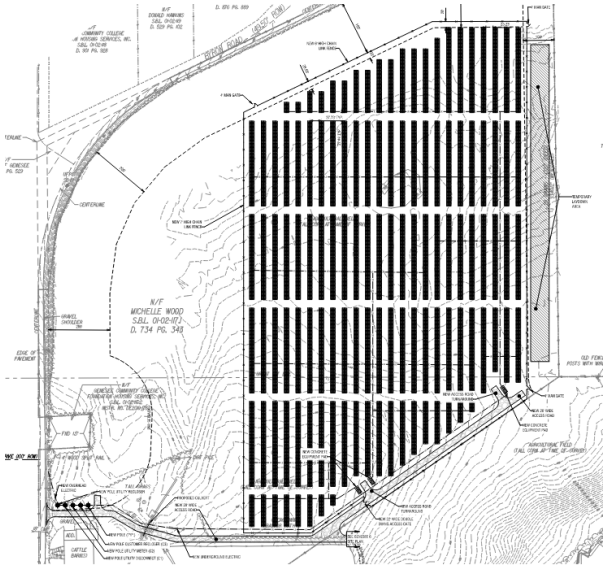
Genesee 5 (5.0 MW AC) Community Solar

Operation and Maintenance plan

8244 Batavia-Stafford Townline Road, Batavia, NY 14020



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In case of emergency:
Refer to Emergency Action Plan
Stafford Volunteer Fire Department, Inc. 1-585-345-0938 NY
CDG Genesee 5, LLC 1-267-358-0971
NYSEG Electric Emergency 1-800-572-1131
Non-emergency contact information:
NY CDG Genesee 5, LLC janet.ward@catalyze.com
Code Enforcement Officer- Town of Stafford 1-716-474-1093

Operation and Maintenance Plan shall be in place for the life of the project until decommissioned. Any changes to plan shall be provided to Town of Stafford Code Enforcement Officer

Property Maintenance and Housekeeping

- **Observation and review of the property and planting buffer to include tree, vegetation and grass trimming to prevent obstruction of the solar arrays as well as, maintain access and egress of the site, maintain adequate coverage of pollinator mix, and maintain screening requirements.**
- Clearing of snow on an as-needed basis - O&M provider dispatches to the site with a snow plow to clear a solid path on the site access road for vehicles to access the site safely.
- Inspection of access road checking for sediment buildup, drainage issues, rutting and other failures.
- Inspection of stormwater practices as outlined in the SWPPP.
- All non-emergency maintenance to be performed during normal business hours
- No use of herbicides proposed. If herbicides use is required O&M contractor is to contact Town of Stafford Code Enforcement Officer to understand the procedures required for approved use

Emergency Response and Unplanned Maintenance
Information below is in addition to the Emergency Action Plans for each site.
Refer to Emergency Action Plan first

Monitoring

- Using the Data Acquisition System (DAS), monitor daily, the day-to-day system output and performance. Ensure 98% availability of system. Low performance strings for a period of 30 days would trigger investigation. Low performance inverters for a period of 1 week would trigger investigation. Unjustified low performance of the site would trigger immediate investigation.
- Setup alarm point for abnormal system behavior including any inverter shutdowns and protection tripping. These alarms would prompt immediate dispatch to investigate, remediate and place back in service.

Unplanned maintenance

- 24-hour response to alarms to identify and document failures.
- Coordination with utility and other authorities, as necessary.
- Troubleshoot issues and document details of testing or performance maintenance work, create a remediation plan if issue cannot be solved during first response.
- Make and coordinate claims for reimbursement and/or replacement under any available warranty from manufacturers, installers or other similar entities relating to the System.

Stand Down Plan for High Wind Conditions

- The tracker is designed to a max 140 mph (225 km/h) per ASCE 7-10 (3-second gust).
- Site specific wind analysis will be performed on-site prior to tracker racking design.
- Array Tracker racking systems will include 24/7 wind sensory data to measure wind speed and wind direction in real-time.
- Tracker systems will include NEXTracker fasteners or approved equal.
- At high wind speeds, a High Stow angle will be pre-programmed into the tracking system, thereby reducing wind vortex and decreasing wind instability during high-wind events.
- Battery-backer controllers will be utilized to activate racking stow in the event power from the grid is currently unavailable.
- Upon activation of High Stow Angle, a Full Site Visual inspection will be performed.

