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STATE OF THE MARKET REPORT FOR HEALTHCARE FACILITY ELECTRIFICATION

2026 UPDATE

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ABBREVIATIONS

ACRONYM	DEFINITION	ACRONYM	DEFINITION
ABERME	Agence Béninoise d'Électrification Rurale	**LFP**	Lithium Iron Phosphate
ADELE	Access to Distributed Electricity and Lighting in Ethiopia	**MIGA**	Multilateral Investment Guarantee Agency
AGREE	Access Governance and Reform for the Electricity and Water Sectors Project	**MoH**	Ministry of Health
ASCENT	Accelerating Sustainable and Clean Energy Access Transformation	**MoBSE**	Ministry of Basic and Secondary Education
BESS	Battery Energy Storage System	**NISHP**	Nigeria Solar for Health Project
CAPEX	Capital Expenditure	**NPHI**	Nigeria Power for Health Initiative
DAC	Development Assistance Committee	**O&M**	Operations and Maintenance
DARES	Distributed Access through Renewable Energy Scale-up	**ODA**	Official Development Assistance
DECIM	Digital and Energy Connectivity for Inclusion in Madagascar	**OPEX**	Operating Expenditure
DFI	Development Finance Institution	**PPA**	Power Purchase Agreement
dMRV	Digital Monitoring, Reporting and Verification	**PSA**	Pressure Swing Adsorption
D-REC	Distributed Renewable Energy Certificate	**PV**	Photovoltaic
EaaS	Energy-as-a-Service	**RBF**	Results-Based Financing
EAC	Environmental Asset Certificate	**REC**	Renewable Energy Certificate
EASP	Energy Access Scale-up Project	**ROGEAP**	Regional Off-Grid Electricity Access Project
EPC	Engineering, Procurement and Construction	**SDG**	Sustainable Development Goal
ESMAP	Energy Sector Management Assistance Program	**SESCO**	Sustainable Energy Services Company
EU	European Union	**SEforALL**	Sustainable Energy for All
FCDO	Foreign, Commonwealth & Development Office	**SESCO**	Sustainable Energy Services Company
GBE	Green People's Energy	**UECCC**	Uganda Energy Credit Capitalisation Company
GSEP	Gambia Sustainable Energy Project	**UNDP**	United Nations Development Programme
HETA	Health Electrification and Telecommunications Alliance	**UNICEF**	United Nations Children's Fund
HFSE	Health Facility Solar Electrification	**USAID**	United States Agency for International Development
IRENA	International Renewable Energy Agency	**WHO**	World Health Organization
kWh	kilowatt-hour	**WRI**	World Resources Institute
kWp	kilowatt-peak		
KPI	Key Performance Indicator		

EXECUTIVE SUMMARY

Healthcare electrification on a turning point

Reliable electricity is indispensable to modern healthcare. It enables affordable medical oxygen systems while powering vaccine cold chains, operating theatres, laboratories, digital health infrastructure, water supply and sanitation systems. Renewable energy enables healthcare facilities to continue operating during disease outbreaks, climate disasters and grid failures. The COVID-19 pandemic and, more recently, recurring Ebola outbreaks, climate-related disasters and increasing fuel price volatility have reinforced the strategic importance of resilient renewable energy systems for healthcare facilities.

Broader global initiatives such as Mission 300 have accelerated attention toward electrification of public institutions alongside household energy access. The World Bank has committed significant financing toward the electrification of social infrastructure through flagship regional programmes such as the Distributed Access through Renewable Energy Scale-up (DARES) and the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) programme as part of broader national energy access and development strategies.

Meanwhile, climate finance mechanisms are directly supporting healthcare electrification as a climate adaptation and resilience intervention. The Green Climate Fund supports a Save the Children programme in Malawi to adopt a holistic climate-informed approach to strengthening Malawi's health system.

At the same time, official development assistance (ODA) declined by 23% in 2025, representing the largest annual reduction on record. The termination of the Health Electrification and Telecommunications Alliance (HETA), managed by the United States Agency for International Development (USAID), and broader reductions in bilateral development assistance have exposed the vulnerability of a sector that has historically depended almost entirely on grant-funded projects.

Against this backdrop, the healthcare electrification market is undergoing a profound transformation. Governments, development finance institutions (DFIs) and private sector actors are increasingly recognizing that traditional donor-funded engineering, procurement and construction (EPC) projects alone will not deliver universal, reliable electricity to healthcare facilities. The market is progressively shifting towards nationally coordinated programmes, service-based delivery models and commercially enabled financing approaches that prioritize long-term reliability over short-term infrastructure deployment.

Market overview

This report analyses 426 healthcare electrification initiatives implemented across 73 countries, making the 2026 Sustainable Energy for All (SEforALL) Healthcare Electrification Database the most comprehensive source of information currently available in the sector. The World Bank has emerged as the largest single financier of healthcare electrification, while the European Union (EU), the UK government, the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the World Health Organization (WHO), Gavi, the Vaccine Alliance, SEforALL and SELCO Foundation continue to play central roles in implementation, policy development, innovation and market coordination. A notable evolution since the previous report is the early but promising shift from fragmented donor projects towards coordinated national programmes supported by healthcare electrification masterplans, geospatial planning tools and integrated government coordination mechanisms.

Out of the 426 initiatives, the database includes 160 major projects launched since 2021 and spanning more than 38,000 healthcare facilities worldwide. Together, they are expected to add at least 141 MWp to the global energy mix. India accounts for the largest number of facilities through SELCO Foundation's Energy for Health programme, while Sub-Saharan Africa remains the largest regional market in terms of implementation activity.

Even if all ongoing and planned initiatives identified in the database are successfully completed, at least 286,170 healthcare facilities worldwide, including 81,407 in Sub-Saharan Africa, will still require either first-time electrification or reliable backup power. In Sub-Saharan Africa alone, closing this remaining gap is estimated to require approximately USD 2.67 billion in upfront investment, before accounting for the substantial long-term cost of operating and maintaining these systems. Importantly, this gap is dynamic rather than static. As aging renewable energy systems begin to fail, future investment requirements must address both new installations and the replacement or rehabilitation of existing infrastructure. Without sustainable operations and maintenance (O&M) arrangements, today's electrification successes risk becoming tomorrow's replacement challenge.

The report also finds that programme duration is evolving alongside delivery models. While most UNICEF and UNDP interventions continue to operate over two-year implementation cycles aligned with donor funding windows, larger programmes financed by the World Bank and the EU increasingly adopt five-year implementation periods to allow sufficient time for institutional development, market creation and the deployment of long-term service contracts.

Technology and digitalization

Declining costs of renewable energy components and the global fossil fuel crisis have further strengthened the economic case for solar-based electrification in recent years. Manufacturing of photovoltaic (PV) modules and battery cells have reached historically low prices, while improvements in system reliability, and the widespread adoption of lithium iron phosphate (LFP) batteries have made renewable energy systems increasingly capable of supporting the full spectrum of healthcare services. At the same time, system architectures have evolved from small stand-alone installations designed primarily for lighting and vaccine refrigeration to modular, scalable power systems capable of supplying large hospitals and staff accommodation.

Technological innovation is increasingly focused on improving system performance, reliability and long-term sustainability. Higher-voltage architectures for larger health facilities like hospitals reduce installation costs and improve operational efficiency; meanwhile, small health facilities rely on lower voltage inverters from 12V to 96V offering lower costs and increased safety. Several developers choose to oversize the systems and create “hub and spoke” solar mesh grids to supply excess energy to surrounding communities to cover the ongoing O&M costs for the health facilities.

Following the COVID-19 pandemic, reliable oxygen has emerged as a global health priority, driving demand for larger and more resilient energy systems capable of powering oxygen concentrators, pressure swing adsorption (PSA) plants and associated medical infrastructure. This represents a significant evolution in the market, with renewable energy increasingly supporting critical clinical services rather than only basic facility operations.

Remote monitoring systems, once used primarily to detect equipment faults, are evolving into comprehensive digital monitoring, reporting and verification (dMRV) platforms that support predictive maintenance, automated performance verification, asset management and financial reporting. These platforms are increasingly becoming essential infrastructure for service-based delivery models, enabling governments, financiers and private operators to monitor system performance in real time and verify contractual obligations in long-term service agreements.

Digital technologies are creating new opportunities to strengthen the link between energy performance and health outcomes. Emerging integrated digital platforms combine energy monitoring with facility management, geospatial planning, climate resilience assessments, health information systems and operational analytics, providing governments with a more comprehensive understanding of how reliable electricity influences healthcare delivery.

Digitalization also enables the unlocking of innovative financing opportunities. High-quality operational data generated through digital platforms can support results-based financing, facilitate the issuance of renewable energy certificates (RECs), strengthen carbon credit methodologies and reduce verification costs for climate finance.

Delivery models and market transformation

The healthcare electrification market is undergoing a fundamental transformation in both delivery models and financing mechanisms. While traditional EPC projects remain the dominant approach, the sector is gradually moving towards long-term, service-based models with blended financing approaches, shifting from grant-funded infrastructure projects to catalytic financing mechanisms that mobilize small pockets of private investment while strengthening government ownership.

Historically, healthcare electrification has relied almost exclusively on a donor-funded build–transfer model, under which development partners finance the full capital cost of renewable energy systems before transferring ownership and responsibility for O&M to governments. Although this approach has successfully electrified thousands of healthcare facilities and demonstrated the benefits of renewable energy, it has struggled to ensure long-term sustainability. As maintenance contracts expire and systems age, many governments lack the financial resources, institutional capacity and procurement mechanisms required to operate and replace these assets, creating a growing replacement challenge. At the same time, the heavy reliance on grant funding has done little to catalyse commercial investment or create sustainable healthcare electrification markets.

In response, an intermediate "EPC-plus" model has emerged, extending contractor responsibility for O&M for two to five years after commissioning. While this approach improves system reliability during the early years of operation, it does not fundamentally address the long-term financing challenge. More recently, governments and development partners have begun adopting blended financing approaches, using concessional funding strategically to mobilize commercial capital rather than financing infrastructure entirely through grants. Donor resources are increasingly deployed as catalytic capital through targeted subsidies, guarantees, first-loss facilities and risk mitigation mechanisms, while private operators assume greater responsibility for financing, operating and maintaining systems over contract periods extending five, ten or more years.

Service-based healthcare electrification is emerging through two complementary pathways. Government-led programmes, typically structured as public-private partnerships, procure long-term energy services for large portfolios of public healthcare facilities through performance-based contracts. In parallel, market-led models enable private energy service providers to contract directly with individual healthcare facilities, primarily private and faith-based institutions, demonstrating the commercial viability of healthcare facilities as energy off-takers. These models serve different market segments: government-led programmes are essential for achieving national-scale electrification of public health systems, while market-led models can accelerate deployment where commercial opportunities exist and facilities are able to pay. However, both approaches will continue to require blended finance and concessional support to ensure affordability, particularly in low-income and remote settings.

Although service-based models remain at an early stage of market development, they are gaining momentum. Since 2021, only 597 healthcare facilities have been electrified through completed service-based projects, representing approximately 4.3 MWp of installed capacity, indicating that these models remain a relatively small share of today's market. However, the future pipeline demonstrates a rapid shift in direction. The 2026 SEforALL Database identifies

2,976 healthcare facilities expected to be electrified through long-term service contracts in ongoing or planned programmes, representing more than 55 MWp of planned capacity and nearly USD 195 million in investment. Most of these programmes are supported by the World Bank and the EU in countries including Chad, Madagascar, Malawi, Nigeria and Uganda, signalling growing confidence in blended finance and service-based procurement.

The report identifies the following barriers preventing scale of sustainable models:



Limited market maturity and institutional readiness



Limited access to commercial finance



Government payment risk and uncertain revenue streams



Regulatory, policy and institutional barriers:

- Restrictive and slow public procurement rules
- Lack of clear national policies and inter-ministerial coordination.
- Absence of institutionalized approaches to long-term O&M in fiscal policy
- Absence of a conducive tariff and regulatory framework



Digital technologies, data and connectivity:

- Unreliable and expensive connectivity in remote areas
- Data quality concerns
- Cost and complexity of digital platforms.
- Government procurement delays and interoperability



Market distortions:

- Expectation of fully donor-funded capital investment
- Competing grant-funded projects
- Distorted perceptions of the cost of electricity
- Reduced incentives for government ownership and private innovation

To overcome these barriers, the report proposes the following mechanisms and conditions:



Government ownership and leadership:

- Government commitment and financial ownership
- Acknowledging the limits of traditional public asset management
- Cross-government coordination
- Institutionalizing long-term delivery



Creating bankable financing structures:

- Catalytic use of donor funding.
- Results-based financing
- Risk mitigation and payment security (liquidity reserve facilities, political risk insurance, sovereign-backed payment support)



Enabling regulatory and procurement frameworks:

- Sub-national regulatory and tariff autonomy
- Long-term concessionary legal frameworks
- Iterative, "smart" procurement design



Embracing innovation in designing revenue models:

- Affordable service fees and pragmatic financial benchmarking.
- The "energy hub" or commercial cross-subsidization model
- Minimum-subsidy competitive bidding
- Diversified revenue streams

Recommendations by stakeholder group

STAKEHOLDER	PRIORITY ACTIONS
Governments	Shift procurement from assets to services; create dedicated budget lines; aggregate demand; establish payment security mechanisms; strengthen institutions.
Donors	Use grants catalytically; finance project preparation; support guarantees; reduce transaction costs; align programmes with long-term government ownership.
Development Finance Institutions	Expand guarantees; support local currency lending; develop portfolio financing; back aggregation platforms.
Private Sector	Engage early in programme design; develop scalable portfolios; integrate digital monitoring; explore complementary revenues.
Coordinating Organizations	Develop standard contracts; harmonize procurement; maintain market intelligence; facilitate knowledge exchange.

Outlook

Across the 51 initiatives for which sufficient budget and capacity information is available, average upfront project costs are approximately USD 4,500 per kWp installed. Applying this benchmark to the remaining Sub-Saharan African gap suggests that approximately USD 2.67 billion in upfront investment would be required to solarize these facilities. Evidence from an early service-based project indicates that providing 10 years of O&M through long-term service contracts could require a total budget equivalent to approximately 70% of initial capital expenditure (CAPEX). This reinforces one of the report's central messages: **closing the infrastructure gap without financing the operational gap will not deliver sustainable healthcare electrification.**

Mission 300 represents one of the most significant opportunities to mobilize the next wave of investment. Of the six major planned healthcare electrification programmes captured in the database, three are financed by the World Bank and three by UNICEF. The World Bank has set an ambitious goal to electrify approximately 75,000 healthcare facilities under the broader Mission 300 agenda through regional programmes such as DARES and ASCENT as well as country-specific operations.

However, closing the remaining gap will require financing beyond ODA alone. Early service-based tenders suggest that, in markets with sufficient government fiscal capacity and credible payment mechanisms, grant funding can be used strategically to mobilize additional resources. In ideal cases, every USD 1 of grant funding could potentially mobilize approximately USD 0.40 in government co-funding and USD 0.30 in private capital over a 10-year period. In fragile and higher-risk markets, grant funding may still need to cover most or all long-term service costs. Private capital can nevertheless reduce upfront funding requirements by financing part of CAPEX and recovering that investment over the contract period, although the higher cost of private finance must ultimately be reflected in service fees.

A third pathway will remain necessary in countries where neither government fiscal capacity nor market conditions currently support significant private participation: continued donor and public financing of both CAPEX and operating expenditure (OPEX). Even in these markets, programmes should use fully subsidized investment to establish the enabling environment for future sustainable models by strengthening government institutions, building local markets, introducing performance-based O&M, improving procurement and payment mechanisms, and generating reliable operational data.

Substantial grant and concessional finance will remain essential to closing the healthcare electrification gap, particularly in low-income and fragile countries. The opportunity is to combine each dollar of grant funding, where conditions permit, with government co-financing, private capital, risk-mitigation instruments, and complementary climate and environmental revenues. The objective should not be to maximize private investment at any cost, but to identify the combination of public, concessional and commercial finance that delivers reliable electricity at the lowest lifecycle cost. Early service-based programmes offer two particularly promising prospects: they can substantially increase the operational lifetime and reliability of renewable energy systems compared with business-as-usual asset-transfer approaches, and they can reduce the proportion of total lifecycle costs that must be financed through grants by mobilizing government and private resources.

BACKGROUND AND OBJECTIVES

With fewer than four years remaining to achieve the Sustainable Development Goals (SDGs), the global healthcare electrification challenge remains immense. While exact data remain difficult to capture, we estimate that more than 286,000 healthcare facilities worldwide still lack either electricity or reliable power, including over 81,000 facilities across Sub-Saharan Africa. At the same time, the international development landscape has changed dramatically. Official development assistance (ODA) is under increasing pressure, humanitarian budgets are tightening and governments face growing fiscal constraints. The sector can no longer rely solely on traditional grant-funded approaches; delivering universal access to reliable electricity will require smarter investment, stronger partnerships and delivery models capable of maximizing the impact of every dollar invested.

The urgency is further reinforced by the increasing frequency of health emergencies and climate-related disasters. Recent disease outbreaks, including COVID-19, Ebola and Mpox, together with floods, heatwaves and extreme weather events have repeatedly exposed the vulnerability of health systems operating without reliable electricity or without climate-resilient energy infrastructure. Health facilities cannot provide life-saving services, power medical oxygen systems, maintain vaccine cold chains or continue operating during emergencies without dependable energy infrastructure. Reliable electricity and climate resilience measures[1] are therefore no longer simply an energy access challenge; they have become a prerequisite for strong health systems, climate adaptation and global health security.

Against this backdrop, healthcare electrification stands at a turning point. While important progress has been made over the past two years, the sector is simultaneously facing unprecedented financial constraints and opportunities. Rapid declines in renewable energy costs, advances in digital technologies, the emergence of service-based delivery models and growing government ownership are creating new pathways to scale. Harnessing these opportunities will require a transition from isolated infrastructure projects to coordinated national programmes capable of delivering reliable energy services over the long term.

This report provides an updated assessment of the global healthcare electrification market using the latest data from Sustainable Energy for All's (SEforALL's) Powering Healthcare Intervention Database and Heatmap (the 2026 SEforALL Database), which now captures information from 426 healthcare electrification initiatives implemented across 73 countries. The analysis is complemented by country case studies, interviews with governments, development finance institutions (DFIs), multilateral organizations, private sector companies,and implementing partners, together with an extensive review of recent literature, programme evaluations and policy documents.

[1] SEforALL. Climate resilience and powering healthcare in the Global South. 2025

The objectives of this report are to:

- ➔ Provide an updated overview of the size, composition and evolution of the global healthcare electrification market.
- ➔ Identify emerging trends in technologies, digital infrastructure, financing mechanisms and delivery models.
- ➔ Assess the progress made in transitioning from donor-funded EPC approaches towards sustainable service-based models.
- ➔ Examine the barriers that continue to constrain market growth and private sector participation.
- ➔ Document lessons learned from recent programmes and identify opportunities to accelerate the scale-up of healthcare electrification.
- ➔ Provide evidence-based recommendations for governments, development partners, investors and implementing organizations to support the next phase of market development.

