



# MAINE POWER RELIABILITY PROGRAM

A CENTRAL MAINE POWER COMPANY PROGRAM

## ORRINGTON, MAINE UPDATE TO: APPLICATION FOR SITE PLAN REVIEW

**Section 254 Transmission Line Construction  
Section 3023 Transmission Line Construction  
Section 388 Transmission Line Construction  
Orrington Substation Improvements**

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**UPDATED EXHIBIT 2**  
**Project Mapping**

**Project Scope and Natural Resources Maps**  
(Revised 04/30/10)

**UPDATED EXHIBIT 4**  
**Range in Transmission Line Support Heights in the Town of**  
**Orrington, Maine**  
(Revised 04/30/10)

**Maine Power Reliability Program  
Town of Orrington**

**Aboveground Height of Proposed Transmission Line Supports\***

\*Includes transmission corridor H-Frame and monopole supports only. Supports within the Orrington Substation fence line are not included in this summary.

<b>Section 254</b>	
<b>Aboveground Height (ft)</b>	<b>Number Of New H-Frame/Monopole Supports</b>
41 - 50	2
51 - 60	15
61 - 70	23
71 - 80	4
81 - 90	6
<b>Total</b>	<b>50</b>

<b>Section 3023</b>	
<b>Aboveground Height (ft)</b>	<b>Number Of New H-Frame Supports</b>
71 - 80	5
81 - 90	1
<b>Total</b>	<b>6</b>
Note: The remaining Section 3023 supports are existing H-Frames.	

<b>Section 388</b>	
<b>Aboveground Height (ft)</b>	<b>Number Of New H-Frame Supports</b>
61 - 70	3
71 - 80	14
81 - 90	20
91 - 100	4
101 - 110	3
111 - 120	3
<b>Total</b>	<b>47</b>

**AUDIBLE NOISE MODELING  
AND EVALUATION METHODOLOGY**

**(Excerpted from: “EMF and Audible Noise Modeling: Maine Power Reliability Program”)**

## Audible Noise

AN results from the partial electrical breakdown of the air around the conductors of a transmission line. In a small volume near the surface of the conductors, energy and heat are dissipated. Part of this energy is in the form of small local pressure changes that result in AN. This AN can be characterized as a hissing, crackling sound that may be accompanied by a 120-Hz hum. The conductors of 345-kV transmission lines are designed to be free of AN under ideal conditions. However, protrusions on the conductor surface—particularly water droplets on or dripping off the conductors—cause the electric field intensity at the conductor surface to exceed the breakdown strength of air, producing AN. Therefore, audible noise from transmission lines is generally a foul-weather (wet-conductor) phenomenon. Wet conductors can occur during periods of rain, fog, snow, or ice.

The amplitude of a sound wave is the incremental pressure resulting from sound above atmospheric pressure. The sound-pressure level is the fundamental measure of AN; it is generally measured on a logarithmic scale with respect to a reference pressure. The sound-pressure level (SPL) in decibels (dB) is:

$$\text{SPL} = 20 \log_{10} (P/P_0)\text{dB}$$

where  $P$  is the effective rms (root-mean-square) sound pressure and  $P_0$  is the reference pressure of 20 micropascals ( $\mu\text{Pa}$ ). The human response depends on frequency, with the most sensitive range roughly between 2000 and 4000 Hz. The frequency-dependent sensitivity is reflected in various weighting scales for measuring AN. The A-weighted scale weights the various frequency components of a noise in approximately the same way that the human ear responds. In this report, AN levels are expressed in decibels on the A-weighted scale (dBA) as L50 values, which are the sound-pressure levels exceeded 50 percent of the time. Foul-weather AN levels for MPRP in dBA units weighted by the sensitivity of the human ear were calculated using computer algorithms developed by the BPA. Fair weather levels were calculated by the subtraction of 25 dBA from the calculated foul-weather values as recommended by the BPA.<sup>6</sup>

An altitude of 2,000 feet was used for all sections in the calculation and an assumed height of a sound receiver of five feet. At lower altitudes the levels of AN will be lower.

### **Audible Noise Levels Associated with Common Sources**

Comparisons of the relative sound intensity of measurements expressed in dB are sometimes difficult for people to understand. An increase in the sound intensity by a factor of 10 increases the decibel rating by adding 10 dB. Increasing the sound intensity by a factor of 100 increases the decibel rating by adding 20 dB. The threshold of hearing for the average human is approximately 20 microPascals (20 millionths of a Pascal – a Pascal is a unit of sound intensity that is power per area squared). The *perceived* loudness of a sound, however, is not linearly proportional to the intensity of the sound. The ear perceives a tenfold increase in the sound intensity as much less than a tenfold increase in the sound level. The human ear requires almost a doubling of the sound intensity (3 dB) in order to perceive a noticeable increase or just-noticeable-difference (JND) in the loudness of the sound. The range of AN levels from the threshold of hearing to the threshold of pain is provided in Table 2. The sound pressure level in

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<sup>6</sup> Bonneville Power Administration (BPA). 1991. Corona and Field Effects Computer Program.

