transmission facilities, and stability of the interconnected system, considering various contingencies and fault conditions. In November 2001, a Facilities Study was completed by SCE describing the new interconnection facilities and system upgrades required for the interconnection of the project. Due to time elapsed since the completion of the original SIS and due to the changes to the application queue, SCE found it necessary to re-evaluate the original SIS. The Ocotillo-Restudy SIS was completed on April 6, 2005. The SIS is provided in Appendix H.

The SIS determined that the generation does not cause any loading or voltage criteria violations under the Base Case condition.

The SIS identified one single contingency (N-1) overload and three double contingency overloads on the Devers – San Bernardino No. 1 220-kV transmission line:

- The line overloaded to 910A (115 percent) under the outage of Devers – Valley 500-kV T/L. The SIS also identified three double contingency (N-2) overloads
- The line overloaded to 862A (108 percent) under the simultaneous outages of Devers – Vista No. 1 and No. 2 220-kV T/Ls.
- The line overloaded to 906A (114 percent) under the simultaneous outages of Devers – Vista No. 1 and Devers – San Bernardino No. 2 220-kV T/Ls.
- The line overloaded to 909A (114 percent) under the simultaneous outages of Devers – Vista No. 2 and Devers – San Bernardino No. 2 220-kV T/Ls.

The SIS recommended the installation of a new Special Protection Scheme (SPS), but noted that the Devers-Palo Verde 2 upgrade, if eventually built, may eliminate the need for the SPS. Until this can be confirmed, the facilities study assumes the need for the SPS. The SIS also determined that the new generation increases Three Phase Short Circuit Duty 0.1 kA at three 500-kV, twenty three 220-kV, and three 115-kV buses in the SCE system.

The Facilities Study (Restudy) completed January 9, 2006, provides a detailed evaluation of the equipment required for system upgrades and interconnection associated with the project. Appendices A and B from the January 9, 2006 Facilities Study have been included in the AFC Appendix H to show the plan line termination at the Devers substation.

On December 21, 2006, CAISO and SCE completed an Optional Study requested by the project to evaluate several proposed alternative configurations. The Optional Study concluded that the proposed changes in configuration (from a F-class combined cycle facility to an LMS100 simple cycle configuration) would not have a material impact on lower queued projects and that the project would maintain its queue position and could proceed forward with CAISO and SCE towards the execution of a Large Scale Generator Interconnection Agreement (LGIA). The Optional Study and a letter explaining the Optional Study results are attached in Appendix H.
4.5.1 Transmission System Reliability Criteria

The North American Electric Reliability Council (NERC) and the Western System Coordinating Council (WSCC) Reliability Criteria for Transmission System Planning, the ISO and the SCE Reliability Criteria has been used in the evaluation of the transmission system. Additionally, SCE has special operating criteria for the Southern California area. These criteria have been used in the analysis to ensure that minimum criteria requirements are adhered to and project objectives are met.

4.5.2 Transmission System Interconnection Study

The SIS shows the CPVS can be reliably interconnected to the SCE Devers 220 kV substation. The SIS for the CPVS is included in Appendix H.

4.5.3 Transmission Line Safety and Nuisance

4.5.3.1 Electric and Magnetic Fields

Electromagnetic fields (EMF) occur independently of one another as electric and magnetic fields at the 60-Hz frequency used in transmission lines, and both are created by electric charges. Electric fields exist when these charges are not moving. Magnetic fields are created when the electric charges are moving. The magnitude of both electric and magnetic fields fall off rapidly as the distance from the source increases (proportional to the inverse of the square of distance).

