Maintenance Guidelines for Photovoltaic Systems

A photovoltaic (PV) system is composed of one or more solar panels combined with an inverter and other electrical and mechanical hardware that use energy from the sun to generate electricity. PV systems can vary greatly in size from small rooftop or portable systems to large utility-scale generation plants. Properly maintaining this equipment can help extend the life expectancy of the system and reduce the risk of breakdowns. The following information describes common photovoltaic system safeguards and controls along with general maintenance guidance based on industry best practices.

When installing a photovoltaic system, design consideration should be addressed prior to installation. A structural assessment should be performed to verify there is adequate support for the system equipment given the weather conditions unique to that region.

Inspection and maintenance activities should be performed by a qualified technician to include following manufacturer recommended procedures and all applicable safety practices.

Recommended Controls and Safeguards

The following controls, protective devices and features should be tested and calibrated as applicable according to the manufacturer's specifications or annually if not specified:

- Lightning arrestors
- Surge protection
- Overcurrent and ground fault protection
- AC overvoltage and undervoltage detection
- DC overvoltage and undervoltage detection
- Inverter over temperature detection and associated cooling fans

Periodic Inspection Guidelines

Detailed visual inspections should be completed to ensure the physical integrity and performance of the PV system. These inspections should include the following activities:

- Inspect the inverter electrical pad to make sure it does not show cracking or signs of wear. The inverter should be bolted to the pad at all mounting points per the manufacturer installation requirements.
- Perform a visual inspection of the interior and exterior of the inverter cabinet and disconnect enclosures. Look for signs of water, pests or dust intrusion into the inverter.
- Inspect PV modules for defects that can appear in the form of burn marks, discoloration, delamination or broken glass.
- Check PV modules for excessive soiling from dirt buildup or animal droppings.
- Ensure that the module wiring is properly secured.
- Inspect the racking system and support structure for defects such as corrosion, sagging, and missing or broken fasteners.
- Inspect conduits for proper support, bushings and expansion joints, where needed.
- Check combiner boxes and inspect for loose electrical connections.

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Inverter Preventative Maintenance Guidelines

Each inverter manufacturer may have specific requirements for inspecting, testing, servicing and documenting preventive maintenance. Typical requirements for inverter maintenance include the following activities:

- Record and validate all voltages and production values displayed on the inverter interface or metering.
- Record and investigate system errors as applicable.
- Clean the interior of the enclosure and check air filters if installed.
- Test fans for proper operation.
- Check fuses.
- Check torque on terminations.
- Look for discoloration from excessive heat buildup.
- Check integrity of lightning arrestors.
- Check continuity of system ground and equipment grounding.
- Check mechanical connection of the inverter to the wall or ground.
- Check internal disconnect operation. Verify tightness of electrical connections.
- Verify that the software installed is up to date or coordinate with the equipment manufacturer or service provider to obtain the correct software updates.

Tracker Preventative Maintenance

Tracker manufacturers may have specific requirements for inspecting, testing, servicing, and documenting preventive maintenance. Typical maintenance or startup requirements for tracker systems include the following activities:

- Lubricate the appropriate tracker components per the equipment manufacturer’s recommendations.
- Check voltages inside the controller box and verify electrical connections are secure.
- Use a digital level to check the inclinometer calibration and positioning.
- Check array for signs of parts inadvertently contacting or rubbing against other parts.
- Remove vegetation that is near the drive shaft or moving components.
- Check wind-stow operation.

Contingency Planning

Some PV components can have limited market availability or may no longer be supported by the original equipment manufacturer, which can result in long replacement times. This can drastically affect system continuity in the event of a breakdown or result in unnecessary downtime. It is a best practice to evaluate the system software, components and support equipment at least annually to identify market availability and original equipment manufacturer’s support. Develop a contingency plan with this information to help ensure a detailed strategy is in place to avoid lengthy interruptions in the event a breakdown occurs.

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