



GARNET ENERGY CENTER

Case No. 20-F-0043

1001.5 Exhibit 5

Electric Systems Effects

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Appendices

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Appendix 5-3 Preliminary Operations and Maintenance Plan

Exhibit 5: Electric Systems Effects

This Exhibit will track the requirements of Final Stipulation 5, dated March 5, 2021 and therefore, the requirements of 16 New York Codes, Rules and Regulations (NYCRR) § 1001.5.

5(a) System Reliability Impact Study

A System Reliability Impact Study (SRIS) was completed on March 11, 2021 for the Garnet Energy Center (the Project) in accordance with the open access transmission tariff of the New York Independent System Operator (NYISO) approved by the Federal Energy Regulatory Commission (FERC). The SRIS details the expected flows of the system under normal, peak, and emergency conditions and discusses the effects on stability of the interconnected system. Technical analyses of the thermal, voltage, short circuit, and stability were conducted to evaluate interconnection impacts. The SRIS evaluated the proposed collection substation and interconnection facilities, as well as required system upgrades that have been deemed necessary.

The SRIS, provided as Appendix 5-1, includes proprietary, confidential, and critical energy infrastructure information. The Applicant will seek the requisite trade secret protection for this information pursuant to Public Officers Law (POL) Section 87(2)(d) and 16 NYCRR § 6-1.3.

5(b) Potential Impacts

The SRIS analysis indicates that the Project will not have adverse impacts on the reliability of New York's transmission system. The following assumptions and understandings were made for this conclusion:

- The Project will be operated in accordance with all applicable requirements, including Article 10 Certificate conditions and NYISO and Transmission Owner day-ahead and real-time operational procedures and limitations. The Project will be operated in a manner that does not adversely impact reliability of the New York State Transmission System; this may include dispatching patterns that eliminate potential reliability issues that may exist during certain system contingency conditions.
- The Project and associated interconnection facilities will be designed in accordance with all applicable reliability standards.

5(c) Ancillary Services and Electric Transmission Systems Impacts

The SRIS analysis indicates that the Project will not have significant adverse impacts to the New York State Transmission System. The power flow analysis demonstrated that the Project would not result in any new thermal or voltage violations during the summer and winter peak. In addition, the stability analysis demonstrated that the Project does not cause any stability criteria violations. The N-1-1 contingency analysis did not show any significant unmitigable impacts on thermal loadings of the transmission system or undervoltage impacts. The short circuit analysis indicated that there was an increase in the total bus fault currents at nearby substations. For those substations with an increase in fault current by 100 amps or more, the post-Project fault current levels were less than their lowest breaker rating at those substations.

5(d) Reasonable Alternatives to Mitigate Adverse Reliability Impacts

As discussed above, significant adverse impacts to the reliability of the affected transmission systems are not anticipated as a result of the Project. Under the Minimum Interconnection Standard (MIS), any potential adverse reliability impact identified by the Interconnection Study that can be managed through the normal operating procedures of the New York Power Authority (NYPA) will not be identified as a degradation of system reliability or noncompliance with North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council, Inc. (NPCC), or New York State Reliability Council (NYSRC) reliability standards. It is assumed that the Project will be subject to, and shall abide by, the applicable NYISO operating procedures (e.g., security constrained economic dispatch; meaning that, pre-contingency, the system will be dispatched at all times in such way as to not violate the post-contingency applicable limits). The Project does not present any significant adverse impacts to the reliability of the affected transmission systems.

5(e) Estimate of the Total Transfer Capacity across Each Affected Interface

The results of the thermal, voltage, and stability transfer analyses show that the Project has no adverse impact on the transfer capability of the NY State Transmission Grid. The thermal limits are the constraining values for the West Central, West Central Closed, Volney East, and Volney East Closed interfaces. The transfer analyses were performed for the stressed summer peak cases on the normal and emergency thermal transfer limits for the West Central, West Central Closed, Volney East, and Volney East Closed interfaces (all open and closed, as applicable). The voltage transfer limit for all four interfaces increased as follows: West Central by 206.5 MW, West Central Closed by 221 MW, Volney East by 97.7 MW, and Volney East Closed by 97.7 MW.

