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3.0 TRANSMISSION FACILITIES

This section describes the transmission facilities proposed to interconnect the Puente Power Project (P3 or project) with the Southern California Edison (SCE) transmission switchyard that is adjacent to the Mandalay Generating Station (MGS) site and the proposed P3 project site. The new P3 consists of a General Electric (GE) Frame 7HA.01 single fuel combustion turbine generator (CTG) that will tie into the existing Mandalay Switchyard owned by SCE using one of the breaker positions that will be vacated when the existing gas fired steam generating MGS Units 1 and 2 are removed from service. MGS Units 1 and 2 would be retired by the completion of commissioning of P3. One single-circuit 220-kilovolt (kV) transmission line will be required to connect the P3 to the SCE switchyard to facilitate delivery of the project's electrical output to the transmission grid. The 220-kV single circuit will be designed and constructed in accordance with California Public Utilities Commission (CPUC) General Order (GO) 95, "Rules for Overhead Line Construction" and other applicable state and local codes.

3.1 INTERCONNECTION TO TRANSMISSION GRID

The new P3 unit will be connected to one existing 220-kV breaker position in the Mandalay Switchyard. One auxiliary transformer will be provided and connected on the low side of the generator step-up (GSU) transformer on the CTG. Single-ended 4-kV and 480-volt switchgear lineups will be provided as required to serve the GE-supplied electrical loads, as well as all required balance-of-plant loads. A backup diesel generator to facilitate safe shutdown and serve station loads in the event of the loss of the single line feeding the auxiliary system has been included.

The 220-kV single circuit line for the project will be a direct intertie between the P3 and SCE's 220-kV switchyard, which is adjacent to the MGS and P3 sites. A conceptual diagram showing the proposed interconnection is shown on Figure 3-1. The transmission line interconnection will be approximately 735 feet in total length, from the GSU to the 220-kV tie-in-point at the switchyard. It will be located mostly within the P3 site, but will cross a small portion of the MGS site and then directly enter the SCE switchyard. It is anticipated that one existing 220-kV bay in the SCE switchyard will be upgraded from an oil-filled breaker to SF_6 breaker. The position is currently assigned to MGS Units 1 and 2, which will be retired. The new P3 generating unit will be connected to the upgraded breaker.

Applicant filed a Generation Unit Repowering request for the project with the California Independent System Operator (CAISO). SCE is currently preparing the Facilities Study, as discussed in Section 3.5 and Appendix B-1.

3.2 TRANSMISSION LINE CONFIGURATION

3.2.1 Structures

The new 220-kV circuit line from the project switchyard to the SCE switchyard will use four steel pole structures. These will be constructed of weathered or galvanized steel. The structures will be bolted or slip-fit design. The structures will be 100 feet tall, with phase conductors that may be arranged horizontally, vertically, or in a delta configuration, depending on the requirements for particular structures. The vertical configuration will be the predominant configuration type (see Figure 3-2). Two shield wires will be used as necessary, depending on the type of structure. The specified maximum mid-span line sag will be calculated at an ambient temperature of 130 degrees Fahrenheit under maximum load conditions.

Structure design, material, and fabrication will be in accordance with the minimum loading requirements of GO 95 Class H Circuit with Grade B construction. In addition, the loading will meet the construction and maintenance practices of Applicant and standards of GO 95, Section III, Rules 37, 38, and 39, and Section V. The structures will be designed to withstand simultaneous vertical, transverse, and

longitudinal loads, with the applied overload factors, without failure or permanent deformation of the structure members. The Light Loading District condition with no ice, and 8 pounds per square foot wind on pole surface at 25°F, as specified in GO 95, Section IV, will be considered for structure design.

