Clean energy and mini-grid toolkit

Module 6

Business models, finance and regulations

1. General introduction

Different approaches to ownership and operation exist depending on local socio-economic conditions and on the regulatory situation of each country. Ownership of the system and responsibility for maintenance and care are the two key factors. The operator does not need necessarily to be the owner. All business (ownership-operator models) have to find ways to control fee collection and customer behaviour to avoid overuse, misuse or careless use.

There are four major business models for mini-grid: a) utility-government agency, b) private and social enterprise, c) community and d) hybrid operator models. The preferred choice of model depends on national, social, cultural and political circumstances.

The mini-grid economics (information Sheet No.4) and business models are intimately related with financing models, options and sources, discussed further in this Information Sheet.

2. Business (ownership-operator) models

These models differ based on who owns the power generation and distribution assets, and who operates and maintains the system, and they are further defined according to relationships with customers. A mini-grid can have two entities, one owning and/or operating the power production and the other owning and/or operating the distribution. Given the small size, the owner-operator often performs both functions. In all of these mini-grid operator models, management and operations can also be performed by the owner or contracted to a third party.

In general, there is no 'best practice' or ´one-size-fits-all´ business model for mini-grids. Successful deployment of each model depends on its unique context: the natural environment (e.g. geography, and climate/weather conditions), the size of the system and availability of the energy resource), local socio-economic context, local experiences with organisations and institutions (local government, cooperatives, private organisations) and the policy and regulatory environment. Regarding the latter, policy decisions about which models to support through a particular policy and regulatory framework determine which mini-grid operator models can flourish in a country.

Utility and government agency model

In the **utility-government** business model, the utility is responsible for all mini-grid operations. If the originator is the government or government agency, the newly built mini-grid in rural areas is generally handed over to the utility for technical operation, the sale of electricity and billing of customers according to the national tariff. The funding is usually secured from the national treasury or government ministry responsible for electrification. The utility usually operates the mini-grids in much the same way that it operates the national electricity network. Power is generated by the utility (from diesel, renewable energy or in hybrid configuration) and fed into the distribution grid and supplied to the consumers, usually at the same rates paid by the utility's customers connected to its main grid.

Given the fact that the generation cost per kWh of minj-grids tends to be higher than that of the national grid as a whole with larger economies of scale, this implies that utilities usually cross-subsidise electricity tariffs for mini-grids. Utilities have the adequate financial and human capacities rapidly install a large number of mini-grids in rural areas and manage these. However, utilities usually do not invest voluntarily in mini-grids because they often consider mini-grids as an expensive non-core business. Therefore, when utilities build and manage mini-grids, most of the time they are directed to do so by the government, for example, as scheduled in the country's electrification plan (see Information Sheet No.1) and/or as an intermediate solution before the main grid arrives, and supervised by the government entity (ministry or agency) in charge of rural electrification. Utilities have limited interest in operating mini-grids in remote small and

medium-sized settlements and often are content to let these be run privately or by local communities. Financing of the engineering, procurement of equipment and construction typically comes from the national treasury, either through the energy ministry's budget. Sometimes a rural electrification fund set-up (and managed by the ministry or a separate electrification agency) that is replenished with funds from the regular budget, from a levy on the national tariff or fuels, and from long-term loans and grants provided by donors.

A variant of this utility-government model is the **utility/local government** business model whereby a mini-grid is put under the responsibility of a of a local government that has become responsible for the development of public service infrastructure in its constituency or even initiated by such a local authority.

Community-based model

In this model, the mini-grid is initiated by a national or local NGOs or directly by the village end-users. The end-users can group themselves under a cooperative (non-profit organisation under the cooperative act) or under the authority of the local community or village with an empowered decision committee and capacity to raise funds and secure partnership with the public and private sectors.

The planning, procurement of equipment, installation, and commissioning is often done by third parties, as local communities rarely have the full technical and economic expertise to develop and implement mini-grids. In the community-based models, the mini-grid may be built and initially owned by such a third party, but is ownership is eventually transferred to the local community that owns, operates and manages the system and provides all services for the benefit of its members.

The financing is typically highly grant-based with some community contributions (financial or in-kind). To allow long-term operation of the system, it is essential that community operated mini-grids at least have end-user tariffs that cover reinvestment/depreciation, operations and maintenance costs. Small community models often require ad-hoc working social and decision-making structures in the village to prevent conflicts. Larger community-driven grids are often run by more formalised structures (existing cooperative or council) and they depend less on new structures. Communities most often use the cooperative approach for mini-grid ownership and management, but also local enterprises (social or profit-oriented) can own and operate the mini-grid.

