Sierra Leone Healthcare Electrification Project: Impact Assessment & Developmental Evaluation

July 24,2025

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SUSTAINABLE ENERGY FOR ALL

CATALYST ENERGY ADVISORS

Sierra Leone's Healthcare Electrification Project (SL-HEP) is a large-scale healthcare electrification initiative

- Implemented by Sustainable Energy for All (SEforALL) and funded by the UK Government, SL-HEP addresses Sierra Leone's urgent need for sustainable, reliable, and clean power solutions to improve healthcare service delivery.
- The project addresses the challenges of **43 healthcare facilities, including 25 Peripheral Health Units (PHUs)[1] and 18 hospitals** across Sierra Leone **over three phases** of work executed between 2021 and 2025, equipping them with solar PV and battery systems to provide reliable electricity and improve healthcare services.
- The UK Government has committed **19.95 million GBP** in total funding.
- The selected health facilities have a total catchment area of **8.5 million people[2]**, including 4.2 million women.

Overview of Sierra Leone's HEP as of June 2025

Phase	Kick off date	Number of facilities targeted	Solar PV Capacity [kWp]	Battery Capacity [kWh]	Status
1	August 2022	6	1,061[3]	1,851[3]	Commissioned
2	August 2023	26	312	590	Commissioned
3	April 2024	11	2,926	5,097	Commissioned[4]
Total		**43**	**4,299**	**7,538**	

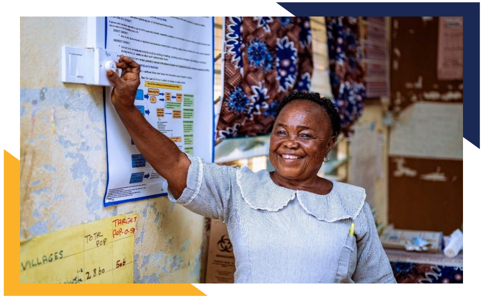
[1] Peripheral Health Units include Community Health Centres (CHCs), Community Health Posts (CHPs) and Maternal and Child Health Posts (MCHPs)
[2] The SL-HEP is targeting the main maternal and children's hospitals, as well as healthcare facilities in all the main districts and regions of Sierra Leone
[3] Including all expansions
[4] All facilities are commissioned except for Koidu Government Hospital due to reasons beyond SEforALL's control.

Assignment Context

Catalyst Energy Advisors was contracted by SEforALL as a non-biased entity to perform an independent evaluation of SL-HEP, consisting of two main components:

Impact Assessment (IA)

- As a supplement to the Independent Evaluation, this IA conducts an in-depth study of Phase 1 of the SL-HEP to provide quantitative and qualitative data evidence of the impact of the project.
- It measures the extent to which the 6 hospitals that were solarised in Phase 1 achieved their intended health, energy, climate, and socio-economic outcomes.
- The assessment compared post-solarisation data for 2024 (before expansions) against baseline data reported in Crown Agent's[1] Baseline Report.



Developmental Evaluation (DE)

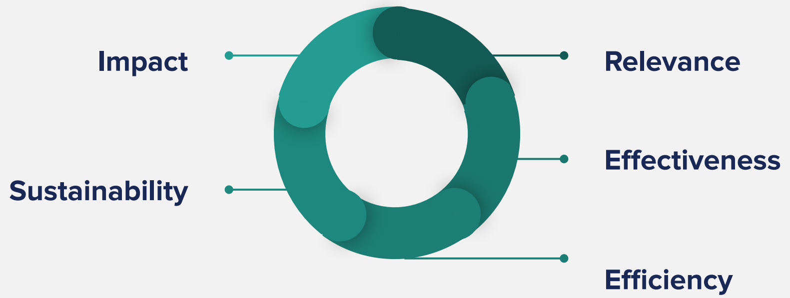
- The DE was developed in parallel to the IA, building on the phase 1 process-driven evaluation and gauging the development of phases 2 and 3 to ultimately support the implementation of future phases of the project.
- It builds on data gathered through key informant interviews and field visits to 18 healthcare facilities:
  - 6 hospitals under Phase 1
  - 8 Peripheral Health Units (PHUs) under Phase 2
  - 4 hospitals under Phase 3
- Data collection and evaluation took place between November 2024 and April 2025, so findings and recommendations address the reality until that date.
- The DE also included a Results Framework and Tool consisting of:
  - Revised Theory of Change (ToC)
  - Excel-based tool capable of calculating key impact dimensions for ongoing monitoring of healthcare facilities.

[1] *Former Project Management Firm*

Scope of this independent evaluation

The scope of the IA and DE builds on the **Organisation for Economic Co-operation and Development's (OECD's) Development Assistance Committee's Evaluation Scope** and sets targeted objectives and evaluation themes

OECD's Development Assistance Committee's Evaluation Scope



IA Objectives

1. Measure the extent to which Phase 1 of the SL-HEP achieved its intended Key Performance Indicators (KPIs)
2. Identify unforeseen or additional effects not captured by existing monitoring and evaluation (M&E) frameworks
3. Assess the sustainability of the interventions
4. Evaluate the overall impact of the project

DE Evaluation Themes

1. Overall project design
2. Innovation and technology
3. Scalability and replicability
4. Sustainability and maintenance
5. Value-for-money (VfM)
6. Social and gender inclusion
7. Climate co-benefits
8. Relevance and coherence

Sierra Leone HEP: Phase 1 implementation

Implementation status as of June 2025: **Initial stage and expansions fully commissioned**

Facility	Solar PV Capacity [kWp]	Battery Capacity [kWh]	Solar PV Expansion Capacity [kWp]	Status
Bonthe Hospital	70.4	217	26.5	Commissioned
PCMH / ODCH	300.8	547	120[1]	Commissioned[1]
Masanga Hospital	105.6	290	52.8	Commissioned
Kabala Hospital	90.8	290	49.5	Commissioned
Kambia Hospital	59.4	217	35.2	Commissioned
Total	**627**	**1,561**	**284**	

[1] *An additional 150 kWp PV system and 290 kWh battery capacity to supply an oxygen gas plant are being installed. Commissioning of the expansion is subject to the installation of the oxygen plant with estimated completion date of December 2025.*

Sierra Leone HEP: Phase 2 implementation

Implementation status as of June 2025: **all solar PV systems commissioned**

Peripheral Health Units:, The primary level of care in Sierra Leone's health system, comprising Community Health Centres (CHCs), Community Health Posts (CHPs), and Maternal and Child Health Posts (MCHPs), which provide essential outpatient, maternal, child, and preventive services to local populations.

Community Health Centre (CHC): A primary healthcare facility that provides basic medical services to a defined local population, typically offering outpatient care, maternal and child health services, and preventive care**.**

Community Health Post (CHP): A smaller, more basic health facility than a CHC, usually staffed by health workers or nurses, providing limited primary care and referral services in rural or underserved areas.

Maternal and Child Health Posts (MCHP): A facility focused specifically on maternal, newborn, and child health services, such as antenatal care, safe deliveries, immunization, and nutrition support, often located in remote communities.

Facility	Solar PV Capacity [kWp]	Battery Capacity [kWh]	Status
Khalimat Shahed Hospital	6.6	10	Commissioned
Kameindor CHC	13.2	20	Commissioned
Mamosasanka CHC	6.6	10	Commissioned
Makali CHC	6.6	10	Commissioned
Yele Community CHC	13.2	20	Commissioned
Jenner Wright CHC	13.2	20	Commissioned
Cline Town CHC	13.2	20	Commissioned
York Peripheral Village CHC	6.6	10	Commissioned
Newton CHC	6.6	10	Commissioned
Kent CHP	6.6	10	Commissioned
Tombo CHC	13.2	20	Commissioned
Moriba Town CHP	6.6	10	Commissioned
Mokotawa CHP	6.6	10	Commissioned
Taiama Trauma CHC	6.6	10	Commissioned

Sierra Leone HEP: Phase 2 implementation

Implementation status as of June 2025: **all solar PV systems commissioned**

Facility	Solar PV Capacity [kWp]	Battery Capacity [kWh]	Status
Kindoya CHC	13.2	10	Commissioned
Bo School Clinic CHC	6.6	10	Commissioned
Torwama MCHP	6.6	10	Commissioned
Taigbe CHP	6.6	10	Commissioned
Mindohun CHP	6.6	10	Commissioned
Torma Bum CHP	6.6	10	Commissioned
York Island MCHP	6.6	10	Commissioned
Foya CHP	6.6	10	Commissioned
Bonthe Under Five MCHP	6.6	10	Commissioned
Bayama Lela CHP	6.6	10	Commissioned
Ngelehun CHC	6.6	10	Commissioned
Kailahun Government Hospital	114.4	290.3	Commissioned
Total	**312.4**	**590.3**	

Sierra Leone HEP: Phase 3 implementation

Implementation status as of June 2025: **One hospital pending commissioning due to reasons beyond SEforALL's control**

Facility	Solar PV Capacity [kWp]	Battery Capacity [kWh]	Status
Port Loko Hospital	181.7	394	Commissioned
Makeni Hospital	247.8	496	Commissioned
Magburaka Hospital	190.0	350	Commissioned
Lakka Government Hospital	99.7	190	Commissioned
Connaught Hospital	759.9	1225	Commissioned
King Harman Road Hospital	94.4	190	Commissioned
Koidu Government Hospital	667.7	860	On Hold
Moyamba Government Hospital	235.4	262	Commissioned
Rokupa Hospital	94.4	292	Commissioned
Pujehun Hospital	165.2	634	Commissioned
Kenema Hospital	190.0	204	Commissioned
Total	**2,926.2**	**5,097**	

Impact Assessment

Evaluation Methodology

The robustness of the impact assessment was compromised by factors that adversely affected the availability and quality of raw data, however these challenges were overcome wherever possible via qualitative methods and triangulation.

