Gustin Solar

Harrisville Township

Exhibit D

Solar PV Station O&M Manual

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Revision Summary

9/21/2026 Updated complaint reporting and resolution plan.

Purpose

The purpose of this document is to provide a summary of Consumers Energy's utility-scale solar photovoltaic (PV) station operations and maintenance policies, standards, and guiding principles. These standards are intended to promote consistency, safety, reliability, environmental stewardship, and operational excellence across Consumers Energy's solar generation portfolio.

To support uniformity and efficiency, the standards contained in this document are developed for broad application across similar solar facilities and reflect industry best practices and lessons learned. Project-specific modifications are generally limited to site-specific information, such as facility details, local contacts, emergency response information, and other jurisdictional requirements.

This document is intended solely as a reference for policy and standards. It does not establish operating procedures, work instructions, or step-by-step requirements for performing specific tasks. Personnel shall refer to applicable procedures, work instructions, and site-specific documentation for detailed operational and maintenance activities.

Scope

Consumers Energy operates and maintains all utility scale PV generating stations of which it owns. The operation and maintenance of these assets will be conducted by union Solar/Battery Technicians who are trained in an 18 month earn-while-you-learn Department of Labor (DOL)-certified program that provides individuals with specialized skills that are essential to ensure high availability and capacity factor of the assets they support. UWUA Power for America Training Trust Fund (P4A) and the Utility Workers Union of America (UWUA), AFL-CIO administers the Michigan based program.

This Operations and Maintenance Management Plan establishes the policies, standards, and management framework governing the post-Commercial Operation Date (COD) operation of Consumers Energy's utility-scale solar photovoltaic (PV) generation facilities. The scope of this plan includes the management of Environmental, Health, Safety and Security (EHSS) programs, Technical Asset Management, and the operation and maintenance activities necessary to ensure the safe, reliable, efficient, and compliant performance of solar generation assets throughout their operational life.

This document is intended to provide overarching guidance and standards applicable across Consumers Energy's solar portfolio. To promote consistency, operational efficiency, and the application of industry best practices, these standards are developed for broad implementation across similar facilities, with site-specific customization generally limited to local information such as facility details, contact information, emergency response contacts, and jurisdiction-specific requirements.

Certain specialized subjects are addressed in separate stand-alone plans and procedures and are therefore outside the detailed scope of this document. These include, but are not limited to, Emergency Response, Vegetation Management, Stormwater and Environmental Compliance, and Decommissioning, each of which is governed by its own project-specific management plan or program document.

Consumers Energy is authorized by the Michigan Public Service Commission (MPSC) to own, construct, operate, and maintain electric generation facilities within the State of Michigan and conducts its operations in accordance with applicable MPSC requirements, federal and state laws, and nationally recognized codes and standards. The operation and maintenance of utility-scale solar PV facilities are governed by compliance with these applicable regulatory and industry requirements. Neither MPSC regulations nor the applicable federal or national codes require a separate certification of the solar facility owner or operator as a condition of operating such facilities.

Accordingly, the purpose of this plan is to establish a standardized management approach that supports regulatory compliance, asset reliability, environmental stewardship, worker safety, and operational excellence throughout the operational life of Consumers Energy's utility-scale solar PV facilities.

Vision & Policy

Vision: Consumers Energy Generation Operations is recognized as a world leading clean energy supplier. Our innovative and empowered team achieves industry defining outcomes that power Michigan safely, reliably, and affordably.

Policy: Safety is foremost at Consumers Energy, starting with public safety as detailed in the PV Emergency Response Plan. Ongoing operations and maintenance of the site will be conducted safely by Consumers Energy and its agents, with all such activities being conducted with the utmost care of the environment. Physical and cyber security shall also be paramount in ensuring public safety as well as the safe and reliable operation of each asset and components there-of.

Technology

The key components of a utility scale solar site are:

Solar Modules: Solar cells contain a material that conducts electricity only when energy is provided—by sunlight, in this case. This material is called a semiconductor; the "semi" means its electrical conductivity is less than that of a metal but more than an insulator's. When the semiconductor is exposed to sunlight, it absorbs the light, transferring the energy to negatively charged particles called electrons. The electrons flow through the semiconductor as electrical current, because other layers of the PV cell are designed to extract the current from the semiconductor. Then the current flows through metal contacts—the grid-like lines on a solar cell. To boost energy yield, bifacial solar modules, which are double-sided to capture light on both sides of a silicon solar module, they capture light reflected off the ground or roof where the panels are installed. (Source: energy.gov)

> ***Notably, solar modules proposed for the Gustin Solar project do not contain PFAS, Mercury, Cadmium, nor do they release liquids or gases.***

Trackers: These devices change their orientation throughout the day to follow the sun's path to maximize energy capture. Single-axis solar trackers rotate on one axis moving back and forth in a single direction. Motors and gear trains direct solar trackers by means of a controller that responds to the sun's direction and/or adjusts on a chronological basis to counteract the Earth's rotation by turning in the opposite direction.