Private business model

In this business model, a private entity (enterprise) plans, builds, manages and operates the mini-grid system. The funding depends on private equity and commercial loans as well as some form of government support, e.g. grants, subsidies, results-based financing, or public-sector loan guarantees. The enterprise may be owned by private shareholders (often local businesspeople or community members), NGOs, or a mix thereof. The company may have a pure **for-profit** objective (revenue maximization) or a social objective (balancing revenues with low end-user tariffs to at least cover costs plus a small margin; **social enterprise**).

In the **concession mode**l, a private company is granted the electricity supply monopoly in the concession region during a certain period, typically 15-25 years (concession contract). The company has the responsibility to implement incremental investments mentioned in the concession contract (such as mini-grid extension over small distances) and to operate the mini-grid. A large portion, typically between 60% and 80% of the initial investments costs of the mini-grid, is financed by the public sector and donors in the form of subsidies. A portion has to be financed by the private company, which can be small or substantial, depending on the size of the concession. Unless the concession is specifically aimed at mini-grids, the private companies who invest or contribute to investment will try to maximize the return on equity by extending the main national grid and to minimise the risks of running mini-grids in rural areas (dispersed population, weak capacity to pay).

Pure private sector ownership-operator models in which all the investment comes from private sources are rare but do exist. The private sector is often better suited (than utilities) to manage efficiently smaller mini-grids. Private entities interested by off-grid business are more attracted to become an independent power producer only (IPP) and to sell power to one customer (to the national utility or local grid or off-taker) with suitable and guaranteed "feed-in-tariff". The tariff of the power purchase agreement should enable a full recovery of the annuitized capital expenditures (CAPEX) and all incurred operating costs (OPEX). The off-grid power distribution business model is less-demanding technically but is much riskier as the revenue is strongly dependent on the electricity sales to households. The revenue is directly affected by the number of customers and the average consumption per customer (see Information Sheet No.5 for detailed calculation examples).

Most companies that run rural mini-grids use a cooperative structure and are close to the NGO sector or are local social enterprises. Larger, profit-oriented, companies may be found as providers of the preparation and construction phase, that is, as a provider of engineering, procurement and commissioning services (EPC).

Hybrid business models typically try to integrate success factors of the above-mentioned models while eliminating the risks associated with a particular model. Generation and distribution of electricity may be split and carried out separately by government utilities, private companies or communities in the form of small power producers (SPP) and small power distributors (SPD). The operational structure often reflects the ownership structure, but alternatively, the duties and responsibilities can be split according to who builds, owns, operates and maintains the system. For example, the assets may be owned by the national government, but a local entity is in charge of management (operation and administration). This may be a local entrepreneur or company (that may also own part of the assets), village cooperative or a local government entity.

In the rural energy service company (RESCO) model, the investment is fully financed by the public sector and donors. The construction works are done by other contractors which are selected based on a bidding process by the public authority in charge of renewable energy. The RESCO operates and maintains the system once it has been set up and sells electricity. Those private service companies usually bid for such contracts. The tasks of the private company comprise power production and distribution, maintenance of the system and commercial tasks (meter reading, billing, collection, etc.). If things go well, the private company recovers its costs and makes a (small) profit. This model involves limited risks for the private company and does not require it to contribute to the financing of the investment costs. Finding private operating companies for power generation may not be difficult, depending on how the company is rewarded for services. As mentioned before, power distribution in rural areas is often much less profitable and attractive for the private sector.

It is essential to clearly define roles and responsibilities prior to commissioning. No matter which hybrid model is used, it depends on a regulatory framework that accommodates 'mixed' ownership and management, as well as the political will of the utility to allow or pursue it.

Malawi

In Malawi, only a few village mini-grids have been set up that are basically set up by the Government and run by ESCOM utility (the diesel-based MGs on islands) or by local communities (pilot solar/wind hybrid MGs). A few diesel-based mini-grid systems are installed at Likoma islands (750 kW) and Chizimulu Islands (300 kW), both owned and operated by ESCOM (and customers paying the regular tariff). The Department of Energy Affairs (DEA) supported the installation of three stand-alone solar PV-wind 20 kW hybrid electricity generating systems (locally known as solar villages) for demonstration throughout the country, but the systems have had design and battery problems and some have stopped functioning altogether. A detailed description of the experiences with this Government-utility led model is given in the Case Study *Powering mini grids by solar-wind-diesel hybrid systems.*