As with the first edition, published in 2024[2], this report adopts a bottom-up, evidence-based approach grounded in real-world implementation experience. By combining quantitative market data with qualitative insights from practitioners across the sector, it aims not only to describe the current state of the market, but also to identify the actions needed to accelerate progress towards universal access to reliable electricity for healthcare facilities. In doing so, it seeks to support the continued evolution of healthcare electrification from isolated infrastructure projects to integrated, sustainable health system investments capable of improving the lives of millions of health workers and patients worldwide.

[2] SEforALL. State of the Market Report for Healthcare Facility Electrification. 2024.



CHAPTER ONE

MARKET OVERVIEW

Market at a turning point

Health facility electrification has become an increasingly important component of global efforts to strengthen health systems, improve climate resilience and expand sustainable energy access. Reliable electricity is essential for powering critical medical equipment, vaccine cold chains, digital health systems, laboratories, maternal care services and water systems. Without reliable power, healthcare facilities are unable to provide consistent and quality healthcare services, particularly in rural and underserved areas.

Reliable electricity is linked closely to the increasing role of medical oxygen in healthcare delivery. Following the COVID-19 pandemic, medical oxygen is now recognized as a global health priority and an essential component of universal health coverage. Yet an estimated 374 million people require oxygen therapy each year, while approximately 5 billion people still lack access to safe, affordable oxygen services. In low- and middle-income countries, only around 30% of patients requiring oxygen for acute medical or surgical conditions receive adequate therapy[3]. Reliable electricity underpins every stage of the oxygen value chain making dependable power a prerequisite for life-saving care. The World Health Organization (WHO) estimates that strengthening oxygen systems alone could prevent up to 122,000 childhood pneumonia deaths annually, while recent evidence suggests that almost half of hospital deaths in some low-resource settings occur from conditions for which oxygen is an essential treatment[4].

[3] Graham, H.R, et al., Reducing global inequities in medical oxygen access: the Lancet Global Health Commission on medical oxygen security. The Lancet Global Health Commission 2025.

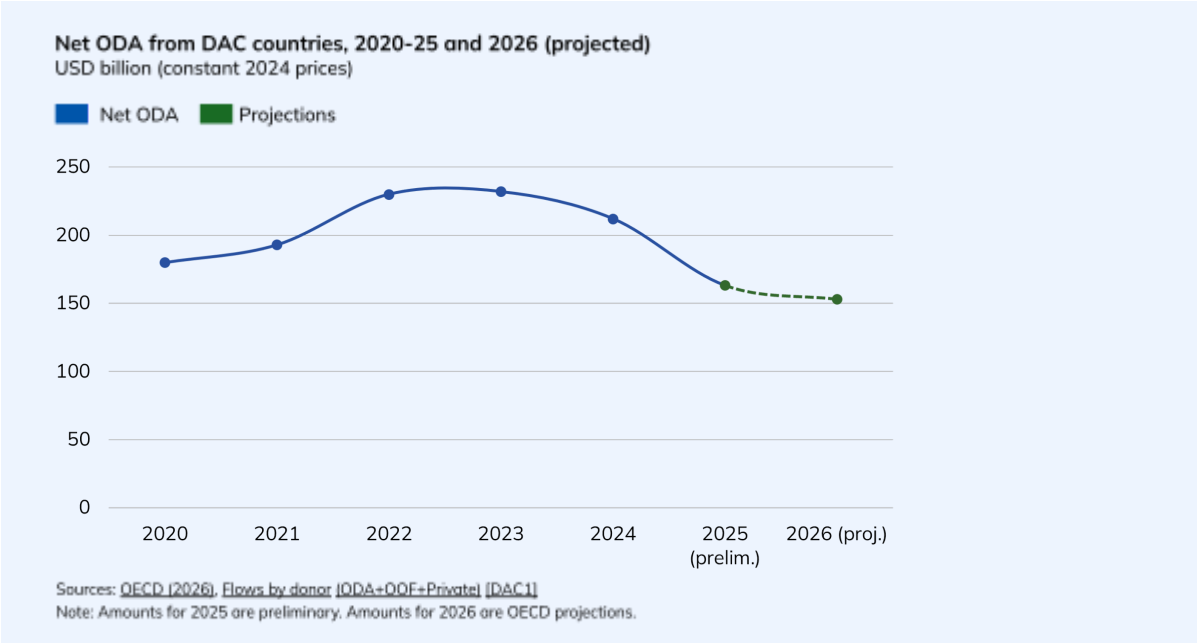
[4] WHO, 2026 https://www.who.int/health-topics/oxygen

The sector has experienced significant growth in response to health, climate and geopolitical events that have exposed the vulnerability of healthcare systems operating without reliable electricity. The COVID-19 pandemic demonstrated the critical importance of powering oxygen plants, vaccine storage facilities, laboratories, emergency response centres and digital health infrastructure during large-scale health emergencies. Meanwhile, the continued threat of emerging and re-emerging infectious diseases such as Ebola has reinforced the need for healthcare facilities to remain electrified and operational for emergency preparedness. Beyond health emergencies, the climate crisis is increasing the frequency and severity of extreme weather events that place additional pressure on health systems, while fuel supply disruptions and price volatility linked to geopolitical conflicts, including tensions in the Middle East, have highlighted the risks of dependence on diesel generators. Together, these crises have elevated healthcare electrification using renewable sources from a niche energy access intervention to a strategic priority for health system resilience, emergency preparedness and climate adaptation.

At the same time, broader global initiatives such as Mission 300, led by the World Bank and the African Development Bank, offer an opportunity to further increase attention toward electrification of public institutions alongside household energy access. Through flagship programmes such as the Distributed Access through Renewable Energy Scale-up (DARES) and the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) programme, the World Bank has committed significant financing toward the electrification of healthcare facilities and other social infrastructure as part of broader national energy access and development strategies.

However, the market is also facing significant disruption. Official development assistance (ODA) contraction is emerging as an increasingly important constraint for healthcare facility electrification, particularly for programmes that rely heavily on fully grant-funded delivery models. According to Organisation for Economic Co-operation and Development (OECD) data, ODA declined by 23% in 2025, representing the largest annual decline on record and the second consecutive year of contraction. Bilateral development programming declined by 26.3%, while bilateral ODA to Sub-Saharan Africa fell by a similar proportion. Core contributions to the United Nations system also declined significantly.

Figure 1: Net ODA from countries that are members of the Development Assistance Committee (DAC)

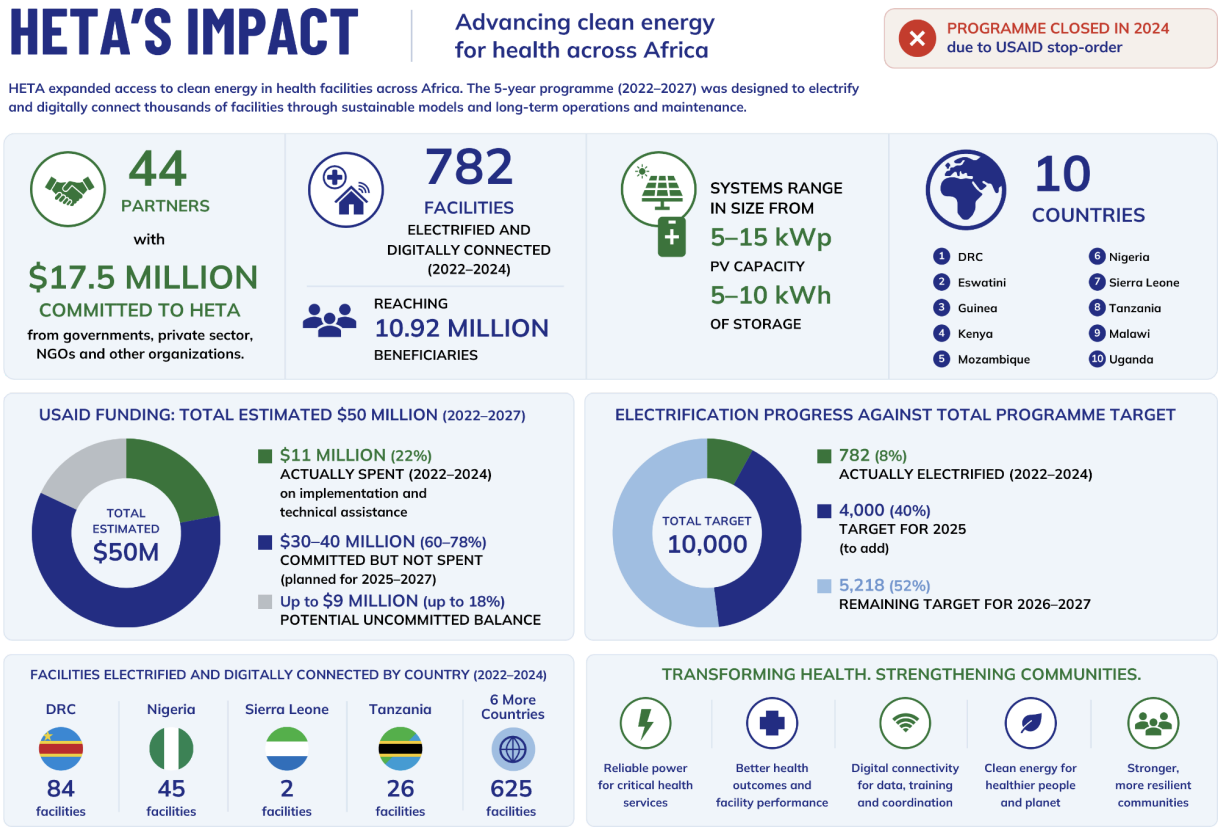


While stakeholders generally agreed that the full effects of these reductions have not yet been felt within the healthcare electrification sector, many programmes currently under implementation were funded through commitments made before the decline in development assistance. As these programmes conclude and competition for concessional funding increases, stakeholders expect financing constraints to become more visible.

The termination and broader retreat of United States Agency for International Development-(USAID)-supported healthcare electrification activities, including the Health Electrification and Telecommunications Alliance (HETA) in early 2025, is the most significant recent market shock, particularly for project pipelines, coordination mechanisms and financing for long-term operations and maintenance (O&M). Out of the $50 million total USAID funding committed to HETA and 10,000 health facilities targeted, only $11 million was actually spent, solarizing 782 health facilities and providing technical assistance to the sector (see Figure 2). Various private companies that had received grants from HETA suffered immediate impacts including cancelled projects, stranded equipment and inventory, delays in implementation, and emerging gaps in maintenance support for already deployed systems.

Beyond direct project financing, HETA served as an important platform linking health actors, energy companies, telecommunications providers, governments and donors, helping reduce fragmentation and facilitate knowledge-sharing across the sector. The loss of this coordinating function and project funding may have longer-term implications that are not yet fully visible; the full impact of donor tightening is expected to materialize over a one- to two-year period as existing projects conclude and funding pipelines diminish.

Figure 2: HETA's impact numbers



Meanwhile, healthcare electrification is starting to benefit from increasing convergence between climate, health and energy agendas. For the first time, climate finance mechanisms are directly supporting healthcare electrification as a climate adaptation and resilience intervention. A notable example is the Green Climate Fund-supported Save the Children programme in Malawi, established to adopt a holistic climate-informed approach to strengthening Malawi's health system and reduce the adverse effects of climate change on the health and well-being of the population.

Climate finance actors are increasingly recognizing reliable electricity and resilient health infrastructure as essential climate adaptation and resilience interventions. This might be a potentially transformative development for the sector, opening opportunities to mobilize substantially larger pools of climate finance for healthcare electrification and integrated resilience programming. Growing alignment between health, climate adaptation and energy access agendas could become a major driver of future investment, particularly in highly climate-vulnerable countries across Sub-Saharan Africa or small island development states.

From individual projects to programmatic approach

A major evolution within the healthcare electrification sector is the gradual transition from fragmented project-based interventions toward more coordinated and programmatic national approaches. While country-wide strategies are in the early stages and most initiatives are still isolated and poorly coordinated with national governments and other entities, stakeholders are recognizing that sustainable scale cannot be achieved through isolated facility-level projects alone. Instead, they require national planning frameworks, standardized data systems, minimum quality standards, coordinated donor engagement and integrated implementation strategies aligned with broader health and energy sector priorities.

As a result, a growing ecosystem of organizations is now supporting governments through technical assistance, national healthcare electrification masterplans, geospatial mapping and planning tools. Several actors are focusing specifically on supporting country-led programme development and investment planning. For example, the Clinton Health Access Initiative (CHAI) provides technical assistance to governments to develop national healthcare electrification strategies and implementation plans. Between 2024 and 2026, CHAI supported national and sub-national governments in Eswatini, Kenya, Malawi and South Africa with funding from the Swedish International Development Agency (Sida) to develop and implement national healthcare electrification plans. Similarly, the UK Partnering for Accelerated Climate Transitions (UK PACT) programme in Nigeria, implemented by Landel Mills, launched in 2025 to replace fragmented and short-term electrification interventions with a coordinated national framework focused on sustainability, data-driven planning, blended finance and long-term O&M strategies.

With reliable data still largely unavailable in a majority of geographies, other organizations are supporting the sector through development of market intelligence and national roadmaps. The International Renewable Energy Agency (IRENA), in partnership with SELCO Foundation, has developed healthcare electrification roadmaps and policy frameworks for countries including Burkina Faso, Mali, Mozambique, Sao Tome and Principe, and Zimbabwe. Sustainable Energy for All (SEforALL) has similarly supported healthcare market assessments and national roadmaps in the Democratic Republic of Congo, Kenya, Madagascar, Nigeria and Rwanda, as well as in five Indian states.

At the same time, a number of organizations are increasingly focused on addressing critical sector data gaps through geospatial platforms and analytical tools. The World Resources Institute (WRI) has developed the Energy Access Explorer platform, which maps healthcare facilities and electrification status while supporting multicriteria analysis for investment planning. The platform currently includes healthcare electrification layers for Nigeria, Tanzania, Uganda and Zambia. Similarly, the Access Insights Platform developed by Catalyst Energy Advisors, aggregates geospatial and infrastructure data to support planning for healthcare electrification and broader last-mile service delivery.

Additional tools such as the Clean Energy Access Tool, developed by the European Commission Joint Research Centre, and GRID3's georeferenced health facility databases elaborated for the Democratic Republic of Congo, Nigeria and Sierra Leone, are helping governments and development partners improve targeting, disease surveillance, infrastructure planning and electrification analysis in underserved and rural areas. Together, these initiatives reflect a broader sectoral shift toward data-driven, nationally coordinated and programmatic healthcare electrification approaches capable of supporting scale, sustainability and long-term system integration.

Key market players

The healthcare electrification market is shaped by a diverse ecosystem of multilateral development banks, United Nations (UN) agencies, philanthropic organizations, bilateral donors, private sector companies and implementing non-governmental organizations (NGOs). Analysis of ongoing programmes, funding commitments, implementation activities, advocacy efforts, data and knowledge generation, and sector coordination initiatives indicates that the World Bank, the European Union (EU), UK government, Global Fund, the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the Office for Project Services (UNOPS), WHO, Gavi, the Vaccine Alliance, SEforALL and SELCO Foundation currently play the most influential roles in shaping the sector's direction.

Table 1 provides an overview of the key actors shaping the healthcare electrification sector and their respective roles. This is followed by a deeper analysis of selected actors for which the 2026 SEforALL Database provides sufficient data to examine their portfolios, geographic reach and contribution to the market in greater detail.

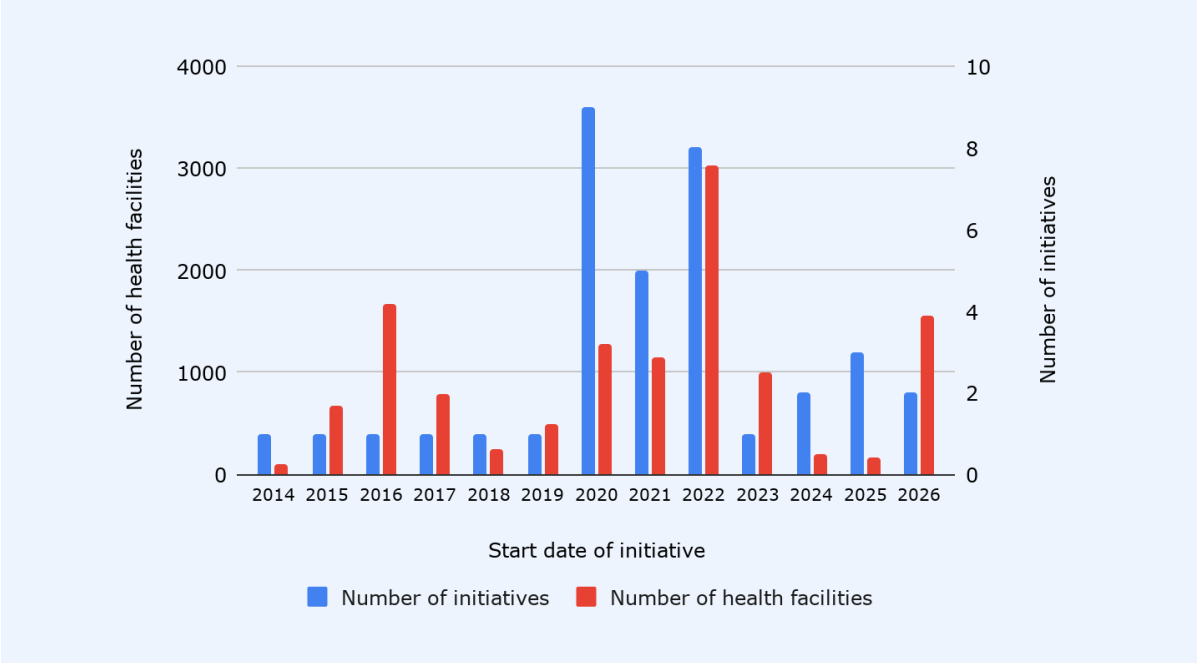
Table 1: Key actors in the healthcare electrification sector

ROLE	KEY ACTORS	MAIN CONTRIBUTION
Financing institutions & donors	World Bank, EU, Global Fund, UK government, Gavi, the Vaccine Alliance	Provide grants, concessional finance, blended finance and catalytic funding for healthcare electrification programmes.
Normative agency	WHO	Provide normative guidance, standards and frameworks, technical advice, and health-sector coordination for healthcare electrification.
Technical assistance & implementing agencies	UNICEF, UNDP, UNOPS	Support assessments and programme design, procurement and implementation, quality assurance, monitoring, evaluations, impact analysis and capacity strengthening.
Energy sector & market development partners	SEforALL, IRENA, SELCO Foundation	Provide market assessments, energy-sector analysis, roadmaps, delivery-model expertise and investment planning support.
Government / programme owners	Ministries of health, energy, finance and other national institutions	Set priorities, coordinate partners, provide enabling policies and approvals, and lead long-term ownership, financing and O&M arrangements.
Private sector delivery partners	EPC contractors, ESCOs, technology and monitoring providers	Design, supply, install, operate and maintain systems and provide energy services and digital monitoring solutions.

