Audible Noise Performance

for the Construction Activities
Associated with the

Energia Sierra Juarez U.S. Gen-Tie Alternative Project

in

San Diego County, California
Application No. MUP 09-008
KIVA 09-0107420

Prepared for:
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Energia Sierra Juarez U.S. (ESJ U.S.) Transmission Gen-Tie Alternative Project
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Project No. 52573

Project Description

Energia Sierra Juarez (ESJ) U.S. Transmission, LLC, proposes the construction, operation and maintenance of a less than one-mile electric generator-tie line (Gen-Tie) from the Mexico border to a proposed East County Substation (ECO Substation) adjacent to the South West Power Link (SWPL) 500 kV gen-tie line in Eastern San Diego County. The ECO Substation will be permitted, constructed and operated by San Diego Gas and Electric (SDG&E). In August of 2009, SDG&E submitted a Proponents Environmental Assessment (PEA) with the proposed "ECO Substation" location. Subsequently, SDG&E proposed an "ECO Substation Alternative" that was located approximately 100 meters to the northeast. Therefore, two sets of gen-tie routes for the ESJ Gen-Tie Project are proposed. The "ESJ Gen-Tie" route consists of Routes A1 and A2. The "ESJ Gen-Tie Alternative" route consists of Routes D1 and D2. Each set consists of a single circuit 500 kV line (Route A1 or Route D1) or double-circuit 230 kV lines (Route A2 or Route D2) supported on three to five 150- to 170-foot steel monopoles or three to five 150-foot tall steel lattice towers (total line capacity would be 1,250 MW for either alternative).

A noise analysis was previously developed and submitted to the County of San Diego for Routes A1 and A2. This report examines the audible noise performance for the ESJ Gen-tie Alternative Project (Routes D1 and D2) located in San Diego County, California. This report has been developed for ESJ U.S. by Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) as a requirement of the application for a San Diego County Major Use Permit (MUP).

Audible Noise Performance

Corona is a phenomenon associated with all energized transmission lines. Under certain conditions, the localized electric field near an energized conductor can be sufficiently concentrated to produce a tiny electric discharge that can ionize air close to the conductors. This partial discharge of electrical energy is called corona discharge, or corona. Several factors, including conductor voltage, diameter, and surface irregularities such as scratches, nicks, dust, or water drops can affect a conductor's electrical surface gradient and its corona performance. Corona is the physical manifestation of energy loss, and can transform discharge energy into very small amounts of sound, radio noise, heat, and chemical reactions.

Transmission lines can generate a small amount of sound energy during corona activity. This audible noise from the line can barely be heard in fair weather conditions on higher voltage lines, and is typically immediately near the structure. During wet weather conditions, water drops collect on the conductor and increase corona activity so that a crackling or humming sound may be heard near the line. This noise is caused by small electrical discharges from the water drops.

The corona performance of the proposed project was predicted using the Corona and Field Effects Program (CORONA) developed by the Bonneville Power Administration (BPA, 1977). Corona performance is calculated using empirical equations that have been developed over several years from the results of measurements on numerous high-voltage lines. Of the methods available for predicting radio interference levels, the BPA empirical equivalent method agrees most closely with long-term data. Important input parameters to the computer program are voltage, current, conductor size, and geometric configuration on the line.

Because corona is a statistical phenomenon, corona computations are made under conditions of average operating voltage and for average line height. Corona is basically a foul-weather phenomenon, and is characterized by exceedence levels, typically L_5 and L_{50} foul weather levels. The L_{50} value is the level exceeded for 50% of the time. It is statistically the mid-point of the noise readings, and is most commonly used for audible noise evaluation.

Using the BPA CORONA program, audible noise values were calculated for the ESJ U.S. Gen-Tie lines under foul weather conditions. This project is zoned S92, so the levels were compared to the San Diego County Noise Ordinance, Section 36.404. The audible noise limit is a one-hour average daytime sound level limit of 50 dBA in daytime and a nighttime sound level limit of 45 dBA at the property line.

Table 1 shows a summary of the results for both the 500kV single-circuit configuration and the 230kV double-circuit configuration at various receptor locations. This modeling indicates that, during wet weather conditions for the 500kV configuration, conductor selection is a factor concerning the audible noise level limit. A 2-conductor 2156 kcmil Bluebird configuration, Line Configuration A, and a 3-conductor 795 kcmil Drake configuration, Line Configuration D, both meet the criteria, but a single Bluebird or a 2-conductor 954 kcmil Cardinal configuration do not.

TABLE 1
Foul Weather Noise Analysis Results

			Audible Noise Level (dBA)					
Receptor No.	Location	Line Configuration -->	A	B	C	D	E	F
1	On 230kV Centerline		--	--	--	--	17.9	23.6
2	On 500kV Centerline		52.8	69.1	60.1	49.4	--	--
3	On Access Road 375 ft from 230kV 625 ft from 500kV		42.3	58.6	49.5	38.9	9.8	15.1
4	On Access Road 800 ft from 230kV 1050 ft from 500kV		39.0	55.4	46.2	35.6	6.6	12.2
5	On East Property Line 1000 ft from 230kV 775 ft from 500kV		41.0	57.3	48.2	37.6	5.2	10.6
6	On West Property Line 1100 ft from 230kV 1300 ft from 500kV		38.0	54.3	45.2	34.6	4.7	10.3
7	Edge of 230kV ROW 65 ft from Centerline		--	--	--	--	16.7	22.3
8	Edge of 500kV ROW 107 ft from Centerline		49.7	66.0	57.0	46.3	--	--
9	On West Property Line 1750 ft from 230kV 1850 ft from 500kV		36.4	52.7	43.8	33.1	2.5	8.1

Line Configuration	Line Description	Conductor Configuration
A	500kV Single-Circuit	(2) Bluebird
B	500kV Single-Circuit	(1) Bluebird
C	500kV Single-Circuit	(2) Cardinal
D	500kV Single-Circuit	(3) Drake
E	230kV Double-Circuit	(2) Bluebird
F	230kV Double-Circuit	(2) Finch / ACSS

Corona and audible noise are usually not a design issue for transmission lines at 230kV or below. Either 230kV conductor configuration will meet the audible noise criteria.

Conclusions

Audible noise decreases with distance from the proposed transmission line. The proposed transmission line is located in open country, away from residences, businesses, and other receptors. During most of the year, in fair weather, the audible noise level at the edge of the right-of-way will not exceed 28 dBA. Due to all of these factors, impacts from corona noise should not be significant with the correct conductor selection.

A 3-conductor bundle 795 kcmil ACSR Drake has been selected for the 500kV ESJ U.S. Gen-Tie line. A 2-conductor bundle 1113 kcmil ACSS Finch has been selected for the 230kV ESJ U.S. Gen-Tie lines.

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Energía Sierra Juárez U.S. Transmission, LLC. San Diego County, United States