Pascals, the noise level in dBA, and examples of various noise levels are also provided in the table.

**Table 2. Examples of Audible Noise Levels\***

Sound Pressure	dBA	Condition
	140	
<i>100 Pa</i>	134	Threshold of Pain
	130	
		Pneumatic Wood Chipper; Jackhammer
	120	
<i>10 Pa</i>	114	Loud Auto Horn (~ 3'); Rock Concert
	110	
	100	
<i>1 Pa</i>	94	Inside Subway Train (NY)
	90	
		Inside Bus
	80	
<i>100 milli-Pa</i>	74	Traffic on Street Corner
	70	
		Conversational Speech
	60	
<i>10 milli-Pa</i>	54	Typical Business Office
	50	
		Suburban Living Room
	40	
<i>1 milli-Pa</i>	34	Quiet Library
	30	
		Quiet Bedroom at Night
	20	
<i>100 micro-Pa</i>	14	Broadcast Studio
	10	
<i>20 micro-Pa</i>	0	Threshold of Hearing

\*Adapted from EPRI Transmission Line Reference Book: 345-kV and Above. Palo Alto, CA: EPRI, 1982.

**TABULAR SUMMARY OF  
AUDIBLE NOISE MODELING RESULTS**  
(Excerpted from: “EMF and Audible Noise Modeling: Maine Power Reliability Program”)


Table C-1. Audible noise levels (dbA) in fair and foul weather

Line Section	Configuration	FAIR WEATHER		FOUL WEATHER	
		-ROW edge	+ROW edge	-ROW edge	+ROW edge
XS-1A Segment 10 - Section 67, Pole # 232 (ROW X-section N5-10-1)	existing	< 0 <sup>†</sup>	< 0 <sup>†</sup>	17.0	16.5
	proposed	12.7	16.2	37.7	41.2
XS-1B Segment 10 - Section 67, Pole # 259 (ROW X-section N5-10-1)	existing	< 0	< 0	17.0	16.5
	proposed	12.7	16.2	37.7	41.2
XS-1C Segment 10 - Section 67, Pole # 224(ROW X-section N5-10-1)	existing	< 0	< 0	17.3	16.5
	proposed	12.7	16.2	37.7	41.2
XS-2A Segment 10 - Section 67, Pole # 294(ROW X-section N5-10-2)	existing	< 0	< 0	15.1	18.5
	proposed	12.7	15.7	37.7	40.7
XS-2B Segment 10 - Section 67, Pole # 290(ROW X-section N5-10-2)	existing	< 0	< 0	15.8	18.7
	proposed	11.9	15.0	36.9	40.0
XS-3A Segment 10 - Section 67, Pole # 335 (ROW X-section N5-10-3)	existing	< 0	< 0	17.0	16.5
	proposed	12.7	16.2	37.7	41.2
XS-3B Segment 10 - Section 67, Pole #'s (377,378,397)(ROW X-section N5-10-3)	existing	< 0	< 0	16.9	16.4
	proposed	12.7	16.2	37.7	41.2
XS-4 Segment 19 - Section 102, Pole #'s (49, 50, 58 ,61,62)(ROW X-section S1-E-19-1)	existing	< 0	< 0	< 0	< 0
	proposed	13.9	16.2	38.9	41.2
XS-5 Segment 19 - Section 102, Pole #'s (4,5,6,7,8,9,10,11,12,13,14,15)(ROW X-section S1-E-19-1)	existing	< 0	< 0	< 0	< 0
	proposed	12.8	16.2	37.8	41.2
XS-6 Segment 27 - Section 250, Pole #'s (408,407,406,394) (Row X-section S1-E-27-9)	existing	< 0	< 0	14.1	16.5
	proposed	18.7	15.4	43.7	40.4
XS-7 Segment 27 - Section 250, Pole #'s (339,338,309) (Row X-section S1-E-27-4)	existing	< 0	< 0	14.7	16.4
	proposed	18.7	15.4	43.7	40.4
XS-8 Segment 27 - Section 250, Pole # 199 (Row X-section S1-E-27-2)	existing	< 0	< 0	11.1	15.9
	proposed	16.2	11.7	41.2	36.7
XS-9 Segment 27 - Section 250, Pole #160 (Row X-section S1-E-27-1B)	existing	< 0	< 0	14.3	16.4
	proposed	16.2	10.9	41.2	35.9
XS-13A Segment 15 - Section 212, Pole #'s(116,121,124) (Row X-section N5-15-8)	existing	< 0	< 0	13.4	10.4
	proposed	16.2	14.2	41.2	39.2

