

5.18 Corona and Induced Current Effects

5.18.1 Environmental Setting

Corona

One of the phenomena associated with all energized electrical devices, including high-voltage transmission lines, is corona. The localized electric field near a conductor can be sufficiently concentrated to ionize air close to the conductors. This can result in a partial discharge of electrical energy called a corona discharge, or corona. The corona effect is the physical manifestation of discharged electrical energy into very small amounts of sound, radio noise, heat, and chemical reactions with air components. It is a phenomenon associated with all energized electrical devices but is especially common with high-voltage power lines.

The amount of corona produced by a power line is a function of line voltage, conductor diameter, conductor locations in relation to each other, power line elevation above sea level, condition of conductors and hardware, and local weather conditions. Corona typically becomes a design concern for power lines 230 kV and higher (i.e., transmission lines). It is less noticeable for lines that are operated at lower voltages (i.e., subtransmission and distribution-sized lines). The electric field gradient is greatest at the conductor surface. Larger-diameter conductors have lower electric field gradients at the conductor surface and, therefore, lower corona noise than smaller-diameter conductors.

Induced Currents

Electric currents can be induced in metallic objects located within the electric fields created by power lines. An electric current can flow when an object has an induced charge and a path to ground is present. The amount of induced current that can flow is important to evaluate from a safety perspective because of the potential for electrical shocks to people and the possibility of electric arcs that could form across small gaps between conductive surfaces and ignite flammable materials in the vicinity of the arc.

From a safety perspective, the National Electrical Safety Code (NESC) specifies that transmission lines be designed to limit short circuit current from vehicles or large objects near the line to no more than 5 milliamperes (mA). The California Public Utilities Commission (CPUC) General Order 95, Rules for Overhead Electric Line Construction Section 35, covers all aspects of design, construction, operation, and maintenance of electrical power lines and fire safety hazards. The Public Utilities Code, CPUC General Order 95, and the NESC also address shock hazards to the public by providing guidelines on minimum clearances to be maintained for practical safeguarding of persons during the installation, operation, or maintenance of overhead transmission lines and their associated equipment.

5.18.2 Environmental Impacts and Assessment

The CEQA Guidelines do not provide significance criteria for evaluating impacts from corona or induced current effects. Corona and induced current from high-voltage power lines can cause environmental impacts through:

- Audible noise
- Radio and television interference
- Computer interference
- Disturbance of cardiac pacemakers
- Ignition of flammable materials

The Proposed Project involves construction of the new Banducci Substation, construction of two new 66 kV subtransmission line segments that would loop the existing Correction-Cummings-Kern River 66 kV line, construction of three new underground 12 KV distribution getaways, and installation of telecommunications facilities to connect the proposed new substation to SCE's existing telecommunications system. The audible corona noise level caused by the 66 kV power line was not quantified. However, circuits operating at 66 kV typically cause noise at levels comparable to the ambient baseline noise levels for agricultural and rural-residential land use, which as noted in Section 5.12 (Noise), would be approximately 30 dBA. At this level, the impact of audible noise from the corona effect would be less than significant.

Although corona can generate high frequency energy that may interfere with broadcast signals or electronic equipment, this is generally not a problem for transmission lines. The Institute of Electrical and Electronic Engineers (IEEE) has published a design guide (IEEE, 1971) that is used to limit conductor surface gradients so as to avoid corona levels that would cause electronic interference. Corona or gap discharges related to high frequency radio and television interference impacts are dependent upon several factors, including the strength of broadcast signals, and are anticipated to be very localized if they occur. Individual sources of adverse radio/television interference impacts can be located and corrected on the power lines. Conversely, magnetic field interference with electronic equipment such as computer monitors can be corrected through the use of software, shielding or changes at the monitor location. As a result, impacts from corona, radio/television interference, and magnetic field interference would be less than significant.

Induced currents and voltages on conducting objects near the proposed power lines would not pose a threat in the environment if the conducting objects are properly grounded. Project construction and operation would meet or exceed General Order 95 standards and work would be done in accordance with SCE's safety practices. Likewise, induced currents would not significantly increase the risk of fuel ignition in the area.

The electric fields associated with the Proposed Project's subtransmission lines may be of sufficient magnitude to impact operation of a few older model pacemakers resulting in them reverting to an asynchronous pacing (IEEE, 1979). Substantial adverse effects would not occur with prolonged asynchronous pacing; periods of operation in this mode are commonly induced by cardiologists to check pacemaker performance. Therefore, while the transmission line's electric field may impact operation of some older model pacemakers, the result of the interference would be of short duration and is not considered significant or harmful. No mitigation measures would be required or recommended.