FLAT CREEK SOLAR

Permit Application No. 23-00054

§ 1100-2.23 Exhibit 22

Electric and Magnetic Fields

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Acronym List

EGTS	Eastern Gas Transmission and Storage, Inc.
EMF	Electromagnetic frequency
HDD	Horizontal directional drilling
HV ROW	High Voltage (Transmission) Right-of-Way
kV	Kilovolt
kV/ft	Kilovolts per foot
LOD	Limits of Disturbance
mG	Milligauss
MV	Medium voltage
MVA	Megavolt-amperes
NYPA	New York Power Authority
NYS	New York State
NYPSC	New York State Public Service Commission
ORES	Office of Renewable Energy Siting and Electric Transmission
POI	Point of Interconnection
PSC	Public Service Commission
ROW	Right-of-way

Glossary Terms

Applicant	Flat Creek Solar NY LLC, a subsidiary of Cordelio Power LP, the entity seeking a siting permit for the Facility from the Office of Renewable Energy Siting and Electric Transmission (ORES) under Article VIII of the New York State Public Service Law.
Facility	Flat Creek Solar, a 300 MW solar generating facility located in the Towns of Root and Canajoharie, NY. The proposed Facility components to be constructed for the generation, collection, and distribution of energy for Flat Creek Solar include solar panel modules, electrical collection system, collection substation, point of interconnection (POI) switchyard, access roads, laydown/staging areas, and other ancillary facilities.
Facility Site	The participating parcels encompassing Facility components, which totals approximately 3,794 acres in the Towns of Canajoharie and Root, Montgomery County, New York (Figure 2-1).
Study Area	The Study Area for the Facility includes a radius of five miles around the Facility Site boundary, unless otherwise noted for a specific resource study or Exhibit. The 5-mile Study Area encompasses approximately 108,667 acres, inclusive of the approximately 3,794-acre Facility Site.
Limit of Disturbance (LOD)	The area to which temporary construction impacts will occur, totaling approximately 1,637 acres.

Exhibit 22: Electric and Magnetic Fields

This Exhibit provides information required in accordance with the requirements of §1100-2.23 of the Article VIII Regulations.

Electromagnetic fields (EMF) are produced by a source that generates, transmits, or uses electricity. New York State (NYS) has a policy limiting EMF from new transmission lines to levels produced by existing transmission lines or maintaining current levels. The NYS Public Service Commission (PSC) in Opinion No. 78-13, issued in June 1978, addressed health and safety concerns for EMF, and imposed interim operating standards. The Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, issued September 11, 1990, sets standards for EMF associated with substations and transmission lines. According to the interim policy, the health standard for magnetic field is 200 milligauss (mG) while the health standard for electric field is 0.5 kilovolts per foot (kV/ft), both measured 1 meter above ground level at the edges of major transmission facility rights-of-way (ROW). An EMF Study was conducted to estimate the EMF strength created by the Facility's proposed system and is provided as Appendix 22-1: *Electromagnetic Fields Report*.

22(a) Right-of-Way (ROW) Segments with Unique Characteristics

The proposed underground medium voltage (MV) collection system for the Facility, designed to be rated at 34.5 kilovolts (kV), is anticipated to contain a total of 290,000 linear feet (54.9 miles) of collection line. The collection line will be collocated within the same trench in several instances and are shown in the Design Drawings in Appendix 5-1. The MV collection system will be installed by either trenching or horizontal directional drilling (HDD) and will connect the solar arrays to the collection substation. The trench width for the collection system will range in width from 3 to 100 feet depending upon the number of parallel trenches in each location. Per Section 1100-2.23(a), an EMF analysis is not required for collection lines operating under 69 kV. No collection lines rated above 69 kV will be utilized by the Facility, therefore an EMF analysis was not performed on the MV collection system.

Facility design proposes an approximately 130-foot-long 345 kV transmission line (generation tie line [gen-tie]) segment to connect the collection substation to the point of interconnection (POI) switchyard. The POI switchyard will also include loop-in and loop-out connections with the existing New York Power Authority (NYPA) 345 kV #352 Transmission Line (#352) via two adjacent 345 kV transmission lines (tap lines), both approximately 230 feet long.

Although there are three transmission lines (one gen-tie line and two tap lines) exiting the POI switchyard, all three transmission lines have the same conductor orientation and are all rated over 69 kV; thus, only one transmission line was considered in the EMF analysis. Within the EMF analysis, two different structures were studied including: the H-frame structure within the collection substation, and the turning structure that connects to the NYPA Transmission Line #352. Therefore, the transmission line studied in the EMF analysis represents conditions for both the gen-tie line and tap lines through analysis of an H-frame and turning structure.

