Lasting Impact: Sustainable Off-Grid Solar Delivery Models to Power Health and Education

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Welcome and Introductions

Panelists:
• Jem Porcaro, Lead Energy Access Specialist, SEforALL
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• Raihan Elahi, Lead Energy Specialist, World Bank

Q&A Session
Powering Health Care

CURRENT CONDITIONS

• 1 in 4 health facilities in SSA lack access to electricity; 3 in 4 lack reliable power
• Business-as-usual (grid extension) leaves large access gap by 2030
• Infrastructure is main cost driver for achieving UHC
• DRE provides a fast and cost-effective way to power health facilities

STRATEGY

Build an investment case
Address structural barriers (lack of capacity, business models, appropriate technologies)
Put in place system to monitor progress

VISION

UNIVERSAL HEALTH FACILITY ELECTRIFICATION BY 2030

• Health worker and patient safety and hygiene improves
• Electricity-driven equipment is available, functional and used more for medical services
• Energy-efficient devices/appliances are available
• Health worker retention improves

ACTIONS

Evidence/data
Thought leadership
Convening
Communications

IMPACT

Short-term
 Policies Capacities
 Delivery models
 Coalitions

Long-term
 Finance Sustainability
Key challenges to powering public institutions with off-grid solar

**Sectoral Leadership**
Issue falls between sectors, leaving unclear leadership and a need for better coordination, capacity and policies.

**Capital Expenditure**
Off-grid solutions can be prohibitively expensive, but have multiple benefits over incumbent solutions.

**Sustainability**
Sustaining the operation of off-grid solutions (e.g. PV systems) at community facilities in resource-constrained environments can be difficult.

**Lack of Information and Actionable Data**
Rudimentary data about the problem, resulting in low levels of awareness of and priority given to the topic.
Key challenges to powering public institutions with off-grid solar

![Graph showing average kWp installed and % functional for Ghana, Uganda, Tanzania, and Malawi.]

- **Average kWp installed**
  - Ghana: 2
  - Uganda: 2
  - Tanzania: 2
  - Malawi: 5.5

- **% Functional**
  - Ghana: ~100%
  - Uganda: ~80%
  - Tanzania: ~60%
  - Malawi: ~50%

- **Average # of systems per facility**
  - Ghana: 2
  - Uganda: 2
  - Tanzania: 2
  - Malawi: 5.5

*Source: UNF*
Commissioned to:

- Help public, private and philanthropic stakeholders design and sustainably implement robust off-grid public-facility electrification projects.
- Encourage innovation in the way off-grid PV solutions are designed for and delivered to public facilities.
- Recommend areas for further research
Sustainability vs Scale

Sustainability

“Reliable delivery of energy services over time”

Scale

“Number of facilities and beneficiaries served over time; replicability”

Meeting the SDGs

Lasting Impact
Questions

What are the critical decisions made at each stage of a project’s lifecycle that most significantly drive project sustainability?

What are the drivers of these decisions?

What are the consequences of these decisions?

What innovative approaches and insights have been observed?
Report methodology

Delivery Models
Public, private, philanthropic

Case Studies (7)
Interviews with stakeholders from implemented and ongoing projects

Key Insights
Lessons learned

Emerging Cases (2) & Hypotheticals (2)
Highlight key design features & challenges of new cases

Conclusions
Sustainability and Scale

Sustainability Framework
Organizational, Technical and Economical Pillars
## Sustainability framework

<table>
<thead>
<tr>
<th>Sustainability Framework Pillars</th>
<th>Organizational</th>
<th>Technical</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three “pillars” of sustainability—Organizational, Technical, and Economic</td>
<td>Arrange project stakeholders to preserve systems’ long-term functionality</td>
<td>Make certain installed systems are robust and fit for purpose</td>
<td>Ensure financing and incentives are structured for the long haul</td>
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### Model Sustainability Framework

<table>
<thead>
<tr>
<th>Project Lifecycle Phases</th>
<th>I. Inception</th>
<th>II. Design</th>
<th>III. Build</th>
<th>IV. O&amp;M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each pillar contains four project lifecycle phases—Inception, Design, Build, and Operation and Maintenance (O&amp;M)</td>
<td>Define core goals and approach</td>
<td>Finalize facility sitting, expected needs, and system sizing</td>
<td>Undertake procurement and execute installation contracts</td>
<td>Ensure system performance for its expected life</td>
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Delivery models

- **PUBLIC**
  - Government Agencies
    - Financing from national and/or local government budgets, multilateral institutions, or development partners.

