



## **FLAT CREEK SOLAR**

**Permit Application No. 23-00054**

**§ 1100-2.6 Exhibit 5  
Design Drawings**

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## Acronym List

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
Applicant	Flat Creek Solar NY LLC
ANSI	American National Standards
ASCE	American Society of Civil Engineers
EGTS	Eastern Gas and Transmission Storage
FERC	Federal Energy Regulatory Commission
FM	Factory Mutual
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
kV	kilovolt
LOD	Limit of Disturbance
MVA	Mega volt-amp
MW	Megawatt
NEMA	National Electric Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYCRR	New York Codes, Rules, and Regulations
ORES	Office of Renewable Energy Siting and Electric Transmission
OSHA	Federal Occupational Safety and Health Administration
PE	Professional Engineer
POI	Point of interconnection
ROW	Right-of-way
RUS	Rural Utilities Service

## **Glossary Terms**

<b>Applicant</b>	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.
<b>Facility</b>	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.
<b>Facility Site</b>	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).
<b>Study Area</b>	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.
<b>Limit of Disturbance (LOD)</b>	The area to which temporary construction impacts will occur, totaling approximately 1,637 acres.

## Exhibit 5: Design Drawings

This Exhibit provides information required in accordance with the requirements of §1100-2.6 of the Article VIII Regulations and contains the Design Drawings as Appendix 5-1.

### 5(a) Statement of Engineer Qualifications

The Design Drawings, included as Appendix 5-1, and supporting documentation prepared for the Application were developed under the direction of a licensed Professional Engineer (PE) in the State of New York, as identified on Sheet C-100-01, of the Design Drawings (Appendix 5-1), Sheet 1 of the Substation and Point of Interconnection Switchyard Plans (Appendix 5-2), FCS-E-400-00 of the Site and Array Plans (Appendix 5-3), and Sheet FCS-E-600-00 of the Voltage Plans (Appendix 5-4).

### 5(b) Conformance with Setback Requirements for Wind Turbines

The proposed Facility is a solar facility, and therefore, this section is not applicable.

### 5(c) Wind Turbine Descriptions

The proposed Facility is a solar facility, and therefore, this section is not applicable.

### 5(d) Conformance with Setback Requirements for Solar Facilities

The Facility has been designed to meet or exceed the setback requirements required under Section 1100-2.6(d) of the Article VIII Regulations (see Table 1, below).

**Table 5-1. Setback Requirements for Solar Facility Components**

Setback Type	94-c Solar Facility Setback
Non-participating residential property lines	100 feet
Centerline of Public Roads	50 feet
Non-participating property lines (non- residential)	50 feet
Non-participating occupied residences	250 feet

<sup>1</sup> Setbacks as defined in 16 New York codes, Rules, and Regulations (NYCRR) § 1100-2.6(d), Table 2.

The Article VIII setback requirements have been applied to the solar arrays, inverters, and collection substations; fencing, collection lines, access roads, and landscaping may be

constructed within the setback. Setbacks from property lines, residences, and road rights-of-way (ROWs) are detailed on the Design Drawings in Appendix 5-1. Please refer to Exhibit 24 (Local Laws and Ordinances) for a discussion of the Facility's compliance with applicable local laws in the Towns of Root and Canajoharie. The Applicant is currently seeking a waiver from ORES regarding a required setback of 500 feet from non-participating property boundaries in the Town of Canajoharie and the Town of Root. See Exhibit 24. *Local Laws and Ordinances* for more details on applicable local setback requirements and requested waivers. for more details on applicable local setback requirements and requested waivers.