Under both summer peak and light load conditions with the Project in service at full output, the system was found to be stable and compliant for all contingencies tested.

5(f) Criteria, Plans, and Protocols for Generation and Ancillary Facilities

(1) Engineering Codes, Standards, Guidelines and Practices

The Project will be designed in accordance with applicable standards, codes, guidelines, and will utilize best industry practices as explained below.

Electricity from the Project will be generated using photovoltaic (PV) solar panels. The panels produce electricity at a low voltage. The electricity is converted from direct current (DC) to alternating current (AC) at the Project's inverters. Additionally, an energy storage system will be DC-coupled at a select number of the Project's inverters. The collection system for the Project will be composed of 25.2 miles of underground 34.5 kilovolt (kV) lines. The collection lines will be directly buried and installed via horizontal directional drilling (HDD). The collection lines will feed into the onsite collection substation, which will step up the voltage to 345 kV.

The cable conductor size and type will be determined in order to carry the required load with the conductor not to exceed 100 degrees Celsius during normal operations. The collection substation will connect to the point-of-interconnection (POI) facilities, which will be comprised of an onsite 345 kV three breaker ring bus switchyard and two interconnection lines, totaling 770 feet. These lines will be transferred to NYPA to own and operate and will connect to the adjacent NYPA Clay to Pannell 345 kV transmission line. The interconnection facilities will be located within the Project Area, which encompasses all Project parcels and components.

Project components will be designed in accordance with, but not limited to, the following codes, guidelines, and references:

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- American Society of Civil Engineers (ASCE)
- Building Code of New York
- Institute of Electrical and Electronics Engineers (IEEE)
- National Electric Code (NEC)
- National Electric Safety Code (NESC)

- National Fire Protection Association (NFPA)
- NERC
- NPCC
- NYSRC
- Occupational Safety and Health Administrator (OSHA)
- Rural Utilities Service (RUS) Bulletin 1724E-200
- State Energy Conservation Construction Code (Energy Code)
- Underwriters Laboratories (UL)
- Uniform Fire Prevention and Building Code (Uniform Code)

The Applicant will adhere to all applicable NYPA requirements in relation to the proposed POI facilities. Exhibit 11(i) details a complete list of all applicable engineering codes, standards, guidelines, and practices with which the Applicant will conform. Refer to Appendix 5-2, Collection Substation Design Criteria for additional information.

(2) Generation Facility Criteria

Materials and equipment used for the Project will be new and will meet applicable requirements and standards. The equipment will be investment-grade to facilitate the long-term, reliable operation of the Project. Type certification, as commonly provided for wind turbines, is not applicable for photovoltaic solar power equipment; however, some equipment, such as the PV modules or the inverters, may be listed per the requirements of the NEC. The Applicant will consider several PV module and inverter suppliers. Data sheets for representative solar modules, racking systems, inverters, and energy storage systems are provided in Appendices 2-1, 2-2, 2-3, and 2-4 in Exhibit 2, respectively. The equipment types under consideration have received an UL certification. Final selection of the major Project components will be completed prior to construction and will depend on factors such as market conditions. All equipment used at the Project must comply with the applicable standards and requirements.

(3) Procedures and Controls for Facility Inspection, Testing, and Commissioning

Inspection, testing, and commissioning is conducted to validate the electrical connections, panel operation, and to perform the appropriate field tests to ensure the integrity of the Project components. Commissioning of the solar panels will occur once the panels, collection substation,

energy storage facilities, and switchyard are fully constructed and NYPA is ready to accept the transport of power to the New York State electrical grid.

