## **Installation checklist – Solar water pumping system**

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 ‘quick connects’ are tight. |
| 4. | 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. |
| 5. | Before powering up the system, at the final array breakers, repeat open circuit voltage tests to verify the correct voltage and polarity. |
| 6. | Verify modules are wired so that they can be removed without interrupting the grounded conductor. |
| 7. | 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." |

# Wiring

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| 1. | Check exposed array wiring for correct rating and sunlight-resistant 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 over-current 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. |

# Inverters for water pump

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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. | 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. |
| 4. | 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’ literature. |
| 5. | Follow the inverter-starting procedure from the manufacturer’s manual. |
| 6. | Instruct the system owner on what to do in the event of an inverter failure and provide them with an initial start-up test report. |

# 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. |

# Pump

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| 1. | Verify that the pump is fastened properly in the correct orientation (as per manufacturer’s recommendation). |
| 2. | Verify that the cable connections in the pump are properly terminated and insulated. |
| 3. | Check the vibration and check for any abnormal noise of the pump during operation. |
| 4. | Check that the float switch is connected at the appropriate location to prevent the dry run. |

# 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. |

# Water collection and distribution infrastructures

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| 1. | Verify that the dimensions and construction work of the horizontal roughing filter (for drinking water projects only) are satisfactory. |
| 2. | Verify that the dimensions and construction work of the collection reservoir are satisfactory. |
| 3. | Verify that the dimensions and construction work of the distribution reservoir are satisfactory. |
| 4. | Verify that all plumbing and fitting connections are appropriately connected and tightened without leakages. |
| 5. | For drinking water projects, check the counter of water meters to ensure satisfactory performance. |
| 6. | Check all distribution points and ensure adequate water output during operation. |

# Safety signs

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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. | Place a sign at the point of the PV system disconnect listing: the operating current, operating voltage, maximum system voltage, and short-circuit current. |
| 4. | Place a laminated Standard Operating Procedure on a wall so that everyone can see the details easily. |