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4 Engineering

In accordance with California Energy Commission (CEC) requirements, this section presents information related to the design and engineering of the Vaca Dixon Power Center Project (Project). The proposed Project includes BESS facilities south of I-80, and co-located gen-tie facilities to the north with interconnection points on the PG&E parcel.

4.1 Facility Design

4.1.1 Site Conditions

This section summarizes the Project site conditions based on information detailed in Section 5.13, *Water Resources*, Section 5.14, *Soils*, and Section 5.16, *Geological Hazards and Resources*.

As discussed in Section 5.13, *Water Resources,* the Project is not located in a flood hazard area. In addition, as discussed in Section 5.16, *Geological Hazards and Resources,* no known faults have been mapped through the Project Site and the closest active faults to the Project Site are within the Rio Vista Fault Zone and Great Valley Thrust Fault System, located approximately 4 miles southwest of the Project area. The Project area is located in Seismic Zone 3, as defined by the most recent California Building Code (CBC), which requires specific seismic design standards. As discussed in Section 5.14, *Soils*, the Project Site is not mapped within a known liquefaction zone on the California State Geoportal, CGS Seismic Hazards Program Liquefaction Zones map and according to the Solano County General Plan, the Project Site has a low potential for liquefaction. In addition, the soils that predominately underlie the Project Site have low shrink-swell classes. The Project Site is relatively flat and not subject to landslide risk. Refer to Section 5.14, *Soils*, and Section 5.16, *Geological Hazards and Resources*, for additional information regarding soils and geological hazards, respectively.

A Project-specific geotechnical engineering report will be used to inform and finalize the facility design criteria. Project construction would adhere to the specifications, procedures, and site conditions contained in the geotechnical report and final design plans, which would be fully compliant with the seismic recommendations provided by the California-registered professional engineer in accordance with CBC requirements.

4.1.2 Improvement Measures

Project construction would adhere to the requirements and specifications contained in the geotechnical report and final design plans, which would be fully compliant with the seismic recommendations provided by a California-registered professional engineer in accordance with CBC requirements.

4.1.3 Foundation Design

Battery containers, PCS enclosures, and major electrical equipment such as transformers would be installed on piers, piles, spread footings, and/or mat foundations during the initial Project installation. The foundation type(s) selected during final design would be strong enough to support the weight of the equipment in accordance with the manufacturer's design requirements.

4.1.4 Facility Description

Chapter 2, *Project Description*, provides a description of the Project. The Project would include battery containers, a medium voltage power collection system, main power transformer, high voltage equipment, and gen-tie line to the interconnecting substation. Drawings with dimensions, where available, are provided in Appendix C. The Project is not a power generation system. Battery enclosures would include an integrated thermal management system that provides active cooling and heating to the internal components; therefore, an external heating, ventilation, and air conditioning (HVAC) or thermal system would not be required. The thermal system would include radiators and pumps that circulate coolant through the battery enclosure. Atmospheric emission control systems, waste disposal systems, geothermal resource conveyance and re-injection lines are not applicable to the BESS. Noise emissions are discussed in Section 5.3, *Noise*.

4.2 Transmission System Design

4.2.1 Need and Junction Points

The Vaca Dixon BESS is proposed to connect to the existing 13.8/115 kV generation step up (GSU) transformer at the existing CalPeak Power - Vaca Dixon Peaker Plant (VDPP) on the PG&E parcel via a new overhead 13.8 kV line from the proposed BESS switchyard to the low side of the VDPP GSU transformer to the north. The existing GSU transformer in the VDPP switchyard is connected to the PG&E substation by an existing 115 kV line. The Arges 400 MWh BESS would interconnect to the PG&E substation via a new overhead 115 kV gen-tie to be constructed from the Arges 400 MWh BESS switchyard at the BESS Project area south of I-80 to the PG&E substation to the north.

The proposed gen-tie components for the Vaca Dixon 57 MWh and Arges 400 MWh BESS facilities would be co-located on shared transmission structures carrying both 13.8 kV and 115 kV conductors for approximately 1,500 feet of the gen-tie lengths, from the vicinity of the BESS switchyards across I-80 and up to the northwest corner of the VDPP facility site. From that point, the 13.8 kV gen-tie component for the Vaca Dixon 57 BESS would continue approximately 150 feet to the east for connection to the low side of the 13.8/115 kV GSU transformer at the VDPP. The Arges 400 MWh 115 kV gen-tie continues approximately 725 feet north and east to the connection point at the PG&E Vaca-Dixon Substation.

4.2.2 Transmission System Safety and Nuisance

BESS facilities generally produce low electric and magnetic fields (EMF) as the equipment is largely enclosed in steel containers that would contain the fields, as well as connected via underground cables where the close phase spacing reduces EMF to extremely low values at any significant distance. The greatest EMF would occur at the Arges 400 MWh BESS switchyard and from the overhead 115 kV transmission tie line. This 115 kV line would be located above numerous existing 69 kV and 34.5 kV lines on the PG&E parcel. The number of lines, the directionality of power flow, magnitude of load, and other factors will significantly impact if this line is additive or subtractive to the existing fields; however, beyond the crossing of the existing lines, the EMF change from this new line will be insignificant.

Transmission and distribution lines at 115 kV and below generally do not produce significant radio or television interference due to corona activity which can be seen at higher voltages. Loose hardware could produce gap discharge resulting in some level of radio interference; however,

proper construction and maintenance will avoid this, and it is again unlikely this new line would significantly contribute to any existing radio or television interference beyond the Project Site. Inverter equipment associated with the BESS facilities can produce some radio interference, but the inverters are shielded (contained in steel enclosure) and radio interference is anticipated to be insignificant.

4.3 Reliability

4.3.1 Fuel Availability

Fuel availability is not applicable because battery storage projects do not rely on a fuel source. Excess energy is stored and discharged without the need for a supporting fuel source outside of station auxiliary power.

4.3.2 Facility Reliability

The Project would be designed to be available to operate at its full load at least 98 percent of the time. The Project is expected to have a design life of approximately 35 years. Battery enclosures for the Project will undergo specific factory testing and laboratory testing to adhere to all applicable installation standards. The BESS enclosures would include internal heating, ventilation, and air conditioning (HVAC) and internal fire detection and fire suppression systems in each enclosure. The internal HVAC systems would allow the battery enclosures to function properly in temperatures ranging from approximately -13 degrees Fahrenheit to approximately 131 degrees Fahrenheit. These enclosures would also include a battery management system which monitors battery voltage, current, temperature, security, fault diagnosis and management, and external communication with the power conversion system.

Redundant site controllers would be installed for site communications and control redundancies. Battery control equipment will have Uninterruptable Power Supplies (UPS) with backup power sources to minimize equipment downtime from maintenance activities or unexpected events. Operation and maintenance procedures would be consistent with manufacturer and industry standard practices to maintain the useful life of the components.

4.4 Efficiency

It is anticipated that the Vaca Dixon 57 MWh BESS component would operate a single charge/discharge cycle per day for one hour. The Arges 400 MWh BESS component would operate a single charge/discharge cycle per day for four hours per day.

Additionally, the Project's strategic location in proximity to the Vaca-Dixon Substation minimizes the distance that energy needs to travel for charging and discharging into the grid.

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