Quantitative Methods

- Health outcome data from the Ministry of Health's (MoH) DHIS2 database
- Energy usage and electricity system performance from RMS logs
- On-site fieldwork and surveys to gather financial data

Qualitative Methods

- Structured interviews with stakeholders, including hospital facility managers, healthcare staff, SEforALL project team and management, and government representatives
- Discussions with patients and community members

Data Triangulation and Ethical Considerations

- Findings from the quantitative analysis were validated through qualitative insights
- The IA adhered to ethical standards, securing informed consent from participants and maintaining strict confidentiality measures

Challenges with data acquisition:

- Health data from the MoH is incomplete, and there is a lack of standardised reporting protocols between public and private hospitals.
- RMS data from key sensors is either unreliable or too nuanced.
  - There is no dependable RMS data on genset use; estimates must be derived through back-calculations, supplemented by staff recall.
  - Quality of service indicators are calculated at the room level.
- Unknown source of baseline data, preventing like-for-like comparisons.
- Expiring contracts with RMS providers have disrupted data collection, limiting coverage across the full evaluation period and hindering future assessments.

Impact - Energy

With a combination of solar PV, diesel gensets, and the national grid, **Phase 1 hospitals are likely meeting the 23-hour daily uptime target**

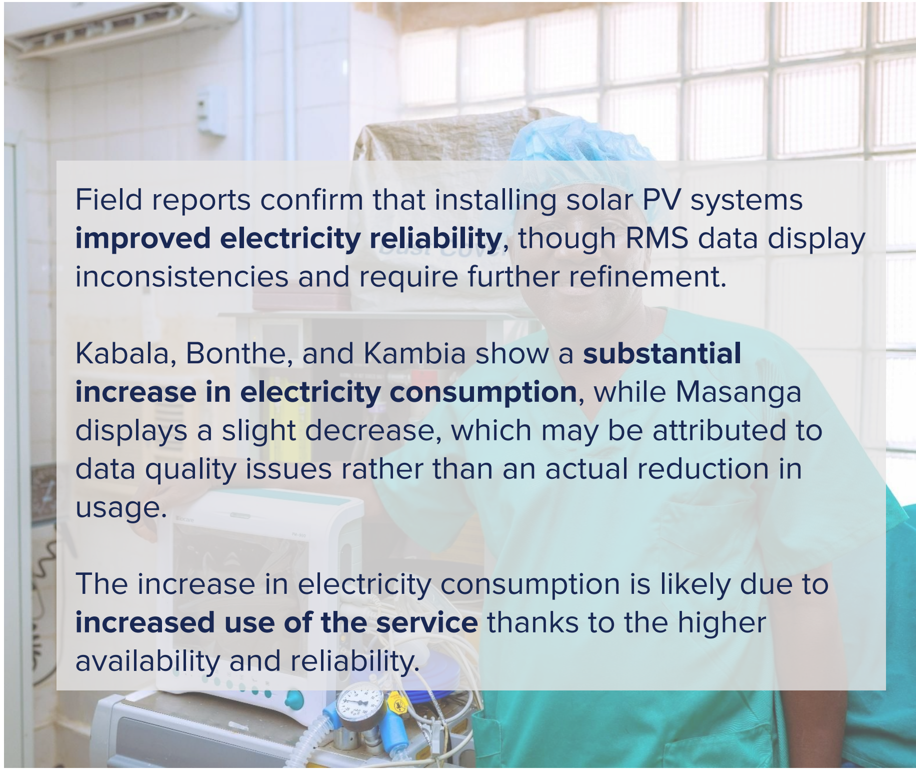
Electricity uptime[1]	
14% increase	
Post Install.	20 hrs/day
Baseline	17 hrs/day

Electricity consumption	
158% increase[2]	
Post Install.	1,597 kWh/day
Baseline	618 kWh/day

Solar PV system generation[3]	
342% increase	
Post Install.	1,316 kWh/day
Baseline	298 kWh/day

Share of on-site RE supply[4]	
200% improvement	
Post Install.	69%
Baseline	23%

[1] *Facility-wide average based on RMS data from nLine, which underestimates uptime for critical loads because non-critical outages lower the facility average. Room-level data can be analysed for a more detailed evaluation of critical loads.*
[2] *Excluding grid consumption.*
[3] *Source: RMS data from AlphaESS*
[4] *Source: Calculation based on RMS data from AlphaESS and Prospect*



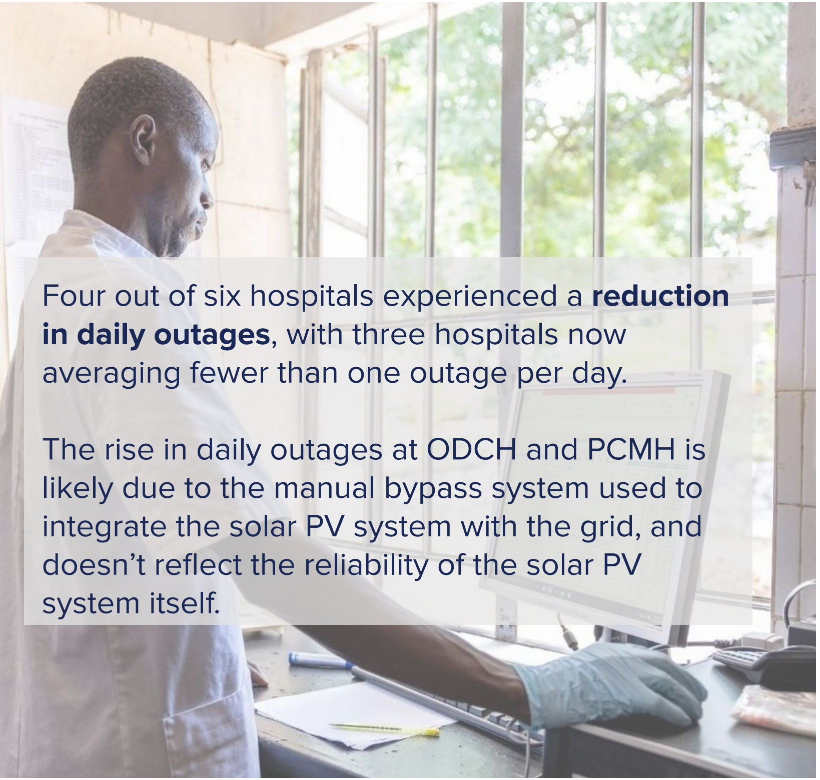
Field reports confirm that installing solar PV systems **improved electricity reliability**, though RMS data display inconsistencies and require further refinement.

Kabala, Bonthe, and Kambia show a **substantial increase in electricity consumption**, while Masanga displays a slight decrease, which may be attributed to data quality issues rather than an actual reduction in usage.

The increase in electricity consumption is likely due to **increased use of the service** thanks to the higher availability and reliability.

Impact - Electricity System Reliability

The solarisation of hospitals has **improved the quality and stability of electricity services** across all facilities



Four out of six hospitals experienced a **reduction in daily outages**, with three hospitals now averaging fewer than one outage per day.

The rise in daily outages at ODCH and PCMH is likely due to the manual bypass system used to integrate the solar PV system with the grid, and doesn't reflect the reliability of the solar PV system itself.

Daily average voltage

79% improvement

Post Install.	229.6 V
Baseline	227.8 V

Daily average frequency

68% improvement

Post Install.	50 Hz
Baseline	49.9 Hz

Time outside nominal voltage range

25% worsening[1]

Post Install.	0.7 hr/day
Baseline	0.6 hr/day

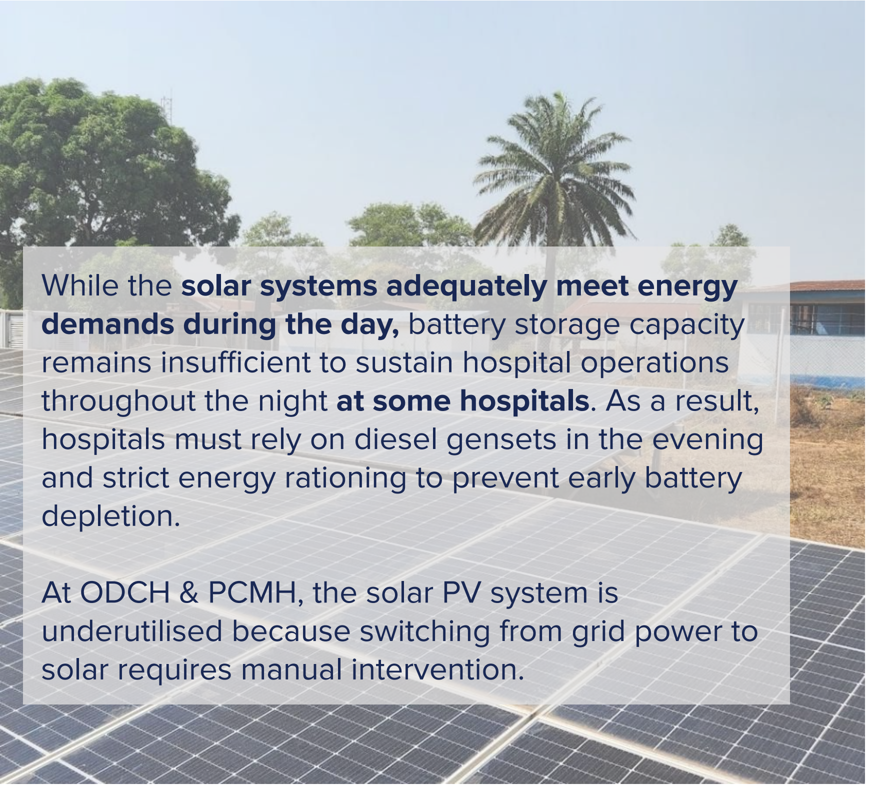
[1] 4 of 6 hospitals improved significantly vs. the baseline, but declines at 2 hospitals led to an overall worsening in the facility average.