Notably, solar trackers are also used to stow or position solar modules into a safe store position to mitigate any potential equipment damage in the event of severe weather such as high wind, hail and/or heavy snow.

Wiring and Connectors: Specialized, environmental resist conductors and connectors are used to connect solar panels in series to form a string. This arrangement allows the electricity generated by each panel to flow through the entire string, resulting in a cumulative voltage output.

Strings are then connected in enclosed electrical combiner boxes to form an array. By connecting multiple strings of solar panels in parallel, meaning that the positive terminals of all the strings are connected, as are the negative terminals. This provides for an increased current output, thereby enhancing the overall power production of the solar panel system.

Inverters: The inverter converts the direct current (DC) to an alternating current (AC), which flows into the electric grid and, eventually, connects to the circuit that is your home's electrical system. As long as sunlight continues to reach the module and the circuit is connected, electricity will continue to be generated.

Generation Step Up Transformer: Generator step-up transformers (GSU) are the critical link between the utility scale solar station and the transmission network connecting AC networks of different voltage to each other. GSUs must be built to withstand severe electrical stress from fault currents and transients. generator. Its configuration and overall build are meant to withstand extreme thermal loading without

succumbing to early wear and tear. A generator step-up transformer works by converting the generator's low voltage and high current output into a higher voltage and lower current. This is done by windings of wire around a common iron core.

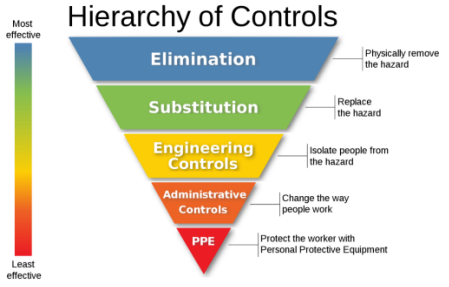
Notably, GSUs are typically filled with an insulating fluid that is also circulated through cooling tubes/fins to dissipate heat. Mineral and synthetic oils are most often used. Spill containment is required for environmental protection/best practices, and the fluid is periodically sampled to ensure its purity and efficacy. Polychlorinated Biphenyl (PCBs) oils are no longer used in the United States as of the 1979 Toxic Substance Controls Act.

Substation: In addition to the GSU, substations may contain equipment that helps keep our electricity transmission and distribution systems running as smoothly as possible, without repeated failure or downtime. This includes protection equipment, which detects and clears faults in the network. Generally PV generating stations and substations are unattended, relying on SCADA (supervisory control and data acquisition) for remote supervision and control. Sensors, computers, networked data communications and graphical user interfaces are typically housed in a climate-controlled building called the control house which is connected via specialized fiber optic lines and communications to a remote control room that is staffed 24/7.

Environmental, Health, Safety & Security (EHSS)

The generation, transmission and distribution of electricity included inherit hazards and risks that must be mitigated by robust hazard identification and controls including:

Each of the aforementioned key components will have been supplied by a Consumers Energy Approved Supplier based upon Consumers Energy technical specifications, as well as relevant codes, statues, etc.



EHSS hazards and risks are first eliminated and/or mitigated through facility design. Written policies, standards and work-instructions further mitigate EHSS hazards and risks and are required for every potentially hazardous situation at every Consumers Energy site. Each is informed by all relevant

governmental and industry standards, codes, etc. as a minimum. Personal protective equipment is required commensurate with each situation and task, thereby providing a further barrier of protection.

EHSS communications and reporting each follow internal and external stakeholder standards and are to be conducted well within required timeframes. Security encompasses both physical security and cyber security as to ensure that wanderers and/or trespassers are kept safely outside of physical and/or cyber boundaries.

Technical Asset Management

Technical Asset Management (TAM) includes those activities that are used to inform, optimize, monitor and control energy production, minimize down time, reduce costs and accentuate the EHSS performance of the site. Such activities include remote monitoring and diagnostics of site equipment, sensors and instrumentation augmented by the use of unmanned aerial vehicles (drones) and third-party satellite imagery.

Change control, document and records management and warranty adherence/administration are also key elements of TAM. In particular, technical drawings and records must be up to date and readily accessible for both routine and emergency situations.

Operations

At Consumers Energy, the Merchant Operations Center (MOC) is responsible for dispatching Consumers Energy-owned and contracted generating resources in support of the reliable operation of the Bulk Electric System (BES). The MOC provides continuous monitoring, supervision, and operational oversight of utility-scale solar photovoltaic (PV) facilities and associated equipment. Routine operations are conducted remotely through secure communication, monitoring, and control systems within a control room environment staffed 24 hours per day, seven days per week.