The EMF Report (Appendix 22-1) was prepared using Polaris-EMF software developed by Electric Utility Design Tools. The study provides analysis assumptions, design scenarios, and calculation tables and field strength graphs which represent the conditions at the H-frame and turning structure on the gen-tie and tap lines.

The results of the EMF analysis show that all electric field levels, at each occurrence of the H-frame and turning structures, are within the acceptable limits of 3.6 kV/ft and 0.5 kV/ft, respectively, both within the ROW and at the edge of the ROW. For magnetic fields, the results of the analyses, at each occurrence of the H-frame and turning structures, are within the acceptable limits of 200mG at the edge of the ROW.

22(b)Cross Sections

The EMF Report in Appendix 22-1 shows cross-sections of the cumulative EMF for the two structure types being used: the H-frame structure and the turning structure. These two configurations illustrate the typical structure, phasing, and ROW configuration assumptions for the various segments of the proposed 345 kV gen-tie line and 345 kV tap lines. Refer to Figures 1 and 2 of Appendix 22-1 for detailed ROW cross-sections of these two structures.

(1) Overhead Electric Facilities

The existing NYPA 345 kV Transmission Line #352 has a width of approximately 200 feet and runs east-west adjacent to the northcentral portion of the Facility Site. The Facility will interconnect to this transmission line via two tap lines through the POI switchyard which will be located immediately adjacent and to the south of the existing Transmission Line #352 ROW.

(2) Underground Electric Facilities

No known existing underground electric transmission, sub-transmission, or distribution facilities are located on the Facility Site.

(3) Underground Gas Transmission Facilities

There are two oil and natural gas wells, each owned and operated by Millenium National Resource Development, located in parcel ID 112.-1-10.11 on the eastern portion of the Facility Site. The westernmost well is listed as “plugged and abandoned.” The easternmost well has an unknown status.

Two existing gas pipelines are mapped within the Facility Site. The Eastern Gas Transmission and Storage, Inc. (EGTS) Natural Gas Pipeline, owned by Berkshire Hathaway Energy Company and operated by EGTS, traverses centrally though the Facility Site from east to west. Just south of this line, a natural gas pipeline owned by TC Pipelines and operated by Iroquois Gas Transmission System, LP traverses the Facility Site.

UDig NY will be consulted prior to any excavation to identify precise locations of underground utilities. If underground facilities are identified by UDig NY, the Applicant will work with owners of the underground utilities to ensure safe construction practices. Therefore, no impacts to existing utilities are expected due to construction or operation of the Facility.

(4) Right-of-way Boundaries

The edges of the gen-tie line ROW from the collection substation and the POI switchyard are designed to be 100 feet from the centerline.

The two new tap lines from the POI switchyard to the existing NYPA Transmission Line #352 are designed to be 100 feet from the edge of the High Voltage (Transmission) Right-of-Way (HV ROW).

Multiple collection lines would be spaced 10 feet apart with the collection trenches ranging in width from 3 to 100 feet depending upon the number of parallel trenches.

(5) Structure Details and Identification

Details and dimensions for all structures and an overview map showing the locations of the proposed structures are included in Exhibit 5, Appendix 5-1. The proposed turning structures will be located within the existing NYPA ROW, while the proposed POI switchyard H-frame dead-end structures and the substation H-frame dead-end structure will be located within the POI switchyard and collection substation, respectively.

22(c) Aerial Photographs/Drawings

The Electromagnetic Fields Report (Appendix 22-1) provides drawings detailing the proposed electrical facilities. Graphic 1, below, shows an aerial photograph enhanced with location of the identified ROW segment.

(1) Right-of-way Segment

Appendix 22-1 includes a set of drawings showing the exact location of each identified ROW segment for the gen-tie line and the tap lines (see pages 50 and 53).

(2) Cross-section

Appendix 22-1 includes a set of drawings showing each cross-section (see Figure 1 and 2).

(3) Nearest Residence or Building

As shown in Graphic 1 below, an aerial photo was enhanced to show the location of the nearest residences or occupied non-residential buildings to the gen-tie line and tap lines. This photo includes the distances between the transmission line structures and the nearest edge of residences or buildings. A review of the Facility Site shows that there are four residential properties in proximity to the proposed gen-tie and tap lines. These residential properties are located approximately 1,010 feet to 1,168 feet away from the proposed transmission line structures.

Graphic 1. Aerial photo showing locations of and distances to the nearest residences from the gen-tie line and tap lines.

22(d)Electric and Magnetic Field (EMF) Calculation Report

The Electromagnetic Fields Report (Appendix 22-1) includes the following:

(1) Signature and Stamp

The Electromagnetic Fields Report was prepared and signed by a licensed Professional Engineer, registered and in good standing in the State of New York.