World Bank

The World Bank has emerged as the single largest implementation actor in the healthcare electrification landscape over the past decade, demonstrating a significant scale-up in both the number of initiatives and healthcare facilities reached since 2020. While early engagements between 2014 and 2019 focused on relatively small and targeted interventions, the portfolio expanded rapidly during and after the COVID-19 period, reflecting increased global recognition of the importance of reliable electricity for resilient health systems. Between 2020 and 2026, the number of facilities targeted through World Bank-supported initiatives increased substantially, driven by large-scale national and regional programmes such as DARES in Nigeria, and Digital and Energy Connectivity for Inclusion in Madagascar (DECIM). The programme cycles illustrated in Figure 3 further demonstrate the evolution of the market; the majority of large-scale projects were initiated between 2020 and 2022, many continuing implementation through 2025, while a new pipeline of initiatives is scheduled to commence from 2026 onward. Interviews suggest that the World Bank's growing influence stems from its ability to integrate healthcare electrification within broader energy access, digital connectivity and public infrastructure programmes, while also promoting sustainability through service-based implementation models, private sector participation and long-term O&M arrangements.

Figure 3: Annual project starts & facilities covered in World-Bank funded initiatives



European Union

The EU supports healthcare electrification in Africa through its Global Gateway strategy and Team Europe initiatives. Unlike traditional grant-funded infrastructure programmes, the EU has increasingly promoted service-based delivery models that combine EU grant funding, national counterpart financing and private sector participation. Through the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), and other European development finance institutions (DFIs), the EU provides loans and grants to support countries in achieving their universal energy access targets while improving the resilience of public services. Within these broader energy investments, Global Gateway provides dedicated grant funding for priority sectors such as healthcare and education, enabling the deployment of renewable energy systems, technical assistance, and long-term O&M arrangements.

In Nigeria, this approach is reflected in the Nigeria Solar for Health Project (NISHP), implemented by NTU International. The programme combines EU grant funding with counterpart financing from state governments to electrify 140 primary healthcare facilities through a 10-year energy-as-a-service model. Rather than financing equipment alone, the programme procures long-term energy services, with private operators responsible for O&M throughout the contract period. A similar approach is being adopted in the Gambia, where the EU supported the Gambia Sustainable Energy Project (GSEP) with a €24 million grant, additional to an €8 million loan from the EIB.

The Africa Investment Platform is an EU regional blending facility that addresses critical funding gaps in Sub-Saharan Africa to accelerate nationwide electrification while supporting renewable energy investments in hospitals, health facilities and schools, among other areas. Together, these initiatives illustrate the EU's emphasis on leveraging large-scale infrastructure financing alongside targeted support for healthcare electrification, with an increasing focus on long-term sustainability rather than one-off infrastructure delivery.

UK government

The UK government, overseen by the UK Foreign, Commonwealth & Development Office (FCDO), remains one of the most influential bilateral donors in healthcare facility electrification. Its support spans innovation, implementation, technical assistance, market development and country-level coordination. Through the Ayrton Fund's Inclusive Energy & Leave No One Behind Challenge, the UK is one of the principal funders of SEforALL's Powering Healthcare programme, which has become a major platform for demonstrating and scaling sustainable healthcare electrification approaches. It also funded the £20 million Solar for Hospitals project (SfH), implemented by SEforALL, which solarized 18 hospitals and 25 primary health units in Sierra Leone between 2022 and 2026.

Beyond project financing, the UK is supporting enabling environments for scale. In Nigeria, UK PACT is funding the Nigeria Power for Health Initiative (NPHI), a technical assistance programme to develop a coordinated national healthcare electrification framework, bringing together federal and state governments, development partners, and private sector actors around a common strategy for achieving universal electrification of health facilities.

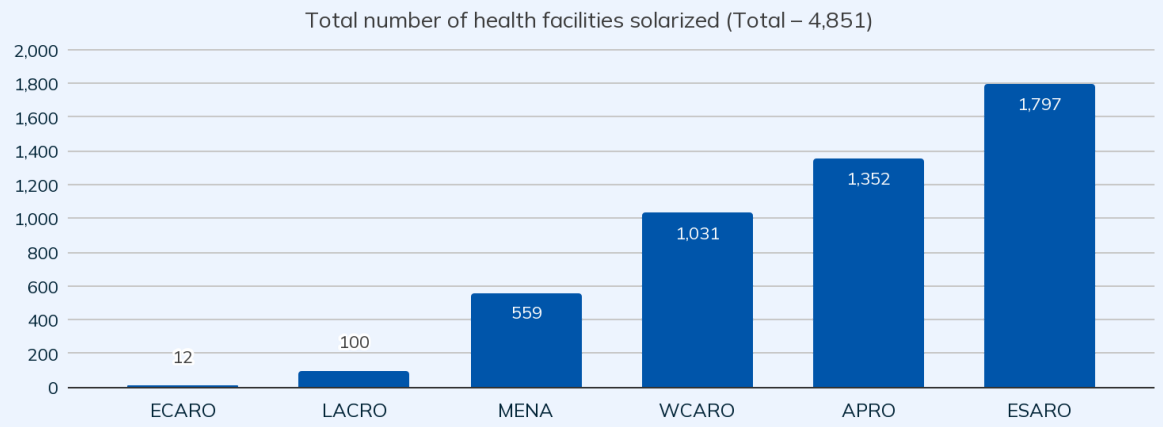
UNICEF

UNICEF has emerged as one of the leading global actors in healthcare electrification, occupying a unique position at the intersection of health systems strengthening, primary healthcare delivery and sustainable energy access. Through its extensive country presence and long-standing relationships with governments and their ministries, UNICEF helps translate energy investments aligned with national health priorities into improved health outcomes and resilient health systems. The organization leverages its technical leadership, global procurement capacity and operational expertise in both development and humanitarian settings to support the full programme cycle, from assessment and design through to procurement, implementation, O&M, monitoring and evaluation.

Between 2018 and 2026, UNICEF-supported programmes solarized approximately 4,851 health facilities globally, spanning Sub-Saharan Africa, Asia, the Pacific Islands and the Middle East[5]. This represents a substantial 135% expansion from the 2,067 facilities reported in the 2024 State of the Market report for the period 2018–23.

[5] Source: UNICEF, Global Programme Division

Figure 4: Health facilities solarized by UNICEF between 2018 and 2026 by UNICEF region



APRO Asia Pacific Regional Office
ECARO Europe and Central Asia Regional Office
ESARO Eastern and Southern Africa Regional Office
LACRO Latin America and Caribbean Regional Office
MENA Middle East and North Africa Regional Office
WCARO West and Central Africa Regional Office

Unlike actors primarily focused on infrastructure financing or energy sector development, UNICEF's comparative advantage lies in connecting reliable energy directly to essential primary healthcare services with a focus on the last mile. Building on decades of experience in immunization, cold chain systems, maternal and newborn care, medical oxygen, digital health, water, sanitation and hygiene (WASH), and other essential services, UNICEF is transitioning from equipment-based energy interventions towards full health facility solar electrification to power reliable, climate-resilient essential health services.

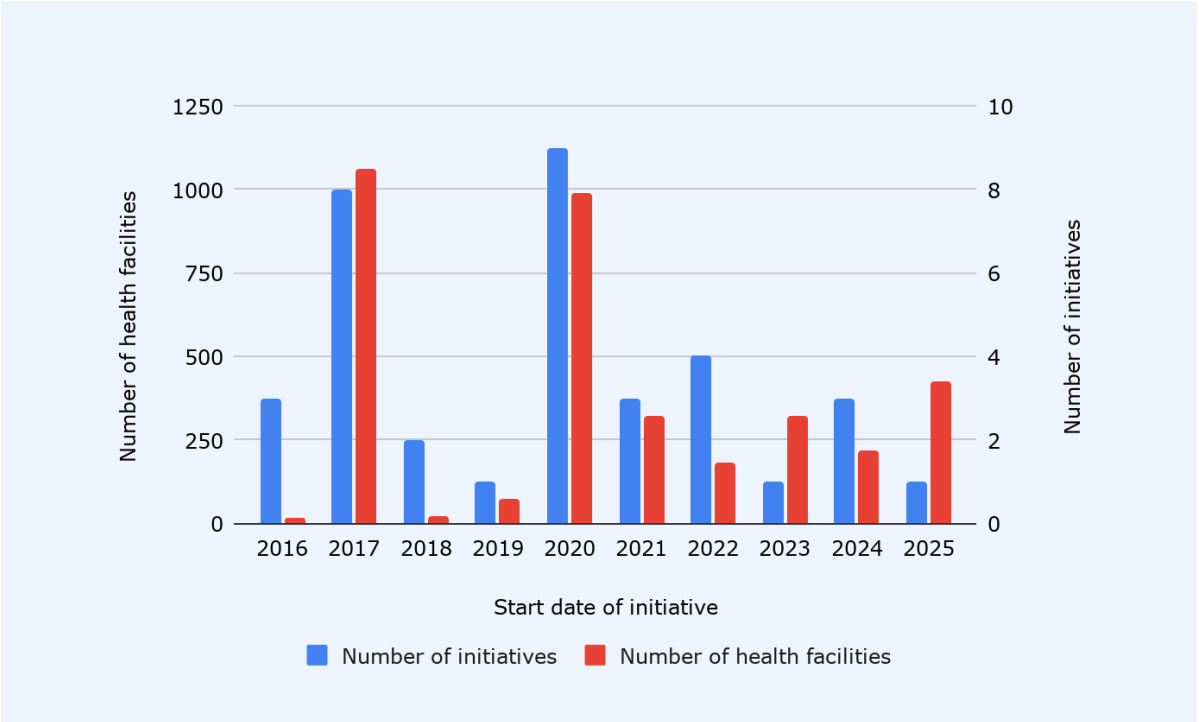
More recently, UNICEF has expanded its role through large-scale partnerships, aimed not only at deployment, but also at shaping future market development. In partnership with Gavi and WHO, the Health Facility Solar Electrification (HFSE) Learning Agenda is supporting whole health facility solarization across Ethiopia, Pakistan, Uganda and Zambia covering 1,323 health facilities, while generating evidence on delivery models, O&M, financing modalities, health services outcomes and long-term sustainability. By combining implementation with structured learning and evaluation, this initiative seeks to inform future healthcare electrification investments and support the development of scalable models for health sector electrification. UNICEF works closely with WHO on global monitoring and frameworks covering electricity and other essential infrastructure services in health facilities. At the country level it partners with WHO, Gavi and other stakeholders to drive health facility electrification.

UNDP

UNDP has established itself as one of the most prominent and long-standing actors in the healthcare electrification market, with a portfolio spanning more than 20 countries across Sub-Saharan Africa, Asia and the Pacific, and fragile and conflict-affected contexts. UNDP's interventions are characterized by their strong integration with national government systems, partnerships with ministries of health and energy, and alignment with broader sustainable development, resilience, and climate adaptation objectives. Through its Solar for Health initiative and related programmes, UNDP has increasingly positioned healthcare electrification not only as an infrastructure challenge, but also as a catalyst for strengthening primary healthcare delivery, vaccine cold chains, digital health systems and climate-resilient public services.

Early projects between 2016 and 2019 were generally smaller-scale demonstration initiatives focused on stand-alone solar systems for rural health facilities in countries including Liberia, Malawi, Namibia, Nepal, Sudan and Zambia. From 2020 onwards, the scale and complexity of interventions increased significantly, particularly in response to the COVID-19 pandemic and growing donor attention to resilient healthcare infrastructure. Between 2020 and 2026, UNDP supported larger national programmes in countries including Afghanistan, the Democratic Republic of the Congo, India, Solomon Islands, South Sudan, Uganda, Zambia and Zimbabwe. A defining feature of UNDP's approach is its ability to mobilize diverse funding sources and implementation partnerships. The reviewed interventions were financed through mechanisms including the EU Humanitarian Fund, GEF, the Global Fund, KfW and Innovation Norway, alongside bilateral government support and national government co-financing. UNDP also works closely with ministries of health, electrification agencies, and local engineering, procurement and construction (EPC) contractors to implement projects.

Figure 5: Annual project starts & facilities covered in UNDP-supported activities



Gavi, the Vaccine Alliance

Gavi, the Vaccine Alliance, plays an important financing and strategic partnership role in healthcare electrification through its mandate to strengthen immunization systems, vaccine cold chains and primary healthcare. Rather than acting as a direct infrastructure implementing agency, Gavi mobilizes and provides catalytic financing for country and partner-led investments that help ensure reliable power for vaccine storage, refrigeration and other essential health services, particularly in hard-to-reach and underserved communities. Historically, Gavi-supported interventions focused largely on strengthening vaccine cold-chain infrastructure and targeted solarization.

Since 2023, Gavi has expanded its engagement through the HFSE Learning Agenda, a multi-country initiative designed to generate evidence on the effectiveness, sustainability and scalability of full health facility solarization through the Cold Chain Equipment Optimization Platform modality as a mechanism for strengthening immunization and primary health care systems. The initiative is funded by Gavi and implemented through UNICEF in collaboration with national governments and WHO, combining full health facility solar electrification with a structured learning agenda on testing implementation models, O&M financing models, long-term sustainability, and health-service outcomes. This approach reflects Gavi's broader role in using immunization investment as an entry point for strengthening resilient primary healthcare infrastructure and generating evidence that can inform future scale-up.

World Health Organization

WHO acts less as a large-scale infrastructure financier and more as a global coordinator, standard-setter, technical advisor and convener across the health and energy sectors. Over the past decade, WHO's engagement in healthcare electrification has evolved from targeted implementation research and facility energy assessments toward broader system-level coordination initiatives aimed at integrating energy access into health systems strengthening, climate resilience and medical device deployment strategies.

WHO's role has become increasingly important as the sector grows more crowded and complex, particularly in ensuring coordination at country level and reducing duplication among donors and implementers in resource-constrained environments. A major development in this regard is the emergence of the Health and Energy Platform of Action (HEPA), launched in 2019, which reflects growing recognition that healthcare electrification cannot be addressed solely as an infrastructure issue, but must instead be integrated into broader health, climate and development planning frameworks.



SELCO Foundation

SELCO Foundation remains one of the leading organizations advancing healthcare electrification through integrated energy and health system strengthening approaches. SELCO combines technology innovation, ecosystem development, capacity building and government engagement to scale sustainable healthcare electrification. Its flagship Energy for Health programme, supported by the IKEA Foundation, is one of the largest healthcare electrification initiatives in the world, targeting 25,000 public health facilities across India. As of the end of 2025, more than 10,000 facilities had been electrified in partnership with state governments. Beyond implementation, SELCO has played a pioneering role in developing standardized energy assessments, integrating energy planning with healthcare service delivery, supporting local manufacturing and maintenance ecosystems, and strengthening government capacity to manage long-term healthcare electrification programmes.



Photo: Michael Mubangizi

Size of the electrification gap

According to the WHO-led Energizing Health report (2023), developed in collaboration with the World Bank, IRENA and SEforALL, an estimated 324,432 healthcare facilities worldwide required either first-time electrification or reliable backup power systems, including 93,350 facilities in Sub-Saharan Africa. Of these, approximately 25,000 facilities in Sub-Saharan Africa lacked electricity access altogether, while 68,350 required backup systems to improve electricity reliability[6]. These figures provide the baseline against which the 2026 SEforALL Database assesses progress.

The 2026 SEforALL Database identified 160 healthcare electrification engagements launched from 2021 onwards, covering 38,262 healthcare facilities globally. Table 2 lists the initiatives with the largest number of facilities targeted. First is the Energy for Health programme in India

[6] WHO, the World Bank, IRENA & SEforALL. Energizing Health: Accelerating Electricity Access in Healthcare Facilities. 2023.

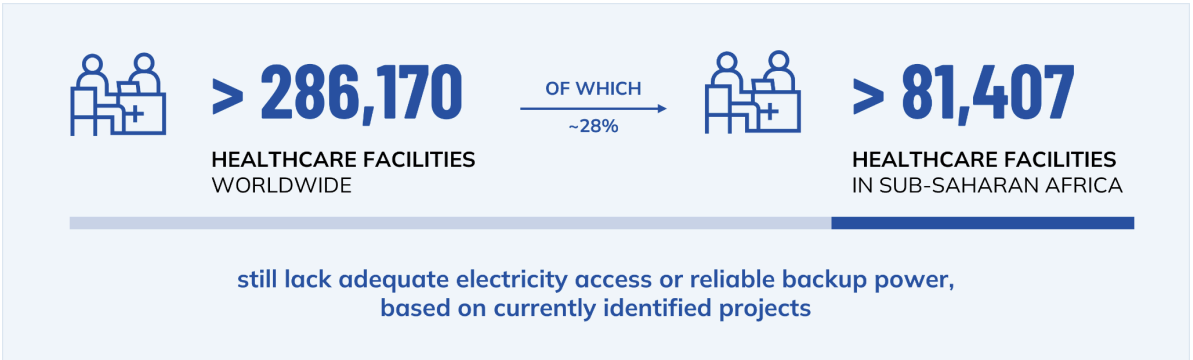
Photo: UNOPS

with 25,000 facilities, while World Bank, UNDP, Gavi, UNICEF and WHO projects complete the list of top ten.

Table 2: Top 10 largest initiatives in terms of number of facilities targeted

PROGRAMME NAME	DONOR AND IMPLEMENTING AGENCY	COUNTRY	PROGRAMME START-END YEAR	FACILITIES TARGETED
Energy for Health	IKEA Foundation & SELCO Foundation	India	2023-2026	25,000
PAAET (extension)	World Bank	Chad	2026-2030	1,279
DECIM	World Bank	Madagascar	2023-2028	1,000
PAAET	World Bank	Chad	2022-2027	850
ADELE	World Bank	Ethiopia	2021-2026	700
AGREE	World Bank	DRC	2022-2029	613
PADAES	World Bank	Senegal	2022-2027	600
Smart Health Systems	Global Fund & UNDP	Zambia	2025-2026	426
Ensuring Stable Electricity in Primary Health Centres through Solar-Hybrid PV Systems	Clarios Foundation & UNICEF	India	2021-2023	407
HFSE Learning Agenda	Gavi, UNICEF, WHO	Ethiopia	2024-2026	380

Despite significant commitments and market growth, the remaining electrification gap remains substantial.



The emerging replacement and effort duplication challenges

Importantly, this gap should not be viewed as static. Most estimates compare current access levels against current deployment commitments, but they do not account for the gradual degradation and failure of existing energy systems. A significant proportion of solar photovoltaic (PV) systems installed over the past decade were deployed under grant-funded models with limited provisions for long-term O&M. As batteries reach end of life, components fail and maintenance contracts expire, some facilities risk falling back into energy poverty unless refurbishment, replacement or service contracts are put in place.

Evidence from the field indicates that maintaining reliable electricity services beyond the lifetime of the initial project remains one of the sector's most persistent challenges. As early as 2010, the World Bank warned that solar PV systems without adequate maintenance and repair services often become inoperative within three to five years. Subsequent assessments across multiple African countries have confirmed these risks, with studies typically finding that between 30% and 60% of installed solar energy systems are partially or fully non-functional several years after installation. In some cases, assessments have also documented significant duplication of equipment and weak maintenance arrangements, resulting in facilities accumulating multiple systems while still experiencing unreliable electricity services[7].

As a result, healthcare electrification programmes face a dual challenge: electrifying facilities that currently lack adequate power while simultaneously sustaining and replacing existing systems. Future investment requirements will therefore need to account not only for the remaining access deficit, but also for a growing "replacement factor" associated with ageing infrastructure. Without adequate investment in long-term operations, maintenance and asset replacement, the number of under-electrified facilities could increase over time despite ongoing deployment efforts.