The MOC continuously monitors plant performance, equipment status, alarms, weather conditions, and power output to ensure safe, reliable, and efficient operation of each solar PV facility. When abnormal operating conditions, equipment failures, or other anomalies are detected, the MOC follows established protocols to notify and engage the appropriate operations, maintenance, engineering, environmental, safety, or emergency response personnel, as necessary, to evaluate and address the condition.

Operational control of the facility also includes management of site conditions that may affect public safety, neighboring properties, transportation corridors, and aviation operations. Solar PV facilities are designed and constructed to minimize glare through the use of low-reflectivity photovoltaic modules, engineering analysis, and site-specific design considerations. In the event that a glare-related concern is reported by a stakeholder, adjacent property owner, roadway user, aviation authority, or regulatory agency, the MOC serves as the initial point of operational coordination and will initiate the appropriate investigation and response process.

Consumers Energy maintains operational authority to evaluate reported glare conditions, coordinate technical assessments, engage subject matter experts as necessary, and implement reasonable corrective measures if warranted. Such measures may include operational adjustments, maintenance activities, vegetative screening enhancements, replacement or modification of affected equipment, or other mitigation actions determined to effectively address the identified condition. All reported glare concerns will be documented, investigated, and resolved in accordance with applicable company procedures and/or local regulatory requirements.

Through continuous monitoring, established response protocols, and proactive stakeholder engagement, Consumers Energy maintains operational control of its solar PV facilities in a manner that prioritizes public safety, regulatory compliance, system reliability, and responsible stewardship of community interests.

Maintenance

Preventative and Predictive Maintenance: Is the core element of the maintenance activities at solar PV power stations. Periodic visual and physical inspections, as well as verification activities each performed at scheduled intervals are required. Original Equipment Manufacturer (OEM) manuals and specifications are used to inform the preventative and predictive maintenance plan.

Corrective Maintenance: Refers to activities performed to restore a solar PV station, equipment or component to a fully functioning state after a failure detection by remote monitoring or during an on-site inspection. Oftentimes corrective maintenance only affects a small portion of the solar PV station which can be isolated from the remainder of the site using lockout-tagout (LOTO) and electrical clearance/de-energization/grounding/etc. procedures. Replacing a couple of low performing solar modules in a string would be such an example.

Major Maintenance: Pertains to the replacement or substantial refurbishment of a major piece of equipment. Replacing a complete inverter skid or doing a site-wide electrical shut-down to test/repair substation breakers and/or other components are two examples. Major maintenance typically involves the creation of a specific outage plan and supporting procedures/work instructions.

Spare Parts Management: Must ensure that spare parts are available and in operating condition in a timely manner to minimize the downtime of the solar PV station.

Indicative Schedule of Maintenance

Site

Item/Activity	Frequency	Comments
Monitor Cameras	Daily	Central security command center escalates any concerns to management, law enforcement and/or emergency responders.
Inspect Perimeter Fencing	Quarterly	Patrol perimeter to inspect fencing for damage.

Inspect Drain Tile Outlets	Quarterly	Patrol site to visually inspect drain tile outlets.
Storm Water Facilities	Quarterly or more frequently as specified in SWPPP.	Patrol site to visually inspect storm water facilities. See site specific Storm Water Pollution Prevention Plan (SWPPP)
Vegetation Management	Various	See stand-alone vegetation management plan specific to the site.
Respond to Community / Neighbor Concerns	Within two business days	Site manager or designee

Solar Modules

Item/Activity	Frequency	Comments
Module Cleaning	Infrequent	Standard practice in the Midwest is not to wash panels except in extreme soiling situations when rain is insufficient.
Module Snow Removal	Infrequent	Standard practice is to use tilt and natural heating of the panels to clear snow/ice.
Visual Inspection	Ad Hoc	Large solar PV stations may contain over ½ million individual panels. Visual inspection will be conducted as needed in response to specific concerns.
Unmanned Aerial Inspection / Satellite Imagery	Annual, Ad Hoc	LIDAR, Infrared and other advanced imagery techniques will be utilized to identify anomalies.

Trackers

Item/Activity	Frequency	Comments
Visual Inspection	Bi-Annually	1. Inspect all fasteners on the outer rows of the site for any signs of loosening such as misaligned torque marks or loose nuts. 2. Inspect the Damper assemblies for misalignment or damage. 3. Inspect the Center Structures and Drivelines for to verify they are still correctly aligned. 4. Inspect the bolts on drive components to ensure torque markings are aligned; re-tighten if necessary, on all outer rows.

