Solar Operation & Maintenance Plan

GD Middletown West Main - Middletown, RI

Green Development, LLC I 2000 Chapel View Blvd, Suite 500, Cranston, RI 02920 I 401-295-4998 I www.green-ri.com

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1. Overview

The following information in this manual describes the operation and maintenance plan for the 2.50 MW PV solar generating facility located at 1747 West Main Rd., Middletown, RI. The site is developed, designed and operated by Green Development, LLC under the entity of GD Middletown West Main I, LLC.

The site consists of the following components:

Component	*Quantity*	*Function*
Solar PV Panels	See note	Transform Solar Energy to DC Electricity
Solar Combiner Boxes	See note	Group multiple Solar PV Panels together
Solar PV Inverters	See note	Receives DC Energy from multiple Combiner Boxes and Transforms that DC Energy to AC Energy
Pad Mount Transformers	See note	Receives the AC Energy that is output by the Inverters and steps the voltage up to the required Utility Voltage
Neutral Reactors	See note	The Neutral Reactor helps absorb any excessive fault current to protect site and utility equipment in the event of a major short circuit in the Solar PV Array
MV Collection System	See note	The MV Collection System is underground cabling that brings the energy from the Combiner Boxes to the Inverters as well as from the Inverters to the Pad Mount Transformers then to the Utility Point of Common Coupling
Pole Mounted Recloser	See note	Monitored Disconnection Point of the site to the Utility Feed. Serves as a protection device for various electrical anomalies either from the site or the utility to protect equipment
Recloser Relay	See note	Monitors the status of the electrical system and opens when an event outside of the established parameters occurs to protect site and utility equipment
GOAB Switch	See note	Group Operated Air Break Switch – Used as a visual open to disconnect the site from the utility to safely work on site equipment

Note: Quantities to be provided prior to Final Plan/ Recording submission

The solar PV facility is comprised of PV modules, associated wiring components and multiple string inverters. In operation, the DC power produced by the solar sub-array is converted to three-phase AC power by the inverters. That power is then supplied into an electrical collection system, which effectively enables each sub-array to function independently. The sub-arrays are then collectively interconnected to the utility system through a series of step-up transformers.

In the event of a power failure, the PV facility will automatically shut down when a loss of AC power occurs per UL 1741 and IEEE 1547 to protect utility personnel from injury while repairing the utility system.

This manual provides a description of the PV facility, procedures for the basic operation, maintenance and troubleshooting of the system and important safety information.

2. Responsible Parties

A Land Lease Agreement will be executed between the Landowner (Lessor) and Operator (Lessee/Site Operator).
GD Middletown West Main I, LLC is the Operator of the Solar Project at the Site, and is the responsible party for the following Solar operations and maintenance activities on the Site:

- Grounds maintenance and maintenance of vegetative cap within the limits of the leased area, which shall include all solar generation equipment and a 10-20' buffer surrounding such equipment, to be determined based on topography and site conditions. Such leased area will be shown on final leased premises plan to be completed prior to commencement of construction and incorporated into the land lease.
- Drainage swales and stormwater controls (if any) within the limits of the leased area
- Maintenance and repair of access roads of the leased premises

2.1. Contact Information

Land Owner: Cenz Corp

Site Operator (Lessee): GD Middletown West Main I, LLC (Green Development)

For the purposes of reporting problems associated with the Site, a sign shall be maintained on the perimeter fence which lists appropriate contact information. Access to the Site shall be provided to authorized personnel only.

3. Safety

The system has been designed for safe and reliable operation. However, it is critically important that any personnel who operate or maintain the system observe the proper safety precautions. Listed below are some of the most critical safety considerations:

- ONLY LICENSED, QUALIFIED, EXPERIENCED AND TRAINED PERSONNEL SHOULD PERFORM REPAIR WORK ON ANY ELECTRICAL COMPONENTS OF THE SYSTEMS.
- DANGEROUS VOLTAGE LEVELS ARE PRESENT IN EACH SYSTEM – VOLTAGES UP TO 1,000 VOLTS DIRECT CURRENT (DC) AND 13,000 VOLTS AC CAN BE FOUND UNDER PARTICULAR OPERATING CONDITIONS. IT SHOULD BE NOTED THAT HIGH VOLTAGE SYSTEMS REQUIRE SPECIAL SAFETY PRECAUTIONS DURING MAINTENANCE OR REPAIR OPERATIONS.
- PV MODULES PRODUCE VOLTAGE WHENEVER THEY ARE EXPOSED TO SUNLIGHT. AT ANY TIME DURING DAYLIGHT HOURS, (INCLUDING MINIMAL SUNLIGHT CONDITIONS) THERE IS AN ELECTRICAL SHOCK HAZARD IF ANY PERSONNEL SHOULD CONTACT EXPOSED PV ARRAY ELECTRICAL CIRCUIT COMPONENTS.
- BROKEN OR CRACKED PV MODULE GLASS CAN INCREASE RISK OF SHOCK HAZARD, ESPECIALLY WHEN WET. IMMEDIATELY CONTACT QUALIFIED PERSONNEL FOR REPLACEMENT SERVICES IF ANY BROKEN PV MODULE GLASS IS NOTICED.