In addition to system failure and degradation, another factor contributing to miscalculations of the electrification gap is the presence of multiple, overlapping interventions within the same facility. Different programmes often target specific services or departments, leading to the installation of discrete solar PV solutions within a single clinic, such as a We Care Solar Suitcase, a vaccine refrigerator or a small system dedicated to a maternity ward clinic. This fragmentation is often driven by weak coordination both within governments and among development partners. The absence of a single cross-sector coordination mechanism, national healthcare electrification platform or master-planning task force makes it difficult to systematically identify gaps, allocate interventions and prevent duplication. Needs assessments of healthcare facilities routinely reveal the coexistence of several stand-alone energy systems, each designed for a particular use case rather than integrated into a comprehensive facility-wide solution. This pattern is even more pronounced in hospitals, where interventions may focus on specific wards or services such as laboratories. As a result, facilities may be counted as electrified multiple times across different programmes, while still lacking reliable, system-wide electricity access, highlighting the need for stronger national coordination and integrated planning of healthcare electrification investments.

[7] Energy Sector Management Assistance Program (ESMAP). 2026. Sustainable Energy for Schools and Health Centers: Public -Private Partnerships for People's Prosperity. ESMAP Papers. Washington, DC: World Bank.

Market snapshot

The growth of healthcare electrification has been driven by several factors, including increased recognition of electricity as a health systems requirement, declining renewable energy technology costs, expansion of climate finance and growing government engagement. Data show that by 2030 the 160 engagements reported will have installed at least 141 MWp[8]. The largest initiatives by installed capacity are concentrated in Chad, India, Madagascar, Nigeria and Sierra Leone (see Table 3), and are primarily funded by multilateral donors and development partners including the World Bank, the EU, the UK government and the IKEA Foundation.

Table 3: Top six larger initiatives in terms of PV capacity installed

PROGRAMME NAME	DONOR	MAIN PARTNERS	COUNTRY	TARGETED CAPACITY INSTALLED (MWP)
Energy for Health	IKEA Foundation	SELCO Foundation	India	49
DARES	World Bank	Rural Electrification Agency (REA)	Nigeria	39
DECIM	World Bank	Project Coordination Unit (Ministry of Energy and Hydrocarbon)	Madagascar	5
Solar for Hospitals (SfH) project	UK government	SEforALL	Sierra Leone	4
PAAET (extension)	World Bank	Project Implementation Unit Office of the Ministry of Water and Energy (CEP-MEE)	Chad	3
Nigeria Solar for Health Project (NISHP)	EU	NTU International, GIZ	Nigeria	3

Among the initiatives reviewed, the largest by installed capacity is the ongoing Energy for Health programme in India, funded by the IKEA Foundation and implemented by SELCO Foundation, targeting 25,000 last-mile health facilities with an estimated installed capacity of 49 MWp. The programme combines stand-alone solar PV systems with a wide range of medical appliances, including radiant warmers, phototherapy kits and cold-chain equipment. The intervention emphasizes critical-load electrification and incorporates remote monitoring systems to improve long-term system performance and healthcare delivery outcomes.

[8] Including only initiatives that started in or after 2021.

In Nigeria, the World Bank-supported DARES programme represents one of the largest public sector healthcare electrification initiatives currently under development, with planned deployment across more than 100 health facilities and an estimated installed capacity of 39 MWp.

The Nigeria Solar for Health Project, funded by the EU and implemented by NTU International with GIZ support, is deploying approximately 3 MWp of solar PV capacity across 140 healthcare facilities using micro-grid systems ranging from 6 kWp to 120 kWp.

In Sierra Leone, the Solar for Hospitals (SfH) project funded by the UK government and implemented by SEforALL in partnership with the Ministry of Health, has installed approximately 4.3 MWp of solar PV and 7 MWh of battery storage across 18 district level hospitals and 25 primary care units. The initiative demonstrates increasing adoption of containerized modular systems, advanced lithium-ion storage technologies and remote monitoring platforms provided by AlphaESS and Odyssey Energy Solutions.

Additional large-scale programmes include the World Bank-financed DECIM initiative in Madagascar and the PAEET programme in Chad, both focused on deploying off-grid solar rooftop systems to primary healthcare facilities through service-based delivery mechanisms. These initiatives indicate increasing donor and government interest in integrating healthcare electrification into broader national energy access and digital inclusion programmes.

Across the portfolio, several common trends emerge:

- ➔ Increasing use of stand-alone solar PV and battery energy storage systems (BESS)
- ➔ Adoption of remote monitoring and digital performance platforms
- ➔ Growing use of energy-as-a-service (EaaS) and third-party O&M models
- ➔ Increasing attention to sustainability, reliability and service delivery outcomes rather than only installation targets

However, substantial variation remains in business models, long-term O&M financing structures and integration of medical appliances within implementing organizations.

Implementation cycles and the challenge of long-term sustainability

For initiatives that started in or after 2021, their average duration is approximately two years. Large multilateral programmes supported by the World Bank and the EU operate on longer implementation cycles of approximately five years, while projects implemented by organizations including UNICEF, UNDP and USAID-supported initiatives are typically shorter, averaging approximately two years in duration.

Programme cycles are largely explained by institutional mandates, funding instruments, procurement models and risk appetite, rather than by healthcare electrification itself. Shorter duration of programmes implemented by organizations including UNICEF and UNDP reflects their institutional role as implementing agencies operating within donor grant cycles, which typically span two to three years and focus on delivering infrastructure and immediate development

outcomes. By contrast, programmes financed by the World Bank and the EU are generally structured over five or more years because they seek to establish government-led delivery mechanisms, strengthen institutions, develop markets and implement more complex procurement and financing arrangements. This longer timeframe is particularly important for service-based models, which require governments to design new contractual frameworks, build implementation capacity, procure private operators, and establish long-term monitoring and payment systems before they can be scaled sustainably.

Analysis of ongoing projects further demonstrates that the current investment pipeline remains concentrated within the present decade. Most ongoing projects are scheduled to conclude by 2026, with 21 projects currently expected to end during this year. A much smaller number of projects extend to 2027 and beyond, while only four identified programmes currently have committed implementation periods extending to 2030: the World Bank-supported ASCENT programme in Malawi; the PAAET programme in Chad; the GCF-supported project in Malawi implemented by Save the Children; and the World Bank-funded Solar Energy Scale-up and Access Project in Guinea Bissau.

Table 4: Completion year of ongoing initiatives.

YEAR OF INITIATIVE TERMINATION	NUMBER OF INITIATIVES
2026	21
2027	6
2028	2
2029	1
2030	4

The growing emphasis on service-based models with long-term contracts can therefore be understood as an attempt to overcome the limitations of traditional project financing. Rather than viewing electrification as a one-time infrastructure investment, these approaches seek to establish financing and accountability mechanisms that align more closely with the multi-decade operational life of energy systems. The sector's challenge is not simply deploying more systems, but ensuring that funding mechanisms exist to sustain them long after project implementation periods have ended.

A further implication is that healthcare electrification should increasingly be viewed as a recurring public service expenditure rather than a capital investment alone. As governments, donors and DFIs seek to scale electrification nationally, the ability to finance operations over 10–15 year periods may become more important than the ability to finance initial installations. This shift is already visible in programmes such as ASCENT Malawi and Uganda's Energy Access Scale-up Project (EASP), which are piloting with long-term service contracts and dedicated O&M financing mechanisms that extend well beyond traditional project cycles.

Geography of the market

Healthcare electrification activity remains heavily concentrated in Sub-Saharan Africa and South Asia. Analysis of initiatives launched during and after 2021 and either ongoing or completed shows that at least 38,246 healthcare facilities are covered globally across the reviewed portfolio. Asia accounts for the largest share of healthcare facilities reached, representing 26,281 facilities, largely driven by the large-scale Energy for Health programme by the IKEA Foundation and SELCO Foundation in India. Africa represents the second largest regional market with 11,927 healthcare facilities covered, while a smaller number of interventions were identified in Oceania, North America and South America.

Table 5: Distribution of health facilities by continent.

CONTINENT	NUMBER OF HEALTH FACILITIES	NUMBER OF INITIATIVES
Africa	11,927	135
Asia	26,281	17
North America	4	2
Oceania	32	4
South America	2	2
Grand total	38,246	160

Data presented in Table 5 show that Sub-Saharan Africa accounts for the largest number of dedicated healthcare electrification initiatives, while Asia is characterized by fewer but substantially larger programmes, mostly driven by the Energy for Health programme in India. This reflects differences in programme structure rather than the absolute scale of need. Although 12% of health facilities in South Asia remain unelectrified or poorly electrified[9], healthcare electrification is increasingly being integrated into broader national health and energy programmes. The Energy for Health programme in India provides an example of this transition. Rather than operating as a conventional donor project, the programme is embedded within government health systems and follows a phased approach that progressively transfers procurement and O&M responsibilities to state governments. By contrast, in Sub-Saharan Africa, development partners continue to play a central role in financing and implementing dedicated healthcare electrification programmes.

In terms of number of initiatives, Nigeria emerges as the most active country market, with 20 identified healthcare electrification engagements covering approximately 1,115 healthcare facilities (see Table 6). Nigeria's high number of initiatives reflects the presence of multiple overlapping donor-supported programmes, including interventions led by the World Bank, UNICEF, the EU, and private-sector actors. Malawi, Tanzania, Uganda and Zambia also record high numbers of initiatives, demonstrating the strong concentration of healthcare electrification activity within Eastern and Southern Africa.

[9] WHO, the World Bank, IRENA & SEforALL. Energizing Health: Accelerating Electricity Access in Healthcare Facilities. 2023.

Table 6: Top five countries with highest number of initiatives.

COUNTRY	NUMBER OF INITIATIVES	TOTAL HEALTH FACILITIES	AVERAGE HEALTH FACILITY PER INITIATIVE
Nigeria	20	1,115	56
Uganda	18	486	27
Tanzania	13	420	32
Malawi	13	819	63
Zambia	9	903	100

At the same time, the number of initiatives alone does not necessarily reflect the scale of deployment. Countries including Chad, Ethiopia, India and Madagascar stand out for the exceptionally large number of healthcare facilities covered per programme. India alone accounts for more than 25,000 healthcare facilities through only six major initiatives, primarily driven by the IKEA Foundation-funded Energy for Health programme. Similarly, Chad's healthcare electrification portfolio includes only two large programmes but covers more than 2,100 healthcare facilities, through the World Bank-supported PAAET programmes. Ethiopia and Madagascar also demonstrate increasing adoption of nationally coordinated, large-scale deployment models rather than fragmented project-based approaches.

Table 7: Top countries with more than 1,000 health facilities covered in completed or active projects.

COUNTRY	TOTAL HEALTH FACILITIES	NUMBER OF INITIATIVES	AVERAGE HEALTH FACILITY PER INITIATIVE
India	25,592	6	4,265
Chad	2,129	2	1,065
Nigeria	1,115	20	56
Ethiopia	1,094	4	274
Madagascar	1,038	4	260

These geographic trends suggest that the sector is gradually transitioning from isolated pilot projects toward broader programmatic implementation at national scale. Countries with strong government ownership, integrated energy access strategies and active donor coordination mechanisms tend to attract larger and more sustained healthcare electrification investments. At the same time, stakeholders noted that fragile and conflict-affected countries continue to face substantial implementation challenges despite growing investment interest, particularly regarding logistics, maintenance capacity and long-term sustainability.

From basic healthcare to hospital electrification

The first generation of healthcare electrification programmes focused primarily on providing basic electricity access to unelectrified primary healthcare facilities, often through small stand-alone solar systems designed to power lighting, vaccine refrigerators and essential equipment. Success was typically measured by the number of facilities electrified.

Today, the market is undergoing a significant transition. Electrification is increasingly viewed as a component of healthcare infrastructure rather than an isolated energy intervention. As a result, programmes are moving beyond basic access toward ensuring reliable power for the full range of health services delivered by facilities.

This shift is reflected in the growing number of projects targeting secondary and tertiary healthcare facilities, where energy requirements are substantially higher. These facilities require power not only for lighting and refrigeration but also for oxygen generation, laboratories, surgical theatres, imaging equipment, water supply systems, digital health platforms and staff accommodation. Consequently, system sizes have increased significantly, with several recent programmes deploying systems in the hundreds of kilowatts.

Among the largest hospital-focused initiatives identified in the 2026 SEforALL Database is the SEforALL-implemented SfH project, funded by the UK government. The programme combines stand-alone solar PV, mini-grid and grid-connected systems across 43 healthcare facilities, including 18 district-level hospitals ranging from 60 kWp to 760 kWp. The PV systems have been handed over to the Government of Sierra Leone, where ministries and development agencies established an O&M Harmonization Committee to streamline efforts in operating and maintaining government-owned facilities.

As part of the Gambia Sustainable Energy Project (GSEP), the EU funded the solarization of the country's 11 largest hospitals including five years of O&M, a cost of €3 million. The design involved the use of modular systems of basic blocks of 100 kWp and 240 kWh.

Similarly, the World Bank-supported Nigeria DARES programme includes plans to electrify more than 100 hospitals and large public institutions in Lagos State using distributed solar PV and hybrid systems with an estimated total installed capacity of approximately 39 MWp. DARES adopts a long-term EaaS implementation model with ten-year O&M arrangements and third-party service provision, reflecting the broader market shift toward service-oriented electrification approaches.

Other notable hospital-focused initiatives include the Global Fund-supported programme implemented by UNDP in South Sudan, which deploys stand-alone solar PV systems and battery storage across 28 hospitals, and the KfW-supported UNDP programme in Lebanon, which installed more than 1 MWp of solar power across 10 public health facilities with systems ranging from 40 kWp to 650 kWp.

The emergence of hospital-scale electrification represents a new phase of market development. These projects increasingly resemble commercial and industrial energy investments, requiring more sophisticated system design, larger financing packages, long-term O&M arrangements and stronger integration with health sector planning. While primary healthcare facilities continue to account for the majority of installations, tertiary hospitals are becoming important demonstration sites for advanced delivery models, digital monitoring systems and service-based financing approaches.

The future pipeline

The pipeline of planned healthcare electrification projects indicates continued market expansion over the coming years, particularly through large-scale multilateral and donor-funded programmes. The 2026 SEforALL Database identified six planned initiatives, with the largest being the World Bank-funded ASCENT programmes in Mozambique, Tanzania and Zambia. While detailed implementation plans and the number of targeted healthcare facilities have not yet been publicly disclosed, these programmes are expected to significantly expand the scale of healthcare electrification within broader national energy access frameworks.

Another major planned initiative is the HFSE programme in Pakistan, funded by Gavi, the Vaccine Alliance and implemented in partnership with UNICEF, WHO and national governments. In Pakistan alone, the HFSE programme plans to electrify 397 healthcare facilities using standardized 6.5 kWp containerized solar PV solutions with integrated battery storage and remote monitoring systems. UNICEF also reported additional planned healthcare electrification initiatives in Afghanistan and Niger, further illustrating the continued geographic expansion of donor-supported healthcare electrification efforts. Together, these planned programmes suggest that healthcare electrification is increasingly being integrated into broader health systems strengthening climate resilience and universal energy access agendas.



CHAPTER TWO

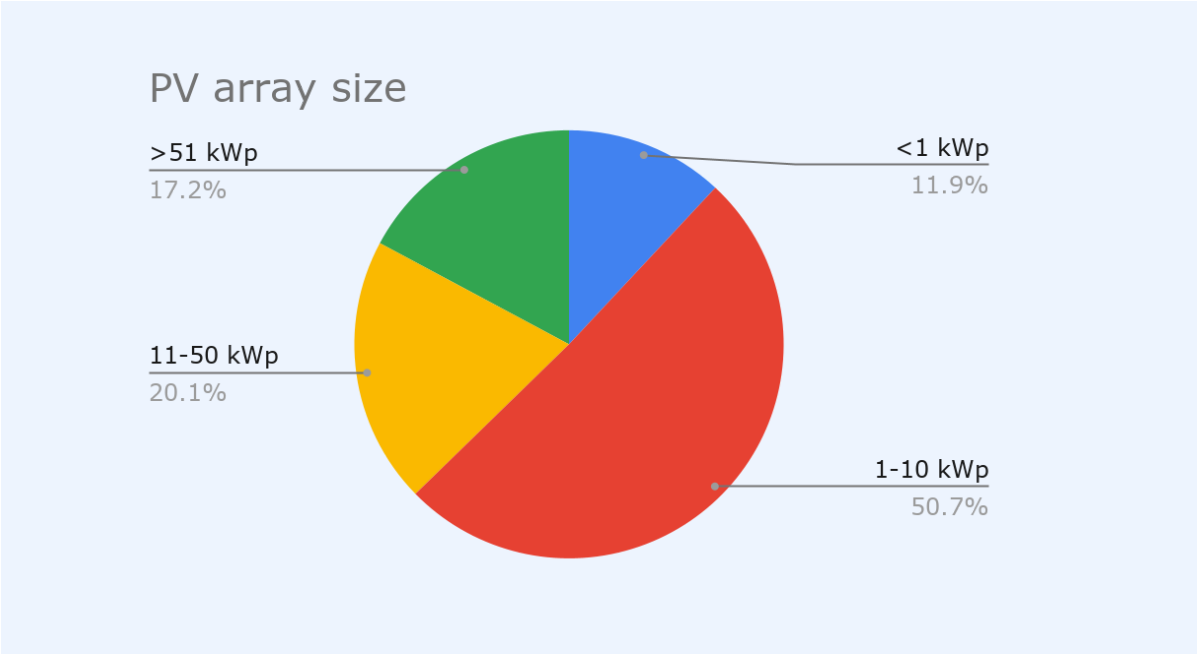
TECHNOLOGY

From basic energy access to high-capacity healthcare electrification

Declining costs of renewable energy components and the global fossil fuel crisis have further strengthened the economic case for solar-based electrification in recent years. This trend has enabled a transition from small "lighting-only" systems toward larger, whole-facility electrification models capable of powering laboratories, cold chains, oxygen systems, staff housing and productive-use applications, replacing partial electrification approaches that often led to system misuse, overload and limited impact.

Figure 6 shows the size of the photovoltaic (PV) systems installed in or after 2021. Half of the systems are in the range of 1-10 kWp, which is the typical size of a health centre offering primary care services. A considerable share of 20% range between 11 and 50 kWp and target larger health centres and small hospitals, while 17% of PV systems deployed are larger than 51 kWp and electrify tertiary healthcare hospitals.

Figure 6: Size of PV systems deployed



Analysis of healthcare electrification projects implemented since 2021 indicates that most primary healthcare facilities are electrified using solar PV systems ranging from 3–10 kWp, with a typical system size of approximately 5–8 kWp. Smaller rural health posts often receive systems below 3 kWp focused on lighting, vaccine refrigeration and communications, while larger health centres and secondary facilities increasingly require systems in the 10–20 kWp range to power laboratories, staff housing, water pumping and digital health infrastructure. Hospitals generally require substantially larger systems, typically above 20 kWp and in some cases exceeding 100 kWp and reaching the MWp scale, where oxygen plants, surgical services or extensive inpatient facilities are present. The PV system size, however, depends not only on the facility's electricity demand but also on the design principle of the solar installation, whether designed to serve as the primary source of electricity for the whole facility, the critical loads only or to provide backup and supplement grid supply. Most large hospitals are already grid connected and typically have multiple backup power sources in place, such as diesel generators, meaning that solar PV and battery storage are increasingly designed as part of a hybrid power architecture rather than as a stand-alone source of electricity.

