Cassadaga Wind Project

Case No. 14-F-0490

1001.35 Exhibit 35

ELECTRIC AND MAGNETIC FIELDS

EXHIBIT 35 ELECTRIC AND MAGNETIC FIELDS

The information presented in this Exhibit is from the electric and magnetic field (EMF) study prepared for the Cassadaga Wind Project by Main Line Energy Consultants, LLC. The study is included in Appendix GGG.

(a) Every Right-of-way Segment Having Unique Electric and Magnetic Field Characteristics

Seven right-of-way (ROW) segments with unique EMF characteristics were identified in the EMF study. The strength and location of EMFs were modeled on representative areas of each of these segments. Modeling calculations identified existing EMFs and future EMFs that would result from construction and operation of the Facility. The segment containing the overhead 115kV line had separate calculations performed for a small section in which there is a currently existing 115 kV double circuit line. For the purposes of calculations, the ROW is assumed to be 100 feet (50 feet from centerline) for all of the segments. Table 35-1, below, identifies the name and calculation number of each of these segments, as referred to in the EMF study. A map of these segments is provided in EMF study (see Appendix GGG).

Table 35-1. Unique ROW Segments within the Facility

ROW Segment Name	ROW Calculation
(2) Overhead 115kV Line & (1) 34.5kV Line Underbuilt	1
(1) Overhead 115kV Line & (1) 34.5kV Collection Underbuilt	2
(1) Overhead 115kV Line	3
(1) Overhead 115kV Line & (1) 34kV Distribution Line	4
(1) Overhead 34.5kV Line	5
Underground 34.5kV Line (1 through 5 circuits possible; worst case, 3,4, or 5 circuits evaluated)	6
(3) Overhead 34.5kV Lines & (1) 34kV Distribution Line	7

(b) For Each Right-of-way Segment, Base Case and Proposed Cross Sections Showing:

For each of the unique ROW segments identified above in 1001.35(a), the EMF study provides both base case (where existing facilities are present) and proposed cross sections that show, to scale, the following features:

- all overhead electric transmission, sub-transmission, and distribution facilities including the proposed Facility showing structural details and dimensions and identifying phase spacing, phasing, and any other characteristics affecting EMF emissions;
- all underground electric transmission, sub-transmission (i.e., 34.5 kV collection system), and distribution facilities (please note that no new distribution facilities are proposed for the Facility, but all existing distribution facilities have been included in calculations);
- all ROW boundaries; and

- structural details and dimensions for all structures (dimensions, phase spacing, phasing, and similar categories) and an overview map showing locations of structures.

The station numbers associated with each of the seven unique ROW segments and the sheet on which they can be found in the Preliminary Design Drawings are indicated in Table 35-2, below.

Table 35-2. Approximate Station Numbers at Each ROW Segment

ROW Segment Name	ROW Calc Number	Approximate Station Numbers	Preliminary Design Drawings Sheets
(2) Overhead 115kV Line & (1) 34.5kV Line Underbuilt	1	285+00 - 292+00	SW-307
(1) Overhead 115kV Line & (1) 34.5kV Collection Underbuilt	2	0+00 - 47+00	SW-301
		48+00 - 94+00	SW-302
		95+000 - 142+00	SW-303
		143+00 - 183+00	SW-304
		184+00 - 198+00	SW-305
(1) Overhead 115kV Line	3	199+00 - 237+00	SW-305
		238+00 - 284+00	SW-306
(1) Overhead 115kV Line & (1) 34kV Distribution Line	4	10+00 - 67+00	CE-201
		68+00 - 114+00	CE-202
		10+00 - 36+00	CE-208
		39+00 - 77+00	CE-209
(1) Overhead 34.5kV Line	5	10+00 - 56+00	SE-201
Underground 34.5kV Line (1 through 5 circuits possible; worst case, 3,4, or 5 circuits evaluated)	6	10+00 - 38+00	CE104
		39+00 - 65+00	CE105
		10+00 - 67+00	CE203
		64+10 - 99+00	CE204
		10+00 - 32+00	CE207
		10+00 - 33+00	NE-101
		34+00 - 57+00	NE102
		58+00 - 81+00	NE103
		82+00 - 104+00	NE-104
		105+00 -128+00	NE105
		129+00 -137+00	NE106
		10+00 - 30+00	NE-107
		31+00 - 34+00	NE-108
		10+00 - 26+00	NE109
		10+00 - 20+00	NE-112
		10+00 - 32+00	NE-113
		33+00 - 51+00	NE-114
		21+00 - 51+00	NE-201
		10+00 - 37+00	NW201
		40+00 - 66+00	NW202
		10+00 - 33+00	NW203
		10+00 - 20+00	NW204
		10+00 - 46+00	NW205
		10+00 - 33+00	SE-101
		34+00 - 57+00	SE-102
		10+00 - 31+00	SE-105