- IF YOU HAVE ANY QUESTIONS OR ARE UNSURE ABOUT HOW TO PROCEED, CALL GREEN DEVELOPMENT ASSET MANAGEMENT PRIOR TO PERFORMING ANY MAINTENANCE OR SERVICE WORK ON THE PV FACILITY.

EMERGENCY CONTACT INFORMATION

IN THE EVENT OF AN EMERGENCY, DIAL 911

Local Non- Emergency Contact Numbers

Agency	*Address*	*Phone Number*
Middletown Police Department	123 Valley, Road Middletown, RI 02842	(401) 846-1144
Middletown Fire District	239 Wyatt Road Middletown, RI 02842	(401) 846-1031
Newport Hospital	20 Powel Avenue Newport, RI 02840	(401) 846-6400

3.1. System Component Safety Information

3.1.1. PV Arrays:

The solid-state nature of the PV array greatly reduces the amount of maintenance required when compared to traditional mechanical generating systems. Unless a portion of the PV array becomes physically damaged, the system will be safe and reliable for the majority of its service life. In the event that repair or maintenance work must be undertaken, please be aware of the following precautions:

- Only qualified personnel should be allowed access to the internal or energized components of the PV array junction boxes, inverters, panelboards, transformers, disconnect switches or field wiring.
- The PV array will always be electrically energized during all daylight conditions; so proper training, experience and precautions are required to ensure personnel safety.
- Before attempting any maintenance or washing operations, carefully inspect the entire PV array for modules with broken glass. A qualified contractor must replace broken PV Modules before any array washing or other maintenance work is attempted.
- In order to disconnect the entire PV array from the inverters, secure the operating handles of all mounted PV Array disconnect switches in the "Off'' position.
- To disconnect a single PV array source circuit from the inverter, secure the operating handle of its associated PV Array disconnect switch in the "Off'' position.
- Verify that all components undergoing maintenance or repair are disconnected from the inverter before servicing.
- Do not remove any fuses, or disconnect any PV module wiring while the array is electrically connected to the inverter.

- Physical damage to components and hazardous conditions will result if any individual PV Array component is opened under load.
- Do not attempt to access the junction boxes on the back of the PV modules. There are no user serviceable components in the module junction boxes.
- Always follow safe work practices and use proper safety equipment during maintenance or repair operations on the PV array.

3.1.2. Inverters

When compared to historical rotary inverter technology, the solid-state design utilized in the Inverters greatly reduces maintenance requirements while maximizing system-operating efficiency. Before undertaking any routine maintenance or repair work, please read the Inverter manual and pay close attention to the following precautions:

- To shut down an inverter, turn the AC and DC Disconnect Switches, on the front of the inverter, to the "OFF" position. These switches can be used to shut down an inverter whenever there is a question regarding personal safety or the operation of either inverter.
- The appropriate AC breaker in the main panelboard for the respective inverter must be secured in the "OFF" position in order to ensure that the inverter is not energized by utility during routine maintenance operations.
- Only qualified, experienced and trained personnel should perform repairs on the electronic and electrically energized components inside the inverters.
- Because the interior of the inverter cabinet contains exposed high voltage components, the cabinet door should remain closed at all times. Qualified, maintenance or repair personnel should only open the cabinet to perform maintenance or service work after the inverter has been completely disconnected from all electrical energy sources and the capacitors have fully discharged.
- To reduce the risk of electric shock, do not perform any maintenance work other than that specified in the Inverter manual.
- Only [inverter manufacturer] factory personnel or their designated agents should perform any service work on the inverter's power conditioning or control components.
- Do not open the inverter cabinet doors during wet or inclement weather conditions. Introducing rain or moisture into the cabinet interior could result in hazardous conditions or damage to electrical components. For further information on the inverter, please refer to the appropriate inverter manual.
- Be sure to follow safe work practices and use proper safety equipment during maintenance or repair operations on the inverters.

