BECKON: Boosting Energy Communities massive deployment by equipping local authorities with comprehensive technical assistance cooKboOk, integrated services and capacity buildiNg

Title: Operation and maintenance instructions for EC (PV based)

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1. Introduction

Operating a solar energy community requires careful planning, coordination, and adherence to various guidelines and regulations. This document provides comprehensive operation guidelines to ensure the smooth functioning and success of your solar energy community. By following these guidelines, you can effectively manage the roles and responsibilities of personnel involved in day-to-day operations, implement monitoring and control systems, establish maintenance schedules, and prioritise safety measures.

2. Operation guidelines

- Ensure that all necessary permits and legal requirements are obtained and compiled for operating a solar energy community in your country. For this purpose see complementary documents developed by this project.
- Develop a comprehensive operation plan that outlines the roles and responsibilities of personnel involved in the day-to-day operation of the system. These roles can be derived from the legal figure established during the funding act of the community, such as the treasurer, president, vocals, and other members. Here's an expanded example list of the activities than can be follow by the different roles:
    - President/Chairperson:
        - Provide overall leadership and guidance to the solar energy community.
        - Coordinate and oversee the activities of the community.
        - Represent the community in external communications, meetings, and negotiations.
        - Facilitate decision-making processes within the community.
    - Treasurer/Financial Manager:
        - Manage the financial aspects of the solar energy community.
        - Develop and oversee the community's budget and financial planning.
        - Handle financial transactions, such as collecting dues and payments.
        - Keep accurate records of financial transactions and prepare financial reports.
        - Coordinate with external accountants or auditors for financial audits if required.
    - Vocals/Members:
        - Participate actively in the decision-making process and general meetings.
        - Contribute to the community's objectives, policies, and strategic planning.
        - Promote and support the solar energy community within the larger community.
        - Engage in fundraising efforts and community outreach activities.
        - Convey the concerns and feedback of community members to the leadership.
    - Operations Manager/Coordinator:
        - Oversee the day-to-day operation of the solar energy system.
        - Ensure that the system is functioning optimally and meeting performance targets.
        - Coordinate maintenance and repairs as needed.
        - Monitor energy production and consumption patterns.
        - Implement protocols for system shutdown, start-up, and troubleshooting.
    - Communication/Community Outreach Coordinator:

        - Develop and implement communication strategies to engage community members.
        - Facilitate effective communication between the leadership and community members.
        - Manage the community's website, social media presence, and newsletters.
        - Organise educational events, workshops, and awareness campaigns.
        - Coordinate with local authorities, media, and other stakeholders for community initiatives.
    - Technical Advisor/Consultant (if applicable):
        - Provide technical expertise on solar energy systems.
        - Advise the community on system design, installation, and performance optimization.
        - Assist in evaluating and selecting appropriate technologies and components.
        - Conduct training sessions for community members on system operation and maintenance.
- Regularly monitor system performance, including energy generation, battery charge levels (if applicable), and grid interaction (if connected). This monitoring helps identify any deviations or issues that may arise.
- Implement a system for collecting and analysing data on energy production, consumption, and grid interaction to optimise the performance of the energy community.
- Train personnel on system operation, emergency procedures, and safety protocols.
- Regularly communicate with community members about the functioning of the energy community.

a. Monitoring and Control Systems

- Select and install a reliable monitoring and control system that provides real-time data on system performance, energy generation, and consumption.
- Implement remote monitoring capabilities to allow for remote access and troubleshooting of the system.
- Set up alerts and notifications for abnormal system behaviour, faults, or underperformance.
- Regularly review the monitoring data and analyse trends to identify opportunities for system optimization or maintenance requirements.

3. Maintenance guidelines

- Develop a preventive maintenance schedule based on manufacturer recommendations, taking into account factors such as the type of solar panels, inverters, and other system components.

<u>Manufacturer recommendations:</u>

- Review the documentation and guidelines provided by the manufacturers of the solar panels, inverters, batteries (if applicable), and other components.
- Identify the recommended maintenance tasks, intervals, and procedures specified by the manufacturers.
- Take note of any specific considerations or requirements mentioned by the manufacturers to ensure optimal performance and longevity of the equipment.

Component specific maintenance:

- Consider the specific maintenance needs of each component in the solar energy system.
- Solar Panels: Common maintenance tasks include regular cleaning to remove dirt, debris, and shading objects. Additionally, inspect for physical damage, such as cracks or corrosion.
- Inverters: Check connections, monitor performance, and inspect for any signs of faults or malfunctions. Follow manufacturer recommendations for firmware updates or component replacements if necessary.
- Batteries (if applicable): Monitor battery health, including voltage levels, charge/discharge cycles, and electrolyte levels (if applicable). Follow manufacturer instructions for maintenance, such as equalising charges or replacing battery cells.

Maintenance intervals:

- Determine the frequency at which each maintenance task should be performed based on manufacturer recommendations and system-specific factors.
- Some tasks may be performed annually, while others may require more frequent attention (e.g., quarterly, monthly, or even weekly).
- Consider environmental factors, such as the level of dust, pollution, or extreme weather conditions that may impact maintenance requirements.

Here's an example table format for a preventive maintenance schedule:

Table 1. Preventive maintenance schedule

Maintenance Task	Frequency
Solar Panel Cleaning	Annually
Inverter Inspection	Semi-annually
Firmware Updates	As recommended

a. Safety Guidelines

- Ensure that all personnel involved in the operation and maintenance of the solar energy community are trained in electrical safety procedures.
- Use appropriate personal protective equipment (PPE) when working with or near the system, including gloves, safety glasses, and insulated tools.
- Implement lockout/tagout procedures when conducting maintenance tasks to prevent accidental electrical discharge.
- Regularly inspect and maintain grounding systems to ensure the safety of personnel and protection against electrical faults.
- Develop and communicate emergency response procedures in case of incidents such as fires, electrical shocks, or severe weather events.
- Comply with relevant country safety standards and regulations applicable to solar energy systems.

4. Bibliography

- Hernández-Callejo, L., Gallardo-Saavedra, S., & Alonso-Gómez, V. (2019). A review of photovoltaic systems: Design, operation and maintenance. Solar Energy, 188, 426-440.
- Walker, H. A. (2018). Best practices for operation and maintenance of photovoltaic and energy storage systems (No. NREL/TP-7A40-73822). National Renewable Energy Lab.(NREL), Golden, CO (United States).