The 220-kV circuits will use one 1,033 Thousand Circular Mil, Aluminum Conductor Steel Reinforced (ACSR) "Ortolan" conductor with a nominal ampacity rating of 1,021 amps (25 degrees Celsius [°C] ambient, 75°C conductor temperature, and 1.4 miles per hour wind speed). The following tension limits specified by GO 95, Section IV, Rule 43, will be applied for the calculation of structure loads and wire sagging:

Table 3.2-1
Wire Tension Limits

Load Case	Wire Tension Limits (% RBS)
25°F, No Ice, 8 pounds per square foot wind (Heavy Loading), Initial	50
60°F, No Ice, No Wind, Final	25
60°F, No Ice, No Wind, Initial	35

Notes:
If deemed necessary by Applicant and transmission line engineering, these tensions limits could be modified on a case-to-case basis.
RBS = rated breaking strength

3.2.2 Conductors

The 220-kV circuits will use one 1,033 Thousand Circular Mil, ACSR "Ortolan" conductor with a nominal ampacity rating of 1,021 amps (25°C ambient, 75°C conductor temperature, and 1.4 miles per hour wind speed).

3.2.3 Foundations

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

3.2.4 Ground Wires

Two ground wires will be installed on the 220-kV structures. A 0.5-inch extra high strength steel ground wire will be used, unless one of the ground wires is replaced by an optical ground wire of approximately the same diameter. The optical wire will be used, as necessary, to meet any communication requirements between P3 and the SCE switchyard.

3.2.5 Switchyard

P3 will interconnect with the existing SCE 220-kV switchyard that is adjacent to P3 and MGS sites. The CTG unit will connect to the switchyard via a GSU transformer.

It is anticipated that SCE will provide one 220-kV SF_6 breaker which will replace one of the existing oil-filled breakers in the switchyard currently being used by MGS Units 1 and 2.

3.2.6 Transformers

The generator will be connected to the 220-kV switchyard through the main step-up transformer. The step-up transformer will be designed in accordance with American National Standards Institute standards

C57.12.00, C57.12.90, and C57.91. The main transformer will be two-winding, delta-wye, ONAN/ ONAF/ONAF. The neutral point of high voltage (HV) winding will be solidly grounded. The main step-up transformer will have metal oxide surge arrestors connected to the HV terminals and will have manual de-energized ("no-load") tap changers located in HV windings.

The auxiliary power to the plant will be provided by an 18.0-kV to 4.16-kV unit auxiliary transformer connected to 4.16-kV medium voltage combination switchgear/motor controller unit.

A circuit breaker from the 4.16-kV switchgear will feed a 4.16-kV, 480-volt transformer, which will feed a 480-volt Motor Control Center (MCC). The MCC will service all 480-volt AC, 3-phase and single-phase loads (motors, transformers, etc.).

The HV side (18.0-kV) of the unit auxiliary transformer will be connected to the output of the CTG.

3.3 CONSTRUCTION

Construction of the interconnection line between the SCE switchyard and P3 will be undertaken by the EPC contractor for P3 or other specialized contractor. Final connection to the SCE switchyard will be provided by SCE.

Construction of the interconnection will be entirely on the P3 site, the MGS site, and the SCE switchyard and will not disturb any offsite areas. No offsite transmission system upgrades are required.

3.4 TRANSMISSION SYSTEM OPERATION AND MAINTENANCE

Applicant will own, operate, and maintain the transmission lines up to the point of interconnection with SCE's switchyard. SCE will own, operate, and maintain the facilities within the switchyard. Transmission system operation and maintenance are described below. Transmission line safety and nuisance is addressed in Section 3.6.

3.4.1 Inspections

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

3.4.2 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.

3.4.3 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.

3.4.4 Transmission System Reliability Criteria

The North America Electric Reliability Council and the Western System Coordinating Council Reliability Criteria for Transmission System Planning, the Industry Standards Organization, and the SCE Reliability Criteria have been used in the evaluation of the transmission system.

3.5 GENERATION INTERCONNECTION PROCESS

In January 2015, Applicant submitted a Generation Unit Repowering request to the CAISO for P3. The proposed 262-megawatt (MW) (nominal net) P3 repowering project will replace the existing 430 MW from MGS Units 1 and 2 that will be retired by the completion of commissioning of P3.

