**SOLAR PV STAND-ALONE SYSTEMS**

**Good Practice Guide: Installation**

### Conduct thorough site survey at installation site:
- Discuss and assess energy needs with end-user and community
- Verify suitable locations for installing PV arrays, controller, batteries and other components, based on code and design requirements
- Determine suitable, unshaded area for PV array
  - PV arrays should be installed on surfaces that are unshaded between 9:00 and 15:00
  - Determine shortest routing for conduit and wiring systems
  - Consider accessibility for installation, maintenance and safety
  - Plan for future scalability of PV system

### Complete system documentation:
- Design/Sizing specifications
- Site layout drawings
- Electrical diagrams
- Complete components list

### Be aware of electrical and chemical hazards:
- Use proper tools and personal protection equipment
- Use personnel fall arrest equipment
- Provide for at least 10cm space behind module for ventilation
- Mount PV array to appropriate angle!
- Beware of falling objects on PV array, e.g. coconuts

### For pole mount installations, install foundation and mounting pole first:
- Mounting pole should be at least 2m above ground
- Proper shock absorbing mount (10kilo newtons) is required
- Use of appropriate wiring size is critical
- Voltage drop increases with cable length
- More than 5% (or less than 0.55V in 12V system)
- Consider accessibility for installation, maintenance and safety
- Plan for future scalability of PV system

### For roof installations, ensure that weight is supported by house frame(s):
- Mounting points should be on the wooden frames of the house
- Fasten metal parts of module mounts with bolts or screws, never use nails
- Provide for at least 10cm space behind module for ventilation
- Tilt PV array to appropriate angle!
- Beware of falling objects on PV array, e.g. coconuts

### Assemble and install PV array on poletop:
- Attach long side perpendicular to rail
- Tilt PV array to appropriate angle!

### Cabaling and Connecting:

- **Installing Batteries and Controllers**
  - **Cable Options**
    - Use of appropriate wiring size is critical
    - Voltage drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system
  - **Cable Types**
    - USE-2 is rated for 90°C wet or dry, 600 volts, and is sunlight resistant
    - Use of appropriate wiring size is critical
    - Voltage drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Connecting Components**
  - **PV Modules**
    - Mount charge controller and inverter as close as possible to battery bank
    - Do not mount controller(s) directly above the battery bank
    - Mount controller(s) solidly to the building in a room that is neither very cold nor hot
  - **Conduit and Wiring**
    - Fasten wires coming from the controller within 6 cm of the connections so no pulling on the wire will occur at the controller
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
  - **Battery Bank**
    - Voltage drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Secure**
  - **Connections**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Grounding**
  - **Grounding System**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Security**
  - **Access**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Operation**
  - **Safety**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Maintenance**
  - **Testing and Inspection**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Compliance**
  - **Regulations**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Monitoring and Control**
  - **Monitoring**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **System Efficiency**
  - **Performance**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Environmental Impact**
  - **Impact Assessment**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Economic Analysis**
  - **Costs**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Community Engagement**
  - **Community Input**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Electricity Supply**
  - **Supply Options**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Energy Storage**
  - **Storage Solutions**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Education and Training**
  - **Training Programs**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **System Integration**
  - **Integration Planning**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Safety**
  - **Precautions**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Emergency Management**
  - **Emergency Planning**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Insurance**
  - **Insurance Options**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Disaster Recovery**
  - **Recovery Planning**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **System Reliability**
  - **Reliability Measures**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Future Considerations**
  - **Future Trends**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Conclusion**
  - **Summary**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **References**
  - **Related Resources**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Appendices**
  - **Technical Notes**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Glossary**
  - **Key Terms**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system

- **Index**
  - **Index Entries**
    - Voltages drop increases with cable length
    - More than 5% (or less than 0.55V in 12V system)
    - Consider accessibility for installation, maintenance and safety
    - Plan for future scalability of PV system