		5. Test stow functionality; trip any applicable sensor (if installed). 6. Inspect for corrosion on tracker components while performing.
Visual Inspection	Annually	1. Inspect Driveline assemblies and Bearing Housings for misalignment. Column settling can affect the alignment of tracker components. 2. Inspect the Bearings for excessive wear from Column settling. Check for misaligned torque markings on the Columns. Repair, replace, or re-torque if necessary. 3. Inspect the conduits and penetrations in the Motor Controller enclosures and verify the seal remains intact.
Visual Inspection	Every Two Years	1. Inspect all hardware on one complete row per Motor Block. If loose hardware is found on the row, expand inspection to all rows in the Motor Block. 2. Inspect the module clamps on exterior rows for torque drop below the threshold using a torque wrench.

Disconnect, Transition Boxes, Wiring and Connectors

Item/Activity	Frequency	Comments
Unmanned Aerial Inspection / Satellite Imagery	Annual, Ad Hoc	LIDAR, Infrared and other advanced imagery techniques will be utilized to identify anomalies.
Switches, Disconnects, Breakers, Relays	Annual, Ad Hoc	Timing, methods and specifics TBD.

Inverters

Item/Activity	Frequency	Comments
Cooling System Inspection	Every 3 Months	Check for cooling liquid leakages. Check the correct input pressure of the expansion tank. Check and clean protective grilles. (Check for the absence of insects, fluff, dust, etc.) Check, clean and replace air filters. Check the fans' operation.

	Every 5 Years	Change cooling liquid (water / glycol) and hoses.
Switches, Disconnects, Breakers, Relays	Annual, Ad Hoc	Timing, methods and specifics TBD.

Control House/Substation/Generation Step-Up Transformer/Switchyard

Item/Activity	Frequency	Comments
Inspection & Testing	Various	Refer to detailed component requirements and schedule in CE procedure 14-01 Substation Inspections, etc.

Operations and Maintenance Procedures and Work Instructions

CESWS: The Consumers Energy Standard Work System is an electronic library of sorts that houses site and/or equipment specific procedures and work instructions for those activities required for the ongoing operation and maintenance of the PV site.

ProjectWise®: Is an electronic library system of record for engineering drawings, OEM manuals, etc.

Operations and Maintenance Records

SCADA: Supervisory Control and Data Acquisition refers to the onsite hardware and software used to measure and report real time operating data to other CE systems.

PI: Operating and performance data can be monitored at a glance and are recorded using a logging and timestamping tool called PI Historian.

SAP®: Maintenance and inspection programs are prepared, executed, and recorded using SAP® enterprise resource planning technology.

Data Lake: The aforementioned data from SAP® and PI Historian may be captured in a large database that can subsequently be referenced for monitoring and diagnostics as well as reporting.

Training

Each person accessing the facility will be provided with a comprehensive site orientation before commencing any work within the facility. The provided material, at a minimum will cover topics such as a general overview of the project, hazard analysis, emergency response, wildlife conservation training and vegetation management (as outlined in this document).

Stakeholder Concern Intake, Tracking and Resolution

Prior to Commercial Operation, a specific, stand-alone Gustin Solar Complaint Resolution Procedure including specific email and phone intake contact points will be provided to the Township via the Township Supervisor or their appointed representative.

Vegetation Management

As part of detailed engineering and design, a specific, stand-alone vegetation management plan is prepared for each individual utility scale solar station and provided to interested parties. Specifications including ground cover species and maintenance there off, noxious/invasive weed control and fire prevention are detailed within the vegetation management plan. This plan has been provided within Exhibit H of the Harrisville Township Special Land Use Permit Application package.

Emergency Response

As part of detailed engineering and design, a specific, stand-alone Emergency Response Plan (ERP) is prepared for each individual utility scale solar station and provided to interested parties. Prevention, training, and response preparedness are key elements of the ERP. This plan has been provided within Exhibit E of the Harrisville Township Special Land Use Permit Application package.

Decommissioning

As part of detailed engineering and design, a specific, stand-alone decommissioning plan and cost estimate is prepared for each individual utility scale solar station and provided to interested parties. Typically, financial assurance is provided to governmental stakeholders in the form a surety bond in the amount of the estimated decommissioning costs determined in the plan. This plan and cost estimate have been provided within Exhibit G of the Harrisville Township Special Land Use Permit Application package.

References

The following documents were utilized to help inform this policy. Consult these documents for further applicable information.

- **Operations and Maintenance Best Practices 5.0** – Available at www.solarpowereurope.org
- **Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems; 3rd Edition** – Available at www.NREL.gov/solar
- **Various OEM Operating Manuals, etc.**