

Mohawk Solar Project

Preliminary Operations and Maintenance Plan

Prepared for:



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on behalf of Mohawk Solar, LLC
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1. Overview

An Operations and Maintenance Plan (O&M Plan) is a project specific plan that is created and defined around solar project equipment, original equipment manufacturer (OEM) requirements, environmental conditions and permitting restrictions. This preliminary plan will be used as a foundation for a final plan once all variables are determined and the design has been finalized. The final O&M Plan will be implemented at the time of the scheduled Commercial Operation Date (COD). Avangrid employees will be held to this Plan during their daily operational duties and tasks.

The objective of this plan is to optimize plant performance by adhering to OEM suggested maintenance practices while following internal processes and procedures. It is intended to be used as a guide in achieving results through the utilization of known best operational, safety, and environmental practices.

2. O&M Strategy

Avangrid Renewables is a world leader in energy production with over 8,000 MW's of installed capacity across the USA. Avangrid Renewables has developed its reputation as a well-known business leader by setting an example for others to follow through the establishment of a strong cultural mindset that emphasizes safety, environmental awareness, and pride of ownership.

Further, Avangrid Renewables continues to expand upon its energy assets and remain competitive in the renewable market by constantly adapting to the changing energy landscape. For example, Avangrid Renewables takes pride in being at the forefront of new and emerging technologies to ensure it continues to provide efficient and effective operations.

Due to its experienced staff, Avangrid Renewables maintains a high level of competitiveness within the market through a robust training program, quality management during the hiring process, a company culture built around trust, understanding, and the foundational principles of ACTT=R (Accountability, Challenge, Transparency & Teamwork = Results).

Mohawk Solar LLC (Mohawk Solar) is a wholly owned subsidiary of Avangrid Renewables and retains this same culture in all business practices. The Mohawk Solar Project, the subject of this O&M Plan, is formally being proposed by Mohawk Solar.

3. Solar Technology

Equipment selection for a proposed photovoltaic site is based on several factors, including, but not limited to, community / good neighbor stipulations, environmental conditions, grid conditions, reliability, and equipment performance and efficiency. The Mohawk Solar Project will select the best equipment for the site based on the foregoing factors and the technology available at the time of development. However, Mohawk Solar will continue to seek out newer technologies that drive better site reliability and performance while diminishing impact to the environment and, if able, will incorporate those technologies into the project design.

Typical OEM Agreements for major PV equipment account for serial defects that contribute to poor performance. Where defects are identified, the OEM is responsible for submitting and implementing a permanent solution while under the warranty period.

Mohawk Solar engineers work directly with the OEM on implementing engineering strategies that boost performance and reliability on operating assets with older technology.

Avangrid Renewables will provide periodic preventative maintenance to the following solar plant equipment, per manufacturer recommendations and based on in-house knowledge at other similar solar sites:

- PV Modules
- Inverters
- Single Axis Tracking systems
- MV (medium voltage) Transformers
- Substation equipment and other overhead lines at the substation and POI (point of interconnect)

4. Maintenance Schedules

The Plant Manager is responsible for all aspects of routine maintenance to ensure the continued life and service of the solar facility's equipment and its safe operation. Preventative Maintenance (PM) requirements and schedules are determined by the OEM. Routine PM Schedules are typically completed on an annual basis and are scheduled to be completed during low production periods, after sundown or before sunrise.

Mohawk Solar Maintenance Plan														
Activity	Frequency	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
		Visual Inspections												
Tracker Components (5% /Year)	Annual										X			
PV Modules and Mounting (5% /Year)	Annual										X			
DC Electrical(5% /Year)	Annual										X			
Communications Equipment	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
O&M Building HVAC	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
General Grounds	Annual										X			
Electrical Maintenance														
Inverter Components														
Clean and Inspect	Semi Annual				X	X								
OEM Annual Maintenance	Annual										X	X		
Module														
Cleaning	Twice a Year						X			X				
HV/MV Maintenance														
MV Transformers														
Visual Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Oil Sample & Analysis	Annual										X			
Grounding System														
Visual Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Resistance (5Year)	5 year													
Substation														
Visual Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Battery Maintenance	Quarterly/Annual			Q			Q			Q			A	
HVAC	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Fence and Gates Integrity	Monthly/Annual	X	X	X	X	X	X	X	X	X	A	X	X	
Security Integrity	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Main Power Transformer														
Visual Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Oil Sample & Analysis	Annual										X			
Thermography	Annual										X			
Disconnect Switches														
Visual Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Thermography	Annual										X			
Insulators														
Clean and Inspect (Based on site conditions)	3 year													
General Grounds														
Gates Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
Signage Inspection	Monthly	X	X	X	X	X	X	X	X	X	X	X	X	
System Testing														
Communications Equipment														
Pyranometer Calibration	2 Years													
Datalogger	2 Years													
Reference Cell	2 Years													
Software Maintenance/Upgrades	As required													