Full Site Visual Inspection PV Panel Condition

- Inspect for cleanliness, cracked/chipped/scratched/ shattered panels, fading/discoloration, burn marks, seal condition, frame damage or rust

PV Mounting Structure

- Inspect mounts and mounting structures (loose panels, loose rack/clips missing hardware, rusted bolts, flashing issues, ballast condition, rack anchor condition)

PV Array Ventilation

- Inspect conditions under panels, remove of any large debris or pests; visual check to ensure maximum ventilation under panels

PV System Foundations

- Ground mount arrays (visual inspection of grounds and vegetation, identify issues related to mud, water pooling, soil erosion)

Balance of System

- Inspect conduit runs (separated/cracked conduits, misaligned wire runs)
- Inspect panel interconnectivity and string lines (wire/cable wear, wire fading, chewed wire due to pests, identify loose/detached wires)
- Inspect junction/combiner enclosure(s) condition (seals, rust, damage, locks)
- Inspect electrical equipment enclosure(s) (seals, rust, damage, door condition, locks, equipment pad(s))

Inverter(s)

- Inspect inverter structure(s) and enclosure(s) (seals, rust, damage, door condition, switch/handle condition, locks)
- Inspect inverter equipment pad(s) (cracks, base damage, soil erosion)

Data Acquisition System (DAS)

Weather Station Condition (alignment of irradiance sensor, condition of wind and temperature meters)

- DAS device condition (screen, seals, rust, damage)

Shading Conditions

- Visual inspection to identify any shading issues, preventive care if shading caused by nearby vegetation)

System Security

- Visually inspect fence line or confinement structures for wear, damage, breach, vandalism, or problems
- Visually inspect any electronic surveillance equipment (cameras, alarms, etc.) and identify if operating.
- Check condition of any locks, chains or other protection measures preventing unauthorized access to the system.

Reports

- Document all deficiencies and classify as “continue to monitor”, “recommended to repair/replace”, or “unsafe condition”. Immediately notify and properly secure/remediate any hazard.

Inverter Preventative Maintenance

- Conduct preventative maintenance in accordance with manufacturer specifications.
- Clean and vacuum enclosure, vents and heat sink / remove any identifiable debris and clean any accumulation of dust.
- Change air filters according to manufacturer specifications (filters are billed at cost, installation is included in O&M fees)
- Check fuses and switchboards (visually inspect for signs of corrosion/burning of components)
- Check wiring (visually inspect for breaks, deterioration, or signs of corrosion/burning, check cable wire protection)

String Level Voc, DC Operating Current

- Perform testing to measure the open circuit voltage (Voc) and operating current of each string in the system.
- Analyze and document any anomalies that effect system performance and propose correct actions if necessary.

String Level IV Curve Tracing

- Perform string level IV Curve tracing with a minimum of 400 w/m2 irradiance.
- Analyze and document any anomalies that effect system performance and propose correct actions if necessary.

Module Level IR Drone Imaging and Analysis (can replace IV curve tracing)

- Perform drone IR scan and desktop analysis to identify all module, string, connection, or DC bus issues.
- Replace and module operating less than 30% of expected rating. Repair all underperforming strings.
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Thermal Imaging Combiners, Inverters and Disconnects

- Thermal imaging of combiners, inverters and disconnects by a trained thermographer.
- Analyze and document all images taken, identify any potential hot spots and propose correct actions if necessary.

Typical Annual Maintenance Scope of Service with Contractor

Item	Service Description	Frequency / Response Time
1.	Monitoring of the Facility from a control point through internet connection. CONTRACTOR shall be responsible for the setup of alarm points for abnormal inverter shutdowns / faults.	Daily
2.	Remote troubleshooting of inverter / system faults and remote inverter resets when the fault is understood.	Daily as needed. Initial response: Same day
3.	Troubleshooting of inverter / system faults, with on-site response when the troubleshooting cannot be accomplished remotely. This extends past inverter issues to include open circuit, shorted cabling, opened/blown fuse scenarios, and grounding issues. Prior to site visits by CONTRACTOR or CONTRACTOR Subcontractors, clear and safe access to the array and PV equipment must be provided by others, including, but not limited to, vegetation removal, and gate and fence maintenance as needed.	As needed. Initial response within 24 hours of fault / problem.
4.	Troubleshooting of faults/problems, with on-site response as needed, including support on warranty claim items.	As needed. Initial response within 24 hours of fault/ problem.
5.	Coordinate with the Utility to safely turn off the Facility for Utility provided maintenance, repair and or replacement of utility equipment. Safely reactivate the system after Utility has completed their work and confirmed the system can be reactivated.	As and when requested by Utility as needed.
	Preventive Maintenance	
6.	Visually inspect entire Facility: Record, correct, apparent problems.	Quarterly
7.	Visually inspect one bloc of solar panels: Record if panels are properly affixed in racking system, correct if panels are not firmly affixed.	Quarterly
8.	Visually inspect overall racking structure connections (including lateral links).	Quarterly

