

# Energization Checklist

## Introduction

This checklist has been established to ensure the safety of all personnel on site during the energization process. Electrical testing and QA/QC checks have been performed to reduce any electrical issues during energization. However, there is a limited potential to have a component failure or malfunction during the energization. Therefore, to reduce the exposure to personnel there will be multiple layers of control to ensure everyone's safety.

Since the electrical system is considered mechanically complete there is a potential for electrical energy to flow from the substation to any part of the site. There is also a potential for electrical energy flow from the site to the substation. Therefore, during this period everything inside the substation and site should be considered energized. If work is performed on any components, the component must be isolated per the LOTO (Lock Out Tag Out) procedure or using energized electrical work practices.

This checklist is intended to ensure critical areas of the process are addressed and to provide expectations that address the safety of all site personnel.

## Planning

### 1. Energization Planning Meeting

- The meeting should include a discussion of the possible component failures. Everyone should understand that there is a potential for significant failure of components that increase exposure of personnel.
- Review the Energization Procedure, JHA (Job Hazard Analysis), and Energy Control Procedure, including identifying the Energized Area. Designate the person in charge of the procedure. This person will be responsible for the initiation and the termination of the energization plan.
- The person in charge shall establish communications with all personnel involved in the procedure. They will provide direction and monitor the implementation. Consider using radios which would allow all personnel involved to monitor the activities and quickly notify all personnel involved in the normal parameters are exceeded.
- Notify the local off-taker and grid operators that the site will be energizing the substation and major components. They should understand their role per the initial notification.
- Include Human Factor and questions any participants may have.

### 2. Review of Employee Qualifications

- The Energization Procedure shall designate who will perform the tasks and the required training and qualification needed by those individuals.
- The required training and qualification shall align with the training requirements in the procedure. If the procedure states that the person performing the switching is required to be a "qualified switcher" there should be a training document that documents that the

individual is a “qualified switcher.” For example, a “journeyman” does not equal a “qualified switcher.”

### 3. Review of the Emergency Action Plan (EAP) Section on Energization

- If there are no specific requirements, special consideration should be added to the plan for site specific response including who to contact for shock and arc flash incidents, what individual workers are expected to do, verification of emergency equipment being readily available, and circumstances when notification of local emergency management is necessary.

### 4. Pre-Energization Checks

- Before the energization process begins, thorough checks and inspections are conducted to verify that all electrical connections, equipment, and components are installed correctly and functioning as intended. This includes checking the solar panels, wind turbines, battery modules, inverters, transformers, switchgear, protection devices, and other relevant equipment.

### 5. Energization Procedure and Job Hazard Analysis

The Energization Procedure should be a detailed step by step plan that provides directions for the tasks to be performed and the order in which they will be performed.

#### **Energization Procedure, at a minimum:**

- Includes hold points/signoffs for responsible parties;
- Demonstrates an Energized Area Control program is implemented;
- Defines entry personnel required training including site specific instruction;
- Outlines procedure to verify all required PPE (Personal Protective Equipment), insulated tools, equipment and electrical meters are available in sufficient quantity, inspected and have current calibration;
- Identifies area to be energized and all components involved;
- And includes steps to verify the arc flash study and labels are current and available.

A Job Hazards Analysis (JHA) is a systematic process that identifies potential hazards associated with a specific job or task, assesses the risks, and establishes measures to mitigate or eliminate those risks to ensure workplace safety. **JHA, at a minimum:**

- Includes identification of major or substantial job steps;
- Identifies hazards of major or substantial job steps;
- Defines hazard mitigation as determined by the Hierarchy of Controls;
- And identifies risk level after hazard mitigation.

### 6. Final Walk Down

- Verify all work and testing has been completed and is ready for energization.
- Coordinate on the energization with required parties, i.e. the local utility controlling the output of the substation, remote operations centers.

## Implementation

### 1. Notification to Grid Operator and/or Remote Operations Center

- The facility operator notifies the local grid operator, utility and/or Remote Operations Center about the planned energization date and time. This coordination ensures that the grid operator is aware of the upcoming changes to the electrical grid and can make necessary adjustments to accommodate the renewable energy facility's generation.

### 2. Notification of Energization

- Communicate to all site personnel that the electrical system is being energized according to the Energization Procedure.

### 3. Energized Area Control

- Verify all personnel are away from all the components and equipment that will be energized.
- Consider posting personnel in view of major components to ensure no personnel approach during the initial period or notify person in control of an incident they may affect the process.

### 4. Synchronization

- Once all pre-energization checks are complete, the facility is synchronized with the electrical grid. This involves carefully matching the frequency and phase of the facility's output with the grid's parameters to ensure a smooth connection. Grid synchronization is essential to avoid any sudden power surges or disturbances.

### 5. Gradual Power Ramp-Up

- After synchronization and if necessary, the facility gradually ramps up its power output to the desired level. This controlled approach allows the grid operator to monitor the facility's impact on the grid and make any necessary adjustments.

### 6. Grid Connection

- When the renewable energy facility's power output is stable and within the specified parameters, it is fully connected to the electrical grid. At this point, the facility is generating electricity and supplying it to the grid.

### 7. Monitoring and Testing

- Once the facility is energized, continuous monitoring and testing take place to ensure its proper functioning. Various parameters, such as voltage, frequency, power factor, and system stability, are continuously monitored to ensure compliance with grid standards.

### 8. Post-Energization Checks

- After energization, post-energization checks are performed to verify that equipment is operating as expected and to address any issues that may have arisen during the process.

## 9. Reporting

- The facility operator may be required to submit reports to regulatory authorities or the grid operator detailing the results of the energization process.