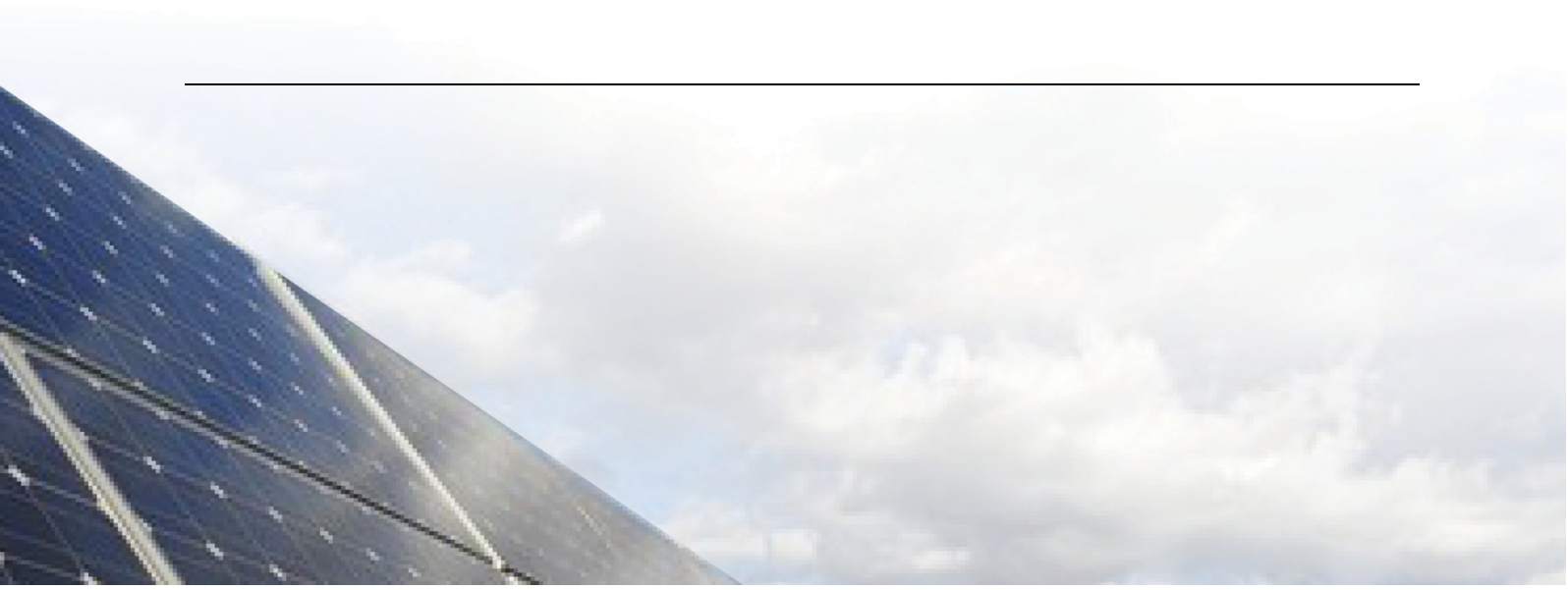
# CCR OPERATIONS & MAINTENANCE

INDEPENDENT SOLAR, LLC

**Cypress Creek O&M, LLC**



# O&M OVERVIEW

Cypress Creek O&M, LLC offers industry leading expertise in solar PV technology and system operations, while providing a comprehensive and continuous monitoring solution to ensure the maximum performance of solar PV facilities is achieved. We provide high quality O&M services based on a foundation of best practices and utilizing the following key advantages:

- **Team Experience**
  - Our team consists of highly experienced solar experts from many of the leading renewable companies including Black & Veatch, Strata Solar, Gehrlicher Solar, RGS Energy, Clean Energy Collective, Strata Solar, Baker Renewables, Heelstone Energy, and Duke Energy Renewables.