Before solarisation there were instances whereby we would have power, but the voltage would be so low that we couldn't use a lot of our equipment. There were several instances when the power would come back [after a power outage], but voltage fluctuations would spoil equipment. Wall sockets would stop working, so we couldn't administer oxygen to and monitor our patients. The situation today is much better."

Dr. Sahr Gborie, Resident Pediatrician, ODCH

Impact - Solar PV System

The solar PV systems **adequately meet energy demands** during the day



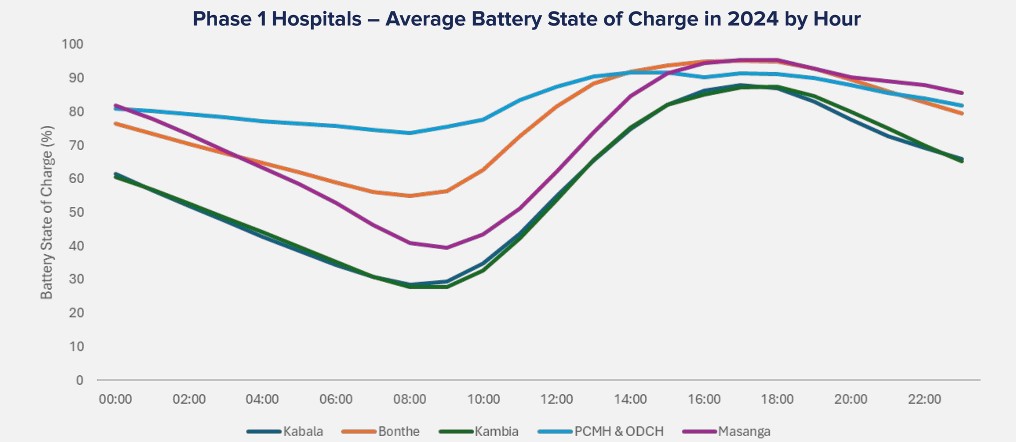
While the **solar systems adequately meet energy demands during the day,** battery storage capacity remains insufficient to sustain hospital operations throughout the night **at some hospitals**. As a result, hospitals must rely on diesel gensets in the evening and strict energy rationing to prevent early battery depletion.

At ODCH & PCMH, the solar PV system is underutilised because switching from grid power to solar requires manual intervention.

627 kWp total solar PV installed capacity[1]

74% average system performance ratio across non-grid connected hospitals[2]

1,561 kWh total battery installed capacity

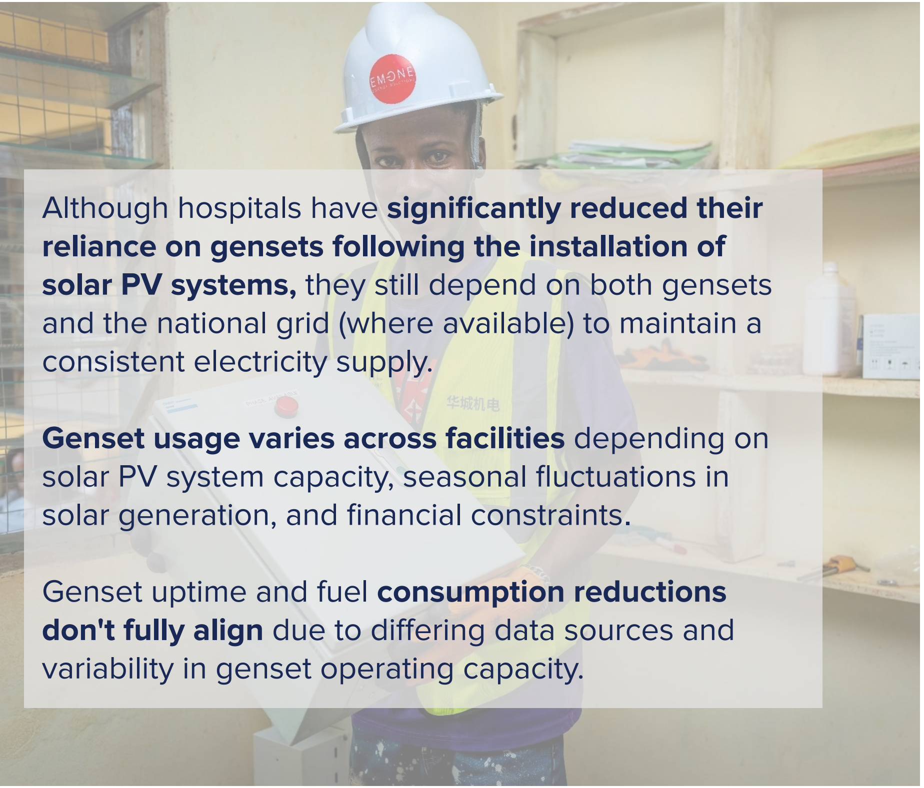


On average, the battery is not able to be fully charged during the day, and the discharge doesn't reach the minimum level, mainly due to overcaution from the PV system operators.

[1] Not including expansions. [2] Optimally, the solar PV system performance ratio should be between 75% and 85%.

Impact - Climate

The reduced use of gensets post-solarisation yields a **positive climate impact**



Although hospitals have **significantly reduced their reliance on gensets following the installation of solar PV systems,** they still depend on both gensets and the national grid (where available) to maintain a consistent electricity supply.

Genset usage varies across facilities depending on solar PV system capacity, seasonal fluctuations in solar generation, and financial constraints.

Genset uptime and fuel **consumption reductions don't fully align** due to differing data sources and variability in genset operating capacity.

Genset uptime[1]	
52% reduction[2]	
Post Install.	1.8 hrs/day
Baseline	3.8 hrs/day

Genset generation[3]	
12% reduction	
Post Install.	282 kWh/day
Baseline	320 kWh/day

Diesel fuel consumption[3]	
38% reduction	
Post Install.	35,945 lt/yr
Baseline	58,437 lt/yr

CO2 emissions[4]	
38% reduction	
Post Install.	115 ton/yr
Baseline	187 ton/yr

By avoiding genset use to meet current electricity demand, **446 tons of CO_2 are avoided annually, totalling 8,912 tons of CO_2 avoided** over the 20-year project lifetime.

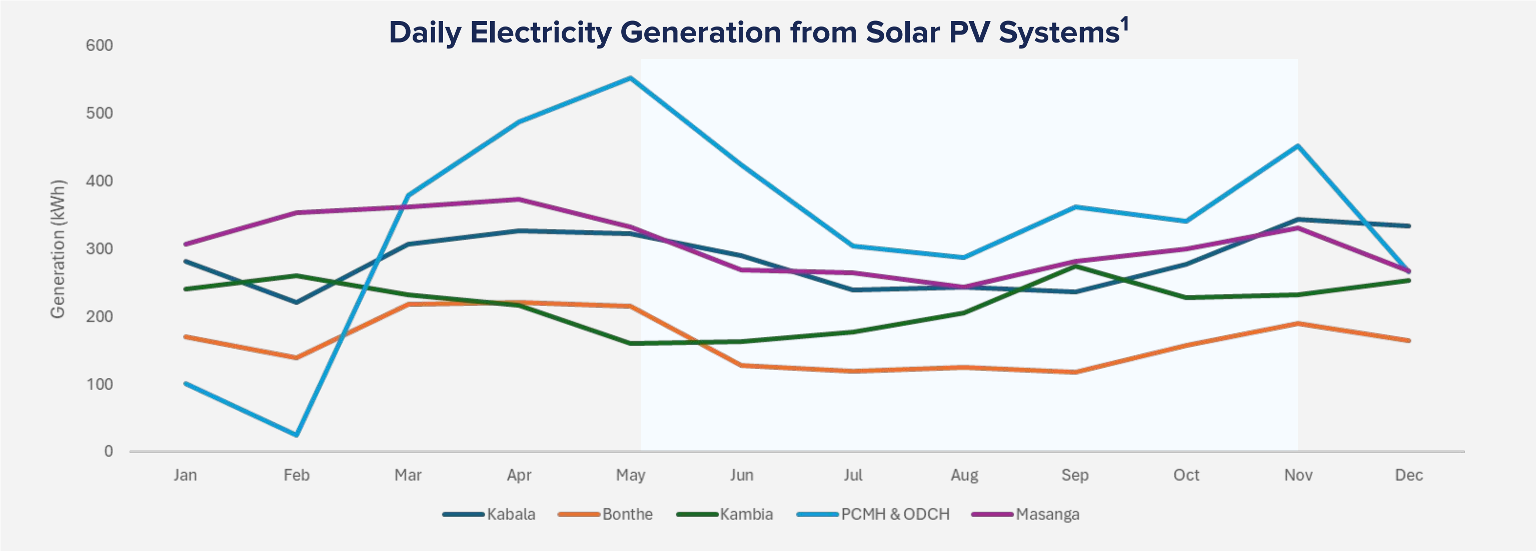
Reduced levels of air and noise pollution within hospital compounds.

