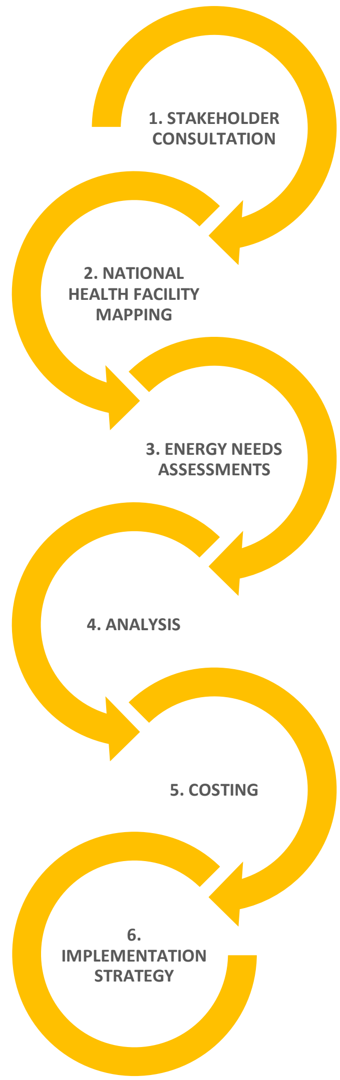
Powering Health Facilities – Approach

This document describes a typical lifecycle approach for kickstarting a large-scale health facility electrification intervention. Under normal circumstances, and depending on the scope and scale of the intervention, the steps as described below could take up to several months. Under an emergency setting, when urgency is of the upmost importance, several steps can be expedited, as well as run in parallel, as described in this document.



1. Stakeholder consultation

It is recommended to start with a round of stakeholder consultation, especially at the national level. While this depends on the country context, as well as the lead agency, this could include:

- Ministry of Energy
- Rural Energy Agency or Rural Electrification Agency (or similar)
- Ministry of Health

This could be supplemented by Ministry of Public Works or Infrastructure, and institutions providing key support to the energy or the health space (e.g. World Bank, USAID, DFID, UNDP), if relevant for the specific country context. This step is necessary to understand the current state of play of planned and ongoing interventions, as well as better understand current and future priorities.

OUTCOME: coordinated approach

2. National health facility mapping

In a next step, an initial mapping of all health facilities in the country is required, focusing on the current 'power status' of each facility. Additional information to collect includes proximity to the grid, lay-out of the health facility, and GIS coordinates.

The data will likely come from several sources and could include both primary sources (e.g. rapid surveys) and secondary sources (available data from Government and other agencies). Some datasets are likely to be more available and reliable – e.g. cold chain power status, or on-grid versus off-grid – and can be used as proxies to prioritize certain facilities over others.

An important component in this step is the categorization or classification of health facilities, to better understand the types of health services that are offered at different levels of care. Lastly, overlaying the dataset with current and planned grid extension plans – at least in the near term – will further help identify priority sites. A priority index can be developed, including: proximity to grid, type of facility, catchment area (and thus people served by the facility), other existing power sources (if data is available).

For a rapid assessment, a useful starting point is the article [A spatial database of health facilities managed by the public health sector in sub Saharan Africa (2019).]

OUTCOME: identified and prioritized health facilities for interventions

3. Energy needs assessments

A. Defining energy needs

To define the energy needs of health facilities, it is imperative to understand which health services are being delivered at the different levels of care, as described in national health policy. In parallel, an analysis needs to be made of which appliances and (electricity-dependent) equipment is needed to effectively deliver these services.
Note: in some cases, health services may not be currently offered because of a lack of equipment or staffing. It is still recommended to use the national policy as a guideline for deciding which services and associated equipment to include in the final needs assessment.

While several different categorizations of power needs exist, they can largely be divided into the following groups:

- Medical services: this includes maternal and child health, surgery, diagnostics, equipment sterilization, etc.
- Infrastructure: this includes water infrastructure, medical waste treatment, and security lights.
- ICT equipment: this includes computers, printers, and connectivity equipment.
- Additional needs: this includes power needs of staff quarters.

A summary table of different types of energy needs and indicative power needs of different appliances can be found in the World Health Organization (WHO) and World Bank publication *Access to Modern Energy Services for Health Facilities in Resource-Constrained Settings* (in Table 3). For COVID-19 specific energy needs, SEforALL is collecting and making available a number of technical resources on this web page.

B. Energy audits

Once the preliminary energy needs for facilities have been defined, an energy audit is carried out to (i) identify the medical equipment on-site, (ii) understand the physical infrastructure, and (iii) conduct pre-feasibility for community mini-grid potential.