### **5(e) Solar Facility Height**

Exclusive of the electric collection, transmission, or substation/switchyard components, the tallest Facility component will be the solar arrays. The maximum height of the Facility solar arrays is 8 feet, 11 inches (2.7 meters). Therefore, the arrays will not exceed 20 feet from finished grade, as required by Section 1100-2.6(e). Furthermore, Section 8(B)(5)(i) of The Town of Canajoharie states: "*The height of the Solar Energy Equipment/System shall not exceed 17 feet. Height is measured from the lowest adjacent grade to the highest point of the structure, including any attachments.*" As such, the proposed Facility meets this requirement as well. The height of the arrays is measured from the highest natural grade below each individual panel to its maximum potential height. As outlined in §1100-2.6(e), electric collection, transmission, or substation components do not apply to the height restriction mentioned above.

### **5(f) Design Drawings**

As required per Section 1100-2.6(f) of the Article VIII Regulations, the following sections describe the information included on the Design Drawings (Appendix 5-1) and within the supporting documentation.

#### **(1) Site Plans**

Site plans of the proposed Facility have been provided within Appendix 5-1, depicting Facility components as required in the following subsections.

##### *(i) Solar Facility Site Plan Drawings*

Design Drawings have been included as a part of this Application and were prepared using the computer software (AutoCAD) at a scale of 1" = 200'. The Design Drawings include the following existing and proposed features:

#### (a) Solar Panel and Setback Plan

The Overall Site Layout Plan (provided in Appendix 5-1, Sheet C-100-04) depicts the location of Facility components such as solar arrays, property lines, and the applicable setbacks described in section 5(d) above. Detailed drawings inclusive of solar arrays, inverters, property lines, and setbacks (as well as additional Facility components) are displayed on Sheets C-102-01 through C-102-60. Within the Facility there are 550,732 solar modules consisting of 26 modules per string (total of 21,182 strings). The proposed inverters for the Facility are SMA SC 4200US-UP with a 293.16 Megawatt (MW) rating. The Facility proposes to use 79 inverters throughout the panel arrays. The collection substation includes a 300 mega volt-amp (MVA) rated step up transformer which steps up the voltage from the collection line voltage of 34.5 kilovolt (kV) to 345 kV for interconnection to the existing NYPA Transmission Line #352. Sheet FCS-E-601-01 of Appendix 5-4 depicts the collection substation and the POI switchyard single line diagram.

#### (b) Access Road and Travel Lane Plan for Solar Facilities

Throughout the Facility Site, the Applicant has proposed development of permanent access roads and are shown within Appendix 5-1. Included within are the extent of proposed access roads, including indications of any existing access roads, and any turn-around areas or site entrance improvements to be made. Proposed permanent access roads within the site are 20 feet wide and vary in location within the site. The final Facility will consist of 74,744 linear feet or 14.16 miles of permanent access roads. See Sheets C-105-01 through C-106-02 for access road and entrance details.

Additionally, limited use pervious access roads are proposed to allow access to equipment pads, collector substations, and laydown yards. Limited use access roads are proposed for post-construction uses only and will be utilized in areas where grades make the use of culverts impractical, and any stormwater runoff will flow over the road.

#### (c) Overhead and Underground Collection Plan for Solar Facilities

The proposed Facility includes 290,000 linear feet of 34.5-kV collection lines, to gather power from the inverters and transport it underground to the collection substation. Horizontal directional drilling will be utilized to install collection lines underground, to avoid impacting sensitive resources. Collection lines have been co-located along available access roads to the maximum extent possible to reduce total impacts of the Facility Site. There are no overhead collection lines

proposed as part of the Facility. For more detailed information on collection lines, see Sheet FCS-E-407-01 of the Site and Array Plans included as Appendix 5-3.

(d) Existing Utility and Interconnection Plan for Solar Facilities

The Facility will interconnect to the existing NYPA 345 kV Transmission Line #352. Interconnect details such as the location of the existing transmission line, proposed collection substation, and POI switchyard are shown on Sheet C-102-29 of Appendix 5-1 and Sheet FCS-E-401-08 of Appendix 5-3. Two existing gas pipelines run through the Facility Site and have been avoided by Facility components. The Eastern Gas and Transmission Storage (EGTS) Natural Gas Pipeline owned by Berkshire Hathaway Energy Company and operated by EGTS, Inc. traverses centrally through the Facility Site from east to west. Just south of this line, is another natural gas pipeline owned by TC Pipelines, and operated by Iroquois Gas Transmission System, LP. Running adjacent to the above-mentioned EGTS Natural Gas Pipeline, is the NYPA 345 kV Transmission Line #352. The Applicant is adhering to the utility protection requirements for avoidance of impacts to these gas pipelines and, where crossing is required, is using HDD techniques to avoid impacts.