- **Project Continuity**
  - Our execution of the development, EPC oversight, and Asset Management of projects/portfolios allow us to offer an in-depth familiarity and continuity during the O&M phase of the project life-cycle.
  - Familiarity with local municipalities and land owners – “Local knowledge”
  - Well positioned to evaluate and hold manufactures, EPCs and subcontractors to warranty claims
  - Full understanding of the project economics and production expectations

# O&M SCOPE OF SERVICES

Cypress Creek will provide a scope of services based on the best industry practices and the latest technology and methodologies for preventative and predictive maintenance.

**PV Operations**

- **Administration of Operations:**
    - Effective implementation and control of O&M activities including document management, equipment inventories, owners and operating manuals, and warranties
- **Conducting Operations:**
    - Reliable process operations to achieve the optimum balance between cost of scheduled maintenance, yield, and cash flow through the life of the system
- **Directing Performance of Work:**
    - Specification of rules and provisions to ensure that maintenance is performed safely and efficiently
- **Monitoring:**
    - Closely monitor the day-to-day operation of plants through remote DAS monitoring systems
    - Data analysis of underperforming systems
    - Manage and refine DAS alerts across all plants
    - Aid field technicians with system troubleshooting (via DAS)
    - Create monthly operability and major issue/downtime reports
    - Predict future issues via data analytics and trends
    - Create monthly and annual system performance reports for asset management and project finance teams

- **Analytics:**
    - Optimization of condition-based O&M, such as identification of blown fuses and under-performing sub-systems
- **Operator Knowledge, Protocols, Documentation:**
    - Thorough operator knowledge, training, and performance to support safe and reliable plant operation
- **Workmanship Warranties:**
    - Thorough operator knowledge, training, and performance to support safe and reliable plant operation
- **Product Warranties:**
    - Thorough operator knowledge, training, and performance to support safe and reliable plant operation

**PV Maintenance**

- **Administration of Maintenance:**
    - Ensuring the effective implementation, control, and documentation of maintenance activities and quality results
- **Preventative Maintenance:**
    - Focus on maximizing system output, preventing expensive failures from occurring, and maximizing the life of a PV system
    - Maintain a schedule for routine maintenance, service, trouble shooting and repair of equipment at solar photovoltaic facilities
- **Corrective Maintenance:**

    - Focus on rapid response times and execution of work required to repair damage or replace failed components in a timely and cost effective manner

- **Predictive Maintenance:**
    - Use of real-time information and historic data to schedule preventative measures such as fuse replacements, or to head off corrective maintenance problems by anticipating failures or catching them early

- **People:**
    - We have a team of highly qualified managers, service technicians and electricians with extensive experience in solar PV O&M

- **Vehicle Fleet:**
    - Technicians have trucks fully stocked with essential tools and commonly used spare parts for rapid repair

- **Tools:**
    - Use of industry leading tools and testing equipment

- **Spare Parts:**
    - Spare parts management and inventory control at centralized warehouse/s and on-site storage solutions

- **Systems and Software/CMMS:**
    - Enterprise Grade Asset Management and O&M Platform with comprehensive Service Ticket Management, Vendor Management and Contract Management System

- **Protocols and Procedures:**
    - Use and improvement of O&M Industry Best Practices

**Vegetation Maintenance**

Cypress Creek Renewables approaches every local solar site as an opportunity to provide local renewable energy, as well as to maintain or improve upon the local ecosystem. From a vegetation perspective, our goal is to stabilize the soil to add strength and durability for the long term success of the generation facility and health of the land.

In many cases, there is a need to re-seed the portions of the property that have been impacted by large construction equipment. There is not a single solution that works for all climates throughout our national footprint, but rather we work to employ best practices and techniques that are most appropriate for each unique, local environment. Some of the factors that we evaluate when making these decisions are:

- Preventing runoff
- Carbon sequestration
- Pollination and other insect services
- Air quality concerns
- Invasive species resistance
- Viable wildflower areas
- Rate of fescue growth

One of the most important considerations for the vegetation plan is the maintenance requirements for the site, which will vary tremendously given the local terrain and microclimates. Our landscape managers' top priority is to minimize mechanical mowing and reduce the use of pesticides and herbicides. Cypress Creek Renewables employs many different strategies to minimize the use of mechanical and herbicidal treatments. For example, in many regions utilizing grazing livestock as a means to manage vegetation growth is a mutually beneficial plan. Other strategies include the use of local vegetation with slow growth cycles.