The small-hydropower potential in Malawi have in the past been utilised in private mini-grids on tea estates, such as the Lujeri tea estate and mission stations. A first hydro-powered mini-grid for rural electrification has been established by MEGA in the Lichenya River. MEGA (Mulanje Electricity Generation Agency) was set up in 2013 and is owned by an NGO, the Mount Mulanje Conservation Trust (MMCT), supported by Practical Action and MuREA (Mulanje Renewable Energy Agency). MEGA obtained a license from MERA to generate and supply electricity (in fact, the first entity other than ESCOM for village distribution). The facility supplies Bondo village with electricity started to become partly operational in 2013/14 at 56 kW capacity and fully since January 2016[1]. MEGA's now aims to provide the rural, off-grid villages of the Mount Mulanje area with access to affordable and available electricity and energy services, locally generated through a series of 40-100 kW micro-hydro schemes. MEGA is the first operational private energy company and operates as a 'social enterprise'. For more on the MEGA business model and experience, the reader is referred to the Case Study *Mulanje: pioneering a social enterprise approach in clean energy mini-grid schemes.*

The pico-hydropower schemes in Kavuzi in Nkhata Bay area are examples of local, private-led initiatives by villagers that have set up their own power supply without government or other financial support. The Kavuzi experience shows the strength but also the limitations of these local bottom-up electrification efforts, which is described in the Case Study *Kavuzi: pico-hydropower schemes, a people's initiative.*

[1] McKinnon (2013); UNDP *Project Document*

3. Financing options and sources

The capital required to start a business or to build an infrastructure project is usually obtained by raising c**orporate (balance sheet)** or **project finance**. Mini-grid distribution and generation assets can be financed using both approaches. A private (or public) company that builds these assets could raise funds at the corporate level, or could establish a project entity (Special Purpose Vehicle, SPV) for which it could arrange project financing. A utility could do either one or the other, but a community would likely not have assets or a balance sheet with a track record to raise corporate finance.

Typically, community mini-grids are developed and implemented by a third-party project developer that would structure such a SPV, into which financing would be raised, and in which the community would have some ownership based on their contribution in terms of land, labour, materials, etc. However, getting project finance is often challenging because, even bundled, mini-grid projects are very small and have relatively high financial transaction costs. Financiers will find providing project finance below USD 20 million hard to justify. In addition, mini-grids often have a large unpredictability cash flows.

Public finance

Unless customers are willing, able or allowed to pay cost-reflective tariffs in the order of USD 0.20-0.50 per kWh, project costs need to be reduced by **grant funding** of capital and project preparation cost. The grant funding may be from the regular national or local government budget, dedicated electrification funding (through an **electrification fund)**, or from charity or NGOs, bilateral and multilateral donors.

Capital subsidies are a common method of reducing project costs. They can offset the high costs of grid infrastructure and user connections and be disbursed in intervals to ensure performance. Capital subsidies may be calculated based on the number of connections, total capital (CAPEX) costs, or project IRR. Grants typically support projects to achieve equity IRRs of 15-20% (although a pure private investor may want higher IRR to reflect the increased risks encountered in rural projects in developing countries). In addition to the capital costs (CAPEX), *grant funding for project organisation, technical assistance, and feasibility work* is often used to make projects investible as well as *to offset development risks* (see Table 1).

Equity capital

Very early stage (seed) equity may be sourced from venture capital funds, and expansion capital by private equity funds, family offices, and public capital markets. Decisions to invest are based on the operator model, the market opportunity, the management team track record, and the perceived scalability of the company. An increasing number of Africa-focused investors identify themselves as impact investors with a mandate to achieve social and environmental impact in addition to financial returns and which are measured by the job creations, by the new/improved energy access, or by the carbon avoidance. While some accept lower than risk-adjusted returns, many investors target relatively high returns (e.g. 20% equity IRR) that contradicts with the social objective mini-grids of offering affordable tariffs (see table 2).

In addition to private investors, multilateral development banks, green and development funds collectively known as **development finance institutions, DFIs**) design, finance, and operate facilities that provide equity. These actors typically prioritise the before-mentioned social development objectives impact as well as financial viability, and provide growth equity to established companies or capital for projects. Due to their small size, mini-grids present a number of challenges to these financiers, but there is an increasing interest in pursuing mini -grids as viable opportunities, in particular, if these can be organised or bundled in larger programmes.

Debt finance

Debt is theoretically available from the same DFIs, local and international banks, and crowdfunding platforms. However, as mini-grids are often considered as an unproven model or fraught with unacceptable technical, regulatory, and operational risks (see Table 1) and in practice commercial lenders are hesitant to lend.