(e) Limits of Disturbance for Solar Facilities

The Limits of Disturbance (LOD) for the Facility totals 1,637 acres and includes all areas to be disturbed as part of the Facility construction, including locations of solar arrays, access roads, collection lines, inverters, the collection substation and POI switchyard, landscaping, and fence lines. Areas to be temporarily disturbed during construction to include laydown yards and clearing limits are also included within the Facility LOD.

(f) Clearing Limits for Solar Facilities

The vegetative clearing limits for the Facility are shown on Sheets C-102-01 through C-102-60 and Sheets L-101-01 through L-101-60 of Appendix 5-1. The proposed vegetation clearing includes 72.1 acres of clearing and grubbing and 66.4 acres of clearing with no grubbing (i.e., no ground disturbance). Vegetative clearing has been minimized to the maximum extent practicable for construction, placement of Facility components, and to prevent module shading during operation.



#### (g) Interconnection Facilities and Setbacks for Solar Facilities

The collection substation, interconnection, and existing NYPA ROW, are shown on Sheet C-102-29 of Appendix 5-1 and Sheet FCS-E-401-08 of Appendix 5-3. The collection substation and POI switchyard will be accessible via an access road off Rappa Road from the east and an access road off of Hilltop Road from the west. The collection substation and POI switchyard conform to the Article VIII setback requirements. Details on the collection substation, POI switchyard, and interconnection design for the Facility are included in Appendix 5-1 (Design Drawings) as follows:

- Collection substation: Sheet C-102-29 of Appendix 5-1; Sheet FCS-E-401-08 of Appendix 5-3; and Drawing No. FLCK-700 through FLCK-721 of Appendix 5-2.
- Collection System: Sheet FCS-E-407-01 of Appendix 5-3.
- POI Switchyard: Sheet C-102-29 of Appendix 5-1; Sheet FCS-E-401-08 of Appendix 5-3; Drawing No. FLCK-720P through FLCK-731 of Appendix 15-2.
- Transmission Drawings: Drawing No. FLCK-720 and FLCK-721 of Appendix 5-2.

The collection substation and POI switchyard will be accessible via new permanent access roads from the east and west (Rappa Road and Hilltop Road) and adhere to Article VIII setback requirements. For additional information regarding applicable setbacks refer to Exhibit 24. *Local Laws and Ordinances*.

#### (h) Energy Storage Systems and Setbacks for Solar Facilities

Battery energy storage systems are not proposed for this Facility, and therefore this section is not applicable.

#### (ii) *Site Security Features for Solar Facilities*

A discussion of site security for the Facility is included in Section 6(b) of Exhibit 6. *Public Health, Safety and Security*, to include security features such as electronic security and surveillance, access controls, security lighting, and cyber security systems. Additionally, a Site Security Plan detailing security features and risk mitigation measures has been included as Appendix 6-1 in Exhibit 6. *Public Health, Safety, and Security*. Security fencing will be installed in areas surrounding the Facility components, including the collection substation and POI switchyard.

Fencing will be located a minimum of 16 feet outside of all array areas, and will be 7 feet in height, consistent with the requirements outlined in the National Electric Code (NEC).

For the collection substation and POI switchyard, fencing will be chain link and will be 7 feet in height with 1 foot of barbed wire, for a total of 8 feet in height. Fencing specifications regarding the collection substation and switchyard, and locations of fencing can be found on Sheet C-105-01 of Appendix 5-1 and Drawing No. FLCK-762 of Appendix 5-2. The Applicant is seeking a waiver from the Town of Root to use galvanized steel fencing and barbed wire. Additional information about requested waivers is included in Exhibit 24.