An early estimate suggests that **19,226 tons of CO2** may be avoided over the **lifetime of the 31 PV systems installed by end-2024**.

[1] Source: nLine sensors, triangulated with field visit data
[2] SEforALL's target was a 75% reduction in genset use
[3] Source: TetraTech, collected on the field during endline evaluation, Jan 2025, triangulated with Catalyst field visit data
[4] Source: calculated based on fuel consumption

Impact - Seasonality

Seasonality can **impact the performance** of the solar PV systems



- **Lower solar radiation during the rainy season (May to November) increases the reliance on backup electricity sources** — such as gensets in off-grid areas — so the use of gensets persists.
- **For grid-connected hospitals (ODCH & PCMH), the fluctuation in solar electricity generation reflects the instability of the national grid;** with major power outages occurring in Freetown in April and May 2024, the hospitals relied more heavily on the solar PV system during that time.

[1] *Source: RMS data from AlphaESS sensor*

Impact - Social

The installation of solar PV systems had **a positive social impact**

Patients report feeling safer, more confident, and more willing to seek care at hospitals due to stable electricity. Improved lighting, reliable oxygen supply, and uninterrupted medical services have enhanced patient trust in healthcare facilities.

Retrofitting existing electrical installations has significantly improved safety in hospitals. Prior to solarisation, some facilities reported unsafe wiring, frequent voltage fluctuations, and sockets bursting, posing risks to staff and patients.

"During one of my previous pregnancies [before solarisation], they [the Hospital] were supposed to do a CS [c-section], but because there was no light in the theatre due to a lack of fuel for the genset, they decided that the safest option was an assisted delivery. With the baby I just had [post solarisation], I was able to have the CS without complications, and my baby is now recovering well in the SCBU."

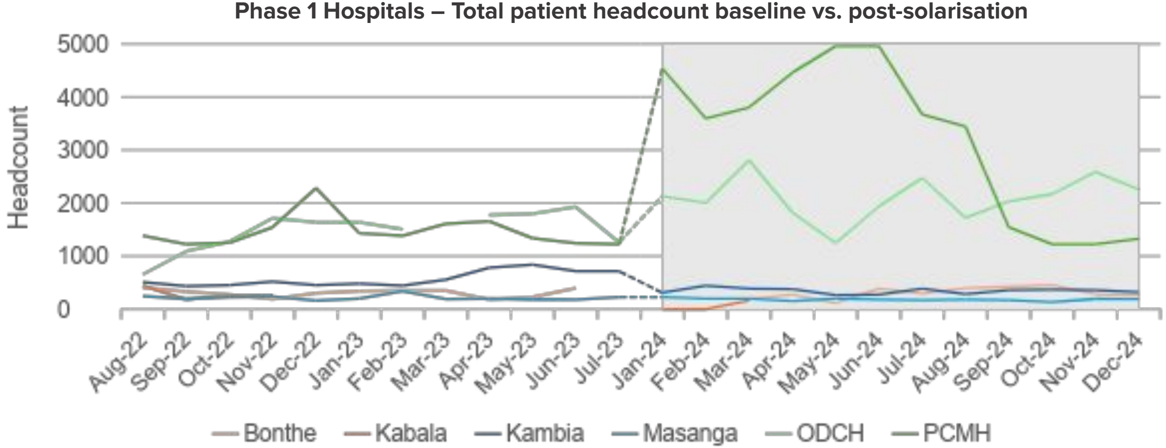
Isata Idrissa, patient at Bonthe Government Hospital

29 technicians trained on O&M across all hospitals

23 female engineers trained through the Women in STEM programme

Impact - Health

Phase 1 hospitals are accessible to Sierra Leone's 8.5 million people and **served over 73,000 patients in 2024**



Increased Patient Volume: Average monthly headcounts rose at most hospitals post-solarisation, except at Kambia.

External Influences: Factors beyond electrification, such as construction[1] at PCMH in Q3 2024, have impacted service delivery and patient numbers.

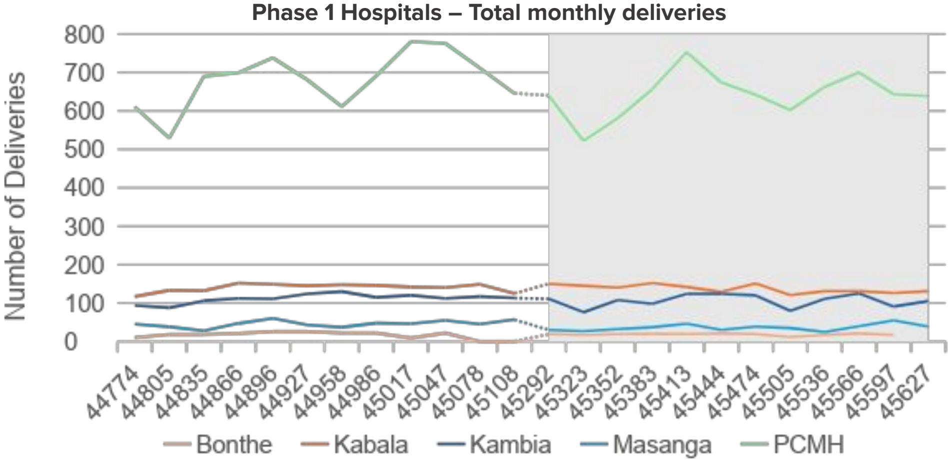
Project Impact: Despite these factors and 22 months of missing data[2] across all hospitals, the project met its target, achieving a **57% increase in total monthly headcount** across Masanga, Bonthe, Kambia, ODCH, and PCMH.

[1] Construction not related to SL-HEP

[2] Missing data points in SL MoH DHIS2 platform; 22 missing data points between August 2022 and December 2024 (excluding Jul-23 to Jan-24 which was not evaluated). Baseline period: Aug-22 to Jul-23; Catalyst evaluation period: Jan-24 to Dec-24

Impact - Health

Anecdotal evidence suggests **improved availability and quality of health services**, though unreliable data hinders a robust quantitative analysis[1]



Deliveries

Over 11,000 deliveries were recorded in 2024—stable from baseline—indicating that factors like family planning and socio-economic conditions may influence delivery rates more than electrification.

Deaths

In 2024, there were 98 maternal deaths and 1,100 under-5 deaths.

Very-low confidence in maternal and children-under-5 deaths figures due to missing data and evident errors in reporting during the baseline period.

[1] *Comparative data is not provided for health impacts due to the varying quality and availability of data for each hospital; anecdotal evidence detailed on the right side of the slide provides a better understanding of the impact.*

Impact - Health

Improved **hospital functionality and patient trust contrast with unclear trends** in surgical interventions due to data gaps

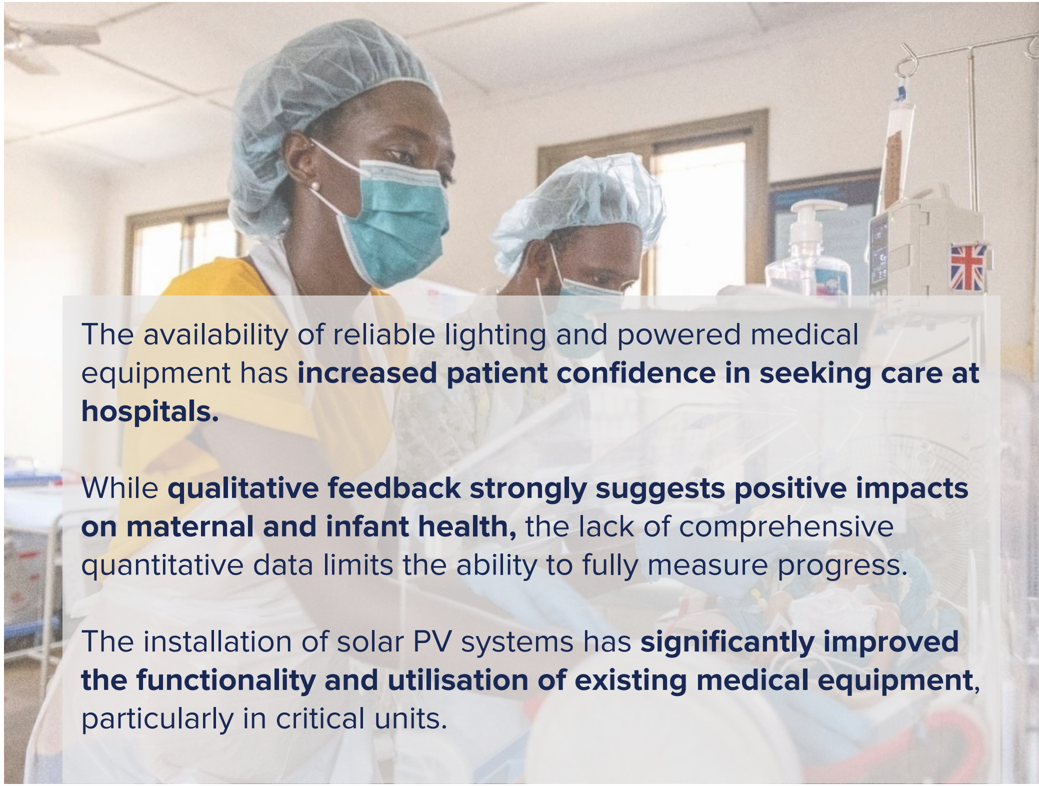
Surgeries[1]

Over 5 thousand major surgeries in 2024 across all hospitals – comparable to baseline.