ROW Segment Name	ROW Calc Number	Approximate Station Numbers	Preliminary Design Drawings Sheets
		32+00 - 41+00	SE-106
		10+00 - 30+00	SE-107
		34+00 - 57+00	SE-108
		58+00 - 81+00	SE-109
		82+00 - 90+00	SE-110
		67+00 - 107+00	SE-202
		10+00 - 38+00	SW101
		39+00 - 45+00	SW102
		10+00 - 31+00	SW104
		10+00 - 32+00	SW105
		33+00 - 42+00	SW106
		10+00 - 20+00	SW107
		10+00 - 31+00	SW-108
		32+00 - 41+00	SW109
		10+00 - 55+00	SW201
(3) Overhead 34.5kV Lines & (1) 34kV Distribution Line	7	101+00 - 124+00	CE-204
		125+00 -180+00	CE-205

There are no underground gas transmission facilities proposed as part of the Cassadaga Wind Project.

(c) Enhanced Aerial Photos/Drawings Showing Exact Locations of Each:

The EMF study included in the Article 10 Application includes a set of aerial photos/drawings showing the exact location of each unique ROW segment and each cross-section. No occupied buildings were within the ROWs. In cases where a residence or occupied building was visible in a drawing but outside of the ROW, distance to the edge of the building is provided in the drawing.

(d) Electric and Magnetic Field Study

(1) Licensed Professional Engineer

The EMF study attached as Appendix GGG to this Application was signed and stamped/sealed by Christian Sorenson, P.E., a licensed professional engineer registered and in good standing in the State of New York.

(2) Computer Software Program

Software used in the EMF study attached as Appendix GGG used EPRI EMF-2 “Electrical Field of Transmission Lines in 2-D” and EPRI EMF-6 “Magnetic Field from Sets of Current Carrying Conductors (2-D).”

(3) Electric Field Calculation Tables and Field Strength Graphs

The EMF study modeled the strength and locations of electric fields to be generated by the Facility. Modeling was conducted at rated voltage. The measurement location was assumed to be 3 feet (approximately 1 meter) above grade, and the measurement interval was 5 feet (1.52 meters). Electric field strength graphs depicting electric fields along the width of the entire ROW and out to the property boundary of the Facility on both sides are included in the EMF study. Field calculation tables are included as Appendix A of the EMF study (attached to this Application as Appendix GGG). Digital copies of all input assumptions and outputs for the calculations are being provided under separate cover.

(4) Magnetic Field Calculation Tables and Field Strength Graphs

The EMF study modeled the strength and locations of magnetic fields to be generated by the Facility. Modeling was conducted at rated voltage. The measurement location was assumed to be 3 feet (approximately 1 meter) above grade, and the measurement interval was 5 feet. There is no expected change in amperage under any of the following conditions: summer normal, summer short term emergency, winter normal, winter short term emergency. Therefore, the magnetic field modeling that was performed is applicable to any of these conditions. Magnetic field strength graphs depicting magnetic fields along the width of the entire ROW and out to the property boundary of the Facility on both sides are included in the EMF study. Digital copies of all input assumptions and outputs for the calculations are being provided under separate cover.

(5) Magnetic Field Calculation Tables and Field Strength Graphs for Maximum Annual Load within 10 Years

There is no expected change in amperage in maximum average load initially versus for 10 years after initiation of operation. Therefore, the modeling of magnetic fields described above in 1001.35(d)(4) (including both the graphs and tables included in the EMF study) is applicable to both initial operation and operation after 10 years.

(6) Base Case Magnetic Field Calculation Tables and Field Strength Graphs

There are no existing power lines within the right-of-way in which the proposed transmission line will be located, therefore this analysis is not applicable to the proposed Facility.