Item	Service Description	Frequency / Response Time
9.	Testing of torque for a sample of modules. (Torque specifications as per the manufacturers recommendations.	Annually
10.	Visually inspect 5% of racking foundations and Power station foundations.	Annually
11.	Visually test for grounding continuity between frames and racking structure on a sampling of PV panels. Visually inspect for corrosion at grounding wire connection.	Annually
12.	Inspect weather station components and verify operation with operations center.	Quarterly
13.	Verify the points where array wiring enters conduit are secure, sealed to prevent rain from entering and free of abrasion on the wire insulation.	Annually
14.	Verify DC means of disconnection are free of damage, corrosion or arc evidence and that they open and close freely.	Annually
15.	Verify AC means of disconnection are free of damage, corrosion or arc evidence and that they open and close freely.	Annually
16.	Test each string for proper short circuit current (Isc) and open circuit voltage (Voc) using inverter monitoring interface	Annually and as may applicable if an issue is detected with any string
17.	Verify conduit is structurally supported and secured.	Annually
18.	Verify conduit junctions and box connectors are secure and sealed.	Annually
19.	Visually inspecting the cleanliness of modules.	Annually
20.	Coordinate with inverter manufacturer so that its annual service obligations are undertaken (e.g. replacement of the air inlet filters on the inverters, cleaning of air intakes at power stations, check power capacitors for signs of damage, charging resistors at inverters).	Annually or as recommended in manufacturer manual

Item	Service Description	Frequency / Response Time
	Inspect and clean the inside of the inverter for dirt deposits and water penetrations and seal penetrations if found. Refer to inverter manual.	
21.	Inspect all inverter cooling fans, test for functionality, replace if found.	Annually or as recommended in manufacturer manual
22.	Check the condition of AC and DC surge suppressors and surge arrestors	Annually
24.	Measure the output of inverter data and DAS.	Annually
26.	Record and clear all faults on the inverters.	As needed
27.	Visually inspect the operation of the ground fault monitor at each inverter.	Annually
29.	Conduct aerial IR drone scans, review and inspect and/or replace faulty modules.	Annually
30.	Inspection of vegetation for impact production of the solar farm with recommended action items	Quarterly
31.	Identify deficiencies that could affect production, equipment operability, or be reasonably expected to cause an unsafe condition at the Site. Report such deficiencies and determine resolution.	As needed.
	Reporting	
32.	Provide reports in January for the prior year to the operations manager of NY CDG Genesee 5, LLC and the Code Enforcement Officer of the Town of Stafford each describing: • Confirm project is operating and in compliance with Special Use Permit Resolution	Annually

Item	Service Description	Frequency / Response Time
33.	Manage spare parts inventory by: • creating an annual spare parts inventory list • communicate within one week of spare part usage and generating a quote for restock • receiving stock and following proper storage techniques	Annual and as needed.
34	Provide and maintain all reports, records and operating logs required pursuant to the PPA and the other Project Contracts.	As needed
	Miscellaneous	
35.	**Refuse:** CONTRACTOR shall ensure that any rubbish or refuse is regularly collected from the Property. Dispose of/Recycle faulty or broken panels replaced during O&M	As needed
36.	Inspect buffer and pollinator mix: Remove weeds, replace plants that have died with the same species and size as originally installed, and re-seed pollinator mix as necessary	Quarterly (monthly in the first growing season)
37.	Cut the pollinator mix	Annually in Spring
38.	Inspect the access drive - checking for sediment buildup, drainage issues, rutting and other failures.	Quarterly
39.	O&M provider dispatches to the site with a snow plow to clear a solid path on the site access road for vehicles to access the site safely.	As-Needed
40.	Inspection and replacement of dead/dying perimeter screening within the following growing season	As-Needed
41.	Periodic repairs to storm water management and erosion control features as necessary, which may include vegetation management measures. Refer to SWPPP for stormwater maintenance	As-Needed

**Annual maintenance will typically be done in early spring to prepare for high irradiance seasons and to review and problems that may have developed over the winter months.