(2) Software Used for Model

The Electromagnetic Fields Report was prepared using Polaris-EMF software developed by Electric Utility Design Tools. The Electromagnetic Fields Report provides analysis assumptions, design scenarios, and calculation tables and field strength graphs which represent the conditions at the H-frame and turning structures on the gen-tie and tap lines.

(3) Electrical Field Model Parameters

The Electromagnetic Fields Report modeled electric field circuits at a voltage rating of 345 kV. The Electromagnetic Fields Report provides electric field calculation tables and field strength

graphs calculated at 1 meter (3.28 feet) above ground level with 5-foot measurement intervals depicting the width of the entire HV ROW out to 500 feet from the centerline on both sides. The Study includes digital copies of all input assumptions and outputs for the calculations.

(4) Magnetic Field Model Parameters

The Electromagnetic Fields Report (Appendix 22-1) modeled the maximum allowable loads for the Project. The summer megavolt-amperes (MVA) rating modeled was 2038 MVA and the winter MVA rating modeled was 2216 MVA. The load ratings for Summer Normal, Summer Long Term Emergency, and Summer Short Term Emergency were all the same value. Similarly, the load ratings for Winter Normal, Winter Long Term Emergency, and Winter Short Term Emergency were all the same value. Thus, the two current loadings that were studied are: (1) Summer at 2038 MVA; and (2) Winter at 2216 MVA. This modeling represents the worst-case scenario. The Electromagnetic Fields Report provides the magnetic field calculation tables and field strength graphs calculated at 1 meter (3.28 feet) above ground level with 5-foot measurement intervals, depicting the width of the entire ROW out to 500 feet from the centerline on both sides. The EMF Report includes digital copies of all input assumptions and outputs for the calculations.

(5) Magnetic Field 10-year Model Parameters

NYPA recently rebuilt the #352 transmission line and has not provided the average annual forecasted load to the Applicant. Thus, the maximum average annual load estimated to be occurring on the NYPA #352 transmission line within ten years after the Project is put in operation could not be modeled.

(6) Magnetic Field Base Case Model Parameters

As stated above, NYPA has not provided the Applicant with the average annual load for the #352 transmission line. Thus, a base case model showing the maximum average annual load currently estimated to be occurring on the existing power lines within the ROW but without the operation of the proposed Project could not be modeled.

(7) Compliance with PSC Standard

The facilities and interconnection transmission lines will conform with New York State Public Services (NYPSC) Interim Policy Standard for Electromagnetic Field Levels (issued September 11, 1990). The Electromagnetic Fields Report concluded that the maximum electric field at the

edge of the ROW is predicted to be 0.153 kV/ft which is below the NYS PSC guideline of 0.5 kV/ft. The results of the Electromagnetic Fields Report show that all electric field levels, both within the ROW and at the edge of the ROW, for the H-frame structure and turning structure are within the acceptable limits of 3.6 kV/ft and 0.5 kV/ft, respectively. Further, the maximum magnetic field at the edge of the ROW is predicted to be 91.27mG which is below the NYS PSC guideline of 200mG. For magnetic fields, the results of the Electromagnetic Fields Report for both the H-frame structure and turning structure are within the acceptable limits of 200 mG at the edge of the ROW. Details are further described in the Electromagnetic Fields Report in Appendix 22-1. Tables 22-1 and 22-2 detail the maximum EMF levels calculated in the analysis.

Table 22-1. Maximum Electric Field Values for Modeled Structures

Electric Field Model	PSC Guidelines Limit	Maximum Value
H-frame Structure		
Within ROW	3.6 kV/ft	1.68 kV/ft
Edge of ROW	0.5 kV/ft	0.153 kV/ft
Turning Structure		
Within ROW	3.6 kV/ft	0.5 kV/ft
Edge of ROW	0.5 kV/ft	0.018 kV/ft

Table 22-2. Maximum Magnetic Field Values for Modeled Structures

Magnetic Field Model	PSC Guidelines Limit	Maximum Value
H-frame Structure		
Summer - Within ROW	No Limit	788.98 mG
Summer - Edge of ROW	200 mG	83.95 mG
Winter - Within ROW	No Limit	857.85 mG
Winter - Edge of ROW	200 mG	91.27 mG
Turning Structure		
Summer - Within ROW	No Limit	119.95 mG
Summer - Edge of ROW	200 mG	43.20 mG

Winter - Within ROW	No Limit	130.43 mG
Winter - Edge of ROW	200 mG	46.97 mG

The remainder of the EMF levels associated with the Facility's transmission interconnections are within the established guidelines of 0.5 kV/ft for the electric field and 200 mG for the magnetic field at the edge of the HV ROWs.

References

New York State Public Service Commission (NYPSC). 1990. Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities. Cases 26529 and 26559 Proceeding on Motion of the Commission. Issued and Effective: September 11, 1990.