ENERGY FOR HEALTH
OPERATIONS & MAINTENANCE
Background and Context on Operations & Maintenance of Solar Health Systems

WHAT is O&M of Solar Health Systems

Ongoing tasks, activities, and procedures involved in running and managing DRE systems to ensure their optimal functionality, efficiency, and longevity.

O&M requires people, technology and tools which includes coming together on technical and financial aspects in order to serve a DRE system overtime.

Problem Statements in the O&M of Solar Health Systems

01. Lack of timely maintenance of public owned DRE assets
   - due to lack of ownership at the end-user level
   - due to lack of skills, supply chain and incentives for stakeholders

02. High transaction cost for DRE services based enterprises
   - Remoteness and limited incentive

03. Budget issues for O&M
   - Lack of separate budgetary provisions to conduct O&M
   - Delay in payments and approval processes
Need for Operations & Maintenance of Solar Health Systems

A. Immediate identification and rectification of the solar system, having a significant impact on the availability of health services (especially in the remote areas)

B. Timely communication & interaction between different stakeholders to avoid misunderstandings, delays and increased costs.

C. Ensuring adequate and timely training to various operators, technicians and maintenance personnel

D. Enable a local servicing-maintenance network for solar energy health systems

E. Boost ownership among enterprises and end-users

F. Create process and costing benchmarks through documentation of issues and data collection
# Key Components and Tools of the E4H Operations & Maintenance System

<table>
<thead>
<tr>
<th>Component</th>
<th>Priority</th>
<th>Primary Stakeholders</th>
<th>Tools to Identify, Raise, Track Issues</th>
<th>Tools to Resolve Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>01. Technical Component</td>
<td>Who does the O&amp;M – Issue Raising and Resolving</td>
<td>Government/Local NGO's/Local DRE Service Enterprises</td>
<td>Remote Monitoring System (RMS)</td>
<td>Remote issue resolution via calls or videos by CRM/Technical staff</td>
</tr>
</tbody>
</table>
Ecosystem Matrix for developing O&M Models for Solar Health Systems

### Parameters

**A. Geography**
- Terrain
- Disaster Vulnerability
- Accessibility
- Transportation Network
- Internet Connectivity

**B. Public Health System**
- Champions at State/District
- Fund Availability
- Human Resources
- Governance System

**C. Energy Enterprise**
- CEE Availability
- Turnaround time
- Supply Chain for Solar Technology
- Market Maturity

### Sub Parameters

Selected States/Districts will be scored based on the parameters. Ecosystem combinations (e.g., A1+B3+C1) will be derived for designing suitable O&M Models.

### Ecosystem Maturity

- **Strong**
  - A1
  - B1
  - C1

- **Medium**
  - A2
  - B2
  - C2

- **Weak**
  - A3
  - B3
  - C3

### Maximum Ecosystem Score for each parameter (A, B, C)

- A: 15
- B: 10
- C: 05

### Ecosystem Scoring Range for each parameter (A, B, C)

- A: 10-15
- B: 05-10
- C: 00-05
## Ecosystem Matrix for NE States

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ecosystem</th>
<th>Questions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geography</td>
<td>• Hilly Terrains</td>
<td>What could be the ideal O&amp;M Model for the NE states?</td>
</tr>
<tr>
<td></td>
<td>• Disaster Vulnerability – Landslides/Lightning Strikes/Heavy Rains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local Transport – Not adequately accessible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Travel Transactions - High in terms of time and cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Network Connectivity – may not be available in the remotest and far</td>
<td></td>
</tr>
<tr>
<td></td>
<td>flunged areas</td>
<td></td>
</tr>
<tr>
<td>Public Health System</td>
<td>• Availability of adequate funds budgeted for system maintenance</td>
<td>How to build up a strong ecosystem for the CEEs?</td>
</tr>
<tr>
<td>Energy Enterprise</td>
<td>• Availability of skilled manpower for O&amp;M of clean energy systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Supply chain for Solar technology – Not strong enough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of existence of CEEs locally</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enhanced turnaround time for system maintenance</td>
<td></td>
</tr>
<tr>
<td>Category of the issues</td>
<td>MINOR ISSUES</td>
<td>MAJOR ISSUES</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>Repair/Service/Replacements Related</td>
<td>Disaster / Man Made Related, Repair/Replacement of Essential Components, Infrastructure Related</td>
</tr>
<tr>
<td>Description of the issues</td>
<td>Maintenance, Replacing battery water, cables, inverter fuse, AJB, battery and panel lugs, tightening of the screws etc.</td>
<td>Floods, Lightening's or manmade occurrences like thefts and breakage etc, Panel, Battery &amp; Inverter replacement as per warranty, Replacement of key components beyond warranty, Infrastructure Changes/Renovations</td>
</tr>
<tr>
<td>Turnaround period</td>
<td>Within 24 hrs OR as per issue priority</td>
<td>&lt; 48 hrs OR as per issue priority, &gt; 48 hrs OR as per issue priority</td>
</tr>
<tr>
<td>Availability of spares</td>
<td>Immediately available with the enterprise</td>
<td>Available / Arranged via government or local enterprise, Not dependant on availability of spares. Needs further approvals based on financial implications</td>
</tr>
</tbody>
</table>
# Addressing Key Inverter Issues

<table>
<thead>
<tr>
<th>Description of Issue</th>
<th>Cause of Issue</th>
<th>Action</th>
<th>Ideal Turnaround Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shutdown Issues</strong></td>
<td>Overload current from heavy loads, Surge voltage from lightning, High Voltage spikes, IGBT Damage, Motherboard Card burnt, SMPS Failure, Cooling Fan Fault, Tripping of MCB (Grid, Solar, Load, Battery)</td>
<td>Needs repair/replacement</td>
<td>&lt;24 Hrs.</td>
</tr>
<tr>
<td><strong>Short Circuit Issues</strong></td>
<td>Insulation damage/Burning of cables, Water clogging (flooding from top/bottom of PCU)</td>
<td>Needs repair/replacement</td>
<td>&lt;24 Hrs.</td>
</tr>
<tr>
<td><strong>Cable Issues</strong></td>
<td>Loose contact at terminals, Improper crimping and insulation, cables disconnection from inverter</td>
<td>Needs repair/service</td>
<td>&lt;24 Hrs.</td>
</tr>
<tr>
<td><strong>Electric Shocks</strong></td>
<td>Leakage current, Earthing Issues</td>
<td>Needs repair/service</td>
<td>&lt;24 Hrs.</td>
</tr>
<tr>
<td><strong>Display Issue</strong></td>
<td>Display Damage</td>
<td>Needs repair/service</td>
<td>&gt; 48 Hrs.</td>
</tr>
<tr>
<td><strong>Theft Issues</strong></td>
<td>Manmade</td>
<td>Needs Replacement</td>
<td>Within 48 Hrs.</td>
</tr>
</tbody>
</table>