5. Balance of Plant (BOP)

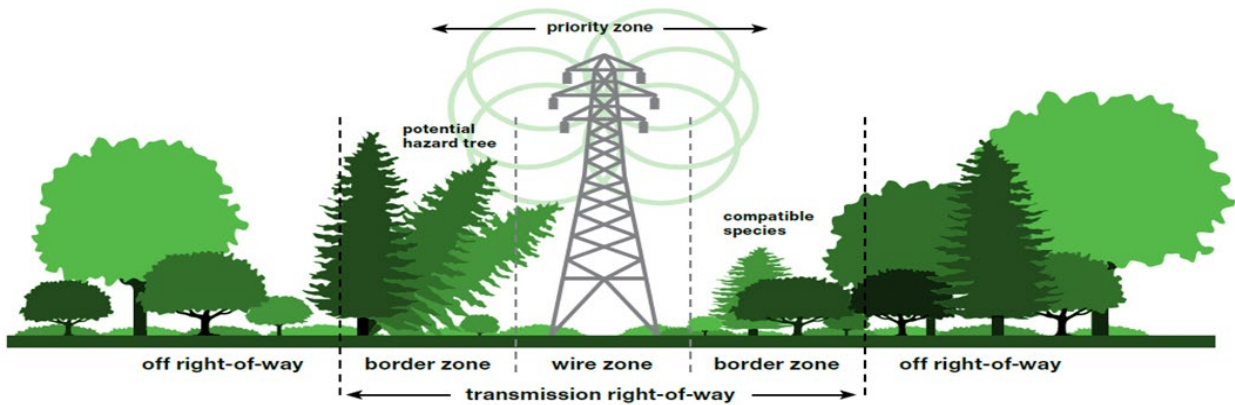
Typical BOP items include collector and substation inspections, maintenance, and repairs, along with road and vegetation maintenance activities.

The Plant Manager is responsible for all aspects of routine inspection, maintenance, and repairs of the plant to ensure the continued life and service of the solar facility’s equipment and material condition. This is further enforced by formal inspections, to include monthly, quarterly, and annual inspections of the collector system and balance of plant equipment.

Typical inspection activities include, but are not limited to, the following: access road suitability (road repairs may be needed after adverse weather events); and substation inspection (leaks; vegetation; and collector and applicable transmission line inspections that determine whether lines are clear of tree branches or other debris).

As per set guidelines, the substation transformers, relays, and all associated equipment receive a formal inspection and maintenance on a scheduled basis. All maintenance is documented and stored for the life of the plant.

Road maintenance and vegetation control generally take place on a semi-annual schedule or when needed. Specific activities would include grubbing and clearing vegetation for access roads. A major area of focus is monitoring vegetation around conductors. The figure below depicts an example of clearance maintenance distances.



Vegetation Clearance Distance - 230kV and Greater = 8 ft, Less Than 230kV = 4 ft
 The table below highlights typical vegetative management activities that will take place twice per year.

Mohawk Solar Semi-Annual Services: Vegetation Management	
Monitoring	Site Assessment
	Overhead collector system
	Substation; switchyard
	Access roads
Annual Reporting	Reporting on state of site; corrective action plan
Mowing / Trimming	Tractor/Mower/Operator
	Tree trimming
	Weed Whipping
Herbicide Application	Herbicides will be used along access roads and at substations and switchyards only if mechanical methods are ineffective.

6. Site Monitoring

- **Performance and Reliability** - All sites are monitored 24/7 by a rotating scheduled staff at our state-of-the-art National Control Center (NCC) located in Portland, OR. Staff responsibilities include site performance monitoring, resets, grid monitoring and balancing along with technician call-outs. They ensure the plants readiness to run.
- **Environmental** - Avangrid Renewables conducts routine monitoring of avian activities inside and outside of the site boundaries and has adopted the standards as outlined under the recommendations of Avian Power Line Interaction Committee (APLIC).

In addition to avian inspections, all Avangrid Renewable sites conduct monthly inspections of all hazardous and non-hazardous chemicals as outlined in the Environmental, Health and Safety Manual along with submitting reports as outlined in the Spill Prevention, Control, and Countermeasures Plan (SPCC).

- **Security** – All sites that have been equipped with video monitoring equipment are monitored 24/7 from our security personnel located at our corporate office. All sites having an alarm system are monitored remotely by an independent contractor which directly contacts the local authorities when needed.

7. Safety

Avangrid Renewables (AR) has developed a robust written safety program. This program consists of a number of policies, procedures and plans which make up the Environmental Health and Safety Manual (EHS Manual). Copies of the EHS Manual are maintained electronically as well as in hard copy at each AR electric generation plant.

The programs within the manual are updated from time to time when needed following a Management of Change review and approval by AR Senior Management. AR employees at electric generation plants receive training on the various programs within the manual initially after they are hired and periodically thereafter.

The initial training is documented in the Basic Operations Department Qualification standard and logged into a computer-based training tracking software program. The periodic training is conducted as outlined in the EHS & Training Matrix and this training is also logged into the computer-based training tracking software program.

The EHS Manual also describes a number of inspections and audits which are performed periodically to ensure that employees at AR electric generation plants are executing their work in accordance with the manual.

8. Training

Avangrid Renewables has a well-defined systematic approach to the training that is needed by each employee. AR utilizes training software to assign (based upon an employee's position), track, and document training that employees receive. The status of fleet training is reported each month to the fleet as well as management.

Training is grouped into several categories including Safety Training and training for qualifications. Generally, the training for qualifications is a one-time training and the safety training is recurring. AR developed a comprehensive training matrix, which describes the periodic requirements associated with training and assessments that employees must accomplish.

General categories listed in the matrix are: 1) PV Qualification training, 2) Electrical Qualification training, 3) EHS Manual program training, and 4) other safety training which includes various videos and other required trainings that may not be specifically addressed in the EHS Manual.

The Training Department has also developed training presentations, classes, and videos. The periodicity of the recurring training is shown on the EHS and Training matrix. Hours spent training for qualifications can vary greatly depending on an employee's knowledge-level when hired.