In December 2013, Applicant had submitted a Generation Unit Repowering request for a potential 300-MW LMS-100 configuration. The CAISO and SCE completed their assessment of the repowering project, and determined that the total capability and electrical characteristics are substantially unchanged in comparison to the existing MGS, and in accordance with Section 25.1 of the ISO tariff; therefore, the project can forgo the interconnection queue process. The 2014 CAISO letter and Repowering Request Technical Review are included in Appendix B-1.

On April 28, 2014, the Applicant signed the Facilities Study Agreement for SCE to perform a Facilities Study to further define scope, cost, and schedule of Interconnection Facility upgrades that may be needed to support the repower project, so that the scope of these upgrades, if needed, can be included in the Interconnection Agreement. See Appendices B-1 through B-3 for the Facilities Study Agreement and proof of payment.

The revised Generation Unit Repowering request submitted in January 2015 amended the repowering project from a 300-MW LMS-100 configuration to the currently proposed 262-MW GE 7HA.01 simple-cycle generation facility. The total capability and electrical characteristics of the proposed P3 are essentially the same or less (262 MW instead of 300 MW) than the originally submitted repowering project. It is anticipated that SCE will complete the Facilities Study in the second quarter of 2015.

3.6 TRANSMISSION LINE SAFETY AND NUISANCE

3.6.1 Electric and Magnetic Fields

The electrical transmission interconnection and other electrical devices that will be constructed as part of the project emit electromagnetic fields (EMF) when in operation. These fields are typically measured near ground level, where they are encountered by people. EMF fields, to the extent they occur, could impact receptors on the properties adjacent to the project site.

The P3 and transmission interconnection will be located entirely within the P3 and MGS properties and the SCE switchyard. There are no receptors adjacent to the P3 site. Site access is restricted and will be limited to station workers, incidental construction and maintenance personnel, other company personnel, regulatory inspectors, and approved guests. Because access will not be available to the general public, general public exposure to EMF is not expected to occur from P3 or the transmission facilities to be constructed as part of the project.

3.6.2 Audible Noise and Radio/Television 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, 115- to 345-kV, EPRI, 1978). The Transmission Line Reference Book, 115- to 345-kV, notes that the noise produced by a conductor attenuates (decreases) by 2 to 3 decibels 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 approximately 2,500-foot distance from the short transmission interconnection line to the nearest residence.

Many factors contribute to the pre-project ambient noise levels in the plant area. The project's single 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.

3.6.3 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 project's transmission lines will be negligible above ground, and because the line will be constructed in conformance with the requirements of CPUC GO 95 and Title 8 California Code of Regulations (CCR) 2700, hazardous shocks are highly unlikely to occur as a result of the project's construction and operation.

3.6.4 Fire Prevention

P3 will comply with Title 14, CCR, Section 1250, Article 4, which establishes fire prevention standards for electric power generation facilities.

3.6.5 Conclusion

No significant EMF mechanisms have been identified within a typical power plant facility that could potentially disrupt or otherwise interfere with communications or other electromagnetic 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 EMF interference problems. Electrical interconnection facilities will be located entirely within the P3 and MGS sites and the SCE switchyard. Access to these areas will be generally limited to power plant and substation employees, incidental construction and maintenance personnel, other employees, and regulatory inspectors. Because access to the general public is not anticipated, general public exposure to EMF is not expected to occur.

3.7 TRANSMISSION LINE AGREEMENTS AND NECESSARY APPROVALS

The project to be certified includes the transmission line up to the first point of interconnection with the transmission system at the SCE switchyard. For this project, the portion of the transmission lines from the GSU transformers on the project site to SCE's switchyard are tie lines that will be designed, constructed, and operated by Applicant. No regulatory approvals other than California Energy Commission (CEC) certification and approvals obtained through the CAISO large generator interconnection process should be necessary.

3.8 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

A description of the laws, ordinances, regulations, and standards (LORS) that pertain to the transmission system interconnection is included in Table 2.13-1 and discussed below.

3.8.1 Federal Authorities and Administering Agencies

47 U.S. Code § 15.25. This authority requires mitigation for any device that causes communications interference.

The administering agency for the above authority is the Federal Aviation Administration.