A first step is to select an appropriate auditing tool, and if necessary adapt to the local context. Several auditing tools exist, both for general off-grid energy needs assessments as well as those tailored for off-grid health facilities. Two examples of detailed surveys that can be rapidly modified for different settings include:

- WHO and World Bank's proposed energy module – Annex 1 of the publication referenced above *Modern Energy Services for Health Facilities in Resource-Constrained Settings*
- The HOMER tool, which is currently being updated to add more COVID-19 specific appliances and context

Ideally, audits should involve on-site inspection of each facility, and interviews with staff. In general, audit results need to be well captured to ensure that the results can be analyzed, aggregated, and compared.

Time permitting, to validate assumptions on the availability of medical appliances and other equipment, their power ratings, and their daily usage, teams could be sent to a representative number of sites to carry out a detailed energy needs assessment. Teams should be trained on the following: the role of energy access in the provision of health services, particularly those relevant to women's and children's health; how to use the survey tool; electric and non-electric power and medical equipment typically found in health facilities; and methods for conducting site surveys.

C. Additional considerations

Additional considerations should be made for specific conditions that may significantly alter the scope or the longevity of the proposed intervention. Critical questions include:

- What does the structure look like? Is it permanent or temporary? Is it likely going to be renovated, upgraded, or be decommissioned?
- What is the potential to expand the power solution to a community-wide mini-grid?

For rapid energy needs assessment, many necessary details can be gathered through a combination of (geospatial) site information complemented with phone interviews.

OUTCOME: detailed energy needs assessments following a standardized audit tool

4. Analysis

A. Load profile

From the detailed energy needs assessments, a load profile can be established. This should include:

- Energy needs for every hour for a 24h period, disaggregated by different priority systems (e.g. medical services may have a higher priority than security lights)
- Peak loads

B. System design: multiple options; standardization

From the load profile, system specifications can be developed. Depending on the energy need requirements, the needs for multi-day autonomy, the temporary vs permanent nature, the proximity to the grid as well as the potential for expanding to a community-wide mini-grid, a decision can be made on the most appropriate technology or mix of technologies. In most cases, several scenarios can be pursued and evaluated – e.g. hybrid models versus pure renewable energy-based technologies.

Aggregating the results from the individual site assessments, it is recommended to provide a limited number of standardized system specifications. While exceptions are possible, facilities that are categorized the same should be allocated similar energy system solutions. This applies especially to primary and secondary healthcare facilities, where the types of services offered are typically standardized. Standardization will enable economies of scale and reduce costs in procurement and installation.

For more rapid deployment of systems, standardized system specifications can be used to develop modular designs for providing a set of basic services for emergency operations.

OUTCOME: individual and aggregated power needs and system specifications

5. Costing

A. CapEx:

The up-front costs are primarily driven by the key components. In general, larger systems will have a lower average cost ($/Wp). Prices can vary significantly, based on inventory levels in-country, the development of a solar PV market, logistics costs (especially for hard to reach areas), and enabling environment factors (such as VAT and import tax exemptions). A solar PV system with storage can cost between $4/Wp to $8/Wp, though costs outside of this range are not unusual.

B. OpEx

The long-term costs, in particular for operation & maintenance, are largely driven by the cost of labour, minor spare parts, and logistics factors (i.e. the distance to the facility). Here too, country context will play a large role in determining these costs. The current lifespan of key components ranges from approx. 7-10 years (for batteries) to 20-25 years (for solar PV panels).

C. Service-based approaches

While harder to implement in emergency settings, an alternative approach is to bundle CapEx and OpEx into a long-term service contract, with performance-based payments over time. SEforALL's report *Lasting Impact: Sustainable Off-Grid Solar Delivery Models to Power Health and Education* details key conditions that need to be met for an intervention to be sustainable in the long-term.

OUTCOME: an overview of different costing models across different scenarios, split out between CapEx and OpEx

6. Operationalize and finance implementation strategy

Once load profiles have been established, system designs have been standardized, and a costing exercise has been undertaken, an implementation strategy needs to be developed. This will include developing bidding documents and establishing the desired delivery models to pursue.

While new funding avenues can be explored, Government agencies and their partners should also be encouraged to reposition existing funding streams to include health facility electrification intervention; this could include existing grants and loans in health infrastructure, water infrastructure, and energy interventions.

Designing the system to also become the basis for a community mini-grid can help ensure the long-term sustainability of the system.

In emergency settings and to facilitate more rapid deployment, certain decision (e.g. approaching pre-qualified bidders, and applying direct procurement processes) may need to be applied.

OUTCOME: implementation strategy, including long-term sustainability options

For more information contact:

Luc Severi
luc@seforall.org

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