## **Installation checklist – Solar mini-grid system**

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| Date: ***[Insert date]***…………………………………………………..  Project name: ***[Insert project name]***………………………………  Site location: ***[Insert site location]***…………………………………  Province: ***[Insert province]***………………………………………… |

# Before testing the system

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| 1. | Use proper safety procedures and equipment when working with electricity. |
| 2. | Verify that all disconnects are locked in the open position with a warning label. This ensures that power cannot travel further down the line until properly tested, and warns others that there may be live conductors in the box. |

#### PV array

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| 1. | Make sure all modules are attached securely to their mounting brackets. |
| 2. | Visually inspect the array for cracked modules, damaged junction boxes, and loose wires. |
| 3. | Visually inspect that all module nuts and bolts are tight. |
| 4. | Check that the array spacing is adequate without any shadow issues in modules. |
| 5. | Open each combiner box and test the open circuit voltage on each series string to verify the correct voltage and polarity. Recheck torque on all DC terminals. |
| 6. | Before powering up the system, at the final array breakers, repeat open circuit voltage tests to verify the correct voltage and polarity. |
| 7. | Verify modules are wired so that they can be removed without interrupting the grounded conductor. |
| 8. | Check for labels on the modules. “Modules shall be marked with identification of terminals or leads as to polarity, maximum over-current device rating for protection, and with rated 1) open-circuit voltage, 2) operating voltage, 3) maximum permissible system voltage, 4) operating current, 5) short-circuit current, and 6) maximum power." |
| 9. | Make sure there is provision for resources (water, pipes, etc.) allowing for panel cleaning. |

#### Wiring

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| 1. | Check exposed array wiring for correct rating and UV-protected insulation. |
| 2. | Check that all wiring and conduits are appropriately rated, neat, and well-supported. |
| 3. | Check that strain reliefs/cable clamps are correctly installed on all cables and cords by pulling on cables to verify. |
| 4. | Make sure that all equipment grounding conductors are green or bare. |
| 5. | Verify that the conductor rating of the PV circuit is at least 156% of the rated short circuit current. |
| 6. | Verify that all junction boxes are accessible. |

#### Over-current protection

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| 1. | Verify that the overcurrent device rating of the PV circuit is at least 156% of the rated short circuit current. |
| 2. | Make sure DC voltage and current ratings are marked on over-current protection. |

#### PV inverters

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| 1. | While disconnects are open, re-torque all electrical terminal connections on the inverter to tighten any connections that may have loosened since the initial installation. |
| 2. | Verify in the inverter manual that the array open-circuit voltage, under the record lowest temperature, is acceptable to the inverter. |
| 3. | If the inverter measures and reports utility or inverter AC voltage on a display, verify that this voltage agrees with a measurement from a high-quality, true-RMS AC voltmeter. |
| 4. | Once the inverter has started and is operational, check that the maximum power point tracking (MPPT) circuit is operating. This should be done during clear sky conditions if possible, by monitoring array voltage from the open circuit condition until it reaches a point where system power peaks and then starts to drop again. Keep monitoring the voltage until you note that the system voltage has been adjusted up and down several times. |
| 5. | Verify that the operating voltage is near the expected peak power voltage for the conditions of the test; this can be found in most manufacturers’ manuals. |
| 6. | Properly connect the temperature compensation probe to control battery voltage. |
| 7. | Follow the inverter-starting procedure from the manufacturer’s manual. |
| 8. | Instruct the homeowner on what to do in the event of an inverter failure and provide them with an initial start-up test report. |

#### Charge controllers

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| 1. | Torque all terminations again. |
| 2. | Check that all voltage settings are correctly set for the appropriate battery type and proper voltage. |
| 3. | If the system is connected to a utility-interactive inverter, make sure that the settings of the charge controller(s) do not interfere with the proper operation and dispatch of the inverter system. |
| 4. | Verify that the charge controller operation matches the programmed settings by forcing the system to the set points and making sure that the unit performs the proper control function. You should test the following points:   * Low voltage disconnect (LVD) * Low voltage reconnect (LVR) * High voltage disconnect (HVD) * High voltage reconnect (HVR) |

#### Disconnects

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| 1. | Verify that disconnects are still locked open and the warning label is still intact. |
| 2. | Verify that there are means to disconnect and isolate all pieces of equipment in the system |
| 3. | If fuses are used, verify means to disconnect the power from both ends. |
| 4. | Ensure switches are accessible and clearly labelled. |
| 5. | Check the continuity of fuses and circuit breakers with power off. |
| 6. | Check voltage drop across switches while operating. |
| 7. | Check individual cell or battery voltages after equalization. |
| 8. | Check the specific gravity of all questionable cells with a hydrometer. |

#### Batteries

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| 1. | Store safety gear nearby (eye protection, rubber gloves, baking soda, and distilled water). |
| 2. | Re-torques all battery connections. |
| 3. | Coat each terminal with anticorrosive gel. |
| 4. | Make sure that access to terminals is limited. |
| 5. | Make sure that the location provides adequate natural ventilation. Well-vented areas include garages, basements, and outbuildings, but not living spaces. |
| 6. | If the battery contains flooded cells, top off the cells with distilled water according to the manufacturer's instructions. |
| 7. | If the battery contains flooded cells, be sure an eyewash station is accessible. |
| 8. | Once the inverter is operational, “equalize charge” the battery to ensure that the battery is properly connected and functioning correctly. |
| 9. | Ideally, run the battery through a few heavy charge-discharge cycles to exercise the battery. |

#### Battery inverter

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| 1. | While disconnects are open, re-torque all electrical terminal connections on the inverter to tighten any connections that may have loosened since the initial installation. |
| 2. | For battery-based inverters, use the programming features of the inverter to charge the battery, and then connect the battery to the DC source to ensure that these functions are operating correctly. |
| 3. | Follow the inverter-starting procedure from the invert installation or operation manual. |
| 4. | Instruct the operator on what to do in the event of an inverter failure and provide them with an initial start-up test report. |

#### Grounding

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| 1. | Verify that only one connection in the DC circuits and one connection in the AC circuits (grounded conductor to grounding conductor) is being used for system grounding referenced to the same point. |
| 2. | Check to see that equipment grounding conductors and system grounding conductors have as short a distance as possible to ground. |
| 3. | Check that non-current carrying metal parts are grounded properly (array frames, racks, metal boxes, etc.). |
| 4. | Incorporate ground fault protection on systems required. |
| 5. | Check the resistance of the grounding system to the earth's ground. |
| 6. | Verify that the equipment grounding conductor is a green or bare wire and is properly sized. |

#### Safety

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| 1. | Label any fuse or circuit breaker that can be energized in either direction. |
| 2. | Place a sign at the equipment service entrance that states the type and location of in-site optional standby power sources. |
| 3. | Post a “No Smoking” sign in the power control room. |
| 4. | Place a sign at the point of the PV system disconnect listing: the operating current, operating voltage, maximum system voltage, and short-circuit current. |
| 5. | Place a laminated standard operating procedure on a wall so that everyone can see the details easily. |
| 6. | Place a fire extinguisher in the powerhouse. |