3.8.2 State Authorities and Administering Agencies

California Public Resources Code §25000 et seq., Warren-Alquist Act, §25520 Subdivision (g). This authority requires a detailed description of the transmission line, including all rights-of-way.

The administering agency for the above authority is the CEC.

GO 52 CPUC. This authority requires the prevention or mitigation of any inductive interference caused by the transmission lines.

The administering agency for the above authority is the CPUC.

GO 95 CPUC. This authority establishes rules and guidelines for transmission line construction.

The administering agencies for the above authority are the CPUC and CEC.

3.8.3 Local Authorities and Administering Agencies

The County General Plan describes general policies regarding energy development in the county.

The administering agency for the above authority is the County Planning and Community Development Department.

3.8.4 Industry Codes and Standards

Radio and Television Interference Criteria. Criteria are established to determine whether any mitigation is necessary.

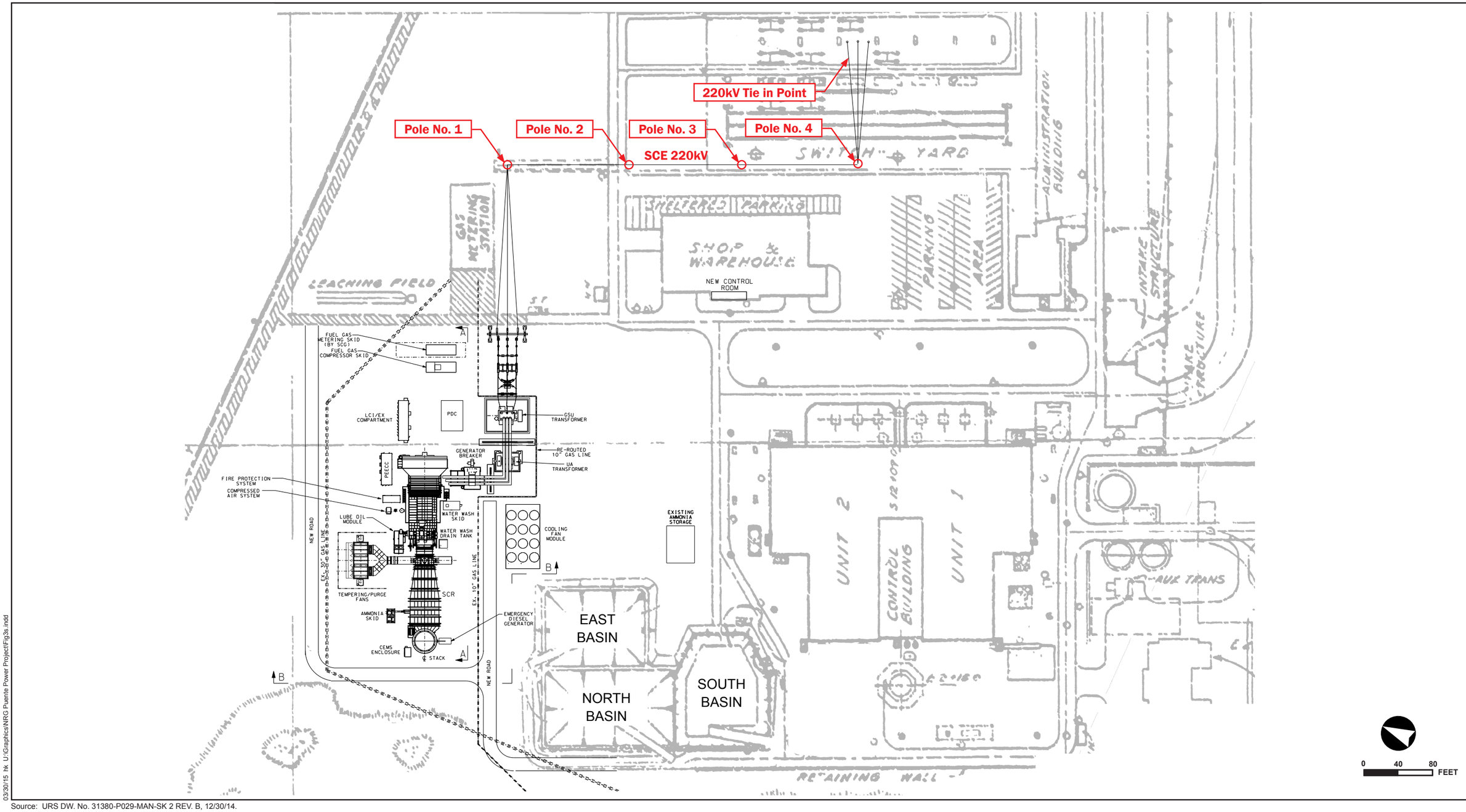
The administering agency for the above authority is the CEC.