Commissioning activities include the testing and inspection of the electrical, mechanical, and communication systems associated with the Project. Inspection, testing, and commissioning will be conducted in accordance with all applicable engineering, design, and manufacturer standards. Upon completion of the applicable commissioning processes, a detailed report will be prepared ensuring that the commissioning processes were completed in accordance with all appropriate engineering and manufacturer standards.

Post-construction inspection, testing, and commissioning of the Project components are described below.

Panels

The inspection, testing, and commissioning process for the Project's panels includes, but is not limited to:

- Abiding by employee safety requirements;
- De-energized verification to ensure no current is flowing through panel electrical components;
- Confirming all protective equipment has been properly installed;
- Verifying all wires and cable have been routed properly without sharp bends;
- Checking that all fuses, connections, safety switches, breakers, inverters, and all other systems/components are appropriately installed and securely fastened;
- Ensuring that there are no short circuits or short protections to confirm components are ready to receive power; and
- Panel and inverter testing.

Collection System

Materials used for the construction and installation of the collection system will be visually inspected for defects and to ensure the associated design specifications have been met. The Applicant and its Contractor(s) shall ensure the proper installation of the collection system using

the best management practices as outlined in the Quality Assurance and Quality Control Plan provided as Appendix 12-1.

The collection substation system commissioning process includes, but is not limited to:

- Visual, mechanical, and electrical testing of power transformers and high-voltage breakers;
- Testing of all metering units;
- Testing of all surge breakers, transformers, switches, relays, computer systems, valves, and other instruments;
- Switchgear and switchboard inspections and testing;
- Testing and diagnostics of all cables;
- Testing of the grounding systems; and
- Substation integration into the data collection system.

Energy Storage System

The inspection, testing, and commissioning process for the Project's energy storage system includes, but is not limited to:

- Abiding by employee safety requirements
- Confirming all systems and protective equipment have been properly installed
- Testing of the grounding systems
- Checking that all fuses, connections, safety switches, breakers, and all other systems/components are appropriately installed and securely fastened
- Confirming Battery Management System (BMS) is operating properly
- Charging and discharging the system to ensure proper functionality

(4) Maintenance and Management Plans, Procedures, and Criteria

The Project's Operations and Maintenance (O&M) procedures will include Project maintenance and management plans, procedures and criteria addressing vegetation management, and Project inspection and maintenance. The O&M of Project Components will follow industry standard

practices. Operations will be monitored for events outside of the normal range expected, and equipment will be immediately and automatically shut down if such an event is recorded. Local on-call technicians will be available to respond quickly to such events as required. Reports will be generated and received by the Applicant's Remote Operations and Control Center (ROCC) which monitors Project critical controls, responds to alarms, and ensures safe and reliable operation of the Project.

The O&M personnel will conduct routine inspection of solar array, access roads, revegetated areas, collection lines, the collection substation, and the energy storage systems, to document Project and equipment condition, compliance with required certificate conditions, and to identify any maintenance or improvement required to satisfy such conditions or compliance requirements. Additionally, inspections will evaluate environmental conditions and assess the effectiveness of restoration activities until site restoration efforts have been completed. Periodic environmental audits will be performed, generally every three years, to ensure compliance with all regulatory and permit requirements. Findings of non-compliance will be immediately resolved by on-site staff whenever possible or otherwise in consultation with permit issuing authorities. Positive operating procedures will be documented and disseminated to other operational solar facilities in efforts to improve best management practices.

Maintenance of the Project during operation will include vegetation management. Vegetation will be mowed at least twice per year within the fenced array areas and shall have a maximum height of the lowest panel height between mowings. Vegetation outside of the fence shall be mowed, maintained, or brush-hogged periodically to prevent shading on the panels and to allow for maintenance along the fence line, as needed. Vegetation maintenance outside of the fence line will most likely occur every two to three years. Mowing clippings and removed brush will remain on site.