4. System Description

4.1. PV Array

The ground-mounted photovoltaic arrays consist of PV modules which convert sunlight directly into electricity for utilization by a load such as a utility interconnected inverter. Each module is a sealed, solid-state device with an expected performance life well in excess of 25 years.

Electrically, the PV modules are wired into groups, which are referred to as strings or source circuits. Each source circuit is comprised of individual PV modules wired in a series configuration. Individual source circuits are then grouped together in combiner boxes forming sub-arrays.

For the PV modules to produce their full electrical output, they must be clean and free of shade. Shadows cast by nearby objects such as antennas, air conditioning equipment, trees, overhead wires, etc. will significantly reduce a module's current and voltage output. Because each module is electrically interconnected with other modules, reducing the output of a single module effectively reduces the energy production for the entire source circuit.

The solar modules are mounted using the RBI Solar ground mounting system, with a steel frame to secure the solar array at a fixed degree tilt and the modules in a design that minimizes shading, while optimizing use of area.

4.2. Inverters

The inverters act as a fully automatic power-conditioning interface between the PV array and the utility system. The inverter will utilize solid-state power and control components to maximize power production from the PV array while meeting power quality and safety standards set forth by utilities under Underwriters Laboratories Safety Standards.

An LED display associated with the Ground Fault Detection and Interrupt Circuit (GFDI) on the face of the inverter will indicate the operating status of the unit along with other pertinent data. Please refer to the Inverter O&M manual for more details on the design and operation of the inverter.

To operate efficiently, the inverter circuit components must be kept free of excessive dust and dirt. In addition, the cooling fans and the blower impellers must be kept clean for efficient air movement. Dirt accumulating on circuit boards and electrical equipment leads to higher component operating temperatures and shorter life.

4.3. Electrical System

The main electrical circuitry associated with the system transfers electrical energy from the PV arrays to the inverters and then from the inverters to the point of utility interconnection. The components utilized in the system design are standard electrical components and can be serviced by any qualified electrical contractor who is thoroughly familiar with photovoltaic power systems.

4.4. Data Acquisition System

This Photovoltaic power system is equipped with a Data Acquisition System (DAS) to monitor the energy production of the system.

The DAS consists of an environmental weather monitoring system, and various energy measurement components, which are both connected to an Internet Broadcast Device. The central DAS components and environmental components are located together within the site.

An environmental instrument package measures solar insolation, wind speed, and ambient temperature while the energy monitoring system measures power and the electrical energy produced by the system.

Information gathered by the DAS is broadcast to a web site for processing and monitoring purposes. This service not only gathers energy production data, but also issues alerts to system administrators when the system's projected performance falls below expected values.

5. Operation

5.1. System Operation

During normal operation, the inverters will act as fully automatic power-conditioning devices. The inverter will start to process power whenever there is sufficient energy available from the PV array. During the generation process, the inverter will utilize peak power tracking technology to maximize the energy production from the array. This function is achieved by varying the peak voltage and current point on the power curve for the photovoltaic array as operating conditions vary throughout the day.

Under basic operation, the PV array generates direct current (DC) and supplies it to the inverter. The inverter processes and conditions the direct current obtained from the PV array into 480 volt three-phase alternating current (AC), which is then stepped up to 13,000 volts via the transformers to the utility voltage at the site. In addition, the inverter synchronizes the phase characteristics and frequency to match that of the utility system.

In the event that the quality of the utility power momentarily falls outside a set of pre-specified parameters, the inverter will automatically shut down in a fault mode. After stable utility power becomes available again, the inverters will automatically restart and continue to process power. In the total absence of utility power, the inverter will not operate.

Whenever the PV array produces insufficient energy to efficiently operate the inverter, the inverter will automatically go into a low power "sleep" mode. The inverter will then sample the PV array for available power and resume power processing functions when sufficient levels of electrical energy are once again available from the array.

The inverter will also shut down whenever an operating problem is detected with the PV array, utility power quality or an internal operating parameter. Under such conditions, a fault code will be displayed on the front user interface panel. The fault code can then be matched to a detailed list of fault codes found in the Inverter O&M manual.

5.2. Emergency Shut Down Procedure

The following steps are required to shut the system down in an emergency:

- Turn the AC Disconnect Switch to the "OFF" position.
- Turn the DC Disconnect Switch to the "OFF" position.