Local financial institutions are natural debt providers due to their ability to understand the local market dynamics and perform due diligence of the local project proponent. However, these institutions have limited experience in cash flow analysis of mini-grids and/or renewable energy and will demand collateral for corporate lending that the project proponent or owner(s) cannot provide. Local banks typically offer short-tenor, high-cost loans at Interest rates which may range from 16-40% that are not viable for mini-grids. DFIs can provide soft loans at much lower interest rates (say

Table 1 Mini-grid development and investment risks

Country and policy risks	Risk of regime and government stability; expropriation (through nationalisation), war, insurrection; risks of industrial action (strikes, blockades); risks of criminality
	Fiscal policy changes (subvention, tariff changes, taxation, import duties); Foreign exchange (currency) risks
	Energy planning risks (arrival of the national grid in the mini-grid area; changing electrification policies and priority of off-grid electrification)
Legal-regulatory risks	Delays in approvals, or any arbitrary actions of public authorities (e.g. withdrawal of granted authorisations) or non-transparent permitting processes for generation licences, water-use rights, land use permits, environmental permits, building permits; Uncertain enforcement of court awards e.g. damages. Lack of regulations that take the mini-grid specific requirements into account
	Risk associated with multiple permitting authorities with overlapping competencies (e.g. national, regional, local, land use planning, energy ministry, etc.); Changes in regulations for grid connection, tariff regulations, volume requirements, etc.
Revenue risks	Non-payment of electricity bills by customers, caused by either inability or unwillingness to pay or lack of effective collection mechanism; risks for non-acceptance by communities or community organisations
	Unpredictability and unexpected changes in power demand
Resource and resource price variability	Increase in diesel or biomass feedstock prices and fluctuations in availability; inaccuracies in early-stage assessment of renewable energy resource; risk of sub-optimal plant design (over- or under-sizing)
Technology risk	Risk of higher or unexpected costs of operation and maintenance: technical malfunctions, defects, or failures of the mini-grid system or parts thereof; reliability and cost of hardware
	Operational risks are mainly caused by imperfections such as miscommunication between business and customer, lack of skilled technical or managerial personnel, conflicts of interests, fraud, temporary power outages,
Environmental risks	Weather events like cloud coverage, low rainfall, storms, hail and lightning can cause damage directly as well as indirectly (e.g. by making roads impassable). Decrease in harvests due to bad weather conditions will affect biomass feedstock, while low water level in rivers can affect hydropower availability
Financial and financing risks	Non-availability of equity and debt (at reasonable interest rates) for non-recourse (project) financing
	Risk for a small project that transaction and administration cost increase beyond feasibility

Sources:
ARE *Risk Management for Mini-Grids* (2015) and ARE *Mini-Grid Policy Toolkit* (2014); UNDP *De-risking renewable energy Investments (2013)*

10%). These loans may fill the gap left by local banks, however, as mentioned earlier, the small size of mini-grids often leads to prohibitively high transaction costs. It is more attractive for DFIs to bundle mini-grids into a programme that justifies sufficiently large lending transactions, or to back up such a mini-grid programme with a credit line or guarantee scheme to encourage private lending.

Social impact funds and crowd-funding platforms also provide debt, although the limited amount of capital available is unlikely to finance mini-grid at a larger scale. However, they may lend to pilot projects to help showcase project viability and carry lower interest rates with a higher risk tolerance than many banks.

Finance and project cycle

In general, different types of financing are applicable at different times during the project cycle. Small private project developers can accelerate their electrification activities if the policy framework includes explicit guidance on the government support available, whether it is debt, equity, grants, subsidies or tariffs. Clear information about access to finance and a straightforward licensing procedure shorten project preparation time and reduce risks for mini-grid developers considerably. Implementing these basic elements of a conducive framework will, in turn, attract more private sector players to enter the mini-grid sector.

Table 2 Investment targets per type of investor

	Amounts available	Percentage of total investment	Expected interest rates
Expected input from core equity investor	Usually USD 50 k - USD 0.5 mn	Usually: >50% Minimum: >25%	15 to 20%
Impact investor / social investor	Usually between USD 0.5 mn-USD 4 mn	25 ... 30% of shares	15 to 20%
Mezzanine Finance from international development banks	Minimum: USD 5 mn – USD 10 mn	Usually: >30% of total investment Sometimes: up to 50%	3 to 18% (depending on performance of company)
Loans from international development banks	Minimum: USD 5 mn – USD 10 mn	Usually: >30% of total investment Sometimes: up to 50%	6 to 12% (interest fixed throughout payback period)

Source: SBI-Inensus *Scaling up Successful Micro-Utilities for Rural Electrification* (2013)