Herbicides may be used as a secondary vegetation control, where necessary. Selective herbicide application would be completed as spot treatments and would target specific discrete locations. Broadcast aerial application of herbicides is not proposed for the Project. Herbicides may be used to treat invasive species, as needed. Herbicides used at the Project shall comply with the regulations and requirements of the New York State Department of Environmental Conservation (NYSDEC) Pesticide Control Regulations. Additional maintenance and management plans, procedures, and criteria are provided in Section 5(i) below.

5(g) Heat Balance Diagrams

The Project will not have a thermal component; therefore, heat balance diagrams are not applicable and will not be included in the Application.

5(h) Substation and Interconnection Standards and Requirements

(1) Description of Substation Facilities to be Transferred

Interconnection facilities will include a 345-kV switchyard consisting of a three-breaker ring bus and two 345-kV interconnection lines, totaling 770 feet, from the switchyard looping into the existing NYPA 345-kV transmission line. The 345-kV bus consists of a straight bus and a 345-kV circuit breaker. The high side and low side are separated by a 345/34.5 kV, 220 MVA GSU Transformer. The Applicant will be responsible for construction of the POI switchyard. After construction, the POI switchyard will be transferred to NYPA, the transmission owner, to own, maintain, and operate. Switchyard ownership is expected to be transferred to NYPA prior to commercial operation of the Project. NYPA will control the O&M responsibilities of the interconnection facilities. The Applicant will be responsible for the O&M of the collection substation.

(2) Transmission Owner's Requirements

The switchyard and interconnection design will be designed in accordance with NYPA's requirements.

(3) Operational and Maintenance Responsibilities

NYPA will define and complete the operational and maintenance responsibilities for the switchyard and two tap lines. However, the Applicant will be responsible for the O&M of the POI until the transfer of ownership to NYPA is complete.

5(i) Maintenance, Management, and Procedures

(1) Solar Panel and Energy Storage Maintenance, Safety Inspections, and Racking and Mounting Post Integrity

Scheduled and unscheduled service and required preventative maintenance of equipment will be conducted in accordance with the PV module, inverter, and energy storage system O&M manuals. Scheduled and unscheduled services will be provided to the electrical system from the inverters to the substation including the pad-mount transformers and collection system. Refer to Appendix 5-3 for a description of the preventive maintenance task and schedule.

(2) Electric Transmission, Gathering and Interconnection Line Inspections, Maintenance, and Repairs

(i) Vegetation Clearance Requirements

Vegetation within the defined clearing limits, with the exception of low-lying growth, will be cleared completely. Vegetation control will be conducted in accordance with the Article 10 certificate conditions and the best management practices (BMPs) approved thereunder. As the Project's POI is located within an existing agricultural field, minimal vegetation clearing will be required.

The minimum vegetation clearing distance will be determined by the line voltage, sag, blowout, and wind loading, and any requirements that NYPA will require.

(ii) Vegetation Management Plans and Procedures

An integrated vegetation management approach has been developed for the identification of vegetation management practices for the Project. Management objectives have been determined through:

- Inspection for and identification of compatible and incompatible vegetation.
- Determination of selective control methods to discourage incompatible vegetation.
- Promotion of compatible vegetation.

Vegetation control methods are based on potential environmental impacts and the anticipated effectiveness of the technique. The methods are also influenced by site characteristics, security, economics, current land use, and other similar factors. The vegetation control methods include, but are not limited to, pruning, removal, mowing, and selective herbicide application, as needed.

Vegetation management objectives include the following:

- Prior to encroachment, managing vegetation into the Vegetation Action Threshold for NERC and Non-NERC lines.
- Reducing fuel levels to acceptable limits in order to minimize fire hazard.
- Compliance with applicable governmental vegetation-related regulations and restrictions.

(iii) Inspection and Maintenance Schedules

Maintenance work will primarily be determined by the inspection process. Routine inspections will occur in the form of ground patrols, aerial patrols, Light Detection and Ranging (LiDAR) and/or imagery analysis. NERC-applicable lines and lines which have been designated as critical to the

reliability of the electrical system shall be inspected at least annually, with no more than 18 months between inspections. The timing, frequency, and overall number of inspections conducted may be adjusted in order to respond to changing conditions such as fuel loading, heavy rainfall, high winds, severe weather events, landowner intervention, and tree mortality.