These steps will power off the inverter; however, AC power from the grid and DC power from the array will still be present in the inverter wire termination section.

The next steps will disconnect power from the array and the utility transformer to the inverters:

- Open DC PV array disconnect switches located on the inverter pad.
- Open the GOAB switch. Or disconnect and ground the individual inverter Pad Mount Transformer.

*Please refer to the as-built drawings for GOAB switch location

IMPORTANT NOTES:

WHILE THE ABOVE STEPS ISOLATE THE PV ARRAY CIRCUITS FROM THE INVERTERS, ALL CIRCUITS BETWEEN THE PV MODULES AND THE DISCONNECT SWITCHES WILL BE ENERGIZED DURING DAYLIGHT HOURS. HIGH VOLTAGE WILL BE PRESENT EVEN AT LOW LEVELS OF SUNLIGHT.

IT IS IMPERATIVE TO FOLLOW SAFE WORK PRACTICES AND USE PROPER SAFETY EQUIPMENT DURING ANY EMERGENCY OPERATIONS, WHICH INVOLVE ANY PORTION OF THE PV ARRAY.

5.3. Activating or Starting the System

Before attempting to operate the inverters, refer to the Inverter O&M manual for initial turn-on procedures. The O&M manual also contains a detailed list of inverter fault codes, safety procedures, and other pertinent information.

The following describes normal steps taken to turn the inverter on or off. Refer to the as-built drawings for identification of components.

The start-up operations listed below should be followed in the sequence listed (for each inverter):

- Remove any lockout devices on the disconnect switches after confirming that any repairs or maintenance operations have been completed and that no personnel are still working on the system.
- Make sure that the inverter cabinet doors and DC disconnect doors are all closed and locked.
- Turn on the Inverter's 3-phase AC disconnect.
- Turn on the Inverter's DC disconnect.
- Watch the LED indicators for initialization (green and red LEDs on), then slow blinking green LED followed by faster blinking green LED. Watch the LCD display for prompts and system status.

- Inverters will start a 5 minute countdown to power on
- Listen for contactor activation (inverter on-line).
- Listen for slight 60Hz hum (transformer on-line).
- Following the blinking green LED and high frequency switching sound you should see a solid green LED (inverter on-line and beginning to feed power into 3-phase circuit). This confirms that the inverter is operating normally. The LCD display will show the AC Power, Energy, current and voltage as well as DC voltage.

If the unit fails to power on, use the troubleshooting information provided in the user manual. If those steps do not resolve the problem, contact the Site Operator or Inverter Manufacturer.

6. Maintenance

6.1. Maintenance Precautions

Before undertaking any maintenance or repair operations involving physical contact with the PV Array or inverter components follow the shutdown procedure described in the previous sections.

- Review and understand all safety precautions and maintenance operations described in both this document and the Inverter Manual.
- **Only qualified individuals should perform or supervise any maintenance procedures.**
- Install appropriate lock out devices on all system disconnecting means to protect personnel performing maintenance operations on the system from electrical shock hazards.
- Contact Site Operator if there are any questions regarding operation or maintenance procedure for the PV array.

Note: The PV array circuits, array combiner boxes, the array disconnect switches and all associated wiring will remain energized as long as there is sunlight. Hazardous DC voltage levels will be present in all these components even during very low daylight conditions.

6.2. Quarterly Maintenance Procedures

As a general rule, the following procedures should be executed for the quarterly maintenance procedure:

- Visually inspect the entire PV array for any broken front glass panels on any of the PV modules.
- Do not physically touch or attempt to clean any broken modules.
- Broken PV module glass can present a serious or fatal electrical shock hazard, especially if wet.
- Log any damage information and report it to the Site Operator.

- Visually check that array wiring is secured to the PV module frames and is not dangling loose where it is subject to damage from wind movement.
- Visually inspect electrical conduits, the exterior enclosures of the disconnect switches and the inverters for physical damage, corrosion or an excessive accumulation of dirt or debris.
- Verify that physical access to the inverters and electrical disconnect switches has not become obstructed by other equipment or materials.