(a) Landscaping improvements for Solar Facilities

Sheets L-101-01 through L-101-60 of Appendix 5-1 include details of the Landscaping Plan for the Facility. Details include the location of proposed vegetative screening in relation to Facility components and adjacent sensitive receptors. Additional information regarding general planting notes, details on plantings, and quantities and types of tree and shrub species proposed for the Facility are detailed within Sheets L-201-61 through L-201-68. There are no berms or retaining walls proposed for the Facility.

*(iii) Wind Facility Site Plan Drawings*

The proposed Facility is a solar facility, and therefore, this section is not applicable.

**(2) Design Detail Drawings**

The Design Drawings provided in Appendix 5-1 contain detailed Design Drawings in accordance with the Article VIII requirements. The Design Drawings were prepared using design software, AutoCAD Civil 3D, and are generally presented using a scale of 1" = 200", excluding drawings that present an overview of the Facility Site.

*(i) Typical Elevation Drawings*

Included within Appendix 5-1 are Typical Elevation Drawings for the collection substation and interconnection facilities. See subsections 5(2)(i)(b) and (c) below for additional information. Details indicated within typical elevation drawings include length, width, height, construction materials, color and finish of all proposed buildings, structures, and fixed structures within

proposed Facility. The electrical equipment (inclusive of the control building) is proposed to be galvanized steel material and equipment color will be natural galvanized steel, white or ANSI grey.

(a) Wind Turbine Typical Elevation Drawings

The proposed Facility is a solar facility, and therefore, this section is not applicable.

(b) Switchyard Typical Elevation Drawings

The POI switchyard will connect to the existing NYPA 345 kV Transmission Line #352 via two adjacent overhead 345 kV lines, expected to be approximately 230 feet in length. The POI switchyard is shown on Sheet C-102-29 of Appendix 5-1; Sheet FCS-E-401-08 of Appendix 5-3; and Drawing No. FLCK-720P through FLCK-731 of Appendix 15-2. The POI switchyard details include provided elevation drawings and can be found on Drawing No. FLCK-721P, with an overview of the point of interconnection on Drawing No. FLCK-720P, of Appendix 5-2.

(c) Collection Substation Typical Elevation Drawings

Collection substation drawings included in Appendix 5-1 contain details on fencing, gates, take-off structures, and additional collection substation equipment. Included within the drawing set is a general arrangement plan depicting elevation mark pointers (arrows) with reference to associated elevation views (including views of all components of the substation). The general arrangement plan is included on Drawing No. FLCK-720 of Appendix 5-2. Details for the control house are included on Drawing No. FLCK-721 of Appendix 5-2. Additionally, the collection substation and POI switchyard lighting plan are included on Drawing No. FLCK-731 of Appendix 5-2.

**Table 5-2. Collection Substation Specifications**

<b>Length</b>	66 feet
<b>Width</b>	20 feet
<b>Height</b>	90 feet (Take-off structure)
<b>Material of Construction</b>	Galvanized Steel
<b>Color and Finish</b>	Silver Matte Finish

#### (d) Energy Storage Typical Elevation Drawings

No battery storage systems are proposed for the Facility, and therefore, this section is not applicable.

##### *(ii) Permanent Access Point Typical Elevation Drawings*

Access road details are included on Sheets C-106-01 through C-106-02 of Appendix 5-1 and include a typical installation plan view, cross section, and side view with appropriate dimensions (temporary and permanent width(s)) and identification of materials to be used along with corresponding material thickness.