In rare circumstances where herbicides are deemed necessary, an effort is made to minimize use and to only apply highly bio-degradable, EPA registered and approved, organic solutions that are nontoxic to pets and wildlife. [1]

[1] Independent Solar, LLC has committed to a "no-spray" approach, utilizing non-herbicidal vegetative maintenance methods.

Cypress Creek Renewables understands the value of sustainable long-term management practices and will continue to develop solutions to enhance these techniques and promote healthy biodiversity within local ecosystems.

# O&M SAMPLE MAINTENANCE SCHEDULE

| Item # | Service | Service Description | Frequency |
|---|---|---|---|
| **1. Monitoring, Reporting, and Inventory** | | | |
| 1.1 | Active Site Monitoring | Monitor inverters and meter output data for issues and alarms. | Daily |
| 1.2 | Annual Maintenance Plan | Provision of Annual Maintenance Plan, including baseline schedule for all maintenance services contemplated to occur in such year. | Annually |
| 1.3 | Monthly Reporting | Provide monthly operating report for the project including a summary of (i) operations; (ii) weather data, power and environmental attributes; (iii) Project performance; (iv) reports of any environmental or Site disturbances; (v) safety/accident reports; (vi) Non-Agreed Services; (vii) maintenance and inspection reporting; and (viii) any proposal of recommended maintenance for the upcoming month. | Monthly |
| 1.4 | Annual Reporting | Provide annual maintenance/inspection reports for the project for the preceding calendar year. | Annually |
| 1.5 | Incident and Maintenance Reporting | Provide written report (in .pdf format) on any event involving unplanned Services, personnel injury associated with the project or material damage to the project or any part thereof. | No later than five (5) business days after the occurrence, or immediately for OSHA recordable events, but no later than 24 hours. |

| Item # | Service | Service Description | Frequency |
|---|---|---|---|
| 1.6 | Security Incident Reporting | Notify Company following provider receiving information indicative of a security issue on site. | Immediately, but no later than 24 hours. |
| 1.7 | Maintain Spare Parts | Store, maintain, and replenish spare parts inventory at Company's expense. Inventory will be stored either on-site in an O&M storage structure or off-site at a centralized storage facility or warehouse. | As Needed |
| **2. Site Property Inspection/Maintenance** | | | |
| 2.1 | Vegetation Management | Maintain vegetation and debris removal/control and landscaping, for all property within the fence line and all property immediately surrounding fencing (within reason), specifically ensuring vegetation does not encroach on modules. | As Needed per local conditions |
| 2.2 | Weed Abatement | Remove all invasive weeds | As Needed per local conditions |
| 2.3 | Perimeter and Fence Inspection | Inspect all fencing for signs of damage, intrusion, and overgrowth of vegetation. Inspect signage to ensure all originally installed signs are present and legible | 2 X per year |
| 2.4 | Roads | Inspect all roads for soil erosion concerns | 2 X per year |
| 2.5 | Site Security | Inspect entire site for general vandalism or other signs of security related issues. | 2 X per year |
| 2.6 | Wildlife and Pest Management | Maintain site to address problematic wildlife matters including but not limited to nest and hive removal | As Needed |
| **3. DC Systems** | | | |
| 3.1 | Racking Inspection | Inspect all racking, racking mounts and conduits on racking for damage, corrosion, settling and stability | 1 X per year |