6.3. Annual Maintenance Procedures

Components & Equipment	Description	Preventative Action
PV Modules	Check for dust & debris on module surface	Wash or wipe clean with water
	Check for physical damage on all PV modules	Replace damaged PV modules
	Check for loose or disconnected cable terminations between PV module wiring	Retighten or reconnect wiring
	Check cable condition	Replace worn cables if necessary
	Check for shading obstructions on all PV modules	Identify source and remove
	Check for fading/discoloration, burn marks, seal condition, frame damage or rust	Log and report conditions to Site Operator
PV Inverters	Check functionality – e.g. auto disconnect upon loss of grid power supply, error & ground fault LED indicators	Consult inverter manufacturer for repair or replacement parts
	Check ventilation condition	Clear dirt, dust or debris from ventilation system
	Check for abnormal operating temperature	Consult inverter manufacturer for repair or replacement parts
	Check for abnormal noises – i.e. irregular humming or rattling	Consult inverter manufacturer for repair
	Inspect inverter structure(s) and enclosure(s) (seals, rust, damage, door condition, switch/handle condition, locks)	Log and report conditions to Site Operator
Cables	Check for cable conditions – i.e. wear and tear	Replace worn cables if necessary
	Check cable terminals for burnt marks, hot spots or loose connections	Tighten connections or replace if necessary
Combiner Boxes	Check cable terminals – e.g. wear and tear, loose connections or burn marks	Tighten or replace if necessary
	Check for placards and signage	Replace if necessary
	Check for physical damage	Replace if necessary
	Check for blown fuses inside the Combiner Box	Replace blown fuses
	Check for water leaks inside the Combiner Box	Replace combiner box or repair to prevent future water leaks
Bonding & Grounding	Check grounding cable and bonding connection conditions	Replace worn cables if necessary
	Check the physical grounding/bonding connection	Retighten connection if necessary
	Check continuity of grounding and bonding conductors	Troubleshoot or replace if necessary
Disconnect Switches	Check functionality	Replace or repair as necessary

Components & Equipment	Description	Preventative Action
PV Module Racking System	Check for corrosion	Treat corroded areas or consult racking manufacturer/installer
	Check for damage to racking system	Replace or repair damaged parts
	Check for settlement	If settlement is detected within the solar array area it will be assessed in conjunction with the Owner, as applicable, and an appropriate response action will be selected
Pole Mounted Equipment	Check for damage or irregularities – e.g. damage from weather related incidents, blown fuses, lightning marks, etc.	Replace or repair damaged equipment
Transformers	Operator will be responsible for attending the site to check the terminations, etc. for the main transformer Any alarms raised by the public or the DAS should be immediately forwarded directly to Site Operator for action Check fluid levels Note: Envirotemp FR3 fluid is a fire-resistant natural ester based dielectric coolant specifically formulated for use in distribution transformers where it's unique environmental, fire safety, chemical and electrical proposers are advantageous. Envirotemp FR3 fluid is formulated from edible seed oils and food grade performance enhancing additives. It does not contain any petroleum, halogens, silicones or any other questionable material. It quickly and thoroughly biodegrades in both soil and aquatic environments. The fluid tested non-toxic in aquatic toxicity tests	Log and report conditions to Site Operator
General/ Vegetation	Check vegetation control to maintain optimal performance of PV system and visual perception of the site Check fence/gate security	Mowing of grassy areas as necessary and applicable Pruning of trees/bushes on property, or overhang property that cause shading of the PV panels or potential damage to fencing/equipment in compliance with any conditions of the land lease Site Operator to carry out repair/replacement of fence and security systems as appropriate

6.4. PV Module Cleaning Procedure

A thin layer of dust does not significantly degrade PV array performance; however, heavy accumulations of dirt or grime should be removed by carefully washing the array. Array cleaning operations are not normally recommended if natural rain events, as expected in the northeast, are frequent enough to keep the PV modules relatively free of dust and dirt.

Perform Array cleaning operations in the order described below:

- Prior to undertaking any cleaning efforts, carefully inspect the entire PV array for any broken glass on any one of the PV modules.
- Do not attempt to wash any broken PV modules; PV modules with broken glass can present a serious or fatal electrical shock hazard, when wet.
- If broken Modules are discovered, contact the Site Operator. All broken PV modules must be replaced before undertaking any cleaning related activities and broken modules shall be disposed of in accordance with all applicable laws.
- Wash the PV array only during early morning hours before the module glass temperature rises above ambient air temperature.
- Turn off and secure all PV Array Disconnect (main DC disconnects and combiner box DC disconnect) switches prior to starting cleaning operations.
- Exercise caution when moving hoses and using cleaning equipment to prevent damage to the PV modules and other equipment during cleaning operations.
- Use clean, low-pressure, hose directed water to remove loose dirt from the module surfaces**.** The use of cleaning agents other than water (e.g., detergents, solvents, etc.) is prohibited).
- Do not use any water sources containing heavy minerals, which upon drying may coat the module surface with undesirable deposits, reducing the PV modules' performance.
- For persistent soil deposits, employ hose directed water and a wet, soft brush to clean modules. Do not use a dry mop or broom without water since it could damage the glass surface.
- If any PV modules are damaged or broken during cleaning work, immediately stop all activities and follow the actions described above.
- After completing cleaning operations, turn all PV Array Disconnect switches back on.
- Verify that the inverters have automatically restarted and that no fault conditions exist.

