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Promoting Energy Access through a Quality Assurance Framework for Isolated Mini-Grids

Mini-Grids to Support Universal Energy Access

Providing clean and affordable energy services to the more than 1 billion people globally who lack access to electricity will be a critical driver for poverty reduction, job creation, and improved health and social outcomes. Distributed energy solutions such as mini-grids are critical because the majority of un-electrified populations—more than 84%—are located in rural areas where traditional grid extension is not cost-effective. The International Energy Agency projects that to achieve universal energy access by 2030, more than 40% of total investments must be directed toward mini-grids.

A Key Barrier to Scaling Up Mini-Grids

While mini-grid technology is mature, mini-grid development is ad-hoc and fragmented. This creates a major barrier to the scale-up and aggregation needed to lower transaction costs and attract the commercial financial investments that are required for rapid and widespread deployment. Developing business models that will allow this scale-up remains challenging. To be successful, any business model for commercially viable mini-grids must address the needs of three key stakeholder groups:

- **Customers:** Need a guarantee of service that they can afford and are willing to pay for
- **Power suppliers:** Need to be able to guarantee a rate of return to their investors while covering all operational costs
- **Investors:** Need to be confident of the risks they are taking

Business models for utilities in mature energy markets work because the roles and relationships between these three stakeholder groups are well-defined. In the case of rural

electrification, this utility model breaks down as a result of three main challenges:

- The high cost of power provision to remote customers
- A lack of consistent cash flows from customers to the power supplier
- Poorly understood investment risk profile due to the small number and high variability of projects

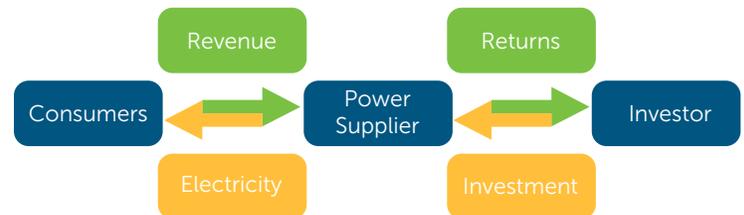


Figure 1. Utility business model in mature markets.

A Quality Assurance Framework for Mini-Grids

To address the root challenges of providing quality power to remote consumers through financially viable mini-grids, the Global Lighting and Energy Access Partnership (Global LEAP) initiative of the Clean Energy Ministerial and the U.S. Department of Energy is teaming with the National Renewable Energy Laboratory (NREL) to develop a quality assurance (QA) framework for isolated mini-grids. The framework will address both alternating current (AC) and direct current (DC) mini-grids, and it will be applicable to renewable, fossil-fuel, and hybrid systems.

The QA framework has two components :

- (1) **It will define different levels of service**—including appropriate thresholds for power quality, reliability, and availability—that are affordable to consumers and can thus ensure more consistent revenue streams for power

suppliers. These levels of service will span the entire energy ladder, from basic energy service to high-quality, high-reliability, and high-availability service (what is often considered “grid parity”).

- (2) **It will specify a common accountability and reporting framework**—based on utility models in developed energy markets—that will define a clear process for validating power delivery by providing trusted information to customers, funders, and regulators.

The QA framework aims to provide a similar structure and transparency for isolated mini-grids akin to that offered by successful utility models, while also reflecting the range of service levels—from basic energy services to grid-parity service—required to meet the needs of various segments of the off-grid consumer base. The framework’s goal is not to set a specific standard level of service, but rather to ensure truth in advertising by specifying a range of service levels and providing assessment and reporting mechanisms that can be used to determine whether an agreed-upon level of service is delivered.

The framework will lay the foundation for sustainable business models in the mini-grid space by clearly defining the roles and relationships of the various stakeholders. It will provide customers with a guarantee of service that they can afford, power suppliers with a guaranteed rate of return, and investors with confidence about their investments.

The Benefits of Quality Assurance: Unlocking Investment and Scaling Up Deployment

The QA framework can drive substantially greater market confidence and investment in this important off-grid sector by achieving the following:

- **Providing a formalized, common standard for classifying mini-grids.** The framework will outline a standard set of tiers or thresholds of end-user service and link them to technical parameters of power quality, power availability, and power reliability. This can provide clarity for mini-grid operators on the system specifications that are appropriate for different tiers of end-user service, enabling the operator to match the tier of service provided to a customer’s or a community’s ability to pay. This in turn can help strengthen a project’s revenue flows and optimize its system design and operability, which will increase the project’s financial viability.
- **Facilitating aggregation of mini-grid projects and unlocking private investment.** The QA framework will provide a clear classification scheme for isolated mini-grid systems based on well-defined levels of service. A common classification system will make it easier for projects to be bundled together for access to larger-scale finance at more competitive rates, facilitated by the framework’s common performance assessment and reporting protocol. The framework will also ensure that robust information is provided to the market on the typical technical and non-technical characteristics of isolated mini-grid systems

(e.g., payment collection rates, customer characteristics, and electrification rates), which will increase investors’ comfort level with this sector and lower the risk profile for mini-grids, decreasing barriers to private investment.

Demonstration Projects

Demonstration projects will be identified to test and verify the QA framework beginning in mid-2015. The projects will enable refinement of the QA framework and development of a final draft for adoption by the International Electrotechnical Commission (IEC). National governments and investor or funding organizations could require projects they support to follow the framework’s reporting specifications as a pathway for standardizing collection of valuable performance data.

Collaboration and Feedback

Stakeholder engagement is critical for both the development of QA framework concepts and the demonstration of results. In 2014 and 2015, our team is seeking input from a wide range of stakeholders from the mini-grid sector—including energy service providers, developers, investors, regulators, donors, and nonprofits. Inquiries and feedback may be addressed to the points of contact shown.

Development Timetable

CEM4 Roundtable on Mini-Grids	April 2013
Program launch	January 2014
India stakeholder workshop	August 2014
Global outreach	August–January 2014
IEC briefing	December 2014
Africa stakeholder workshop	February 2015
Completion of draft framework	March–April 2015
Pilot/demonstration projects	Spring 2015–Spring 2016
Adoption of final framework by donors, governments and IEC	Fall/Winter 2016

For More Information

All stakeholders are invited and encouraged to contact the project team for further information and to discuss possible collaboration around potential demonstration projects.

Caroline McGregor, Program Manager, U.S. Department of Energy, International Affairs: caroline.mcgregor@hq.doe.gov

Rose Mutiso PhD, Fellow, U.S. Department of Energy, International Affairs: rose.mutiso@hq.doe.gov

Ian Baring-Gould, Technology Deployment Manager: ian.Baring-Gould@nrel.gov

Kari Burman, Senior Engineer: Kari.Burman@nrel.gov

Mohit Singh PhD, Electrical Engineer: Mohit.Singh@nrel.gov