4. Policy and regulations

National energy policy defines objectives, identifies priorities, and outlines the broad guidelines for sector development. This might encompass the energy sector as a whole, or focus on specific sub-sectors, such as electricity and electrification. A key element, and a pillar of public support of a **national rural electrification policy** in general and mini-grids in particular, is the political aim for universal national electricity access. Setting targets and backing them up politically (by providing the necessary framework) and with resources to match lead to focused action by the involved stakeholders. Another essential aspect is the explicit decision to integrate mini-grids into the rural electrification approach. The energy or electrification policy (discussed more in detail in Information Sheet No.1) thus lays the groundwork for the entire enabling environment, which is further operationalised at the subsequent level in regulation, financing, and technical assistance instruments, which is the subject of this section.

Economic policy and regulations

Fiscal policy (and regulations) can support mini-grid implementation through low taxes and import duties, accelerated depreciation, or subsidies. Taxes on income, company profits, sales, property, value added or other taxes should be at least on the level of conventional grid supply and can be reduced further to stimulate the mini-grid market (e.g. through investment and production tax credits. The same holds true for import duties and fees, which can be reduced or exonerated for mini-grid and/or renewable energy equipment or components in order to support the mini-grid market. In general, the lower these taxes and import costs, the lower mini-grid electricity tariffs can be. Accelerated depreciation allows a lower tax burden in the early years of a project.

Customer protection; technical and environmental and regulation

One purpose of these regulations is to guarantee that products or services supplied to the public are safe and do not pose any danger in the short or long term, protect the customers, so they should be applied to all mini-grids regardless of the operator model. However, such regulation should be as lean as reasonable in order to minimise transaction costs for stakeholders

Technical regulation is required for all operator models to ensure safe and reliable operations for the protection of customers. The regulations are typically designed, published and controlled by one responsible regulator and should be in line with the national utility's grid standards. However, it may also be necessary to adapt the utility's standards to the rural context and mini-grids so that these do not become an obstacle for mini-grid developers and operators. Technical regulations will cover the following specific aspects:

- Minimum technical standards for mini-grid generation and distribution networks (including minimum safety requirements, allowable voltage and frequency variation as well as harmonic distortion),
- Operating and maintenance requirements,
- In case of integration with the main grid safe and robust interconnections between the utility's grid and the mini-grid in line with national standards.

The **quality of service** has three elements:

- Quality of product (referring to the technical parameters stated in the technical regulations, such as the frequency and voltage of electricity, and also to the quality levels of energy generated and distributed),
- Quality of supply (referring to the availability, in hours per day, and supply reliability (blackouts),
- Quality of commercial service (includes measures such as the number of days to connect a household, resolved complaints, and reconnection conditions).

Environmental regulation

Mini-grids, especially clean energy mini-grids, are usually environmental friendly compared to traditional or conventional energy sources, and local environmental sustainability can be ensured with appropriate standards and norms. Examples include enforcement of recycling of solar PV panels and batteries at their end-of-life and building standards for small hydro plants to ensure minimal impact on river flora and fauna. The procedures and requirements for conducting environmental impact assessments should be straightforward and simple for mini-grids and obtaining an environmental approval should meet little time delays, once all the requirements are fulfilled.

Generation and distribution permits

Licences or permits give the right to generate, distribute and sell electricity. These may be granted on an exclusive or non-exclusive basis. The licensing regime should always specify the role and duties of the providers, set information filing requirements and ensure consumer protection mechanisms according to the regulations discussed earlier. All necessary activities for operating a mini-grid (i.e. for generation and distribution) should be included in one license. The owner/operator of the mini-grid (or the individual owners and operators of distribution or generation assets) must have the legal right to exist and to generate, transmit, distribute and sell electricity services. These rights are usually granted by the regulator. Permits and licenses can include detailed preconditions like land leases/permits specify operating conditions, e.g. service quality and tariff specifications. The licensing regime should also take into account the rights of generation and distribution asset owners in case the main grid connects to the mini-grid

Mini-grids could benefit from using simplified registration for systems under a specified capacity size. Some countries have permanent exemption from obtaining a license or permit for small mini-grids, as in Tanzania (up to 100 kW), and Mali (up to 20 kW) (ESMAP, 2014). This reduces the transaction costs and increases the financial viability of small mini-grid systems. Example templates for distribution and generation license can be found at http://minigridpolicytoolkit.euei-pdf.org/tools.

Financial support schemes

Subsidies and grants are financial support instruments that incentivise actors to provide electricity in regions and to population groups that lack the financial means to afford the full costs of electricity by themselves. In general, for mini-grids, the combination of subsidies, tariffs and connection fees has to cover all costs incurred during planning, implementation and operation of the mini-grid in order to enable long-term operation, while at the same time yielding affordable tariffs for customers.