Almost 800 minor surgeries in 2024 across all hospitals – a 41% reduction from baseline.

Significant missing data limits reliability – up to **62% missing at baseline** and **50% post-installation** for minor surgeries, and **25% missing** across both periods for major surgeries.

[1] Sources: SL MoH DHIS2 platform and self-reported by Masanga Hospital



The availability of reliable lighting and powered medical equipment has **increased patient confidence in seeking care at hospitals.**

While **qualitative feedback strongly suggests positive impacts on maternal and infant health,** the lack of comprehensive quantitative data limits the ability to fully measure progress.

The installation of solar PV systems has **significantly improved the functionality and utilisation of existing medical equipment**, particularly in critical units.

Key Findings - Relevance

The SL-HEP Phase 1 has been **highly relevant** to both Sierra Leone's national healthcare and energy priorities

Sierra Leone's Energy Goals
• **Expand** access to renewable energy, particularly in public services such as healthcare • **Increase** RE capacity to 850 MW by 2030 • **Boost** RE generation to 80% of total by 2030 • Achieve **universal electricity access** by 2040

Sierra Leone's Healthcare Priorities
• Improving health **infrastructure** • **Equitable access** to quality healthcare services • Health system **resilience**

Sustainable Development Goals
• SDG 7 - Affordable and Clean Energy • SDG 3 - Good Health and Well-being • SDG 13 - Climate Action

Key Findings - Effectiveness

The project has been **highly effective** in improving hospital electricity reliability, directly enhancing healthcare service delivery

Reduction in electricity-related disruptions in critical units

- Hospital staff reported that **incubators and oxygen concentrators** that previously failed due to outages **now operate continuously**, leading to improved neonatal outcomes.
- **Emergency C-sections are no longer delayed due to power shortages**, reducing risks to maternal health.
- Qualitative feedback from doctors and nurses suggests that **health outcomes have improved**.

"Before solarisation, infant and maternal mortality rates were really high. Fuel was often not available on the island and patients died while the maintenance team was trying to find fuel. We had to prioritise care, leaving some patients untreated."

Mohammed K Kain - Community Health Officer, Bonthe Government Hospital

Key Findings - Efficiency

SL-HEP has demonstrated **strong efficiency** in reducing reliance on diesel gensets and optimising hospital energy use

Cost Savings

- A reduction in diesel fuel use saves facilities **over US $1,000 per month.**
- The average cost of electricity has **decreased 20%.**

Energy Use

- **Retrofits of the electrical system** have improved energy efficiency at facilities but further training is required to limit the use of non-critical devices.

Solar PV System Technical Design

- **System right-sizing** varies between facilities, with some still having to carefully manage consumption, particularly at nighttime.

Executive Summary of Relevant Recommendations from the Impact Assessment

This summary outlines key recommendations to enhance SL-HEP's project impact, sustainability, and efficiency:

Core Project Enhancements:

- **Technical Design & Reliability:** Boost battery storage, optimise grid integration for solar priority, and implement unified, robust monitoring. Standardise PV security, assess staff quarter electrification, and use containerised powerhouses. Ensure modular and scalable PV systems for future growth.
- **Sustainability & Planning**: Develop long-term O&M strategies and financial forecasts with government partners, defining responsibilities and estimating costs. Establish strong O&M contracts and a multi-donor fund. Implement short-term O&M solutions, improve spare parts planning, and provide training/tools with a digital ticketing system.
- **System Installation & Operation**: Require the presence of maintenance officers before the installation is complete, display toll-free support numbers, and provide site-specific tools/diagrams. Track genset diesel consumption actively.
- **Capacity Building:** Deliver comprehensive training (refresher, specialised, energy efficiency). Strengthen job placement and mentorship for Women in STEM trainees.
- **Modern Equipment Deployment**: Prioritise energy-efficient medical equipment aligned with PV systems. Expand power for oxygen generation and integrate smart technology for optimised energy management.

Improved Monitoring, Evaluation & Learning:

- **Economic Impact**: Conduct a focused study to quantify local economic spillover effects.
- **Data & Performance**: Enhance health data tracking (standardised digital tools) and improve electricity system monitoring with a robust RMS (multiple protocols, memory system) for accurate reliability and sufficiency tracking.

Recommendations – Technical design

Relevant stakeholders: SEforALL & Engineering, Procurement and Construction (EPC) contractor

"The maintenance team used to work tirelessly to fix the genset, but sometimes we couldn't repair it in time, and patients would not survive. Now, I'm grateful that we no longer face those issues"

Francis J. Lahai, Maintenance Officer at Bonthe Hospital

- **Increase battery storage capacity** to ensure uninterrupted power overnight without relying on gensets.
- **Optimise grid integration at ODCH/PCMH** so that solar PV power is prioritised and can be fully utilised for voltage stabilisation.
- **Improve system monitoring and data integration** with a unified monitoring system that can integrate data from multiple sensors, has sufficient data storage capacity, and uses current transformers upstream of power sockets.
- **Standardise security measures for ground-mounted solar PV systems and containerised powerhouses** to reduce the risk of theft and vandalism, ensuring equipment longevity.
- **Assess the feasibility of electrifying staff quarters** at all hospitals to improve retention rates and satisfaction among healthcare personnel.
- **Ensure solar PV systems' modularity and scalability** to effectively accommodate future demand growth.

Recommendations – Sustainability, planning, and institutionalisation

Relevant stakeholders: Government of Sierra Leone (GoSL), SEforALL, EPC contractor

- **Develop a long-term O&M strategy with government partners and clarify stakeholder responsibilities** by clearly defining operational models and estimating costs.
- **Develop a long-term O&M financial forecast and support the establishment of a multi-donor fund for O&M financing** to ensure there is sufficient budget for ongoing maintenance and component replacement.
- **Develop a short-term O&M strategy for existing installations while a long-term national O&M strategy is developed** to ensure the installations are serviced beyond the current O&M contracts.
- **Develop robust O&M contracts** that clearly define performance indicators and Service Level Agreements (SLAs), establishing accountability, to ensure providers are incentivised to maintain high-quality, responsive support.
- **Improve procurement planning for spare parts** so hospitals are not left without essential components.
- **Provide site-specific maintenance tools, including training and maintenance manuals,** to ensure proper system upkeep. A digital ticketing system would improve response times and better track service quality.

Recommendations – System installation and operation

Relevant stakeholders: GoSL, SEforALL, EPC contractor

Ensure hospitals have hired maintenance officers before the installation of the solar PV system to ensure proper system maintenance from the outset.

Provide site-specific maintenance tools and installation diagrams since each installation is unique.

Display a toll-free service number for maintenance support to ensure hospital staff always know how to report technical issues.

Prompt maintenance officers to actively track genset diesel fuel consumption with an onsite logbook to complement RMS data collection and allow more accurate tracking of genset use.

Recommendations – Capacity building and workforce development

Relevant stakeholders: SEforALL, EPC contractor

Establish a structured refresher training programme six months post-installation to reinforce skills and prevent system mismanagement.

Strengthen job placement pathways for Women in STEM trainees, one possible way is by retaining the trainees as mentors.

Provide training manuals and establish specialised training for AlphaESS systems to build in-country installation, operation, and maintenance expertise.

Expand energy efficiency training for hospital staff to decrease unnecessary strain on the energy systems.

Recommendations – Sustainable deployment of modern electrical equipment & Economic impact

Relevant stakeholders: GoSL, SEforALL

Ensure deployment of energy-efficient hospital equipment to ensure hospitals receive modern, efficient equipment that aligns with the capabilities of their solar PV systems.

Integrate smart technology for energy management to optimise electricity demand, extend battery life, and reduce unnecessary strain on hospital power systems.

Expand the power supply to support additional oxygen generation and collaborate with the MoH to facilitate deployment of additional oxygen plants to reduce reliance on external supply chains.

Conduct a study to understand economic spillover effects to corroborate initial findings from the Impact Assessment fieldwork and generate more robust evidence on the broader local economic impacts.

Recommendations – Improvements to MEL systems in place

Relevant stakeholders: GoSL, SEforALL

Improve health data tracking and reporting

- Support MoH to strengthen data collection and reporting.
- Implement standardised digital reporting tools to ensure consistent tracking of health outcomes across all healthcare facilities.

Enhance monitoring of electricity system performance

- Improving the Remote Monitoring System (RMS) will enable more accurate tracking of key power system indicators, increasing the ability to demonstrate and maximise project impact.
- Future RMS setups should not rely on a single communication protocol. Using both cellular and Wi-Fi connectivity can minimize data gaps, while integrating a more robust memory system will help prevent data loss during connectivity outages.