(iv) Notification and Public Relations for Work in Public Right-of-Way (ROW)

The electrical system will require periodic preventative maintenance. The appropriate agencies will be notified prior to starting the work.

(v) Minimization of Interference with Electric and Communications Distribution Systems

The collection lines will conform with applicable safety standards, including those that provide for separation distances from existing electric and communications lines.

5(j) Vegetation Management Practices

Vegetation management and maintenance of the Project Area will be incorporated into the O&M Plan for the Project. Routine inspections and visits by maintenance staff will help identify the general site conditions and required vegetation maintenance. The visits will help monitor the vegetation and site stabilization conditions throughout the Project Area. A long-term vegetation management plan will be filed with the Secretary of the Siting Board after issuance of a certificate.

Stable ground conditions and functioning stormwater management features are key components of the vegetation management plan. Effective vegetation management is also important in order to avoid damage to the solar array components and shading of the PV modules. Long-term maintenance of perimeter landscaping will also be incorporated into the plan in order to maintain the required visual screening. Vegetation maintenance will be restricted to the area within the Project limit of disturbance (LOD). However, inspections and checks may be warranted anywhere within the Project Area. The following sections detail the vegetation management requirements during the initial operation period and ongoing Project operation.

Initial Operation Period:

During the initial operation period, emphasis will be placed on promoting early stage growth of the site ground cover, landscaped areas, and stormwater management features. The stormwater management features will be inspected frequently during the initial operation period to ensure they are functioning properly, and damage is not occurring due to erosion or sedimentation.

Modification to the proposed seed mix for initial site seeding may be required depending on the time of year in which the seed is applied. Reseeding may also be necessary in subsequent seasons following the initial seeding operations. Grass and other ground covers shall be inspected often during the first year of operation to ensure growth is fully established. Bare soil areas may require scarifying of the topsoil and re-seeding to promote proper vegetation establishment.

Regular vegetation inspection shall be conducted through the entire Project Area. Particular attention shall be paid to monitor for fast growing weeds which may dominate the ground cover and invasive species per the Invasive Species Management and Control Plan (ISMCP). The ISMCP will be filed with the Secretary. Invasive species previously identified at the Project Area will be considered when determining the present location of invasive species. The Certificate Holder will consult with a vegetation expert to assist with inspections for invasive species. Project staff may receive ISMCP-focused trainings to facilitate more frequent invasive species inspections at the Project Area.

Watering of newly landscaped areas may depend on the season, weather conditions, and the condition of the newly planted trees, shrubs, and vegetation. Watering may be necessary for the first several weeks after planting has occurred. Newly planted trees and shrubs shall be inspected frequently during the first few months and again in the spring season when the plants have exited the dormant period. Repairs and/or replacement of trees may be conducted, as necessary.

Perimeter trees which need removal or pruning in order to avoid shading of the panel will be addressed during the construction period. Following construction, the O&M staff will continually check the status of the perimeter trees that may cause excessive shading or present a risk such as danger trees, which due to their location or condition, pose a threat to falling on or damaging electrical equipment and Project components. The need for additional pruning and/or tree removal will be determined during the vegetation inspection. The inspections shall also evaluate the ground stability in areas where tree removal has occurred to ensure settlement or erosion issues are not present.

On-Going Operation:

The long-term vegetation management plan will include the efforts described above, but the activities may occur less frequently depending on the site conditions. The long-term plan will primarily focus on the maintenance of vegetation and site stability. Mowing and trimming will

typically occur between late spring/early summer and then again as needed throughout the growing period. Targeted mechanical vegetation trimming may be necessary around inverters, energy storage systems, substations, fencing, gates, and select portions of the access roadways, depending on site conditions. Herbicides will be applied in a targeted, selective manner. Broadcast or aerial herbicide treatment will not be employed at the Project.