In January 1991, the CPUC issued an Order Instituting Investigation into the potential health effects from electric and magnetic fields emitted by electric power and cellular telephone facilities. In September 1991, the assigned CPUC Administrative Law Judge issued a ruling that created the “California EMF Consensus Group.” This group of representatives from utilities, industry, government, private and public research, and labor organizations submitted a document entitled “Issues and Recommendations for Interim Response and Policy Regarding Power Frequency EMFs” on March 20, 1992. Regarding the relevant policy consensus recommendation titled “Facility Siting,” the group stated that the CPUC should recommend that utilities take into account public concern about electromagnetic fields when siting new electric facilities. Although this group could not determine that there is a relationship between EMF and human health effects, they also could not conclude that this relationship does not exist to any extent; therefore, they recommended that the CPUC authorize further research.

Since SCE will be responsible for final design, engineering, construction, operation and maintenance of the generator tie, SCE will be preparing an EMF study for the project. Standards published in the United States that are related to power plant electromagnetic interference (EMI) issues generally address avoidance of interference problems within the plant and its control systems. Standards do not currently exist that address issues related to the EMI emission levels to areas outside of the power plant, due to the fact that no interference is realized outside of the immediate vicinity of the plant.

The electric and magnetic fields produced by the CPVS power system have a frequency of 60 Hz, meaning that the intensity and orientation of the field changes 60 times per second. The amount of electromagnetic energy radiated by 60 Hz electrical power systems is negligible because the wavelength (5,000 km or 3,000 miles) is so long compared to the size of the equipment carrying or generating the energy. Therefore, the interference issues are limited to near-field inductive or capacitive effects which are appreciable only when in very close proximity (less than about 10 m or 30 feet) to the current-carrying equipment. For this reason, 60 Hz field effects are not present outside the plant boundary, except as may exist in the direct close proximity of the outgoing power lines. However, the field levels of overhead power lines are quite low, as can be seen from the following data taken from “Background Paper on Power Line Fields and Public Health,” March 29, 1996 by D. Hafmeister.
“Typical 230 kV transmission power lines produce average fields at distances of 30 and 60 meters as follows:

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Electric Fields (at 30/60 meters)</th>
<th>Magnetic Fields (at 30/60 meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 kV</td>
<td>0.3/0.05 milligauss</td>
<td>7.1/1.8 milligauss</td>
</tr>
</tbody>
</table>

For reference, average magnetic fields at a distance of 30 cm (12 inches) are: color television (7 milliGauss (mG)), microwave (4 mG), analog clocks (15 mG), electric razors (20 mG to 100 mG at 15 cm) and hair dryers (1 mG to 300 mG at 15 cm).”

4.5.3.2 Line Loads for EMF Calculation

Maximum magnetic fields are produced at the maximum conductor currents. For the purposes of the EMF analyses, the maximum line loading will be assumed to be 850 MW. This loading equates to approximately 2,230 amps per phase at unity power factor and 220 kV.

4.5.3.3 Calculation Methods

To estimate the maximum fields, calculations will performed at mid-span where the conductor is positioned at its lowest point between structures (the estimated maximum sag point). The magnetic fields are computed at 1 meter above ground. The Bonneville Power Administration (BPA) Corona and Fields Effects program or comparable program will be used to calculate the magnetic field strengths for the line. This program and others like it have been used to predict electric and magnetic field levels that have been confirmed by field measurements by numerous utilities.

All loads on all circuits on the same tower are assumed to be maximum and taken at normal plant full output operating conditions.

4.5.3.4 Audible Noise and Radio and TV Interference

An electric field is generated in the air surrounding a transmission line conductor when the transmission line is in operation. A corona discharge occurs at the conductor surface when the intensity of the electric field at the conductor surface exceeds the breakdown strength of the surrounding air. The electrical energy released from the conductors during this process is known as corona loss and is manifested as audible noise and radio/television interference.

Energized electric transmission lines can also generate audible noise by a process called corona discharge, most often perceived as a buzz or hum. This condition is usually worse when the conductors are wet. The Electric Power Research Institute (EPRI) has conducted several transmission line tests and studies that measured sound levels for several power line sizes with wet conductors (see their publication Transmission Line Reference Book, 345 kV and Above, EPRI, 1975, 1982). The Transmission Line Reference Book, 345 kV notes that the noise produced by a conductor attenuates (decreases) by 2 to 3 decibels (dB) for each doubling of the distance from the source.