Developmental Evaluation

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Temporal dimensions of SL-HEP's Developmental Evaluation

Fast and effective deployment was achieved under tight timelines; now, long-term sustainability requires institutional ownership and a viable Operation & Management (O&M) strategy

Context	Current status (Apr-25)	Future areas of focus
• **Phase 1** focused on hospitals, proving feasibility of solar-powered systems. • **Gaps identified**: limited system capacity, no staff quarter coverage, weak O&M planning. • **Phase 2** expanded to 1 hospital and 25 PHUs[1]; standardised PV systems (6.6 & 13.2 kWp) for cost-effective deployment in remote areas. • **Phase 3** scaled up to 11[2] additional hospitals, improving technical design, procurement speed, and stakeholder coordination.	• PV Systems operational in 25 PHUs and 7 hospitals across **Phases 1 & 2**. • **Phase 1** hospitals received PV expansions to address capacity challenges. • **Phases 2 & 3** executed under tight timelines using adaptive strategies. • **Phase 3** addressed both on-grid and off-grid hospitals to reduce diesel reliance.	• **Sustainability risks** remain without structured long-term O&M financing. • Active discussions underway with **FCDO[3] and MoH[4]** on viable public-private O&M models. • Future sustainability depends on **stronger government ownership**, inter-ministerial coordination, and more **flexible financing solutions**.

[1] Peripheral Health Units
[2] Koidu Government Hospital is currently on hold as of June 2025 due to reasons outside of SEforALL's control
[3] UK's Foreign, Commonwealth & Development Office
[4] Ministry of Health

Catalyst's DE approach is grounded on field insights and stakeholder feedback

Facility visits, in-depth interviews, and consultations with government and implementing partners informed a comprehensive developmental evaluation

Fieldwork[1]

- 18 facilities visited across Phases 1-3:
  - 6 hospitals (Phase 1)
  - 8 PHUs (Phase 2)
  - 4 hospitals (Phase 3)
- In-depth interviews with facilities' management, healthcare workers and maintenance staff
- Focus groups with patients and other community members
- Focus groups with healthcare workers
- Observational data on system condition, service use, and patient experience

Key informant interviews

- Public institutions in Sierra Leone: Ministry of Energy, Ministry of Health, Electricity and Water Regulatory Commission
- Implementation partner: EM-ONE
- SEforALL staff
- Interviews with STEM[2] trainees
- CEMMATS

[1] See Annexe 1 for detailed analysis of field visits
[2] Science, Technology, Engineering and Mathematics

Key Findings by Evaluation Theme

SL-HEP has an **adaptive and responsive design** that is supported by strong internal learning

Relevance & Coherence

Strong strategic alignment with national health and energy goals.

- Engagement with all relevant government ministries involved in solarisation, especially the MoH, prioritising even coverage of maternal and neonatal health across the country.
- Catalysed the establishment of the Health Facility Electrification Working Group, creating a space for ongoing policy dialogue.

Challenge

- Aim to engage all relevant ministries at the onset of the project.
- Long-term ownership model remains undefined; institutional accountability is unclear.

Scalability & Replicability

The HEP is a scalable and adaptable model.

- Standardised packages proved to be technically appropriate and operationally effective
- Offers replicable blueprint for similar facilities across Sierra Leone.

Challenge

- Centralised power conversion units (50/100/500 kW) restrict system expansion; the design is not always future-proof.

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Key Findings by Evaluation Theme

While SL-HEP's innovative approach **enabled rapid implementation**, certain challenges threaten long-term performance

Innovation & Technology

The HEP introduced delivery innovations that enabled rapid and adaptive implementation.

- SEforALL completed Phase 2 procurement in an unusually short timeframe by leveraging the Phase 1 extension and deploying modular system designs tailored to smaller facilities.
- Phase 3 was procured through a new tender, accelerated by standardised EPC[1] templates and lessons learned from earlier phases.

Challenge

- The Remote Monitoring Systems (RMS) are underutilised due to data gaps and weak connectivity, limiting real-time system oversight and troubleshooting.

Sustainability & Maintenance

Stakeholders agree on the importance of strong O&M[2] frameworks and are currently working to design a national-level solution.

- O&M contracts embedded in EPC agreements for Phase 1, covering basic troubleshooting and periodic servicing.

Challenge

- While interim maintenance contracts ensured short-term functionality, the absence of a clear institutional owner, financing model, and national O&M framework threatens long-term performance.

[1] *Engineering, Procurement and Construction*
[2] *Operation and Maintenance*

Key Findings by Evaluation Theme

The SL-HEP proved to be a **multifaceted success**, delivering positive outcomes across key themes

Social & Gender Inclusion

Increased trust in public hospitals.

- The HEP incorporated deliberate gender inclusion elements, including the recruitment and training of women in STEM.
- There are improved working conditions for female healthcare workers, who can now safely provide services at night in well-lit facilities.

Challenge

- Despite stable electricity access, the lack of medical equipment - particularly in PHUs - continues to endanger women during childbirth.

Climate Co-benefits

Direct reduction in CO_2 emissions.

- Based on the Impact Assessment of Phase 1, there is a proven reduction of diesel genset use across facilities.

Challenge

- Without systematic tracking of genset diesel fuel use, it is impossible to accurately calculate real-time diesel displacement or perform formal Greenhouse Gas (GHG) accounting.

Key Findings by Evaluation Theme

While SL-HEP's flexible funding and design **enabled agile implementation,** challenges remain in detailed cost analysis and long-term demand forecasting

Value-for-Money (VfM)

Rapid adjustments to scope and budget without triggering lengthy donor approvals.

- SEforALL's procurement process benefited from the UK Government's flexible fixed-amount funding model.
- Legal and procurement advisors helped streamline tenders and ensure compliance with international standards.

Challenge

- Lack of detailed cost data limits VfM conclusions, there is insufficient expenditure data to quantify cost savings or calculate unit costs across sites.

Overall Project Design

SL-HEP's success stems from deliberate integration of design-phase planning tools without losing the delivery agility.

- Especially as SL-HEP continues to evolve and potentially inform similar efforts in other sectors, such as education or WASH[1].

Challenge

- There is no standardised process for forecasting future energy demand based on population growth, service expansion, or medical equipment acquisition.

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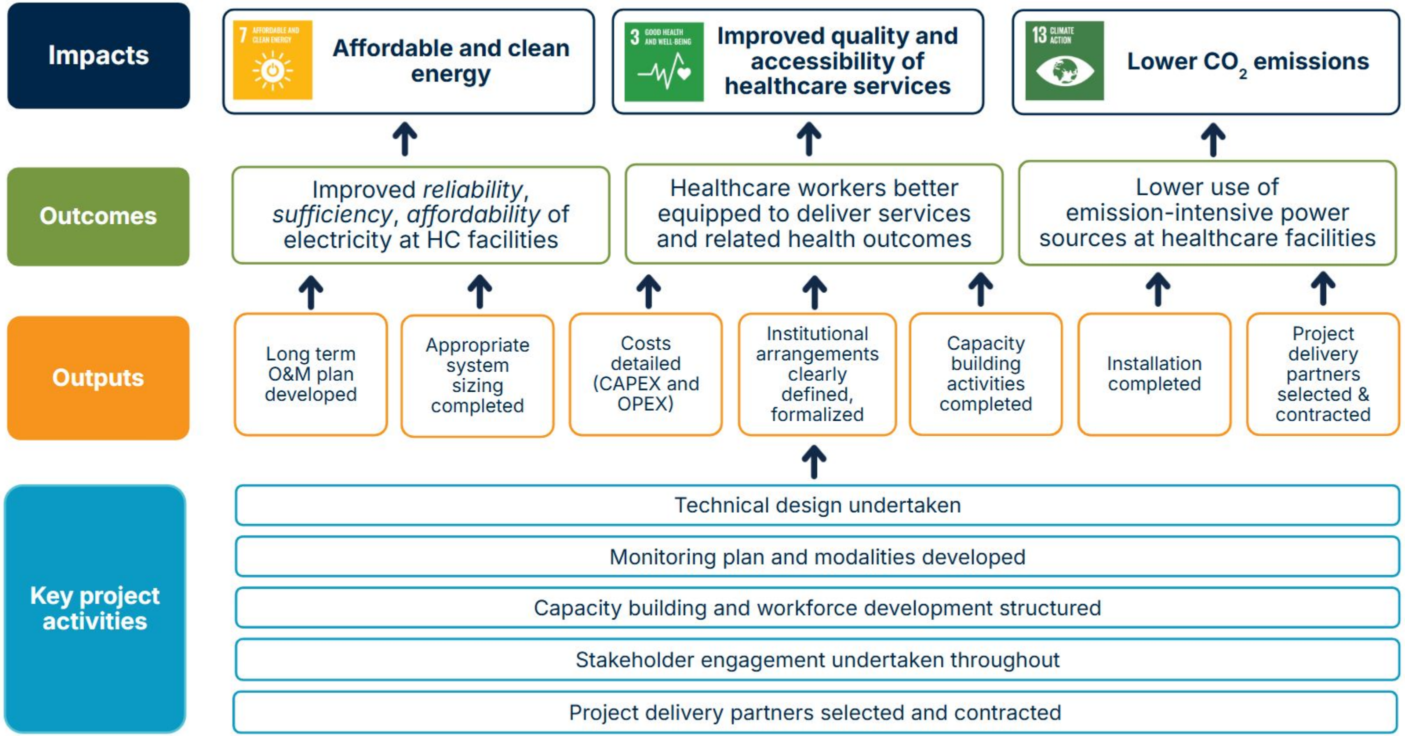
[1] Water, Sanitation and Hygiene

The positive impacts of Sierra Leone's HEP multiply the well-being in communities

"At night, there is electricity, which wasn't the case before. In this neighbourhood, only the facility has electricity. So, at night we are lucky because we live nearby and can benefit from this light. The children in the neighbourhood sit by the hospital in the evening and at night to do their homework and to study." **– Fati, community member at Moriba Town CHC**

Catalyst's Revised Theory of Change

Both Catalyst and Tetra Tech delivered revised Theories of Change based on each firm's analysis. SEforALL is bringing together both top-down and bottom-up approaches to create a final version.