- **PRIVATE**
  - Profit-seeking enterprises
    - Financing from energy service sales to end-users or fees for services provided by intermediate entity.

- **PHILANTHROPIC**
  - Charitable foundations, high-net-worth individuals, and bilateral or multilateral organizations
    - Financing from grants to achieve a desired impact.
7 case studies

Retrospective cases
- India
  - CREDA
  - SELCO
- Malawi
  - CEDP
- Malawi, Tanzania, Uganda
  - IA
- Philippines
  - SSMP
- Uganda
  - ERT-II
- Zimbabwe
  - S4H

Emerging cases
- Kenya
  - KOSAP
- West Africa
  - ROGEP
## Selected case studies

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country(ies)</th>
<th>Dates</th>
<th>Target(s)</th>
<th>Project Scale</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chhattisgarh State Renewable Energy Development Agency (CREDA)</td>
<td>India</td>
<td>2011 - Ongoing</td>
<td>Health</td>
<td>984 facilities electrified to date</td>
<td>I. Inception, II. Design, III. Build, IV. O&amp;M</td>
</tr>
<tr>
<td>Innovation Africa (IA)</td>
<td>Malawi, Tanzania, Uganda</td>
<td>2008 – Ongoing</td>
<td>Health and Education</td>
<td>110 facilities electrified to date</td>
<td>I. Inception, II. Design, III. Build, IV. O&amp;M</td>
</tr>
</tbody>
</table>
Key insights
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Organizational Pillar Insights

Responsibility vacuum for O&M

- Well-equipped local actors
- External and internal Champions perspectives
- Centralized design and/or procurement
- Lifecycle O&M planning
- Central organization
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Technical Pillar Insights

- Facility power needs
- Behavioral and usage patterns
- Custom versus standard system packages
- New technologies & flexible designs
- Quality standards & oversight
- Third-party certification
- Preventive maintenance
- O&M protocols with capacity building
- Remote monitoring
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**Economic Pillar Insights**

- **Optimize on sustainability**
  - **Lifetime financing needs**
    - Incentives for supply and install contractors
  - PV system revenues
  - Decentralized O&M
  - O&M outcome incentives
Assumptions:
• CapEx excludes soft costs (design, logistics, installation, training, community mobilization)
• O&M estimated based on economies of scale across multiple installations; assumes inflation
• Component replacement costs are conservative as they don’t factor in declining battery costs
Emerging cases: KOSAP

Key Design Features:
✓ World Bank funds cover supply & installation
✓ Private Sector Providers (PSPs) selected on lowest NPV supply, installation, maintenance
✓ 10-15 year O&M contracts with PSPs; performance based
✓ Kenya Power owns retail relationship; collecting tariffs from facilities/local governments, paying PSPs

Possible Sustainability Challenges:
? Local governments/tariffs enough to cover O&M
? Kenya Power carries off-taker risk
? Capacity of Kenya Power to monitor PSP performance
Emerging cases: ROGEP

Key Design Features:
- Government inception (design); ESCOs (design), build and maintain
- Timely Government payment based on key performance indicators
- Remote monitoring
- MIGA guarantee

Possible Sustainability Challenges:
- ESCO’s ability to raise CAPEX
- Remote monitoring across West Africa untested
- O&M post year 7 contract period unknown
Ingredients for Sustainability

1. Sustainability requires an all-encompassing definition of success
2. Sustainability demands integrated knowledge and sector-specific expertise
3. Sustainability requires alignment of public and private sector incentives
4. Leveraging of philanthropic models and actors
5. Sustainability is enhanced when energy is a core element in facility planning
6. Sustainability requires both the ability and willingness to pay for electricity
Opportunities for further investigation

1. **Central inventory of data** on current state of energy access in health facilities

2. **Improved site auditing tools and integration of survey techniques** highlighting best practices, focus on understanding facilities’ future energy needs and scaling systems

3. **Holistic policy and regulatory planning** for public-facility electrification including financing and technical standards

4. **System design toolkit** including cost-benefit analysis between technologies and scale, and calculators for long-term revenues and operating costs

5. **Key Performance Indicators** specific to off-grid public electrification programs

6. **Environmental sustainability toolkit** covering system disposal and recycling

7. **Sustainability framework** built for achieving organizational, technical, and economic sustainability in health facilities
Link to full report: poweringhc.org/resources/