Grants and subsidies should be affordable for the country to allow scaling up beyond a few pilot projects and upgrading of existing mini-grids. In most countries, this means that subsidies should be as low as possible, but high enough to allow affordability for customers to increase electricity access. A dedicated agency, most often a Rural Electrification Fund (REF) or Agency (REA), can manage these grants, approve eligible mini-grids, and monitor the proper use of these funds. Information on the experiences of REFs/REAs in Sub-Saharan Africa can be found in ESMAP (2011) *The Experience of Rural Energy Agencies/Rural Energy Funds in Sub-Saharan Africa.*

For mini-grids, these grants or subsidies can be provided during the project planning and pre-investment phase (for feasibility studies, business plan development, technical planning, capacity building and transaction costs), during implementation/construction (e.g. as capital subsidies, connection subsidies), or during operation (operational subsidies, tariff top-up). Generally, it is nowadays recommended to subsidise connection fees for consumers or to use results-based subsidies that are limited in or phased out over time rather than operational subsidies. Rather than

providing a subsidy for the initial investment, the subsidies can be made available to the mini-grid operator upon reaching certain milestones (results-based subsidies)[2].

Loan support and risk mitigation

Access to debt is one of the key challenges for mini-grid developers, as discussed in Section 3 of this Information Sheet. There are various mechanisms to facilitate lending, each of which may be supported by policy and regulation. These include publicly backed debt facilities to eliminate or reduce the need for commercial lenders with market risk-return requirements, loan guarantees to offset default risk assumed by lenders such as commercial banks, political risk insurance to underwrite country risks, currency exchange rate risk mitigation instruments, and broader insurance to cover commercial and other risks. A publicly backed debt or credit enhancement facility may provide or facilitate long-tenor, low-interest loans that commercial lenders would not offer on their own, and may be administered by the national rural electrification agency or fund (or another public entity).

Loan guarantees provided by national banks or special facilities to commercial lenders may compensate the lender in the event of default. For example, political risk insurance, available from the World Bank's MIGA or Africa Trade Insurance (ATI), may protect commercial lenders against the risk of a public utility or other governmental entity failing to perform on its contractual obligations. Insurance for commercial and other non-political risks, while utilised in other sectors, have largely not been deployed for African mini-grid projects due to the small scale of mini-grid projects[3].

Malawi – regulations and licensing[4]

Electricity generation and distribution through mini-grid systems offer a great business opportunity to social entrepreneurs and NGOs. These may also be interested in investment in electricity generation through grid connection where they are eligible for feed-in tariffs (FiTs, see Box 1). The **Electricity Act (2004**) was enacted to make provisions for the regulation of the generation, transmission, wheeling distribution, sale, importation and exportation, use and safety of electricity and for matters connected therewith or incidental thereto. Anybody who generates electricity for sale and/or operates a distribution network for supply of electricity locally will have to keep to regulations and must contact the **Malawi Energy Regulatory Authority (MERA)** to obtain the necessary license.

This Act resulted in the establishment of a MERA to regulate the energy sector, to define the functions and powers of the Authority, to provide for licensing of energy undertakings, and for matters connected therewith and incidental thereto. The Malawi Energy Regulatory Authority (MERA) was established in 2008 as an independent energy sector regulator. Some of MERA's key activities include:

- Receive and process license applications for energy undertakings;
- Grant, revoke or amend licenses under the Act and Energy Laws
- Approve tariffs and prices of energy sales and services;
- Monitor and enforce compliance by licensees with licensing conditions granted under the Act and the Energy Laws;
- Prescribe and collect fees, charges, levies or rates under this Act and Energy Laws;
- In conjunction with other relevant agencies, formulate measures to minimize the environmental impact of the exploitation, production, transportation, storage, supply and use of energy and enforce such measures by the inclusion of appropriate conditions to licenses held by energy undertakings; and
- Promote the exploitation of renewable energy resources.

In order to successfully promote renewable energy technologies in the country, MERA certifies and registers companies that are involved in renewable energy systems. Only certified renewable energy companies are legally allowed to install renewable energy technologies. As of May 2017, MERA had certified 37 renewable energy companies[5].

In Malawi the national grid is owned by ESCOM and the term **Grid Code** is widely used to refer to a set of documents that legally establishes technical and other requirements for the connection to and use of an electrical system by parties other than the owning electric utility in a manner that will ensure reliable, efficient, and safe operation. Malawi has developed a Grid Code to govern the technical and operational relationships between all the parties.