3.8.5 P3 Compliance with Transmission Line Safety and Nuisance LORS

The P3's design will comply with all audible noise, communication interference, and hazards LORS.

3.9 INVOLVED AGENCIES AND AGENCY CONTACTS

A list of agencies and agency contacts that pertain to the transmission system is included in Section 2.14 in Chapter 2.



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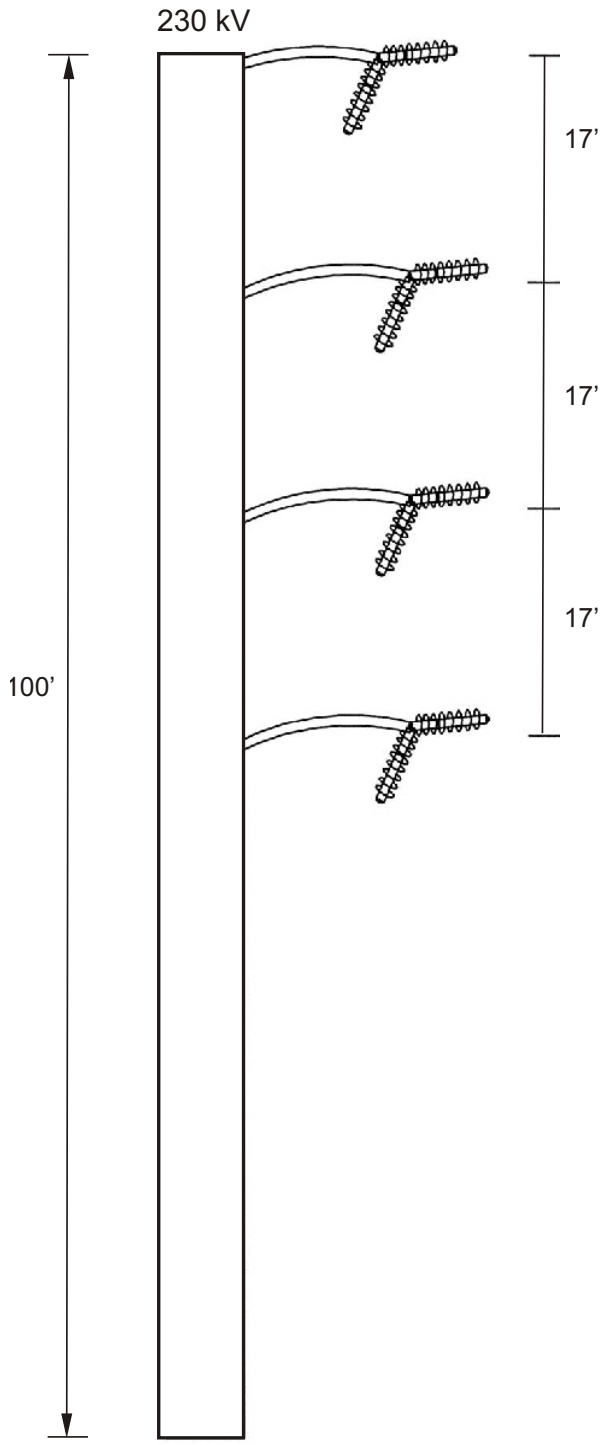
ELECTRICAL INTERCONNECTION TO THE SCE SWITCHYARD

NRG
Puente Power Project
April 2015 Oxnard, California

FIGURE 3-1



Single Circuit Pole

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TYPICAL HIGH VOLTAGE POLE

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FIGURE 3-2