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Line Section	Configuration	FAIR WEATHER		FOUL WEATHER	
		-ROW edge	+ROW edge	-ROW edge	+ROW edge
XS-13B Segment 15 - Section 212, Pole # 110 (Row X-section N5-15-8)	existing	< 0	< 0	13.4	10.3
	proposed	15.5	13.5	40.5	38.5
XS-13C Segment 15 - Section 212, Pole #'s (146,151)(Row X-section N5-15-8)	existing	< 0	< 0	11.9	11.3
	proposed	16.2	14.2	41.2	39.2
XS-14 Segment 15 - Section 212, Pole #'s (187,190)(Row X-section N5-15-10)	existing	< 0	< 0	13.3	10.3
	proposed	16.2	14.2	41.2	39.2
XS-15 Segment 15 - Section 212, Pole #'s(229) (Row X-section N5-15-11)	existing	< 0	< 0	13.6	9.1
	proposed	16.2	12.6	41.2	37.6
XS-16 Segment 15 - Section 212, Pole #'s(250) (Row X-section N5-15-14)	existing	< 0	< 0	13.3	10.3
	proposed	16.2	14.2	41.2	39.2
XS-17 Segment 18 - Section 167, Pole # 66 (Row X-Section S1-E-18-2)	existing	< 0	< 0	15.1	10.3
	proposed	9.8	16.2	34.8	41.2
XS-18A Segment 9 - Section 67, Pole # 8(Row-X-Section N5-9-1)	existing	< 0	< 0	14.5	12.9
	proposed	12.7	16.3	37.7	41.3
XS-18B Segment 9 - Section 67, Pole # 16(Row-X-Section N5-9-1)	existing	< 0	< 0	14.4	12.8
	proposed	12.7	16.3	37.7	41.3
XS-19 Segment 9 - Section 67, Pole #'s (17,28,102,105)(Row-X-Section N5-9-2)	existing	< 0	< 0	12.1	8.0
	proposed	12.9	16.1	37.9	41.1
XS-20 Segment 9 - Section 67, Pole #'s (117,122,135,140,145,146) (Row-X-Section N5-9-4)	existing	< 0	< 0	12.1	8.0
	proposed	12.9	16.1	37.9	41.1
XS-21 Segment 1 - Section 388, Pole #'S (363,374) (Row-X-Section N5-1-1)	existing	18.8	18.8	43.8	43.8
	proposed	19.9	21.2	44.9	46.2
XS-22 Segment 1 - Section 388, Pole # 422 (Row-X-Section N5-1-2)	existing	21.0	15.2	46.0	40.2
	proposed	19.9	18.0	44.9	43.0
XS-23A Segment 1 - Section 388, Pole # 472 (Row-X-Section N5-1-3)	existing	18.1	18.2	43.1	43.2
	proposed	19.4	20.8	44.4	45.8

 Brewer Lake Road Crossing

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Fields Pond Road Crossing

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Line Section	Configuration	FAIR WEATHER		FOUL WEATHER	
		-ROW edge	+ROW edge	-ROW edge	+ROW edge
XS-23B Segment 1 - Section 388, Pole # 481 (Row-X-Section N5-1-3)	existing	18.8	18.8	43.8	43.8
	proposed	20.0	21.3	45.0	46.3
XS-24 Segment 3 - Section 203, Pole #'s (281,314) (Row-X-Section N5-3-2)	existing	< 0	< 0	10.2	13.3
	proposed	14.0	16.2	39.0	41.2
XS-25 Segment 39 - Section 229, Pole #91 (Row-X-Section N5-39-4)	existing	< 0	< 0	13.3	13.3
	proposed	< 0	< 0	13.1	12.7
XS-26 Segment 14 - Section 200, Pole # 6 (Row-X-Section N5-14-3)	existing	< 0	< 0	10.0	7.4
	proposed	< 0	< 0	13.3	8.5
XS-27A Segment 24 - Section 219, Pole # 25 (Rox-X-Section S1-E-24-3)	existing	< 0	< 0	13.1	13.8
	proposed	13.1	14.1	38.1	39.1
XS-27B Segment 24 - Section 219, Pole # 64 (Rox-X-Section S1-E-24-3)	existing	< 0	< 0	13.1	13.8
	proposed	13.1	14.1	38.1	39.1

† < 0, i.e. below threshold of hearing