Executive Summary of Relevant Recommendations from the Developmental Evaluation

This summary outlines key recommendations to enhance SL-HEP's project future implementation and scale-up:

Formalize Long-Term O&M Mechanisms:

- **Institutionalise National O&M Framework:** Build on existing work with key government and international partners.
- **Key actions:** Promote bundled facility contracts, explore hybrid public-private models, strengthen government and private sector capacity for system sustainability.
- **Strengthen Spare Parts Provision:** Require EPC proposals to include comprehensive spare parts plans, maximise local sourcing, and ensure initial supply and accessibility of critical components.

Maximise Return on Investment & System Resilience:

- **Strengthen VfM Monitoring & Cost-Effectiveness Analysis**: Link financial inputs to tangible outcomes, including disaggregated tracking of capital expenditures, operational costs, and site-level performance.
- **Develop Training Manuals & User Guides**: Provide clear, simple guides for healthcare staff and stakeholders on system use, preventive maintenance, and troubleshooting, tailored for different system sizes (PHUs vs. Hospitals).
- **Enhance Remote Monitoring & Community Co-benefits**: Strengthen infrastructure for evidence-based decision-making, track social co-benefits, and promote community-led stewardship.

Expand Cross-Sector & Cross-Country Replication of the SL-HEP Model:

- **Replicate in Other Essential Public Service Sectors**: Explore application in areas like education and WASH in Sierra Leone, where energy access gaps exist.
- **Key actions**: Consolidate lessons learned (adaptive design, procurement, stakeholder engagement), address critical cross-cutting challenges (O&M, demand planning, institutional coordination), and leverage peer learning/South-South collaboration for adaptation and scale-up.

Recommendations

To ensure sustainable and scalable implementation, the key recommendations focus on adaptive design, integrated facility operations, and robust demand forecasting

Build structured demand forecasting into the project design

Relevant stakeholders: GoSL, SEforALL, EPC contractor, PM firm, other development partners

Develop and apply a scalable energy demand forecasting model to guide both initial system design and long-term O&M planning.

- Design systems with modularity to accommodate expected demand growth.
- Create a robust O&M framework that can adapt to service expansion, new technologies, and staffing needs.
- Account for diverse demand sources, including non-clinical and administrative uses.

Leverage and document adaptive design for replication

Relevant stakeholders: SEforALL

Codify key adaptive delivery practices into internal guidance tools or playbooks for future projects.

- Pre-design templates, stakeholder engagement protocols, and procurement pacing strategies that proved effective under tight timelines.

Enhance facility-level operation integration

Relevant stakeholders: GoSL, EPC contractor

Align roles and responsibilities across all key actors within each facility, including medical, technical, and administrative staff.

- Provide clear briefings and onboarding materials to support system understanding.
- Establish internal coordination protocols to ensure shared understanding of system capabilities.
- Promote more effective day-to-day use and maintenance of the systems.

Recommendations

To maximise return on investment and ensure long-term system resilience, we recommend embedding cost-effectiveness analysis, securing sustained access to spare parts, and leveraging local monitoring systems to strengthen accountability

Strengthen VfM monitoring and cost-effectiveness analysis

Relevant stakeholders: GoSL, SEforALL, EPC contractor

Future projects should link financial inputs to tangible outcomes.

- Include disaggregated tracking of capital expenditures, operational costs, and site-level performance metrics.
- Develop standardised cost-efficiency indicators, such as $/kWp installed, $/ton CO_2 avoided, and $/additional patient visit, which will enable more robust VfM analysis and benchmarking across facility types.

Enhance monitoring and community co-benefits

Relevant stakeholders: SEforAll

Strengthen remote monitoring infrastructure and local reporting systems to support evidence-based decision-making.

- Consider tracking social co-benefits and promoting community-led stewardship activities as part of broader sustainability and accountability strategies.

Training manuals and user guides

Relevant stakeholders: SEforALL, EPC contractor

Future projects should ensure that training manuals and user guides are handed over to healthcare staff and other relevant stakeholders during commissioning.

- For PHUs with standalone PV systems, provide simple visual user guides, including guidelines on how to use the system, how to conduct preventive maintenance, how to diagnose and report issues, etc.
- In Hospitals with larger PV systems, provide user guides, technical manuals and installation diagrams, and bill of materials used, to the hospital's staff and other institutional stakeholders.

Recommendations

To institutionalise sustainability and unlock broader impact, we propose formalising national O&M frameworks

Formalise long-term O&M mechanisms
Relevant stakeholders: GoSL, SEforALL, EPC contractor, other development partners
Finalise and institutionalise a national O&M framework, building on current work with MoH, MoE, the UK Government, and EWRC. ● Promote bundled facility contracts, explore hybrid public-private models, and adopt performance-based approaches linked to dedicated budget lines or donor support. ● Strengthen government and private sector capacity to oversee and manage long-term system sustainability. **Strengthen the provision of spare parts** ● Require EPC proposals to include a comprehensive spare parts plan covering the full project lifespan. This should clearly distinguish between components that can be sourced locally (e.g., bulbs, cables) and those requiring import (e.g., batteries, inverters), while maximising local availability wherever possible. ● Ensure initial supply of spare parts is sufficient to cover expected product faults (including bulbs, fans, and other appliances), and ensure facilities know how to access those.

Recommendations

There is an opportunity to scale the SL-HEP model across sectors and geographies where systemic energy access gaps remain

Expand cross-sector and cross-country replication of the HEP model
Relevant stakeholders: GoSL, SEforALL
Explore replicating the SL-HEP model in other essential public service sectors in Sierra Leone, where similar gaps in energy access exist. ● Replicate the SL-HEP model in other essential public service sectors in Sierra Leone (e.g. education, WASH) where energy access gaps persist. ● Consolidate and document lessons learned across the project, particularly in adaptive system design, procurement processes, and stakeholder engagement strategies. ● Address critical cross-cutting challenges identified during implementation (e.g. O&M, demand planning, institutional coordination). ● Leverage peer learning and South–South collaboration with countries facing similar electrification challenges to inform adaptation and scale-up.

Replication & Adaptation Framework

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Replication & Adaptation Framework

This framework highlights key areas of replication and contextual adaptation, offering a structured synthesis of relevant findings to support informed decision-making for future planning and implementation in similar low-resource settings

Key elements for **replication**

- **Standardised, Modular System Design**: Phase 2 successfully applied standardised solar PV systems for PHUs, balancing scale and simplicity for broad applicability.
- **Centralised Procurement Using FIDIC Templates**: The adoption of FIDIC-standard procurement and contracting documents in Phase 3 ensured transparency and familiarity among bidders, improving process efficiency and mitigating procurement delays.
- **Management and EPC Oversight**: The combined use of Engineering, Procurement and Construction (EPC) contractors with independent Project Management Consultants (PMC) ensured quality control, risk mitigation, and performance tracking.
- **Engagement and Demand for Services**: The visibility of the electrified facilities and their impact on service utilisation and staff motivation contributed to widespread community acceptance, a critical enabler for replication.
- **Adaptive, Phased Implementation**: SL-HEP applied a learning-by-doing approach across phases, with Phase 1 informing system improvements in later stages. Midstream adaptations—such as sizing corrections and improved staff quarter integration—highlighted the value of iterative programme delivery.

Replication & Adaptation Framework (cont.)

Key elements for **adaptation**

- ***System Modularity and Expandability***: Although modular in concept, the AlphaESS central power conversion units limit system scaling. This constrains responsiveness to growing energy needs.
  Adaptation need: Future projects should prioritise modular designs that allow for flexible upgrades.
- ***Spatial Constraints in Urban Sites***: Limited roof or ground space in urban health facilities restricts PV installation capacity.
  Adaptation need: Early-stage assessments should integrate spatial feasibility analyses and explore vertical or hybrid solutions (e.g. solar canopies or battery-dominant systems).
- ***Stakeholder Mapping During Site Assessments***: During implementation, coordination gaps with actors like Partners in Health (PIH), who were simultaneously renovating facilities or providing diesel, led to missed synergies.
  Adaptation needs: Include comprehensive stakeholder identification and engagement during site selection, audits, and system design to align with ongoing infrastructure or energy supply interventions.

Replication & Adaptation Framework (cont.)

Key elements for **adaptation**

- ***Facility-Level Planning and Forecasting***: While design templates worked well, they occasionally overlooked evolving operational plans at the facility level.
  Adaptation need: Conduct structured consultations with relevant stakeholders to capture both immediate and future energy needs, including the use of electricity for residential, medical, and administrative purposes.

- ***Ongoing Operations and Maintenance (O&M)***: A risk to long-term sustainability remains the absence of clear national O&M frameworks, disaggregated maintenance budgets, and sustained technical support.
  Adaptation need: Replication efforts must embed a comprehensive O&M strategy from the outset. This includes defining institutional roles, securing recurrent funding, and developing standard O&M protocols.

- ***Grid Integration and Hybrid System Management***: In grid-connected hospitals such as PCMH/ODCH, hybrid system optimisation remains a challenge, and facilities continue to rely on the grid and gensets while underutilising PV systems.
  Adaptation need: Develop smart load management protocols and plan for hybrid operation scenarios where solar, grid, and diesel interact through automatic switchovers.

