SMALL-SCALE MINI-GRIDS

Product Catalogue - 2014

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EUROPEAN MICROFINANCE PLATFORM
NETWORKING WITH THE SOUTH

e-MFP ACTION GROUP
ON MICROFINANCE
AND ENVIRONMENT

Description and Working Principle

Small-scale Mini-Grids (MGs), also referred to as Nano-Grids or Micro-Grids, are micro-utilities that generate, store, and distribute electricity locally. These grids serve a wide range of market segments including off-grid rural areas and islands but also serve as backup systems in urban areas with frequent load shedding. These small scale grids usually work with direct current (DC) and range from approximately 4 to 24 hours of operation time per day. The structure of the system depends on the specific business model – which also defines the owner and operator. Electricity and/or electricity services are sold, leased, rented (or a combination of them) by the operator to end-users. Small-scale Mini-Grids cover two tiers of electrification, which indicate the energy access rate of the connected end-users. The first tier includes the basic household's needs, such as lighting or phone charging. The second tier refers to the situation when users are able to use electricity for small information and entertainment technology uses such as energy efficient TVs.[1]

Technical Characteristics

Target group	Islands, rural off-grid villages
System gize	Approx. 1 kW to 10 kW
Fuel type needed	Solar/wind/hydro/diesel
Fuel replaced	Kerosene, dry cell batteries, diesel
Preparatory work	Site assessment, load and demand forecast, commercial viability, tariff calculation, design and costing, environmental impact, and implementation plan
Product lifetime	~20 years, influenced by O&M. Batteries need replacement approx. every 8 years.
Electricity cost	0.4-0.9 USD$/kWh

Ease of Distribution, Installation and Maintenance

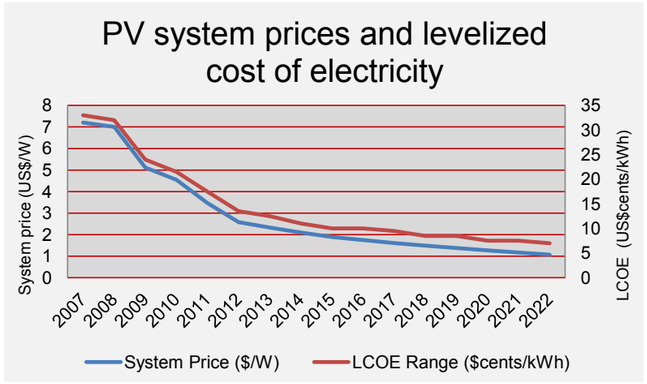
Small-scale Mini-Grids require accurate design in order to ensure sustainable long-term performance. The type of generation and storage technology, capacity of the system, paying method, and other technical aspects depend on the environmental resources, end-users' ability and willingness to pay, nature and volume of demand, and potential long-term load growth. Distribution and installation is normally performed by suppliers or local technicians. In some cases, the same supplier offers generation, distribution, and metering technology, easing the installation. In regard to maintenance, it is critical to ensure that the operator can carry out both the operation and maintenance tasks. Since a certain technical knowledge is required to operate and maintain the system, the installation period can be used to provide the necessary training to the future operator.

Technology Options

A variety of technologies exist at different scales and requirements for the grid infrastructure (respective type and scale of components to be integrated into small-scale Mini-Grids). Local requirements and available resources should be considered at the design stage of the grid structure, as well as the components (battery system, type of meters, etc.). On the generation side, different technologies can be employed, preferably Renewable Energy Technologies (RETs), such as solar photovoltaic (PV), small wind turbines, biomass, but also diesel gensets, which can be flexibly integrated into the grid. These technologies can be installed separately or in combination of two or more, creating a hybrid system, resulting in a more flexible and robust grid infrastructure. Storage technologies can also be integrated on the generation side, as they can be installed next to each other. However, batteries can also be distributed on a decentralized level per household and used independently for each end-user.

