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Audible Noise Performance for the Construction Activities Associated with the Energia Sierra Juarez U.S. Gen-Tie Project in San Diego County, California (October 2009)

Audible Noise Performance

**for the Construction Activities
Associated with the**

Energia Sierra Juarez U.S. Gen-Tie Project

in

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

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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

| Receptor No. | Location | Line Configuration --> | Audible Noise Level (dBA) | | | | | |
|--------------|---|------------------------|---------------------------|------|------|------|------|------|
| | | | 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 700ft from 230kV 1300ft from 500kV | | 38.0 | 54.3 | 45.2 | 34.6 | 6.9 | 12.5 |
| 4 | On Access Road 1400ft from 230kV 2000ft from 500kV | | 35.8 | 52.1 | 43.1 | 32.4 | 3.5 | 9.1 |
| 5 | On East Property Line 1500ft from 230kV 1100ft from 500kV | | 38.8 | 55.1 | 46.0 | 35.4 | 3.2 | 8.8 |
| 6 | On West Property Line 2200ft from 230kV 3000ft from 500kV | | 33.8 | 50.1 | 41.1 | 30.4 | 1.3 | 6.9 |
| 7 | Edge of 230kV ROW 65ft from Centerline | | -- | -- | -- | -- | 16.7 | 22.3 |
| 8 | Edge of 500kV ROW 107ft from Centerline | | 49.7 | 66.0 | 57.0 | 46.3 | -- | -- |

| 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 is an acceptable configuration for the 500kV ESJ U.S. Gen-Tie line. Either conductor configuration will meet the audible noise criteria for the 230kV ESJ U.S. Gen-Tie line.

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Energía Sierra Juárez

Energía Sierra Juárez
U.S. Transmission, LLC.

San Diego County
United States

Gen Tie Line

- 230 kV
- 500 kV
- ECO Substation

US Landowners

- Parcels
- Road



○ = NOISE RECEPTOR LOCATION



Map Ref: US_ECO_Sub_Bs_20091102
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