Electrification has helped improve medical services

"The quality of care we provide to patients now has improved significantly compared to before. Before the solar installation, we had a very hard time providing quality care, because there is only so much you can do without electricity. Sometimes, we would take the patients to the Special Care Baby Unit (SCBU) for them to be treated there because the SCBU had constant light. It was difficult back then; we had to get very creative to provide care for our patients." – **Healthcare worker, focus group discussion at Kabala Government Hospital**

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Annexe 1: Field visit observations

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Key Field Visit Learnings – Phase 1 Hospitals

The field visits to Phase 1 hospitals primarily focused on informing the Impact Assessment, evaluating how electrification improved various impact metrics.

● Positive outcome ● Moderate concern ● High concern

Use of medical equipment and reporting

● (Moderate concern) The functionality and use of medical equipment have improved significantly due to better electricity, especially in critical units. However, persistent shortages and limited access to new equipment still hinder the full benefits of solarisation.

Healthcare service availability

● (Positive outcome) Solarisation has enhanced the quality of care, enabling better emergency response, maternal and neonatal services, and diagnostics. Still, limited oxygen supply and solar capacity constrain the overall service impact.

Electricity uptime

● (Moderate concern) Electricity reliability has improved across all hospitals. However, consistent 24/7 uptime remains a challenge due to seasonal variability and storage limitations.

Key Field Visit Learnings – Phase 1 Hospitals

🟢 Positive outcome 🟡 Moderate concern 🔴 High concern

Quality of electricity service
🟢 More stable voltage quality, allowing safer and more reliable operation of medical equipment. In some hospitals, bypassing the inverter when using grid power still causes voltage fluctuations.

Reliance on gensets & grid
🟡 Hospitals now rely far less on diesel gensets. Nonetheless, seasonal solar variability and limited battery capacity mean gensets remain necessary for overnight power stability.

Routine maintenance protocols
🟡 Hospitals are conducting routine maintenance, but a weak maintenance culture and inconsistent infrastructure management could threaten long-term solar system performance.

Feedback on O&M service provider (EM-ONE)
🟢 EM-ONE's O&M support is timely and effective, improving confidence in the system. Yet, a digital tracking system would further enhance accountability and service longevity.

Hospital Energy Management & Energy
🟡 While solar power availability is stable, inefficient energy use (especially at night) has reduced system efficiency and strained battery storage.

Key Field Visit Learnings – Phase 1 Hospitals

🟢 Positive outcome 🟡 Moderate concern 🔴 High concern

Long-term O&M strategy

🔴 There is currently no clear long-term strategy or funding for solar system operations and maintenance, placing the sustainability of the entire project at serious risk.

Spare part provision of essential components

🟡 Essential components like bulbs and fans are not being replenished in a timely manner. This lack of spare parts undermines the ability to maintain consistent electricity services in hospitals.

Commissioning training & capacity of maintenance staff

🟢 Commissioning training provided practical, hands-on knowledge that was well received. Still, technical skill gaps and the lack of refresher training in some hospitals may reduce long-term system sustainability.

Training of STEM trainees

🟢 The Women in STEM training successfully built technical capacity and inspired participants to enter the energy sector. Some trainees still face difficulty finding stable employment in the field.

Key Field Visit Learnings – Phase 1 Hospitals

Positive outcome (green) | Moderate concern (amber) | High concern (red)

Battery storage capacity

- (High concern) Solar PV systems meet daily electricity demands well, but inadequate battery capacity prevents round-the-clock power, forcing hospitals to rely on diesel gensets and strict energy rationing. Storage limitations are being partially addressed through capacity expansions, but those won't be sufficient to ensure full PV system autonomy.

Security lighting for ground-mounted PV plants

- (Moderate concern) Ground-mounted PV systems lack proper lighting, making them vulnerable to theft or tampering at night. Although no major incidents have occurred yet, the risk remains high without preventive measures.

Standardised containerised powerhouse

- (Moderate concern) Battery and inverter storage areas differ widely between hospitals. Inconsistent housing conditions increase the risk of equipment failure, making standardised solutions important for long-term reliability.

Key Field Visit Learnings – Phase 1 Hospitals

● Positive outcome ● Moderate concern ● High concern

Healthcare staff's motivation to work at hospitals

● Healthcare staff are more motivated thanks to stable electricity, which makes hospitals safer, more functional, and appealing as long-term workplaces, even in remote locations.

Safety in the hospital

● Improved lighting has made hospital environments much safer, especially for night-shift workers. Still, poorly lit areas—especially around pathways—continue to pose security risks.

Living conditions of healthcare staff

● Access to electricity has improved staff living conditions, but inconsistencies remain. Many support staff quarters still lack power, affecting safety, morale, and perceptions of fairness.

Job creation & Improvement

● The project did not generate many new jobs, but it significantly improved existing working conditions, increasing productivity, satisfaction, and service quality among hospital staff.

Patient and community perceptions

● Community members and patients report a major boost in trust and satisfaction with healthcare services. Electrification has transformed perceptions of hospitals, leading to higher patient visits and longer stays.

Key Field Visit Learnings – Phase 2 PHUs

Site visits to Phase 2 facilities included a diverse mix of Community Health Centres (CHCs), Community Health Posts (CHPs), and Maternal and Child Health Units (MCHUs), spread across various geographic regions.

- 🟢 Positive outcome
- 🟠 Moderate concern
- 🔴 High concern

Electricity uptime

🟢 **Consistent power availability in all PHUs.** Installed PV system capacity sufficient to ensure 24 hours of electricity supply throughout the year.

Patient and community perception

🟠 **Positive community response but limited by service delivery constraints**, e.g., lack of medical appliances.

Operation & Maintenance

🟠 EM-ONE provides responsive support and maintains open communication, but the **lack of trained on-site personnel, manuals, and spare parts poses a risk** to long-term functionality of PV systems at PHUs.

Use of medical equipment

🔴 **A persistent lack of medical equipment at PHUs continues to limit the full potential of the intervention.**

Key Field Visit Learnings – Phase 2 PHUs

🟢 Positive outcome 🟠 Moderate concern 🔴 High concern

Training on solar system use and maintenance

🟠 **Lack of consistent, structured training at PHUs** poses a risk to long-term PV system functionality. Most facilities' staff had limited training or knowledge has been lost due to staff turnover and the absence of technically qualified personnel.

Healthcare staff working conditions

🟢 **Improved lighting, ventilation, and overall safety, especially during night shifts**. More efficient service delivery and improved staff morale.

Healthcare staff quarters and living conditions

🟠 Many **staff quarters remain unelectrified** or lack basic amenities, undermining morale.

Key Field Visit Learnings – Phase 3 Hospitals

All Phase 3 facilities visited were in the process of PV solar system installation. The visits focused on assessing readiness for implementation, stakeholder collaboration, and scalability.

Positive outcome (green) · Moderate concern (amber) · High concern (red)

Readiness of maintenance staff

- (Positive outcome) **Maintenance teams were actively involved in planning and installation in most hospitals**, boosting ownership and future maintenance capacity.
  However, **Lakka lacks a dedicated MoH technician**, posing risks to long-term system sustainability and highlighting the need for MoH to assign technical staff prior to commissioning.

Hospital management engagement

- (Moderate concern) **Most Medical Supervisors were actively engaged by EM-ONE and understood system capabilities**. However, inconsistent communication—especially at Port Loko—revealed gaps in stakeholder engagement and expectations around system performance. Clearer, documented communication is needed during rollout.

Assessing future demand

- (Moderate concern) While current energy needs were thoroughly assessed, there is no systematic process to forecast future demand. This poses a risk of system undersizing as facilities expand or receive new equipment. Integrating demand growth planning into system design and O&M strategies is essential to ensure long-term system adequacy and avoid reliance on gensets or costly upgrades.

Key Learnings from Stakeholder Interviews

These interviews illuminated the challenges and innovations driving the scale-up and implementation of Phases 2 and 3.

Targeted institutions for high-level interviews
• Ministry of Energy • SL Electricity Water Reg. Commission • SEforALL • Ministry of Health[1] • EM-ONE • CEMMATS

Design evolution & adaptive delivery

- Phased, "learning-by-doing" implementation enabled rapid scaling via iterative improvements in sizing, procurement, and contracting.
- Flexible contracting ("playbook while running the game") kept delivery on track under tight timelines.
- Result: Strong adaptive capacity; provides a blueprint for replication

Long-term sustainability

- Short-term maintenance secured via EPC contracts—but no clear, dedicated institutional lead or financing beyond March 2025 donor support.
- Missing real-time monitoring systems and insufficient government technical capacity.
- High risk of system degradation without a structured O&M framework.

[1] Limited participation
[2] Operation and Maintenance

Key Learnings from Stakeholder Interviews

Efficient procurement

- Standardised templates, FIDIC-style contracts, legal/technical support, and flexible UK-funded financing enabled fast, compliant procurement.
- Coordination gap: Limited MoE involvement in technical specs—critical for long-term standardisation.

Site selection trade-offs

- Clear roadmap-based selection, but the criteria (grid-status, existing PV, private vs public) lacked transparency.
- Enabled speed but costs in equity and needs-based targeting.

Institutional ownership & sector alignment

- Inter-ministerial working group and rural energy agency plans show promise for institutionalising electrification.
- The existing alignment with national priorities is a solid foundation for policy dialogue and replication.