[1] Bardouille, P. & Muench, D. (2014). "How a new Breed of Distributed Energy Services Companies can reach 500mm energy-poor customers within a decade".

Figure 1: Global average and forecast of PV system prices and LCOE.



Source: Observer Research Foundation Mumbai. 2007 to 2012 are actual figures and 2013 to 2022 are estimate.

Source: MicroEngergy International

Metering technologies depend on the business model and power consumed per connection. In small-scale Mini-Grids, pre-payment meters are commonly used allowing users to pay per power, energy, service, or "air-time"[2] consumed. Nonetheless, post-paid technology can also be utilized. The respective model is supported by smart metering technology.

Price Range

The price of the system depends very much on environmental and accessibility conditions, as well as the scale and respective efficiency at which the system operates. RETs require a larger upfront expenditure than diesel generators. However, diesel powered Mini-Grids' maintenance and fuel costs pose a risk due to market volatility and diesel availability. RETs usually result in significant cost savings on a long-term basis.

Type of Financing

Microfinance Institutions (MFIs) can participate in financing of Mini-Grids in a variety of ways. On the one hand, loans can be targeted either to a community or to an individual that wants to acquire the whole system in order to become the operator. On the other hand, once the system is installed, users may want to connect or enhance their connection with new loads. Loans can be directly provided to the end-users to address any issues of affordability.

Economic and Social Impact for End-users

Access to electricity and energy services can have a huge impact on the development of off-grid rural communities. Economically speaking, small-scale Mini-Grids reduce household costs by providing energy to meet basic needs, such as efficient lighting and cellphone chargers. End-users are able to enjoy an increase in comfort as well as the possibility to access information instantly through appliances such as radios, TVs, and laptops.

Benefits for the MFI

By financing small-scale MGs, MFIs will benefit from the fact that they will be able to widen the portfolio, not only by connecting their customers to a reliable energy supply but also, due to the rebound effect, the opportunity to finance other appliances that end-users would be willing to buy. Furthermore, due to the environmentally sound approach of MGs, i.e. generating and distributing electricity from Renewable Energy Technologies (RETs), MFIs will get a better ranking in the Microfinance Environmental Performance Index (MEPI).

Environmental Benefits

Environment: it reduces particulate emissions and pressure on natural resources used to produce electricity. It reuses wasteland and it reduces waste coming from dry batteries and leakages from kerosene or diesel.

Climate change mitigation: it reduces greenhouse gas emission.

Climate change adaptation: it reduces the vulnerability to electricity and fuel price volatility, and it reduces the vulnerability to volatility in energy provision.

Potential positive synergies with: efficient air conditioner, energy efficient refrigerator.[3]

[2] "air-time" tariff is based on the amount of time the energy service is provided to the end-user, usually per minutes or hours.

[3] For further information on potential positive synergies please check the named product catalogs

European Microfinance Platform

The European Microfinance Platform [e-MFP] was founded formally in 2006. e-MFP is a growing network of over 120 organisations and individuals active in the area of microfinance. Its principal objective is to promote co-operation amongst European microfinance bodies working in developing countries, by facilitating communication and the exchange of information. It is a multi-stakeholder organisation representative of the European microfinance community. e-MFP members include banks, financial institutions, government agencies, NGOs, consultancy firms, researchers and universities.

e-MFP's vision is to become the microfinance focal point in Europe linking with the South through its members.

e-MFP Microfinance and Environment Action Group

e-MFP Action Groups facilitate synergies among e-MFP members and encourage them to implement activities together, thus contributing to the advancement of the microfinance sector.

The aim of the e-MFP Microfinance and Environment Action Group is to bring together microfinance practitioners to discuss and exchange experiences in dealing with environmental issues and to create new practical tools to advance environmental microfinance. The Action Group is also intended to act as a think tank that disseminates its results among e-MFP members and the microfinance sector at large with a view to increasing the awareness of and commitment to act on these issues. It is meant both as an internal knowledge-sharing and external awareness-raising platform that serves as a reference in the microfinance sector.

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