The long-term vegetation management plan may consist of a variety of the measures listed below. The plan will address vegetation management throughout the Project Area including within the solar array areas, fenced perimeter, along the fence line, and at the substation. The plan will be filed with the Secretary after obtaining the certificate. The Certificate Holder will prepare the plan in accordance with the Article 10 certificate conditions and will seek advice from an avian expert regarding the timing of mowing.

- Regularly planned routine inspections:
 - Excessive growth of ground cover grass or weeds;
 - Strive to keep vegetation below the bottom edge of PV modules;
 - Bare spots and/or excessive weed growth;
 - Condition of landscaped trees (signs of stress);
 - Deterioration of erosion control and stormwater management features;
 - Vegetation that impedes on facility equipment;
 - Condition of the wetland vegetation;
 - Signs of uncontrolled runoff or sedimentation;
 - Signs of damage to the perimeter fence due to vegetation growth;
 - Trash and debris;
 - Inspections for invasive species per ISMCP; and
 - Check road conditions and signs of mud tracking off-site and address accordingly.
- Periodic mowing and repairs to grassed areas:
 - Based on actual observed growth (typically maintained to below 18-24”);
 - Approximately 3–6 mows annually depending on conditions;
 - Avoid mowing while ground is wet or with 24-48 hours after heavy rain;
 - Mow fenced area and between solar panel rows;
 - Mow less often just outside fence (about 5 to 15 feet);

- Mow select landscaped areas as needed to promote tree growth;
- Add or repair stakes and support cables for newly planted trees, as needed;
- After full growth, trimming of shrubs and landscaping trees may be required;
- Trim targeted stormwater management features and ditches;
- Trim around and within substation;
- Repair bare soils or eroded areas as necessary; and
- Check for and remove loose debris.
- Periodic selective herbicide treatment:
 - Only United States Environmental Protection Agency (USEPA) and NYSDEC approved products; and
 - Used to support vegetation management efforts.
- Periodic management of perimeter landscaping:
 - Trim branches as needed;
 - Repair stakes and guide strings; and
 - Remove dead or fallen trees and limbs, as needed.
- Periodic repairs to stormwater management and erosion control features as necessary, which may include vegetation management measures.

Vegetation management inspections and maintenance measures will be periodically summarized in the O&M reports. The O&M Plan shall include an environmental compliance review that may address vegetation management requirements, as required by the Article 10 Certificate Conditions. The Certificate Holder shall periodically assess the effectiveness of the O&M Plan for vegetation management and shall make modifications as appropriate.

5(k) Sharing Above Ground Facilities with Other Utilities

The Applicant is not proposing that the Project share any aboveground facility with other utilities.

5(l) Equipment Availability and Component Delivery

The Applicant has no knowledge of equipment availability restrictions in relation to the Project. The Applicant currently plans to place the Project in service in Q4 of 2023. Based on this timeframe, major Project components are expected to arrive onsite from Q4 of 2022 through Q4 of 2023.

5(m) Blackstart Capabilities

Garnet Energy Center will not seek blackstart capabilities.

5(n) Compliance with All Applicable Reliability Criteria

Reliability criteria are identified in the SRIS, which includes consultations with the NYISO and NYPA. The SRIS report demonstrates that the Facility will not have a significant adverse impact on the reliability of the existing transmission system.

An interconnection agreement will be established between the Applicant, NYISO, and NYPA during the interconnection process. The agreements will require compliance with NYISO's and NYPA's technical and operational standards in compliance with the IEEE 1547 (anti-islanding standard). The Applicant will require the Facility inverters to comply with the above stated standard and other applicable NYPA standards.

5(o) Proposed Maintenance and Inspection Schedule

Appendix 5-3 includes the proposed maintenance and inspection schedule to the extent known at the time of the Application filing. The Appendix also details the frequency of Project infrastructure inspections for components such as the solar panels, inverters, energy storage system, and switchyard.