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2 Alliance for Rural Electrification, *Rural Electrification with Renewable Energy - Technologies, quality standards and business models* (2011)

3 ESMAP (2014) and RECP/EUEI-PDF *Toolkit* (2014)

4 An overview is given in CES/MuREA *Community Energy Malawi Toolkit*

5 See, www.meramalawi.mw, *Electrical installers with permits as at 10th may 2017,* Permit category E

Box 1 Feed-in tariffs (FiTs) and purchase power agreements (PPA)

Recognizing the potential of the renewable sources to enhance the country's electricity supply capacity, the Malawi Government through MERA has developed the Malawi Feed-In Tariff Policy. The formulation of this policy which is specifically for small hydro, wind, solar, biomass, biogas, and geothermal will encourage and boost the development of renewable energy sources in the country. A **Renewable Energy Feed-in-Tariff (ReFIT**) is a subsidy designed to encourage the development of renewable energy. It allows power producers to sell renewable energy generated electricity to a distributor at a pre-determined fixed tariff for a given period of time. It should be noted that only e*ntities that are involved in electricity generation through grid connection* with renewable sources of energy are eligible for Feed-in Tariffs (FiT) and do not directly apply to mini-grids as such. However, as discussed in Information Sheet No.5, if the grid is at a reasonable distance, it may make sense to connect the mini-grid to the grid and to negotiate adequate tariff with the utility for the power balance (excess or deficit) or power wheeling to other customers. In principle, FiTs could also be established for Mini-Grids in case of an IPP selling to a mini-grid off-taker.

The following renewable generation technologies were selected for assessment and review which formed the basis for the REFIT for **Malawi**: a) Small scale hydro; b) Photovoltaic-solar; c) Biomass cogeneration; d) Wind, and e) Geothermal. The level of premium required to make renewable energy project economically viable depends on the levelized generation cost (the price at which electricity must be generated from a specific source to break even) and the avoided cost of the systems at the point of injection. The levelized cost of electricity (LCOE) for renewable energy generation is a function of the technology, resource availability (solar radiation, wind speed, feedstock) and the availability of the infrastructure required for the transport and construction of renewable energy projects, as explained in the Information Sheets No.4 and No.5)

Proposed tariffs are (see MERA *Malawi Feed-in Tariff Policy*, 2012)

	Max. firm power tariff (¢/kWh)	Max. non-firm power tariff (¢/kWh)	Comments
Hydropower < 1 MW 1-5 MW 5-10 MW	 14.0 12.0 10.0	 13.0 10.0 8.0	The firm power tariff shall apply to the first 150MW of small hydro, firm power generating stations developed in the country; the e non-firm power tariff to the first 50MW of small hydro non-firm power generating stations
Solar ≥ 500 kW and < 10 MW	20.0	10.0	Tariffs shall apply to the first 100 MW of power generated using solar resource; the non-firm power tariff shall apply to the first 50MW of non-firm power
Biomass ≥ 500 kW and < 100 MW	10.0	0.08	The firm power tariff shall apply to the first 200MW of firm power; The non-firm power tariff shall apply to the first 50MW
Biogas ≥ 500 kW and < 50 MW	10.0	0.08	This tariff shall apply to the first 100MW of power generated using biogas; the non-firm power tariff shall apply to the first 50MW of non-firm power
Wind ≥ 500 kW and < 50 MW	13.0		This tariff shall apply to the first cumulative 200MW capacity of wind power plants
Geothermal < 50 MW	10.5		This tariff shall apply to the first 200 MW of geothermal power capacity developed

Note: Non-firm.power provided by a power plant or system over and above the firm power and lacks capacity lacks a guarantee of continuous availability under all conditions

Given global reductions in the cost of some renewables technologies, especially in solar, if a Re-FiT is going to be formally introduced in Malawi will be *a need to update this framework* to ensure it is reflective of current prices. If developers that wish to become grid-connected IPPs, they need to submit an Expression of Interest (EoI) to MERA for the Feed in tariff Committee to review. Once approved, the IPP would be expected to sign a Power Purchase Agreement with the Power Utility Company (ESCOM). The draft feed-in tariff policy has provided a guide for IPPs to participate in supplying power, and ESCOM has had discussions with RE IPPs, although no PPAs have been signed yet.