##### *(iii) Underground Infrastructure Typical Elevation Drawings*

Typical underground infrastructure/collection system details have been provided, including single and multiple circuit layouts with dimensions of proposed depth, trench width, level of cover, separation requirements between circuits, clearing width limits for construction and operation of the Facility, LOD, required permanent ROW and a description of the cable installation process. Sheet FCS-E-407-01 of Appendix 5-3 include details on the collection system and installation information. Typical details of any proposed splice vaults have also been provided, including vault dimensions, level of cover, required trench length, width and depth, clearing width limits for construction and operation of the Facilities, and limits of disturbance are provided within Sheet FCS-E-407-01 of Appendix 5-3.

##### *(iv) Overhead Electric Transmission and Collection Typical Elevation Drawings*

Typical overhead electric transmission lines, including a profile of centerlines at an exaggerated vertical scale and typical elevation plans including height above grade and structure layouts have been provided. As mentioned above, Drawing No FLCK-721P includes elevation drawings for the Facility point of interconnection and proposed new transmission structures, as well as an overview of the point of interconnection from the POI switchyard to the existing NYPA 345 kV Transmission Line #352, that spans 230 feet. The Facility proposes to use two steel pole towers, approximately 140 feet above ground level. The maximum height of structures within the collection substation and POI switchyard will be 90 feet and will be the 345 kV dead end structure receiving the gen-tie line between the two stations and receiving incoming loop in and loop out lines from the existing transmission line. There are no overhead collection lines proposed for the Facility.

### **(3) Compatibility of Wind Turbine with Existing Conditions**

The proposed Facility is a solar facility; therefore, this section is not applicable.

### **(4) Engineering Codes, Standards, and Guidelines**

Codes and standards that are considered and adhered to throughout the process of design, construction, operation, and maintenance of the Facility site create an extensive list, shown below. This list provides applicable engineering codes, standards, guidelines and practices that the Applicant intends to adhere to throughout the process of planning, designing, constructing and operating the Facility solar arrays, electric collection system, substation, transmissions line, interconnections, and associated structures, when applicable.

- American Concrete Institute (ACI)
  - Building Code Requirements for Reinforced Concrete (ACI 318)
  - ACI Manual of Standard Practice
  - Environmental Engineering Concrete Structures (ACI 350R)
- American National Standards Institute (ANSI)
- Federal Energy Regulatory Commission (FERC)
- Factory Mutual (FM)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Electrotechnical Commission (IEC)
- Insulated Cable Engineers Association (ICEA), S-93-639
- American Society of Mechanical Engineers
- National Electric Code (NEC)
- National Electrical Safety Code (NESC)
- National Electric Manufacturers Association (NEMA)
- National Fire Protection Association (NFPA)
- New York State Uniform Fire Prevention and Building Code
- New York State Energy Conservation Construction Code
- United Laboratories sheets
- American Iron and Steel Institute
- American Institute of Steel Construction
- International Building Code 2006

- American Association of State Highway and Transportation Officials (AASHTO) Standard for Aggregates
- American Society of Civil Engineers (ASCE)
- Federal Occupational Safety and Health Administration (OSHA) 1910.269
- American Concrete Institute (ACI)
- Rural Utilities Service (RUS) Bulletins

***(5) Design, Safety, and Testing of Equipment***

The Applicant intends to use a solar module comparable to the Jinko JKM565M\_72HL-BDVP and a single-axis racking system. Appendices 5-1 and 5-2 of this application provides specification sheets to the proposed solar module and racking system. The collection systems include a CAB© cabling system or underground line to connect the solar modules to the inverters and ultimately to collection substation. The Applicant intends to use the SMA SC 4200US-UP and 293.16 MW, or a similar inverter for the Facility. Appendix 5-1 (Sheet C-104-01) and Appendix 5-4 (Sheet FCS-E-404-01) includes a specification sheet for this inverter.

All Facility components, including the solar modules, collection system, inverters, substation, transmission line, and interconnection systems have been designed to meet the specifications that are provided by the manufacturer of each component and specifications listed in Section 5(f)(4). All systems will be tested prior to commercial operation of the Facility and to ensure components are functioning properly.