## SOLAR PV STAND-ALONE SYSTEMS

### Good Practice Guide: Troubleshooting

#### How to Diagnose the Problem

**Problem: Low or no power output**

Typical Causes:
- Wrong orientation of PV array
- Accumulation of dirt and dust
- Shading of PV array
- Loose connection of wires
- Crack in the module glass
- Module mismatch in PV array
- Theft or vandalism

Possible Solutions:
- Rectify orientation and tilt angle of PV array
- Clean PV modules with water (no detergent)
- Trim surrounding trees/hedges or relocate
- Tighten loose connections at terminal box
- Replace PV module
- Ensure module characteristics are matching
- Replace with theft resistant PV array

#### Problem: Discharged or cannot hold charge

Typical Causes:
- Overuse of Loads
- Loose connection at the terminals
- Insufficient incoming charge current
- Excess sulfation of battery plates
- Low electrolyte level for flooded battery
- Battery has reached end of life

Possible Solutions:
- Review energy use and educate end-user on system capabilities and limitations
- Tighten clean battery terminals
- Check common failure of PV and Controller
- Recharge battery
- Check and add distilled water
- Check system documentation and replace battery

#### Problem: No or incorrect charging/operations

Typical Causes:
- Blown fuse or equipment has been shut down
- HVD and LVD settings are incorrect
- Malfunction of controller/inverter, e.g. regulating charge voltage to battery
- Insufficient incoming charge current

Possible Solutions:
- Review energy use, educate end-user on system capabilities and limitations, replace fuse and restart controller
- Rectify voltage settings, if possible
- Check equipment documentation and replace controller/inverter, if necessary

#### Problem: No or insufficient power transport

Typical Causes:
- Loose connection at terminals
- Open or short circuit or grounding
- Large voltage drop due to inappropriate or undersized cables
- High resistance on the switch contact

Possible Solutions:
- Tighten terminal connections
- Check continuity and polarity of connections
- Check voltage levels at both sides and replace with appropriate cables, if necessary
- Check function and voltage drop of switch

### Typical Causes:

#### PV Module

- High resistance on the switch contact
- Loose connection at input/output terminals

**Typical Causes:**

- Blow fuse or equipment has been shut down
- Overuse of Loads (`Problem: No or incorrect charging/operations`)
- Insufficient incoming charge current
- HVD and LVD settings are incorrect
- Malfunction of controller/inverter, e.g. regulating charge voltage to battery

**Possible Solutions:**

- Review energy use, educate end-user on system capabilities and limitations, replace fuse and restart controller
- Rectify voltage settings, if possible
- Check equipment documentation and replace controller/inverter, if necessary

### Good Practice

- Educate end-user about system operations, maintenance and limitations!
- Develop, promote and follow maintenance policies
- Allocate budgets for maintenance, as well as for training
- Ensure importance of maintenance in every single installation
- Carry a complete and professional Technician Maintenance Toolkit.

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**Tools:**

- Insulated Tool Set
- Multimeter
- Wire Brush
- Tape Measure
- Magnetic Compass

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- Review energy use, educate end-user on system capabilities and limitations, replace fuse and restart controller
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