| Item # | Service | Service Description | Frequency |
|---|---|---|---|
| 3.2 | Module Inspections | Visually inspect 25% sampling of modules for soiling, breakage, delamination, discoloring, hot spots (only via aerial thermal audits), rotating sample areas annually to achieve 100% inspection every 4 years. Inspections may be done either on the ground or via aerial visual analysis and aerial thermal imaging. If systemic issues are identified, notify Company and propose a corrective action plan to be implemented as needed. | 1 X per year |
| 3.3 | Broken Module Replacement | Replace modules that have previously been identified as broken (within reason), or identified as broken at the time of inspection. The cost of replacement modules (either for immediate use or to replenish spare parts) will be paid for by the Company as needed. The procurement of replacement modules is conditional to Company approval. | As Needed |
| 3.4 | Wire Inspection | Visually inspect for proper wire management and any possible damage on exposed conductors. | 2 X per year |
| 3.5 | Combiner Box and Re-Combiner Inspections | Electrical/mechanical inspection of combiners & disconnects. Visually inspect bonding bushings and grounding, check for wire damage especially at entrance/exit locations, terminal corrosion, any discoloration, and inspect fuses for proper functionality. Remove insects/pests debris from all enclosures. | 2 X per year |
| 3.6 | Combiner Box and Re-Combiner Torque Inspections | Confirm and correct terminal torque settings for both sides of all fuse holders, grounded (negative) terminal bar, grounding bar, PV output circuit and DC Disconnects. | 1 X per year |
| **4. AC Systems** | | | |
| 4.1 | Inverters | Perform annual inverter preventative maintenance work for all inverters per manufacturer's recommendations and manufacturer's warranty requirements. | Per Manufacturer's Recommendations and Manufacturer's Warranty Requirements |

| Item # | Service | Service Description | Frequency |
|---|---|---|---|
| 4.2 | Inverter Air Filters and Transformer heat sinks | Inspect inverter air-filters and heat sinks, and clean or replace air filters if applicable. | 4 X per year or Per Manufacturers Recommendations, whichever is more frequent. |
| 4.3 | Transformers | Visually inspect and clean all transformers per manufacturer recommendations, including but not limited to oil level measurement and clearing heat sink of debris. | 1 X per year |
| 4.4 | AC Disconnect (if applicable) | Inspection of latches and seals on enclosure, verify proper operation of disconnect, visually inspect terminations and confirm and correct terminal torque settings. Check for signs of arcing. | 1 X per year |
| **5. DAS/SCADA Inspections** | | | |
| 5.1 | General DAS Inspection | Perform monitoring system maintenance per manufacturer's specifications; verify orientation and attachment of pyranometers and module temperature sensors and MET station, and verify back up power supply functionality. | 1 X per year |
| 5.2 | Pyranometers | Clean pyranometer domes with a soft cloth. | All scheduled & unscheduled site visits |
| 5.3 | Pyranometer Calibration | Coordinate with Company to cause calibration of pyranometers per manufacturer's specifications. | Per manufacturer specifications |
| 5.4 | Data/Instrument Accuracy and Communications Verification | Test MET station sensors (GHI and POA pyranometers, ambient temperature, back-of-module, anemometer, Revenue Grade Meter (including current transducers), and inverter direct | 1 X per year |
| **6. Testing** | | | |
| 6.1 | IV Curve String Testing or Module Level Thermal Audits | 100% IV Curve Testing on strings, or 100% Module Level Thermal Audits | 1 X per year |

| Item # | Service | Service Description | Frequency |
|---|---|---|---|
| 6.2 | Thermal Imaging | Thermal imaging of all: overcurrent protection devices (OCPD) and bolted electrical connections including terminations in combiners and all disconnects, inverters and transformers | 1 X per year |
| 6.3 | Transformer Oil Testing | Conduct transformer oil sampling and testing per nationally and/or internationally recognized testing standards | 1 X per two years |
| 6.4 | Point-to-Point Testing | For 5% random sampling of combiner boxes, inspect grounding from modules & rack to combiners for wear, corrosion, and secure connections, and test the point-to-point resistance between modules, rack and EGC per NETA-ATS 2013 Section 7.13; document location, measure resistance and record results. Investigate point-to-point resistance readings that exceed 0.5 ohms. Notify Company of any issues identified and propose a corrective action plan to be implemented as needed. | 1 X per year |