Table 8: Typical PV sizes per facility type

FACILITY TYPE	TYPICAL PV SIZE (KWP)	TYPICAL STORAGE SIZE (KWH)
Health post / dispensary	0.8–3	2–10
Primary health centre	3–10	5–30
Large health centre	10–20	20–60
District / secondary hospital	20–50	50-200
Referral / tertiary hospital	50–120+	100–500+

Technology maturation and cost optimization

Although the cost of components reached historic lows in 2025, with PV panel prices falling by approximately 50% between 2022 and 2025[10] and lithium-ion battery prices declining by 36%[11], these reductions have not been fully reflected in the actual cost of electrifying rural health facilities. High fuel and transport costs, supply chain disruptions, increasing installation expenses, and the cost of financing continue to keep rural electrification projects expensive. As a result, project developers and EPC companies are increasingly focused on operational efficiencies to reduce costs, including standardizing system designs and incorporating buffer periods into project planning to mitigate logistical delays. Bulk procurement has also emerged as an important cost-reduction strategy; examples from Nigeria in the mini-grid space demonstrate that aggregated procurement approaches can reduce project costs by approximately 20%.

The decline in lithium-ion battery prices has also accelerated the sector-wide transition toward lithium-based storage systems, particularly lithium iron phosphate (LFP) batteries, in healthcare electrification projects. Due to their superior thermal stability, safety profile, long operational lifespan and improving cost-effectiveness, LFP batteries have largely replaced the use of lead-acid batteries in greenfield projects, which were traditionally used in energy access applications.

The use of higher-voltage systems (up to 1000V) in hospital electrification designs in urban or peri-urban locations is gaining traction due to improved cost-performance ratios and the ability to feed large loads such as oxygen plants. Original equipment manufacturers like AlphaESS and system integrators such as Solar MD in South Africa are developing 10ft or 20ft containerized solutions for commercial and industrial applications that can be used to power hospitals.

Meanwhile, smaller systems for rural clinics or health posts rely on lower-voltage inverters ranging from 12V to 96V. Research shows that using low-voltage inverters operating below 12V can reduce upfront costs by up to 20% compared to 48V systems[12]. In addition to lower costs, low-voltage systems offer important safety advantages in resource-constrained settings where technical capacity for installation and maintenance is limited.

Evolving system architectures

Across both large and small facility types, there is growing recognition that health facilities require modular PV and battery storage systems capable of adapting to rapidly increasing electricity demand once health facilities receive reliable electricity. This is important not only for technical resilience but also for financial planning, as many facilities require PV but also battery expansions shortly after commissioning to supply critical nighttime loads. Evidence from the Solar for Hospitals (SfH) project in Sierra Leone showed that electricity demand across six hospitals

[10] Ember. The energy security fallout: from fossil fuel fragility to electric independence. 2026.

[11] BloombergNEF. Lithium-Ion Battery Pack Prices Fall to $108 Per Kilowatt-Hour, Despite Rising Metal Prices. 2025.

[12] Baidoo, A. A., Wang, Z., Cao, J., Zhang, B., Zhao, J., et al. (2025). Low Voltage Inverters for Off-Grid and Portable Applications in Africa: Untapped Potential, Technologies, and Future Prospects. J Appl Mech Rev Rep, 1(2), 1-29.

increased by 158% within the first year of operation, driven by expanded service delivery, increased appliance uptake and growing reliance on electrically powered medical equipment[13].

Oversizing the systems to support additional users and generate revenue streams from nearby households and productive users is emerging in health facility applications. These energy hub models improve asset utilization and strengthen project bankability and long-term sustainability by cross-subsidizing electricity for the health facility. There are several examples of projects using mesh-grid technologies to connect neighbouring loads, including developer SAO Energy using technology provided by Okra solar to power health facilities in Nigeria. In Malawi, CrossBoundary Innovation Lab is piloting a "hub and spoke" solar mesh grid model by design, to improve energy efficiency and operations, while also supplying excess energy to surrounding communities to cover the ongoing O&M costs for the hospitals.

Innovation in medical oxygen technologies

The growing importance of medical oxygen has accelerated innovation in technologies specifically designed for low-resource settings. Increasingly, research centres and manufacturers are designing integrated solutions that combine renewable energy with oxygen production and delivery, recognizing that reliable electricity remains one of the principal constraints to oxygen access in resource-constrained settings.

Several technological approaches are emerging. Portable oxygen concentrators coupled with dedicated solar power systems can be rapidly deployed in remote health facilities or humanitarian settings, while compact on-site oxygen generators reduce dependence on cylinder supply chains and improve resilience. Solar-powered oxygen concentrator systems have already been deployed in countries including Nigeria, Papua New Guinea, Somalia and Uganda, where they have improved oxygen availability, strengthened quality of care and, in several cases, been associated with reductions in mortality. Innovation is also extending to larger-scale solutions, with several initiatives developing solar-powered pressure swing adsorption (PSA) oxygen plants capable of supplying hospitals and surrounding health facilities[14].

Medical oxygen technologies require particular considerations in the sizing and design of the power supply system. Although the cost of PV modules has fallen by almost 90% since 2010 and battery prices have also declined significantly, dedicated solar power systems designed solely for oxygen production remain capital intensive. As a result, renewable energy investments should be designed to meet the electricity needs of the entire healthcare facility rather than powering individual clinical applications in isolation, while considering protections from voltage fluctuations and poor-quality power supply in the designs.

Innovation is also improving the resilience of oxygen equipment itself, which should be tested in the field. New generations of oxygen concentrators are being designed specifically for use in harsh operating environments, with enhanced tolerance to voltage fluctuations, poor-quality

[13] Catalyst Energy Advisors. Sierra Leone Healthcare Electrification Project: Impact Assessment of Project Phase 1. 2025.

[14] Graham, H.R, et al., Reducing global inequities in medical oxygen access: the Lancet Global Health Commission on medical oxygen security. The Lancet Global Health Commission 2025.

electricity supply, dust, humidity, high temperatures and altitude. Solar compatibility, lower energy consumption, simplified maintenance requirements and improved repairability are increasingly recognized as essential design characteristics for deployment in rural health facilities. Field testing new technologies under real-world operating conditions is essential to demonstrate their functionality, usability and durability before large-scale deployment.

Compared to other devices commonly found in health facilities, such as infant warmers and autoclaves, oxygen concentrators are the most energy-intensive. Monitoring undertaken in health facilities in Kisumu County, Kenya, found that oxygen concentrators consumed an average of 7.3 kWh per day compared to infant warmers and autoclaves consuming less than 4 kWh and 3 kWh respectively[15]. As oxygen therapy becomes more widely available, demand for electricity is expected to become an increasingly important consideration in the sizing of PV systems, battery storage and backup power solutions.

Box 1: Just Add Water

Newdigit's Just Add Water platform combines solar PV, hydrogen production and storage, fuel cells and electrolysis to simultaneously provide electricity, medical-grade oxygen and clean water for healthcare facilities in Nigeria. Besides clean oxygen generation, Newdigit's model includes selling excess oxygen to generate additional revenue to support the O&M requirements of the power system in the hospitals under a pilot funded by Sustainable Energy for All's (SEforALL's) Innovation Fund under the Transforming Energy Access platform.

Digital infrastructure

From traditional remote monitoring to digital monitoring, reporting and verification

Remote monitoring has become a standard feature of modern healthcare electrification programmes. By providing real-time visibility of system performance across large portfolios of facilities, remote monitoring enables operators to track the functioning of key components such as PV arrays, batteries and inverters, identify faults before they lead to service interruptions, and optimize maintenance planning. Research from the mini-grid sector suggests that remote monitoring can reduce operational expenditures by approximately 17%, primarily through reduced site visits, lower fuel consumption and more efficient deployment of technical personnel[16].

[15] SEforALL & CLASP. Medical appliances for resource-constrained settings Strategies for context-aware, energy efficient and scalable healthcare solutions. 2025.

[16] Pittalis et al., Quantifying impacts and benefits of advanced remote monitoring solutions for the operation of mini grids in Sub-Saharan Africa, Energy for Sustainable Development 77 (2023) 101335.

Smaller healthcare electrification initiatives continue to rely on monitoring software provided by equipment manufacturers. Platforms offered by inverter and battery suppliers such as Victron, Huawei and AlphaESS allow operators to track energy production, battery status and system faults remotely. However, as portfolios have grown larger and service-based delivery models have emerged, many organizations have developed proprietary platforms that aggregate data across multiple facilities and integrate monitoring with customer relationship management, ticketing and maintenance workflows. Examples include Differ Community Power, SAO Energy and Arnergy; all use customized platforms to manage distributed portfolios of health facilities and automate fault detection and maintenance responses. Similarly, ZOLA Electric has developed ZOLAi, an AI-enabled enterprise platform that combines hardware, software, customer management and predictive analytics to support its EaaS operations.

Remote monitoring is evolving from an operational tool into critical financial infrastructure. As healthcare electrification shifts toward service-based delivery models, performance-based contracts, results-based financing (RBF), carbon finance and renewable energy certificates, the sector is increasingly relying on digital verification provided by digital monitoring, reporting and verification (dMRV) platforms capable of providing auditable, real-time performance data. Payments are increasingly linked to verified indicators such as system uptime, energy generation, battery health and service availability, making independent digital verification a prerequisite for both operational and financial sustainability.

The need for dMRV platforms is particularly relevant for carbon markets and environmental attribute schemes, where conventional approaches to monitoring greenhouse gas emissions and verifying emission reductions are often costly, time-consuming and prone to error. These processes have historically relied on manual reporting, periodic site visits and in-person surveys[17]. DMRV platforms can significantly reduce transaction costs, improve data integrity and provide the level of confidence required by investors, donors, carbon registries and RBF facilities.

Box 2: Prospect's Solution for Carbon Accounting

Prospect, the open-source dMRV platform developed by A2EI and adopted as a digital public good across multiple electrification programmes, aggregates and validates energy access data from connected systems and translates technical performance into auditable digital records. Through a partnership with CarbonClear and the Global Carbon Council, Prospect is being integrated into a digital carbon protocol that automates carbon accounting and certificate generation. This dMRV architecture, developed for the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) programme, combines Prospect's energy data aggregation layer with a dedicated carbon engine that converts verified energy generation data into carbon calculations and reporting outputs, creating a pathway towards automated issuance of carbon credits.

[17] World Bank. 2022. Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets. World Bank, Washington, DC.

If successfully operationalized at scale, this approach could represent a significant breakthrough for healthcare electrification. By dramatically reducing verification costs and administrative burdens, digital carbon protocols could make carbon finance accessible to projects that have traditionally been too small or too fragmented to participate in carbon markets. Several large-scale programmes, including ASCENT, are actively exploring whether these carbon revenues could contribute to long-term O&M funding and strengthen the financial sustainability of public sector electrification programmes. While the commercial viability of this approach remains unproven, stakeholders increasingly view it as a potential game changer for mobilizing additional resources into the sector.

Odyssey Energy Solutions is developing digital infrastructure to enable performance-based payments. Through application programming interface integrations with more than 150 energy systems deployed at healthcare facilities in Burundi and Liberia, Odyssey has developed a pilot EaaS dashboard that aggregates technical performance data, service delivery indicators and operational metrics into a single platform. The platform reflects a broader sectoral shift away from measuring success solely through installation metrics, such as the number of facilities electrified, towards monitoring reliability, sustainability and the ability of energy systems to support critical health services. Rather than focusing exclusively on asset deployment, Odyssey's approach supports a systems-thinking perspective in which electrification is assessed based on its contribution to healthcare delivery outcomes.

Digitalization and remote monitoring remains constrained by operational realities. Poor connectivity in remote healthcare facilities continues to limit real-time data transmission, leading developers to adopt "backfilling" protocols that upload historical performance data once connectivity becomes available. These approaches allow performance verification and payment calculations to continue even when data transmission is temporarily interrupted.

Robust digital verification systems are becoming essential for scaling private sector participation. Private investors and service providers remain hesitant to engage in long-term healthcare electrification contracts due to uncertainty around government payment continuity and programme sustainability. As a result, digital platforms are increasingly being coupled with payment assurance mechanisms, including payment buffers and guarantee facilities, to improve confidence among both governments and private operators.

Digital technologies as a bridge between energy and health outcomes

Healthcare electrification is not electricity provision itself, but improved healthcare delivery and health outcomes. By combining energy data with facility-level health information, digital monitoring platforms can help quantify how reliable electricity contributes to healthcare outcomes such as vaccine availability, oxygen delivery, maternal and neonatal care, laboratory diagnostics, and service availability. This allows electrification programmes to move beyond measuring inputs and infrastructure toward measuring their contribution to health system performance.

Research conducted in the Democratic Republic of Congo linked facility-level energy monitoring with healthcare indicators, enabling analysis of how energy reliability affects the operation of critical services and medical devices[18]. Similarly, studies on oxygen systems have shown that integrating energy consumption data with patient treatment and mortality data can reveal the energy requirements associated with specific health interventions, helping funders understand the direct relationship between electricity investments and health outcomes.

Linking energy metrics with health data and payment histories can further reduce perceived risks, enhance accountability and mobilize public and private financing for the electrification and long-term maintenance of health infrastructure. The Health Energy Performance Platform developed by the Health-Energy Action Lab (HEAL-DRC) Consortium[19] and supported by SEforALL and other partners, standardizes and aggregates digitally verified energy, health and payments data that can provide investors and governments with a risk management tool to verify system performance.

This evolution has important implications for financing. Health sector funding is significantly larger than energy sector funding, yet electrification projects often struggle to access health budgets because their benefits are not quantified in health terms. By generating evidence that links energy reliability to improved health outcomes, digital technologies can help unlock new funding sources from health, climate and development actors. Demonstrating, for example, that improved power reliability increases oxygen availability, reduces vaccine spoilage or supports maternal health services creates a stronger investment case than reporting kilowatt hours generated alone.

Enabling integrated health management platforms

Electrification of the healthcare sector enables the development of healthcare management platforms that integrate energy system management with facility operations, asset management, climate resilience planning, maintenance scheduling, financing and healthcare service delivery. By combining energy and health-related data streams, these platforms can help facility managers, governments and donors link energy reliability with service delivery, equipment utilization, patient access and operational performance.

Adoption of integrated digital platforms is currently most advanced among private and faith-based healthcare providers. Decision-making processes in these facilities are often faster, and they generally have greater flexibility to introduce new technologies and management systems. As a result, many digital healthcare-electrification solutions are being tested and refined in these settings first before being considered for wider deployment in the public sector.

[18] Miles et al., The power of health in the Democratic Republic of the Congo: Electricity quality and reliability in medical facilities of North Kivu Province. Applied Energy 401 (2025) 126830.

[19] Consortium members include: Johns Hopkins University, Duke University, OffGridBox Inc, Research Center for Humanitarian Aid, nLine, A2EI and University of California, Berkeley.

Over the longer term, these platforms could become an integral component of public sector healthcare infrastructure rather than operating as parallel systems. The emerging vision is to ensure interoperability with existing government health information systems, allowing facility-level tools to complement national digital health architectures. Integrated healthcare management platforms would fill operational gaps at facility level while contributing data to national systems, creating a more comprehensive view of healthcare service delivery, infrastructure performance and energy reliability across the health sector.

Box 3: AfyaSolar

Ubuntu AfyaLink is working to strengthen primary healthcare facilities through the AfyaSolar solution, which combines EaaS with a digital platform to support the deployment and management of healthcare infrastructure through core functions:

- Facility profiling and energy assessments
- Remote monitoring of energy systems
- Climate-health resilience assessments
- Asset and maintenance management
- Financing and customer management capabilities including facility onboarding, payment tracking and portfolio management.

In addition, the AfyaSolar solution provides healthcare facilities with access to AfyaBooking, a digital patient and appointment management solution, which helps improve operational efficiency and patient access. While the platform continues to evolve, Ubuntu AfyaLink is creating a digital backbone that enables healthcare facilities to operate more efficiently, remain resilient during climate-related disruptions and deliver uninterrupted care to its communities.

As healthcare electrification increasingly adopts service-based delivery models and countries continue investing in digital health transformation, digital technologies are becoming more than operational tools. They are emerging as a critical mechanism for translating energy performance into measurable health impacts, strengthening accountability, improving financing opportunities and ensuring that electrification investments are evaluated based on the outcomes they enable rather than the infrastructure they deploy. Healthcare electrification programmes may increasingly serve as an entry point for broader digitalization efforts, linking energy infrastructure, facility operations and health information systems in a unified ecosystem.



CHAPTER THREE

DELIVERY MODELS AND MARKET TRANSFORMATION

From build–transfer to blended finance and long-term energy services

While engineering, procurement and construction (EPC) models remain the predominant mechanism to power health facilities, delivery models are gradually progressing from traditional EPC projects with limited or no operations and maintenance (O&M) provision toward long-term service-based arrangements. Under traditional EPC approaches, donors typically finance capital expenditure (CAPEX), while ownership and responsibility for O&M are transferred to ministries or healthcare facilities after installation.

In response to persistent sustainability challenges, many programmes began incorporating short-term maintenance contracts, creating an intermediate "EPC-plus" model that extended support for two to five years after installation. One example is the EU-funded Gambia Sustainable Energy Project (GSEP), under which the EPC contractor is responsible for installation and O&M during the first five years of operation. Healthcare facilities contribute through monthly payments covering the use of the energy systems, helping to strengthen financial sustainability while fostering local ownership and shared responsibility for the long-term operation of the infrastructure.

More recently, governments, development finance institutions (DFIs) and private sector actors have begun adopting hybrid delivery models that combine public or donor funding with commercial finance and long-term private sector participation. Unlike traditional EPC approaches, where donors finance the full capital cost and responsibility for system sustainability is transferred to governments after commissioning, these emerging models seek to leverage private capital to finance part of the upfront investment. Donor funding is increasingly used to reduce project risk, improve commercial viability or subsidize service payments, rather than fully financing infrastructure. This represents an important shift from donor dependency towards catalytic financing, where concessional resources are used to mobilize private investment.

The transition to blended financing reflects growing recognition that the traditional donor-funded build–transfer model, under which grants cover the full capital cost of renewable energy systems before transferring ownership and long-term responsibility to governments, has often failed to deliver lasting results. While this approach has been instrumental in demonstrating the benefits of healthcare electrification and expanding access, it has also created near-total dependence on grant funding and has rarely unlocked private investment. As systems age and maintenance and replacement costs emerge, governments are increasingly challenged to sustain infrastructure that was financed as a one-off capital investment.

At the same time, the scale of the remaining electrification gap, combined with declining official development assistance (ODA), makes it increasingly clear that achieving universal and modern energy access for healthcare facilities in line with the Sustainable Development Goals (SDGs) cannot be financed through grants alone. Emerging financing approaches therefore seek to leverage commercial capital to finance part of the upfront investment, while using concessional funding strategically to reduce project risk, improve commercial viability, provide targeted capital subsidies or support long-term service payments. This represents a fundamental shift from donor dependency to catalytic finance, where scarce public resources are used to mobilize significantly larger volumes of private investment and build financially sustainable healthcare electrification markets.

Examples include programmes in Liberia, Malawi, Madagascar, Nigeria and Uganda funded by the World Bank and the European Union (EU), where CAPEX is partially subsidized while private operators assume responsibility for financing, operating, maintaining and monitoring systems over periods of five or ten years or longer. Payments are increasingly linked to performance indicators such as system uptime, energy availability, response times and equipment functionality, ensuring that revenue depends on the reliable delivery of electricity rather than the installation of equipment.