6.5. PV Module Replacement Procedure

WARNING: ONLY QUALIFIED PERSONNEL SHOULD WORK ON THIS SYSTEM. PHOTOVOLTAIC MODULES ARE ALWAYS ENERGIZED WHEN EXPOSED TO LIGHT.

Perform module replacement operations in the order described below:

- Refer to the string wiring diagram to locate which inverter and DC disconnect the module is associated with.
- Put in the OFF position and lock out all PV Array Disconnect (inverter DC disconnect and AC disconnect) switches associated with the inverter prior to starting replacement operation.
- Open all circuit fuses that the module is associated with.

  WARNING: Do not open fuses until the DC disconnects have been turned off. Pulling fuses under load is an unsafe practice and a fire hazard, doing so could cause damage to PV wire, fuse holder, and combiner box.
- Cover the module with a blank out mat with steel spring clamp.
- Use PV disconnect tool to disconnect positive and negative leads of the broken module.

  WARNING: Do not disconnect modules until the fuses have been pulled. Disconnecting modules under load is an unsafe practice and a fire hazard, doing so could cause damage to PV module, connector, and wire.
- Loosen the four bolts that attach PV module to racking.
- Replace broken module with new module.
- Replace the four bolts and torque to specification outlined by the manufacturer.
- Check module leads for any damage, and then connect positive and negative leads.
- Replace tie wraps for wire management.
- Close all fuses that the module is associated with.
- Follow start up sequence to bring the string back online.

7. Troubleshooting

7.1. Inverter Not Operating

In the event that the inverter is not running as expected during daylight hours with a clear sky and strong sunlight, please check the following:

- Verify that the facility is receiving power from the utility connection and that an electrical outage has not occurred within the last 10 minutes.
- Perform a reboot of the inverter AC power by switching off the AC Disconnect, waiting until the screen on the inverter goes dark, then restarting the AC Power by switching the AC disconnect to On.
- Make sure that the inverter doors are all closed and locked.

If the inverter does not begin countdown to operation after a 300 second delay once step three is complete, look for lockout devices on the disconnect switches listed below.

Important Note: The switches listed below may also be found unlocked in the "OFF" position for a specific reason. Do not close any switches without first verifying that no personnel or property are at risk if the switch is closed.

- Utility AC Disconnect.
- Inverter AC Disconnect.
- Array Disconnects.

After establishing that it is safe to do so, close the switches in the following sequence:

- Close the DC Disconnect switches.
- Close the main disconnect switch and close the individual inverter specific breakers in the panelboard cabinets.
- Close the DC PV array disconnect switches located on the panelboard pad.

If the inverter still does not operate after completing the sequence described above, then a Fault condition likely exists. Please refer to the following section for recommendations on further actions.

7.2. Inverter is in Fault Mode

The inverters have a set of internally monitored operating conditions that must be met for safe and reliable operation. If any of these conditions is not met, the inverter shuts down and goes into what is known as a "Fault" mode. The inverter will remain in off in the Fault mode until the condition is corrected.

Many operating conditions may change temporarily during normal system operation. Temporary fault conditions such as momentary sags in utility line frequency or voltages are transient, so the inverter will automatically restart after the operating conditions return to normal.

If the fault condition is not temporary the inverter will remain out of operation until the fault condition is corrected. In the event that an inverter has been off for several hours with uninterrupted electric utility service and clear sunny skies, then a more prevalent type of fault condition is likely preventing the inverter from operating.

To identify the fault condition, please refer to the Inverter Installation and Operation manual for a description of how identify fault codes and how to do a soft restart as well as a hard restart of the inverter. The menu will indicate the present fault condition, which should recorded, be reported to facility operations manager for evaluation and correction.

7.3. Low Energy Production by the DAS

Some common causes of system underperformance are:

- Heavy dirt, debris, dust accumulation, or shading on the PV array.
- Damaged PV modules.
- Compromised electrical system components such as damaged conduit or wiring.
- Open fuses in the PV array combiner boxes or open disconnect switches.