Radio and television interference, known as gap-type noise, is caused by a film on the surface of two hardware pieces that are in contact. The film acts as an insulator between the surfaces, and results in small electric arcs that produce noise and interference. This type of noise is not a problem in well-maintained transmission lines. Well-trained transmission line maintenance crews will maintain the project transmission line; therefore, problems that might occur can be readily pinpointed and corrected. Furthermore, it is unlikely that the project transmission line would have any effect on radio or television reception due to the approximate 1,300 foot distance from the transmission line to the nearest residence.
The residence currently located approximately 690 feet to the south of the transmission line will be vacated prior to construction.

Many factors contribute to the pre-project ambient noise levels in the plant area. The project transmission line will be designed such that noise from the line will continue to be well below undesirable levels. Any noise or radio/television interference complaints will be logged, investigated, and, to the degree possible, mitigated.

### 4.5.3.5 Induced Currents and Hazardous/Nuisance Shocks

Metallic objects near a transmission line can cause hazardous or nuisance shocks when touched, if they are not properly constructed. Because the electric fields of the transmission line are negligible above ground, and the line is built in conformance with the requirements of California Public Utility Commission General Order 95 and Title 8 CCR 2700 hazardous shocks are highly unlikely to occur as a result of the project construction and operation.

### 4.5.3.6 Conclusion

No significant EMI mechanisms have been identified within a typical power plant facility which could potentially disrupt or otherwise interfere with communications or other EM based devices and systems outside the plant boundary. This is reflected in the lack of U.S. standards governing any such emissions, as well as the lack of any significant anecdotal references to such phenomenon. It is noted that many existing power plant facilities are in very close proximity to other facilities and businesses, with no observed EMI interference problems. In addition, the 1800 foot portion of the new 220 kV transmission line interconnection that is located offsite crosses or follows existing 220 kV or 115 kV lines and is located along infrequently used unpaved roads used for transmission line maintenance. It is located over 1300 feet from the nearest residence. Access to this area will be generally limited to power plant and substation employees, incidental construction and maintenance personnel, other employees and regulatory inspectors. Since access to the general public is not anticipated, general public exposure to EMF is not expected to occur.

### 4.6 TRANSMISSION LINE AGREEMENTS AND NECESSARY APPROVALS

The project to be certified includes the transmission line up to the first point of interconnection. For this project, the portion of the transmission line from the terminal bus on the proposed project site to SCE’s Devers substation is a tie line that will be built designed, constructed, and operated by SCE. It is currently anticipated that SCE will execute contracts with CPV Sentinel under which SCE will be responsible for final design, engineering, construction, operation and maintenance of the generator tie to the Devers substation. SCE will seek a Certificate of Public Convenience and Necessity (CPCN) from the California Public Utilities Commission (CPUC). The environmental impacts associated with constructing and operating the transmission line are being analyzed in this CEC proceeding.

### 4.7 LAWS, ORDINANCES, REGULATIONS AND STANDARDS

A description of the laws, ordinances, regulations, and standards that pertain to the transmission system interconnection is included in Table 2.10-1 in Chapter 2.

### 4.8 INVOLVED AGENCIES AND AGENCY CONTACTS

A list of agencies and agency contacts that pertain to the transmission system is included in Section 2.11 in Chapter 2.
DEVERS SUBSTATION

LEGEND

- Existing 115 kV Pole
- Proposed 230 kV Pole
- 500 kV or 230 kV Lattice Steel Structure
- Proposed 220 kV Transmission Interconnection Line
- Dashed Line Signifies Existing Transmission Line

Lines are shown diagrammatically.
Three-phase lines are shown as single line.

Source:
Spectrum Energy, Inc. 22kV Line Route Concept
(CPV-E-LR-01), Rev. A, 4/13/07

CPV Sentinel Energy Project
CPV Sentinel, LLC
Riverside County, California

FIGURE 4.1-1