At the most advanced end of the spectrum are the energy-as-a-service (EaaS) models. Under these approaches, healthcare facilities or governments purchase energy services rather than energy assets. The service provider typically raises commercial debt and equity to finance system deployment and recovers its investment over time through recurring service payments. By transferring both technical and financial responsibility to the service provider, these models align incentives around long-term reliability, encourage lifecycle asset management and reduce dependence on repeated donor-funded replacement programmes. Although concessional finance and public support remain essential in many low-income markets, the increasing participation of commercial finance offers a pathway to scaling healthcare electrification beyond what grant funding alone can achieve.

Although service-based delivery models share the common objective of providing electricity as an ongoing service rather than delivering energy assets, they are being implemented through two distinct approaches. The first is a government-led model, typically structured as a public-private partnership, in which governments procure long-term energy services from private operators through competitive tenders. Because public healthcare facilities represent the vast majority of health facilities in most countries, these programmes are essential for achieving national-scale electrification and are increasingly being adopted by governments with support from multilateral development banks and development partners.

The second is a market-led model, in which private energy service providers enter into a contract directly with individual healthcare facilities, most commonly private or faith-based providers, and recover their investment through recurring service payments. These models have generally emerged without direct government procurement and have demonstrated that healthcare facilities can become viable off-takers where sufficient ability to pay exists.

These delivery model approaches should not be viewed as competing alternatives, but as complementary pathways for market development. Government-led programmes (either EPC with long-term O&M contracts or service-based) will be essential to electrify public health systems at national scale, while market-led approaches can expand access more rapidly where commercially viable opportunities exist and health facilities have sufficient ability to pay. However, all approaches will require grant support or other forms of concessional financing to reduce service fees to levels affordable for governments and healthcare facilities, particularly in low-income and remote settings. Closing the healthcare electrification gap will require a combination of these approaches, supported by financing mechanisms, regulatory frameworks and institutional arrangements that enable each model to operate where it is most appropriate.

Project Spotlight: The Gambia Sustainable Energy Project

A newly established government-owned entity delivering long-term education and healthcare facilities electrification

The Gambia Sustainable Energy Project (GSEP) demonstrates how a government entity can manage donor-funded infrastructure projects to provide clean and reliable energy service to education and health sectors. Funded by the EU and financed by the European Investment Bank (EIB) under the Africa Investment Platform through a combination of grants and concessional lending, the programme supported the setting up of the Sustainable Energy Services Company (SESCO), and assisted in managing all aspects of procuring, installation and O&M of up to 1,100 solar PV systems with battery storage across the country's health and education sectors.

The programme adopted an EPC plus five-year O&M model. SESCO is responsible for renewable energy asset ownership, technical supervision, quality assurance, O&M and future investments in electrification of public sector education and health care sectors. SESCO acts as the long-term asset owner and energy service provider. It is also responsible for repaying the €8 million EIB loan, creating a strong incentive to operate systems efficiently and generate sustainable revenues.

Programme overview

COUNTRY: THE GAMBIA	
Lead financier	EU & EIB under the Africa Investment Platform
Implementing entity	Sustainable Energy Services Company (SESCO)
Technical assistance	Azorom International, Ireland (under technical assistance agreement with EIB)
Contractor	ECOsys and China National Construction Machinery Company
Total investment	€32 million
Financing structure	€24 million grant (for PV systems procurement, installation, and O&M, and future expansion) €8 million concessional loan for establishment and operation of SESCO
Facilities accomplished	823 public schools and 92 health facilities (11 hospitals and 81 clinics)

Technology deployment

The Ministry of Health (MoH) identified 81 public health centres and 11 hospitals for solarization. Similarly, the Ministry of Basic and Secondary Education (MoBSE) provided a list of 823 schools. Some require full electrification while grid-connected facilities will use PV systems with battery storage as their primary source of electricity supply. Standardized system designs were developed to simplify procurement, installation and future maintenance.

FACILITY TYPE	TYPICAL SYSTEM CONFIGURATION
11 hospitals	Modular 100 kWp PV + 240 kWh battery storage
81 health facilities	Modular 4 kWp PV + 10 kWh battery blocks, with between one and six blocks installed depending on facility demand
823 schools	Modular 2 kWp PV + 5 kWh battery blocks. 821 schools got one block each while only two schools got two blocks each

Approximately half of the programme budget has been allocated to system deployment (€5.5 million for health facilities and €9.3 million for schools), while the remaining funding is reserved for future inverter replacement, system expansion and lifecycle management.

Delivery model

The EPC contractors are responsible for procurement, installation and O&M during the first five years. At the end of this period, SESCO has three options:

- continue with the existing contractor;
- competitively procure a new O&M provider; or
- internalize O&M within SESCO.

This phased approach allows SESCO to gradually build technical capacity before assuming full operational responsibility.

Towards a sustainable business model

Rather than relying exclusively on donor funding, SESCO is expected to generate revenues from multiple sources:

- **Capacity payments** from the respective ministries (i.e. MoBSE and MoH) according to the size of the installed systems.
- **Service fee** from the MoBSE and MoH for electricity consumed by their respective facilities; the fees are negotiated through the Ministry of Finance and Economic Affairs, reinforcing government ownership of the model and ensuring that costs are recognized within sector budgets. The MoBSE and MoH establish a budget allocation for these energy service payments, while SESCO invoices the Ministry of Finance for the agreed amounts. This institutional arrangement embeds O&M within government financial systems, providing a more predictable funding mechanism than the project-by-project approaches typically adopted under donor-funded EPC programmes.
- **Sale of excess electricity to the national electricity grid** where grid interconnection exists.
- **Sale of surplus electricity to nearby households** and businesses served by off-grid systems.

Key lesson

The GSEP experience demonstrates the importance of institutional arrangements in long-term sustainability. By combining extended contractor accountability, shared financial responsibility with beneficiary ministries and the establishment of a permanent public institution dedicated to renewable energy asset management, the programme addresses several of the weaknesses traditionally associated with donor-funded EPC projects.

Progress of the innovative delivery models featured in the 2024 State of the Market report

The 2024 State of the Market report highlighted several emerging alternatives to traditional EPC approaches. These included lease-to-own models developed independently by Differ Community Power in Kenya and GIZ in Benin under the Green People's Energy (GBE) initiative. GreenMax Capital's Greenstreet Africa initiative proposed a public-private partnership model for the electrification of government-owned healthcare facilities in Nigeria. The World Bank introduced service-based delivery models in the design of the Regional Off-Grid Electricity Access Project (ROGEAP) and Uganda's Energy Access Scale-up Project (EASP). Finally, the 2024 report announced SELCO Foundation's commitment to electrify 25,000 health facilities under the Energy for Health programme, funded by IKEA Foundation and 12 state governments across India. Data collected for this update indicate that many of these models have continued to evolve, although progress toward large-scale deployment has been uneven.

Over the past year, Differ Community Power has continued to evolve its business model in response to market realities, piloting a fee-for-service model in Kenya through a partnership with Topcare, a private healthcare provider. The pilot is currently operational at one facility and is intended to scale to approximately 15 additional sites. At the same time, Differ is working with CrossBoundary in Malawi to test a new "energy hub" model that seeks to improve the economics of healthcare electrification through multiple revenue streams. Under this approach, healthcare facilities are deliberately oversized to generate surplus electricity that can be sold to nearby customers. Revenue from energy sales is intended to offset O&M costs and reduce the long-term financial burden on the Ministry of Health. The model is being developed alongside the World Bank-funded ASCENT Malawi programme and is intended to complement the country's broader service-based electrification strategy. A third potential revenue stream under consideration is the monetization of Distributed Renewable Energy Certificates (D-RECs), representing an important attempt to diversify revenue sources and forming a "blended revenue" model.

The 2024 report noted that a lease-to-own model developed by GIZ in Benin under the GBE initiative had not progressed to implementation. However, subsequent evidence from the GBE project indicates that a long-term rental (service-based) model has been successfully piloted, albeit at a smaller scale than initially planned, reaching 20 healthcare facilities in 2023. The project generated lessons learned around the financial, legal and payment structure, as well as equipment ownership. Meanwhile, the pilot proved the benefits of the service-based approach to national stakeholders like the Beninese Agency for Rural Electrification and Energy Management, which plans to solarize another 750 public institutions using the same model.

Service-based approaches are increasingly being adopted by large-scale public programmes. The ROGEAP is piloting projects implementing service-based electrification models across 15 facilities in Benin and 32 healthcare facilities in Nigeria. In Uganda, the Uganda Energy Credit Capitalisation Company (UECCC) has launched two competitive tenders under the EASP, covering the service-based electrification of approximately 130 health facilities and 45 secondary schools through long-term performance-based contracts.

As of the end of 2025, SELCO Foundation reported that 10,299 facilities had been completed out of the 25,000 targeted. The Energy for Health programme is taking a phased approach to government ownership and operation of systems installed under the programme, with high levels of state government capacity and access to funding. India, likewise, benefits from a thriving domestic market for solar power components. As such, lessons learned from this project are not considered immediately applicable to low- and middle-income countries in Africa.

Some innovative models have revealed challenges that the sector has yet to overcome. GreenMax Capital's Greenstreet Africa initiative, which proposed a public-private partnership model for the electrification of government-owned healthcare facilities, has struggled to attract sufficient financing to reach implementation. The experience highlights one of the sector's recurring challenges: while innovative delivery models are increasingly well understood conceptually, mobilizing the long-term capital and risk mitigation mechanisms required for large-scale deployment remains difficult.

Project spotlight: Energy for Health – IKEA Foundation/SELCO Foundation: Implementing a service-based model with state governments in India

In India, SELCO Foundation is implementing a project focused on the sustainable solarization of 25,000 public health facilities. The programme is based on a scalable and replicable process that ensures long-term operational viability of solar-powered energy systems installed at state government health facilities. The model is built on a foundation of government ownership, treating energy for health as a core public service, using a phased and multi-regional approach to test and refine system designs, procurement processes and governance frameworks.

The implementation strategy is evolving from an initial SELCO-led, grant-funded phase to a subsequent phase where state governments take ownership of procurement, funding and maintenance. At both stages, SELCO acts as an advisory partner, helping governments establish quality standards and integrate O&M as a dedicated line item in their annual health budgets.

Based on discussions with key stakeholders, the enabling factors that have contributed to the success of the SELCO Foundation's model include:

- ➔ Government champions and ownership: the model's success is heavily reliant on securing buy-in from government partners, leading to requests for expansion and increasing financial contributions from the states themselves.
- ➔ Focus on long-term sustainability: by shifting the conversation from initial installation costs to long-term O&M, SELCO has successfully worked to get O&M included as a dedicated line item in government health budgets.
- ➔ A phased and evidence-based strategy: the programme began with small-scale pilots to prove the concept. This success created a "pull" from the government for expansion, demonstrating the value of starting small and building on proven results.

- Technological innovation: the integration of remote monitoring systems with digital incident management software allows for proactive maintenance and faster resolution of system issues, ensuring reliability.
- Adaptability to local contexts: the programme uses India's diverse regions as a testing ground, tailoring facility design, procurement and implementation to different geographical and administrative environments.
- External catalysts: the COVID-19 pandemic created a sense of urgency and propelled the programme to a much larger scale, highlighting the critical need for reliable power in health facilities.
- Mature local supply chain: the ability to rely on India's established solar manufacturing sector for equipment sourcing has been a significant advantage.

The SELCO project is enabled by high levels of state government capacity and access to funding. India, likewise, benefits from a thriving domestic market for solar power components. These enabling factors are not necessarily applicable to low- and middle-income countries in Africa. However, stakeholders in Africa-based projects can learn from SELCO's success in using smaller-scale pilot projects to demonstrate the benefits of long-term service-based electrification to governments and thereby generate increased demand from governments for expansion of these pilots. Participants in the EU-funded Nigeria Solar for Health project have reported that the initial phase of implementation in a limited number of Nigerian states has already generated calls by other state governments for the expansion of the model into their jurisdictions.

Current state of service-based models

Analysis of the 2026 SEforALL Database and qualitative analysis, coupled with the broader sector knowledge of the authors, suggests that service-based models are finally starting to be tested in the context of live projects, but that most projects continue to employ EPC models.

The quantitative data suggest that service-based delivery models remain a relatively small segment of the market today. Since 2021, 597 healthcare facilities have been electrified through completed service-based projects identified in the 2026 SEforALL Database. These include initiatives led by SESCO in the Gambia, SAO Energy in Nigeria, IOM in South Sudan, EKI Foundation in Sierra Leone, Off-grid Electric in Tanzania (ZOLA) and a small number of pilot projects in Kenya, Madagascar and Uganda. Together, these projects represent approximately 4.3 MWp of installed capacity and have primarily served as demonstrations of alternative business models rather than large-scale deployment programmes.

Table 9: Completed projects using service-based models

IMPLEMENTER	MODEL	COUNTRY	NUMBER OF FACILITIES	TOTAL INSTALLED CAPACITY (KWP)
Off-Grid Electric (ZOLA)	5-year system financing	Tanzania	300	288
SAO Energy	PPA	Nigeria	102	351
SESCO	5-year service-based	The Gambia	92	2072
A2EI	5-year service-based	Nigeria	75	200
IOM	PPA	South Sudan	2	775
EKI Foundation	10-year financing	Sierra Leone	7	257
Other	Various	Kenya, Madagascar, Nigeria, Uganda	19	350
TOTAL			**597**	**4,293**

Despite their limited current footprint, service-based models increasingly dominate the future project pipeline. The 2026 SEforALL Database identifies nearly 3,000 healthcare facilities that are expected to be electrified through EaaS or other long-term service contracts in ongoing or planned projects. The majority of these facilities are linked to programmes supported by the World Bank, including DARES in Chad, DECIM in Madagascar, ASCENT in Malawi and the EASP in Uganda. Additional projects are emerging through initiatives such as the EU-supported Nigeria Solar for Health programme.

Table 10: Service-based models ongoing or planned

PROJECT	LEAD DONOR & PARTNER	TENDER STATUS	COUNTRY	MODEL	NUMBER OF FACILITIES	TOTAL INSTALLED CAPACITY (KWP)	TOTAL BUDGET (USD)
EASP	World Bank, UECCC	Complete	Uganda	10-year EaaS	130	2,325	16,500,000
ROGEAP	World Bank, ECOWAS	Complete	Benin	5-year EaaS	15	170	200,000
ROGEAP	World Bank, ECOWAS	Complete	Nigeria	5-year EaaS	32	725	800,000
DARES	World Bank, REA	Unknown	Nigeria	10-year EaaS	100	39,000	65,520,000
ASCENT	World Bank, Ministry of Energy	Planned	Malawi	5-year EaaS	280	1,800	4,615,385
DECIM	World Bank, Ministry of Energy	Planned	Madagascar	TBD	1,000	5,000	45,000,000

PROJECT	LEAD DONOR & PARTNER	TENDER STATUS	COUNTRY	MODEL	NUMBER OF FACILITIES	TOTAL INSTALLED CAPACITY (KWP)	TOTAL BUDGET (USD)
PAAET extension	World Bank, Ministry of Water and Energy	Planned	Chad	TBD	1,279	3,000	50,000,000
NISHP	EU, NTU International	Planned	Nigeria	10-year EaaS	140	3,000	12,290,720
TOTAL					**2,976**	**55,020**	**194,926,105**

Barriers to the uptake and scaling of sustainable models

Sustainable delivery models are increasingly being adopted by governments, DFIs and private sector actors, but still not at scale. To better understand the underlying challenges to scaling these models, the authors consulted governments, development partners, private sector developers, financiers and technical experts involved in the design and implementation of healthcare electrification programmes. Despite differences in geography and institutional perspective, there was remarkable consensus regarding the barriers to scale. Their responses are presented in the following sections covering market maturity, access to finance, risk mitigation, regulatory and policy environments, digital infrastructure, and market dynamics.

Limited market maturity and institutional readiness

The transition from traditional EPC projects to sustainable long-term delivery models requires a fundamental shift in how healthcare electrification programmes are designed, financed, procured and managed. Historically, healthcare electrification in low- and middle-income countries has been delivered through donor-funded EPC projects managed by development partners, multilateral organizations or United Nations (UN) agencies. Under these arrangements, donors finance the upfront capital investment, systems are procured and installed within relatively short implementation periods, and success is typically measured in terms of facilities electrified, capacity installed or funds disbursed. By contrast, service-based models rely on long-term performance contracts, typically lasting 10 years or more, in which payments are linked to service delivery outcomes rather than asset deployment.

This transition creates challenges for all stakeholders involved. Donors often operate within rigid funding cycles of two to five years and are accustomed to financing capital investments rather than long-term service payments. In some cases, project funds must be fully committed or disbursed within 12 months of approval, creating a structural mismatch with delivery models designed around long-term O&M.

Ministries have limited experience procuring and managing performance-based energy service contracts, while public procurement systems are often designed around infrastructure acquisition rather than service delivery. Service-based models also require governments to

make long-term financial commitments for O&M, which can be difficult in environments where public budgets are constrained and annual budget cycles dominate financial planning.

Private sector companies are also navigating unfamiliar territory. Most solar developers and EPC contractors involved in health facility electrification have built their businesses around the supply and installation of equipment rather than long-term service provision. Interviews conducted for this report highlighted that many companies continue to approach tenders from an EPC perspective, even when bidding for service-based contracts. Experience from the EASP in Uganda demonstrated that some bidders struggled to understand key aspects of the service-based procurement model, including performance obligations, risk allocation and long-term financial structuring.

The limited number of completed service-based projects do not provide sufficient operational data and proven case studies. Governments, development partners, financiers and private operators have few reference points to guide decisions on contract design, risk allocation, payment mechanisms and financing structures. This lack of a precedent continues to slow adoption and contributes to a preference for familiar EPC approaches.

Nevertheless, the experiences emerging from Benin, Malawi, Nigeria, Uganda and other early adopters suggest that these barriers can be overcome. The first generation of service-based tenders and pilot projects is providing valuable lessons on procurement, contract management, financing structures and performance verification. As implementation experience grows and standardized contractual frameworks emerge, many stakeholders expect service-based models to become increasingly mainstream within the healthcare electrification sector.

Limited access to commercial finance

Limited access to long-term, commercial funding was the barrier most frequently cited by stakeholders interviewed for this report. This finding echoes the conclusions of the 2024 State of the Market report and reflects a broader challenge across the healthcare electrification sector. While there is growing consensus that service-based delivery models offer a more sustainable alternative to traditional EPC approaches, the financing ecosystem has yet to adapt to support them at scale.

Healthcare electrification remains heavily dependent on donor funding, with most programmes continuing to finance capital expenditure through one-time grants aligned with donor implementation cycles. These cycles typically prioritize rapid deployment of infrastructure and rarely extend beyond five years, limiting opportunities to finance long-term O&M. Consequently, responsibility for maintaining renewable energy systems has traditionally been transferred to governments or healthcare facilities following commissioning, often without adequate financial provisions for lifecycle maintenance or component replacement.

Under service-based models, private developers are expected to finance part or all of the upfront investment and recover costs over extended contract periods through energy service payments. While this reduces the need for large upfront public investments, it also requires developers to secure commercial debt, equity investment or working capital facilities. Access to this capital depends on whether projects are considered bankable.

Stakeholder consultations suggest that the principal financing challenge is therefore not one of capital availability, but of bankability. Commercial investors require predictable revenue streams, balanced risk allocation, standardized contractual arrangements and sufficient scale before committing long-term finance. In healthcare electrification, these conditions are often absent. Public healthcare facilities are generally perceived as weak off-takers, governments have limited track-records of making long-term service payments and contractual structures remain largely untested. This uncertainty increases financing costs, limits access to debt and discourages private investment.

The emerging generation of programmes in Chad, Malawi, Madagascar and Uganda funded by the World Bank and in Nigeria by the EU, is beginning to address these challenges through blended finance approaches that combine donor-funded capital subsidies, government contributions, long-term service contracts and dedicated O&M financing mechanisms. These programmes deploy donor funding to play a catalytic role, reducing project risk and mobilizing commercial investment, rather than financing the full cost of infrastructure. However, most remain in the early stages of design and implementation, and their ability to attract commercial finance at scale has yet to be demonstrated.

Stakeholder consultations consistently identified four conditions that must be addressed before commercially financed healthcare electrification can scale:



Financing

Commercial capital (equity and debt) is necessary for scale but will only participate where projects are sufficiently bankable. Donor funding should increasingly be deployed as catalytic capital through grants, concessional debt or capital subsidies rather than financing the full project cost. Aggregation and service-based models improve the conditions for commercial investment.



Income

Commercial finance requires predictable long-term revenue streams. Government energy budgets and recurring service payments are identified as the foundation of commercially financed healthcare facility electrification. Alternative revenues, including productive use of energy, ancillary services, carbon credits and D-RECs, can improve affordability and sustainability but are complementary rather than primary revenue sources.



Credit Enhancements

Credit enhancement is presented as one of the principal roles for donor and development finance. Guarantees, first-loss capital, liquidity support, foreign exchange protection and participation of DFIs reduce project risk and lower financing costs, making commercial investment more attractive. Some of the donor capital should be redirected towards de-risking tools rather than fully funding CAPEX.



Cost

An awareness and intent to reduce project cost beyond CAPEX and OPEX is important. Financing costs, taxes, foreign exchange losses and investor return requirements all influence project viability. Currency depreciation is identified as a structural barrier, increasing financing costs and undermining prospective investment returns.

Government payment risk and uncertain revenue streams

Government payment risk is consistently identified as one of the most significant barriers to scaling service-based models. At its core, the issue is a deep-seated lack of confidence in a government's ability or willingness to honour long-term financial commitments, which paralyzes private investment. This barrier manifests in several distinct ways.

1. The private sector and its financial backers fundamentally do not trust that government entities will make consistent, timely payments over a 10-to-15-year contract period. This perception is often based on historical precedent in the healthcare electrification sector and is the primary reason capital remains on the sidelines.

2. The risk is not just financial but political too. As contracts may outlast political appointments and election cycles, they require institutional and contractual safeguards that ensure continuity despite changes in government or leadership. They should also anticipate changes in the operating environment, such as grid extension or improvements in grid reliability, which could alter the economics of the original service agreement.

3. Even when governments are willing to meet their payment obligations, administrative delays like slow payment processes and verification procedures can create serious liquidity constraints to private service providers.

In summary, public sector payment risk is not a minor hurdle but a foundational barrier. It prevents private companies from investing their own capital, limits access to secure affordable debt and increases the cost of capital for project developers. The resulting uncertainty makes it difficult to establish commercially viable business models at scale, contributing to the sector's continued reliance on donor grants and concessional financing.

Regulatory, policy and institutional barriers

While financing and payment risk dominate discussions around service-based healthcare electrification, stakeholders consistently highlight a range of regulatory, policy and institutional barriers that continue to slow adoption and increase implementation costs. These barriers often stem from rules designed for traditional procurement, a lack of inter-ministerial coordination and the absence of a clear, supportive policy framework for these new models.

Restrictive and slow public procurement rules: government procurement regulations, designed for purchasing goods rather than long-term services, were identified as a direct and significant impediment. These rules often lack the flexibility needed for innovative, performance-based contracts and can stifle crucial communication.

Lack of clear national policies and inter-ministerial coordination: the absence of a unified national strategy for health electrification creates policy silos where the Ministries of Health, Energy and Finance work at cross-purposes. This leads to fragmented efforts, inconsistent standards and a failure to prioritize funding.

Absence of institutionalized approaches to long-term O&M in fiscal policy: historically, public financing mechanisms have focused almost exclusively on CAPEX, while service-based models require dedicated multi-year budget lines for operating expenditure (OPEX) over the asset lifetime.

Absence of a conducive tariff and regulatory framework: in many cases, the rules governing how electricity can be sold and at what price are unclear or non-existent for mini-grids anchored to public facilities. This creates uncertainty for private operators who rely on selling excess power to make their business model work.

Digital technologies, data and connectivity

While digital technologies are widely recognized as a critical enabler of service-based healthcare electrification, deploying these digital systems at scale presents a new set of technical, financial and institutional challenges.

Unreliable and expensive connectivity in remote areas: the remote locations that require off-grid energy often suffer weak or non-existent mobile network coverage, making real-time data transmission difficult, unreliable and costly. In addition, the recurring costs associated with SIM cards, mobile data subscriptions and communications infrastructure can represent a significant share of the overall O&M requirements for rural clinics.

Data quality concerns: even where data can be collected, concerns regarding its quality, completeness and reliability persist. Inaccurate, inconsistent or incomplete data can undermine the credibility of performance-based contracts, carbon markets and RBF mechanisms that depend on independently verifiable performance data.

Cost and complexity of digital platforms: digital monitoring and asset management platforms can represent a significant additional cost, particularly for smaller programmes and local developers. In addition, they are often complex to deploy, require specialized expertise or lack interoperability with other platforms.

Government procurement delays and interoperability: even where governments have committed to digital monitoring strategies, implementation can be slowed by lengthy procurement processes and limited institutional capacity. Furthermore, digital platforms should complement and integrate with existing national health information systems and government digital infrastructure.

Market distortions

Market-distorting expectations, shaped by decades of grant-funded EPC programmes, represent a fundamental barrier to the adoption of sustainable service-based models. While traditional grant-funded EPC models have helped build the capacity around the use of renewable energy, empower the private sector and create an enabling environment for energy access, they risk undermining the development of a commercial market, discouraging government ownership and paralyzing private investment.

Expectation of fully donor-funded capital investment: governments and other stakeholders have become accustomed to delivery models in which donors finance 100% of the upfront CAPEX, reducing incentives to provide counterpart funding, commit to long-term service payments or adopt financing models that require co-investment and shared financial responsibility.

Competing grant-funded projects: the market is influenced not only by expectations of free infrastructure, but also by the continued implementation of parallel donor-funded projects without substantial coordination that provide systems at no cost to beneficiaries. These interventions reduce willingness to pay and create an uneven competitive environment for private sector providers.

Distorted perceptions of the cost of electricity: decades of subsidies and grants have distorted the perception of the true cost of reliable electricity, making it challenging to introduce service fees that reflect the actual cost of installation, operation, maintenance and replacement, while considering affordability.

Reduced incentives for government ownership and private innovation: continued reliance on donor-funded CAPEX can inadvertently reduce incentives for governments to establish long-term financing mechanisms for energy services and for the private sector to develop innovative business and financing models. This can reinforce dependence on grant funding and slow the transition toward more sustainable, market-based approaches.

Enabling factors for sustainable delivery models

The transition from traditional EPC models to long-term service-based delivery remains at an early stage. However, in the Gambia, Malawi, Nigeria and Uganda, governments and development partners are actively designing or implementing programmes that procure reliable electricity as a long-term service. The experiences of these early adopters provide valuable insights into the institutional, financial and regulatory conditions required to scale sustainable healthcare electrification.

At the time of writing this report:

- In the Gambia the GSEP solarized 11 hospitals and 81 health facilities. O&M is provided by the EPC contractors under a five-year contract and payments are subject to the O&M provider meeting their key performance indicators (KPIs).
- In Malawi, the government, with support from the World Bank's ASCENT programme, is preparing its first service-based tender covering 280 public health facilities, supported by a revolving fund to finance O&M.
- In Nigeria, the EU-funded Nigeria Solar for Health Project (NISHP) is preparing to procure long-term service-based electrification for 140 public health facilities supported by up-front funding commitments by participating state governments.
- In Uganda, the UECCC under the EASP has launched competitive tenders for the electrification of 130 public health facilities and 45 secondary schools based on 10-year performance-based contracts.

Although these programmes differ in their institutional arrangements, financing structures and implementation approaches, they reveal a consistent set of enabling factors that are emerging as prerequisites for scaling service-based healthcare electrification. The lessons presented in this chapter are informed by these experiences, complemented by stakeholder consultations conducted for this report and evidence from other emerging programmes across the sector.

Government ownership and leadership

Strong government leadership and a clear commitment to long-term ownership are keys to successful service-based healthcare electrification programmes. Governments are increasingly recognizing that electrification should not be treated as a series of individual infrastructure projects, but as a long-term public service requiring coordinated planning, dedicated funding and institutional capacity.

- **Government commitment and financial ownership.** Successful programmes are characterized by clear government commitments to invest alongside development partners, correcting one of the market distortions created by decades of fully grant-funded programmes. Governments are increasingly allocating counterpart funding, establishing dedicated budget lines for energy services and recognizing that long-term sustainability requires public financial commitment beyond the initial installation of infrastructure.
- **Acknowledging the limits of traditional public asset management.** Many governments have recognized the historical challenges associated with public procurement and maintenance, including slow procurement processes, fragmented responsibilities and limited technical capacity. Rather than planning for the rapid transfer of assets following installation, governments are starting to commit to long-term private sector operation and maintenance through performance-based service contracts.
- **Cross-government coordination.** Social infrastructure electrification sits at the intersection of energy, health, education and finance. Successful programmes therefore establish formal mechanisms for cross-government coordination. Embedding staff from beneficiary ministries, particularly the ministries of health and education, within project implementation units ensures that operational and clinical requirements are incorporated into day-to-day programme implementation. Likewise, enabling a single cross-sector coordination body, national coordination platforms and master-planning task forces help governments, donors and implementing agencies align investments to a single national strategy, reducing duplication and promoting the strategic allocation of resources.
- **Institutionalizing long-term delivery.** Rather than relying on temporary project implementation units, several countries are establishing permanent institutions capable of managing healthcare electrification beyond the lifetime of individual donor programmes. Dedicated national revolving funds and market development funds can receive government budget allocations, provide financing, and capture additional revenues such as Renewable Energy Certificates (RECs). Similarly, centralized digital performance verification platforms enable governments to aggregate data from multiple remote monitoring systems, objectively verify service performance and administer long-term service contracts.

Creating innovative blended finance structures

Limited project bankability remains the principal constraint preventing commercial finance from scaling healthcare electrification. Stakeholders consistently highlight that sustainable delivery models require financing structures capable of mobilizing commercial debt and equity while reducing investment risks to acceptable levels.

- **Catalytic use of donor funding.** Successful service-based projects have deployed donor funding in catalytic ways as concessional finance, first-loss capital and targeted capital subsidies rather than using these funds simply to cover the full cost of procurement and installation of equipment. This approach has unlocked government co-funding and private capital, while improving long-term financial sustainability.
- **Results-Based Financing (RBF).** RBF is widely used within electrification programmes to improve the financial viability of projects. RBF incentives reduce the amount of upfront CAPEX that developers must recover through long-term service fees. By lowering the amount of capital that must be repaid over the life of the contract, RBF can reduce the monthly payments required from healthcare facilities, helping projects achieve affordable and bankable tariffs while bridging the gap between the cost-of-service provision and the ability of facilities to pay. However, RBF does not remove the need for upfront project finance. Results-based payments are typically made only after installation and independent verification, requiring developers to procure equipment and complete construction before reimbursement is received. As RBF generally covers only a portion of total project costs, developers must still finance the remaining investment and recover it through long-term service payments. This creates substantial working capital and financing requirements, particularly for smaller or less capitalized companies[20].
- **Risk mitigation and payment security.** As service-based models gain traction, payment security has become one of the sector's principal financing challenges. Stakeholders noted growing interest in liquidity backstops, guarantee facilities and payment continuity mechanisms capable of reducing payment-related risks and improving project bankability. While these instruments remain relatively untested within healthcare facility electrification, they are increasingly viewed as necessary components of scalable financing structures.
- **Liquidity reserve facilities.** Liquidity reserves, such as the World Bank Group's Guarantees Platform, hosted by the Multilateral Investment Guarantee Agency (MIGA), provide temporary funding to cover payment delays or short-term revenue shortfalls, helping projects maintain debt service and operational continuity. For example, reserve accounts can be used to bridge delayed government payments to service providers.
- **Political risk insurance.** Political risk insurance protects investors against risks such as expropriation, currency inconvertibility, breach of contract and political violence. Providers including MIGA and the African Trade & Investment Development Insurance have a strong history of supporting renewable energy and infrastructure investments across Africa.
- **Sovereign-backed payment support.** Government guarantees, payment security facilities and similar mechanisms help address concerns over the creditworthiness of public sector off-takers by providing assurance that contractual payments will continue even where budget disbursements are delayed. Similar approaches have been widely used in independent power producer programmes to improve investment confidence.

[20] Sustainable Long-Term Energy Access for Social Institutions through Service-Based Models in Benin. https://energypedia.info/wiki/Sustainable_Long-Term_Energy_Access_for_Social_Institutions_through_Service-Based_Models_in_Benin#Lessons_Learned

Box 4: MIGA as an instrument to mobilize private investments

The World Bank Group's Guarantees Platform, hosted by MIGA, is developing a dedicated guarantee instrument to help mobilize private investment in off-grid energy systems for public facilities, including schools and healthcare centres. These projects present a different risk profile from large grid-connected projects, where revenues are typically backed by utility off-takers. Instead, public institutions depend on government budget allocations to meet payment obligations under energy service agreements, creating greater perceived risks of delayed payments, non-payment or premature contract termination. These risks can significantly reduce project bankability and constrain private sector participation.

To address these challenges, MIGA is developing a revolving direct payment guarantee specifically designed for this market segment. Unlike conventional guarantee structures, the mechanism does not require a letter of credit. Instead, it provides direct compensation to private energy service providers when undisputed payments under the contract with the government become overdue. The guarantee revolves, with available coverage amounts being reinstated once outstanding government payment arrears and accrued interest on the late payment are settled with the project company and any guarantee payments made by MIGA have been repaid.

The proposed direct payment guarantee structure incorporates several features intended to improve the effectiveness of the overall transaction structure. Availability of the direct payment guarantee requires a contractual relationship with the sovereign, either as the primary contracting party or as guarantor of another entity's payment obligations. The direct payment guarantee does not require a sovereign counter-indemnity. An independent remote data aggregation and monitoring agent confirms the performance of the energy services company, facilitating prompt confirmation of service delivery, reducing the potential for disputes and supporting timely payment by the government of performance-based service fees. In addition, the guarantee can be called without the need for an arbitral award, allowing for faster claims processing and payment. This is intended to improve investor confidence in challenging markets while reducing perceived risk, ultimately lowering financing costs and making off-grid electrification projects for public facilities more attractive to private investors.

The 2024 State of the Market report referenced MIGA's establishment of a revolving fund, and it is understood MIGA has further developed the proposed payment guarantee concept, refining its design to address the specific payment risks associated with public facility electrification. However, as it has not yet been deployed within World Bank-financed operations, its effectiveness will ultimately depend on how it is integrated into World Bank and wider programming.

Enabling regulatory and procurement frameworks

Moving from individual projects to programmes requires local regulatory environments that enable governments and their partners to test novel contracting models and revenue generation mechanisms. Existing public procurement systems remain configured for traditional EPC contracting and require adaptation to support performance-based delivery models. Stakeholder interviews highlighted several regulatory and procurement innovations that governments are starting to adopt to support service-based electrification of public institutions.

Sub-national regulatory and tariff autonomy: allowing regional governments granting the project's legal authority to regulate and collect localized tariffs enables project developers to establish clear, predictable business cases customized to local realities. This is being implemented in the EU-funded NISHP with the involvement of state governments in tariff setting.

Long-term concessionary legal frameworks: utilizing long-term concession agreements to legally hand over project management to private developers, rather than handing assets directly over to local government offices, protects the installations from political cycles and post-handover neglect. Long-term agreements have been deployed in the cases of EASP in Uganda and NISHP.

Iterative, "smart" procurement design: simplified tender documents, standardized contractual arrangements and performance-based technical specifications reduce transaction costs, minimize administrative errors and encourage more competitive bidding. Several programmes have also introduced non-editable performance requirements within tender documents to ensure bidders compete primarily on efficiency and value for money rather than altering core contractual provisions.

Embracing innovation in designing revenue models

A sustainable service-based model depends on predictable long-term revenues capable of supporting commercial investment while remaining affordable for governments and healthcare facilities. Stakeholders highlighted several emerging approaches to improving project economics and reducing the long-term cost of service delivery.

Affordable service fees and pragmatic financial benchmarking; governments are increasingly benchmarking service payments against existing public expenditures on diesel fuel, grid electricity or generator maintenance to ensure tariffs remain affordable while providing predictable revenues for private operators.

The "energy hub" or commercial cross-subsidization model: prioritizing the selection of electrification sites that are located near commercial off-takers (such as local businesses, agricultural activities or telecom towers) allows private operators to sell excess electricity. This commercial revenue crosssubsidizes the energy costs of the anchor health facility, making the microgrid commercially viable.

Minimum-subsidy competitive bidding: rather than fixing capital subsidies administratively, some programmes are introducing competitive procurement processes in which the long-term service fee is fixed while bidders compete on the minimum grant support required to deliver the service. This approach allows market competition to reveal the true subsidy required while maximizing the efficiency of public funding.

Diversified revenue streams. Stakeholders also identified complementary revenue sources, including productive use of energy, ancillary services, carbon credits and D-RECs, as opportunities to strengthen project economics. While these mechanisms are unlikely to replace core service payments, they can improve affordability and reduce reliance on public funding over time.

Case Study: Renewable Energy Certificates (RECs): Unlocking New Revenue Streams for Healthcare Electrification

Why RECs Matter

One of the greatest challenges facing healthcare electrification is securing sustainable funding for O&M. While donor funding has traditionally financed the installation of renewable energy systems, very few programmes provide long-term financing for maintaining and replacing equipment throughout its lifetime.

RECs and D-RECs are emerging as a complementary financing mechanism capable of generating recurring revenues from renewable electricity generation. Rather than replacing government funding or donor support, RECs can strengthen project economics by providing an additional revenue stream that supports long-term service delivery and improves project bankability.

How RECS Work

RECs are voluntary market instruments that certify the environmental attributes of renewable electricity generation.

Unlike carbon credits, which estimate future emissions reductions, RECs are issued **only after renewable electricity has been generated and consumed**. Each certificate records:

- ➔ renewable technology used
- ➔ electricity generated
- ➔ time of generation
- ➔ location of generation

Corporate buyers purchase RECs to demonstrate renewable electricity consumption.

Why Aggregation is Essential

Individual healthcare facilities generate relatively small amounts of renewable electricity, making the issuance and sale of RECs economically unattractive. The administrative costs associated with certification, verification and transactions often exceed the value of the certificates themselves.

Aggregating hundreds or thousands of healthcare facilities into a single portfolio significantly reduces transaction costs while creating certificate volumes attractive to corporate buyers. Stakeholders consistently identify aggregation as a prerequisite for making RECs commercially viable in the healthcare sector.

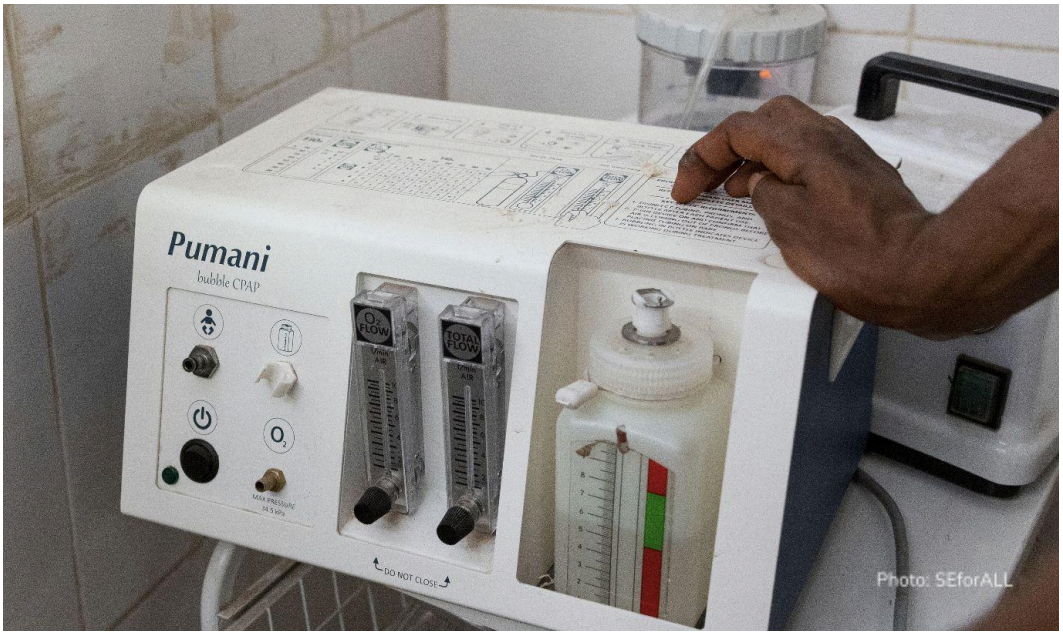
Potential Benefits

Long-term O&M funding: provides an additional revenue stream that can contribute towards routine maintenance, component replacement and system upgrades.

Improved project bankability: additional revenues strengthen project cash flows, making service-based contracts more attractive to lenders and investors.

Corporate participation: creates a mechanism for companies to support healthcare electrification while meeting renewable energy and environmental social and governance commitments.

Recognition of health co-benefits: healthcare electrification delivers measurable development outcomes beyond emissions reductions, including improved maternal and neonatal care, vaccine cold chains, medical oxygen availability, emergency response, and climate resilience. These co-benefits have the potential to position healthcare RECs as premium environmental products rather than commodity certificates.



Remaining Challenges

Several questions still need to be addressed before RECs can become a mainstream financing instrument for healthcare electrification.

CHALLENGE	WHY IT MATTERS
Aggregation	Individual facilities are too small; national or regional aggregation platforms are needed.
Government policy	Countries need clarity on how REC sales interact with Nationally Determined Contributions and climate finance.
Corporate demand	Buyers need to recognize the additional social value of healthcare electrification.
Verification	Digital MRV systems must demonstrate both renewable electricity generation and associated health impacts while keeping transaction costs low.
Pricing	Long-term purchase agreements are needed to generate predictable revenues capable of supporting O&M.

Looking Ahead

Stakeholders generally agree that RECs should currently be viewed as supplementary revenue streams rather than primary financing mechanisms. However, if combined with project aggregation, digital verification platforms, long-term corporate purchase agreements and supportive government policies, they have the potential to become an important component of the financing architecture for service-based healthcare electrification.

Key Takeaways

- ➔ RECs monetize renewable electricity generation, not carbon emissions.
- ➔ Certificates are issued after electricity has been generated and verified.
- ➔ Aggregation is essential to make healthcare projects commercially viable.
- ➔ RECs can strengthen bankability by creating additional long-term revenues.
- ➔ RECs are best viewed as a complementary O&M financing mechanism, alongside government service payments, commercial finance and donor support.

CONCLUSIONS, RECOMMENDATIONS & OUTLOOK

Healthcare electrification is entering a new phase

The healthcare electrification sector has reached an important inflection point. Over the past decade, governments and development partners have demonstrated that renewable energy can transform healthcare delivery by improving reliability, reducing operating costs and enabling essential health services. The sector has evolved from isolated pilot projects to national programmes covering thousands of healthcare facilities, while new technologies, digital platforms and service-based delivery models have expanded the range of solutions available.

However, the analysis presented in this report demonstrates that the next phase of market development will require fundamentally different approaches. The outstanding electrification gap remains substantial, donor resources are becoming increasingly constrained, and maintaining existing renewable energy systems is proving to be equally as challenging as installing new infrastructure. Traditional grant-funded engineering, procurement and construction (EPC) models alone are unlikely to deliver universal access to reliable electricity by 2030.

The data presented in this report point to the beginnings of a sectoral transition to financially sustainable service-based models that combine grant funding, government co-funding and private capital to enable private sector participation as energy service providers. This transition is already underway in Liberia, Madagascar, Malawi, Nigeria and Uganda. Although these programmes are still at an early stage, they demonstrate programme designs are increasingly oriented towards healthcare electrification as a long-term energy service provision, rather than as infrastructure delivery.

The challenge facing the sector is therefore no longer primarily technological. Renewable energy technologies are mature, equipment costs continue to decline and digital platforms are increasingly being deployed to enable transparent performance monitoring. The principal challenges are institutional, financial and regulatory. Scaling healthcare electrification will depend on governments, development partners and the private sector creating the conditions under which financially sustainable service models can flourish.

Framework for scaling sustainable healthcare electrification

The analysis presented in this report demonstrates that the transition from donor-funded EPC projects to financially sustainable, service-based healthcare electrification requires a fundamental shift in how projects are planned, financed, procured and managed throughout their lifecycle. Experiences from early adopters, including governments and development partners in Benin, the Gambia, India, Malawi, Nigeria and Uganda, show that successful programmes share a common set of enabling conditions. Together, these experiences suggest a practical framework for accelerating healthcare electrification based on sustainable delivery models over the coming decade.

Pillar 1: Build Government Ownership and Long-Term Institutional Capacity

Long-term sustainability depends on governments assuming ownership not only of renewable energy assets, but also of the institutions responsible for managing them. This requires moving beyond project-by-project implementation towards national programmes embedded within government planning, budgeting and governance structures.

Governments should establish dedicated budget lines for energy service payments, ensuring that electricity is recognized as an essential healthcare operating cost rather than an exceptional capital investment. Cross-government coordination between ministries of health, energy, finance and education should become standard practice, supported by national steering committees, integrated planning processes and secondment of technical staff across ministries. National healthcare electrification masterplans can help coordinate donor investments, prevent duplication and align interventions with government priorities.

Several countries are also demonstrating the value of establishing permanent institutions, such as national revolving funds, market development funds and digital programme management platforms, that can outlive individual donor programmes. These institutions provide continuity, coordinate long-term investments, manage performance-based contracts and build the institutional capacity required to sustain healthcare electrification beyond the life of externally funded projects.

Pillar 2: Create Conditions for Project Bankability

Commercial finance will only participate where projects are sufficiently bankable. While access to capital is often cited as the principal challenge to project development, capital can't be accessed unless projects meet investor requirements for predictable revenues, balanced risk allocation and efficient delivery.

Creating bankable projects begins with standardizing procurement and contractual arrangements. Governments and development partners should develop common templates for energy service agreements, concession contracts, financial models and bidding documents that can be adapted across countries. Standardization reduces transaction costs, shortens project preparation timelines and increases investor confidence.

Project aggregation is equally important. Individual healthcare facilities are typically too small to justify the due diligence, financing and monitoring costs associated with commercial investment.

Bundling hundreds of facilities into larger portfolios creates projects of sufficient scale to attract institutional investors while reducing transaction costs on a per-facility basis.

Digital monitoring and verification systems should become integral components of programme design rather than optional additions. Reliable performance data support payment verification, strengthen accountability, enable results-based financing (RBF) and improve investor confidence by reducing information asymmetries between governments and private operators.

Pillar 3: Mobilize Commercial Capital and Government Co-financing Through the Catalytic Deployment of Donor Funds

Closing the global healthcare electrification gap will require investment far beyond the levels that can be achieved through official development assistance (ODA) alone. Scarce donor funding should therefore increasingly be deployed to mobilize government co-funding and private capital rather than replace it.

Development partners can play a catalytic role by working with government and other project partners to use donor-funded grants strategically to improve project viability, reduce affordability gaps and absorb risks that commercial investors are unable to manage. Instruments supported by development finance institutions (DFIs), including concessional debt, first-loss facilities, subordinated debt, liquidity reserves and foreign exchange protection can significantly improve project bankability while lowering the cost of capital.

Payment security mechanisms will be particularly important. Guarantee facilities, escrow accounts, lock-box arrangements and revolving payment guarantees can protect investors against delayed government payments while maintaining long-term service contracts. Emerging initiatives, including the World Bank Group's proposed Multilateral Investment Guarantee Agency (MIGA) payment guarantee, illustrate how DFIs are beginning to shift from financing infrastructure towards de-risking commercially financed service delivery.

Commercial investors also have an important role to play. Their participation should begin during programme design rather than after procurement, ensuring that financing structures, contractual arrangements and revenue mechanisms are designed to meet investment requirements from the outset.

Pillar 4: Secure Predictable Long-Term Revenue Streams

Long-term service delivery depends on long-term revenues. Governments should progressively shift from prioritizing capital investments towards purchasing reliable energy services through recurring service payments. Ring-fencing energy expenditures within national health budgets will provide the predictable cash flows necessary to support commercially financed service contracts.

At the same time, programmes should explore complementary revenue streams capable of improving affordability and strengthening project economics. Cross-subsidization through "energy hub" models, where surplus electricity is sold to nearby businesses, telecommunications infrastructure or productive users, offers one promising approach for reducing the net cost of healthcare electrification.

Climate and environmental markets also present new opportunities. Renewable Energy Certificates (RECs) and high-integrity carbon credits have the potential to generate supplementary revenues, particularly when projects are aggregated into national portfolios. Although these mechanisms are unlikely to replace government service payments, they can improve long-term sustainability while creating opportunities to attract corporate investment linked to climate and social impact objectives.

National revolving funds provide another mechanism for pooling government contributions, donor resources and revenues from environmental markets into a permanent financing vehicle capable of supporting operations and maintenance (O&M) over the full asset lifecycle.

Pillar 5: Build Markets, Not Projects

Healthcare electrification must transition from project-based programming to building viable electricity markets. This will require governments and development partners to move beyond isolated demonstration projects towards coordinated programmes capable of creating predictable demand, addressing affordability constraints, guaranteeing payments, reducing transaction costs and attracting long-term investment. Standardization of procurement processes, contractual frameworks and technical specifications will enable lessons learned in one country to be replicated rapidly elsewhere. Regional cooperation and knowledge sharing can accelerate this process while reducing duplication of effort.

Investment in local technical capacity is equally important. Governments should increasingly direct counterpart funding and technical assistance towards training public officials in energy planning, data collection, energy audits, contract management, key performance indicator (KPI) monitoring and payment administration. Building these capabilities within government institutions reduces long-term dependence on external consultants and strengthens programme sustainability.

Digital infrastructure will underpin this transition. National monitoring and verification platforms can support performance-based payments, portfolio management, predictive maintenance and evidence-based policy making, while generating the data required to unlock innovative financing mechanisms such as RBF, RECs and carbon markets.

Ultimately, the transition from donor-funded projects to sustainable healthcare electrification will depend on governments, development partners, financiers and the private sector collectively building the institutional, financial and commercial foundations of a mature market.

Table 11: Recommendations by stakeholder group

STAKEHOLDER	PRIORITY ACTIONS
Governments	Shift procurement from assets to services; create dedicated budget lines; aggregate demand; establish payment security mechanisms; strengthen institutions.
Donors	Use grants catalytically; finance project preparation; support guarantees; reduce transaction costs; align programmes with long-term government ownership.
DFIs	Expand guarantees; support local currency lending; develop portfolio financing; back aggregation platforms.
Private Sector	Engage early in programme design; develop scalable portfolios; integrate digital monitoring; explore complementary revenues.
Coordinating Organizations	Develop standard contracts; harmonize procurement; maintain market intelligence; facilitate knowledge exchange.

Outlook

Despite the progress in global healthcare electrification documented in this report, the challenge remains immense. Even if all ongoing and planned projects identified in the Sustainable Energy for All (SEforALL) Healthcare Electrification Database are successfully completed, at least 286,170 healthcare facilities worldwide, including 81,407 facilities in Sub-Saharan Africa, will still require either first-time electrification or reliable backup power.

Mission 300 is creating a new pipeline of investment

The coming years are likely to be defined by a transition from individual projects and pilots towards national-scale implementation. One of the strongest catalysts for this shift in Africa is Mission 300, led by the World Bank and the African Development Bank. The impact is already visible in the project pipeline: of the six major planned healthcare electrification programmes captured in the SEforALL database, three are financed by the World Bank and three by the United Nations Fund for Children (UNICEF). The World Bank has set an ambitious goal to electrify approximately 75,000 healthcare facilities as part of the broader Mission 300 agenda, through regional programmes such as Distributed Access through Renewable Energy Scale-up (DARES) and Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) as well as country-specific operations.

From fully grant-funded projects to blended financing

Early implementation of service-based models as part of social infrastructure electrification programmes in Malawi, Nigeria and Uganda is demonstrating an emerging blended financing model in which development finance and government borrowing support a substantial proportion of capital expenditure (CAPEX), while private developers finance the remaining investment and assume long-term responsibility for system operation, maintenance and performance. Government ministries, particularly ministries of health, are expected to play an increasingly important role by committing recurring operational budgets to purchase reliable energy services rather than energy assets.

This evolution is also driving innovation in financial risk mitigation. Institutions such as MIGA are exploring portfolio-based guarantee mechanisms capable of reducing government payment risk across large portfolios of healthcare facilities. Rather than guaranteeing individual projects, these facilities could provide payment security for entire programmes, improving bankability and enabling commercial lenders to participate at much greater scale. If successfully implemented, such mechanisms could become a critical component of future healthcare electrification programmes by reducing financing costs while increasing investor confidence.

What will it cost to close the gap?

The SEforALL Healthcare Electrification Database provides an indication of the scale of financing required. Across the 51 initiatives for which sufficient budget and capacity information is available, the average upfront project cost is approximately **USD 4,500 per kWp installed**. This includes development and EPC costs and, in some cases, associated technical assistance.

Applying these benchmarks to the remaining healthcare electrification gap suggests that solarizing the estimated 81,407 facilities that will remain underserved in Sub-Saharan Africa would require approximately **USD 2.67 billion** in upfront investment. Data emerging from one early service-based project indicate that providing 10 years of O&M through long-term service contracts could require a total budget equivalent to approximately 70% of initial CAPEX.

These indicative estimates highlight that closing the infrastructure gap without financing the operational gap will not deliver sustainable electrification. Future financing strategies must account for the full lifecycle cost of electricity provision, rather than treating commissioning as the end of the investment.

Three possible pathways to finance the remaining gap

Early experience suggests that there will not be a single financing model applicable across all countries or even within a country. Instead, the balance between grants, government resources and private capital will need to reflect governments' fiscal capacity, the maturity of local distributed renewable energy markets and the perceived risk of long-term public sector payments.

The first pathway is a blended public-private model. In countries with sufficient government fiscal capacity and credible payment mechanisms, grants can be deployed strategically to subsidize CAPEX and mitigate affordability and payment risks. Early tender data indicate that, in ideal cases, every USD 1 of grant funding could potentially mobilize around USD 0.40 in government co-funding and USD 0.30 in private capital over a 10-year period. The objective is therefore not to eliminate public funding, but to use it catalytically to mobilize additional sources of capital while ensuring long-term system performance.

The second pathway applies to fragile and higher-risk markets where governments cannot credibly assume recurring service payments. In these contexts, service fees in long-term service contracts may need to be largely or fully supported through grants. Private capital could still provide project financing to energy service providers and reduce the amount of grant funding required upfront by spreading CAPEX over time. However, private finance is not free: increasing its share raises financing costs, which ultimately need to be recovered through the service fee.

There is, therefore, a practical limit to how much private capital can be mobilized without increasing the overall cost of service.

A third pathway is continued public and donor financing of both CAPEX and operating expenditure (OPEX), particularly in markets where neither government payment capacity nor commercial conditions currently support meaningful private participation. Even in these contexts, however, programmes should use this financing period to build the enabling environment for future commercial participation, strengthening procurement frameworks, establishing government O&M budgets, developing local markets, standardizing contracts, improving payment mechanisms, and generating the performance data required by future investors. Fully subsidized electrification can therefore remain necessary without perpetuating the traditional build–transfer model.

Across all three pathways, climate and environmental finance could provide an additional revenue stream. Instruments such as internationally transferred mitigation outcomes, RECs and other verified environmental attributes could potentially supplement government service payments or donor subsidies. Combined with digital monitoring and verification, these revenues could reduce dependence on grants and improve project economics, although their contribution should be treated as complementary rather than as a primary source of revenue.

Towards sustainable healthcare electrification

Service-based models have the potential to fundamentally improve the long-term operational sustainability of stand-alone distributed renewable energy systems. They can replace uncertain future maintenance expenditures with predictable service payments, create stronger incentives for energy service providers to maintain system performance, mobilize government and private resources, and potentially unlock new sources of climate finance. At the same time, their design must recognize the realities of the cost of capital and ensure that contracts provide sufficiently strong incentives for providers to meet performance indicators throughout the full contract period.

The evidence presented in this report suggests that substantial concessional and grant finance will remain necessary to close the healthcare electrification gap, particularly in low-income and fragile countries. The opportunity is instead to make each dollar of grant funding work harder. Early service-based tenders point to two particularly promising outcomes: first, long-term performance-based contracts can significantly improve the longevity and reliability of energy systems compared with business-as-usual asset-transfer approaches; and second, where conditions permit, grants can mobilize government co-financing and private investment, reducing the proportion of the total lifecycle cost that must ultimately be borne by development partners.

The next generation of healthcare electrification programmes should therefore be designed around full lifecycle costs rather than installation costs alone. Governments and development partners should undertake robust long-term financial modelling based on realistic government commitments, affordability, cost of capital and potential private sector participation before determining the appropriate financing structure for each market. The objective should not be to maximize private capital at any cost, but to identify the combination of grants, government resources, commercial finance and complementary revenues that delivers reliable electricity at the lowest sustainable lifecycle cost.

About SEforALL

Sustainable Energy for All has a global mandate to accelerate progress on the energy transition in emerging and developing countries. Hosted by UNOPS, we work at the intersection of energy, climate and development, partnering with governments and organizations worldwide to end energy poverty, double energy efficiency, significantly expand renewable energy and combat climate change.

About UNDP

UNDP is the leading United Nations organization fighting to end the injustice of poverty, inequality, and climate change. Working with our broad network of experts and partners in 170 countries, we help nations to build integrated, lasting solutions for people and planet. Learn more at undp.org or follow at @UNDP.

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