For FiT and PPA calculation examples and templates, the reader is referred to http://minigridpolicytoolkit.euei-pdf.org/support-tools. **Tanzania** is the country in the region that has the most advanced policy and regulatory framework for small power projects supplying both the main grid and off-grid mini-grids. The Energy and Water Utilities Regulatory Authority (EWURA) has developed a standardised tariff methodology and standardised power purchase agreements and process guidelines. See www.ewura.go.tz and http://minigrids.go.tz

While PPAs, permits, licenses, and incentives framework usually exist for rural electrification, detailed and reliable information on their appropriateness and relevance for mini-grids are scarce in the literature. One can note that existing administrative procedures are rather complex for off-grid businesses. They should be simplified and standardised for mini-grid operators and small-scale projects: if the legal and regulatory requirements are the same for a small IPP and mini-grid operator as for the larger generation and distribution businesses, then the activity will never emerge.

The current regulatory framework in Malawi requires mini-grid operators to comply with largely the same regulations as a large grid-connected development, which results in costs that are often insurmountably high. The Government wants to ensure that principles of sustainability, safety, and affordability remain a priority for license holders, but realises that the costs and burdens are equitable considering the scale and profitability of new mini-grid schemes. Thus, the Government is now aiming to have distinct regulations include the level of technical detail and environmental considerations in license applications and the regulations governing power availability, tariffs, customer communications and reporting.

In this respect, the SE4All initiatives are developing a quality assurance framework based upon levels of customer service and common accountability that may offer a framework that could be useful in the Malawian context and easily adopted and transcribed by Malawi's regulators (see Bibliography).

The Government has already assisted existing and potential mini-grid developers by allowing for cost-recovery by small independent suppliers of electricity. These are allowed to charge higher prices than those paid by consumers of electricity from the national grid, so that mini-grids can operate on a more level playing field where electricity prices are reflective of the cost of generation. The MEGA-run mini-grid scheme at Bondo is a good example of this new approach, in which residents supplied by that scheme are paying more per unit of electricity than those connected to the national grid. This described in more detail in the Information Sheet No.4 and the Case Study *Mulanje: pioneering a social enterprise approach in clean energy mini-grid schemes.*

Malawi Investment and Trade Centre (MITC) is Malawi's entry point for all new investors and is mandated to provide one-stop services that are aimed at easing registration procedures for Malawi's valued investors. In light of this, MITC works hand in hand with all relevant departments and Ministries to ensure that investment approvals are made speedily. The MITC is also responsible for identifying, packaging and marketing business prospects in the priority sectors of the country. The investment certificate issued by and only attainable at MITC gives investors a chance to enjoy investment incentives. The process that a mini-grid developer should follow for licensing any of the undertakings stated above under the Electricity Act section are summarised in the table below (see CES/MuREA *Community Energy Tookit, Malawi*). More info also on www.mitc.mw

Approving authority	**Information required**	**Area of authority**
MITC	Particulars on the investor/developer	Company registration Foreign direct investment
Ministry of Natural Resources, Energy and Mining	Project concept and feasibility (as below)	Memorandum of Understanding
Malawi Energy Regulatory Authority	Government approvals and permits Project report, containing technical feasibility, financial viability social and environmental management plan, energy supply contract Tariff proposals (based on PPA) Investment programme/business plan	Determination of the project feasibility and sustainability Approval of the project and granting of respective licences
Ministry of Lands, Natural Resources and the Environment District Councils	Proposed location for the project and a brief project/investment description Social and environmental impact assessment (depending on the size of the project)	Approval of the land and terms of land usage Approval of the social and environmental management plans
Ministry of Natural Resources, Energy and Environment	Ministry of Natural Resources, Energy and Environment	Ministry of Natural Resources, Energy and Environment

The World Bank's *Doing Business 2018, Malawi* gives a good overview of setting up business in Malawi, dealing with permits, registering property, getting credit, paying taxes, enforcing contracts, insolvency issues as well as labour market and employment regulations.

In order to boost investments in the energy sector, the following **incentives** have been established to promote private sector investment in the sector:

- Duty, excise and VAT exemption for importation of goods for use in electricity generation and distribution being plant, machinery, equipment, and electricity supply meters;
- Duty, excise and VAT exemption for importation of goods for electric motors, generators, and generating sets for industrial user;
- Duty, excise and VAT exemption for the importation of goods for renewable energy sources such as wind energy engines, solar panels, solar batteries.

MERA issues licenses for the importation and sale as well as the installation and maintenance of solar products while **Malawi Bureau of Standards (MBS)** is responsible for issuing import certificates for products adhering to a set of national standards that the Bureau has in place for renewable energy technologies[6].

Malawi's Rural Electrification Act (2004) was established to, "make provision for the promotion, funding, management and regulation of rural electrification". So far, this **rural electrification fund** has been used effectively for extending Malawi's electricity grid to areas under the Malawi Rural Electrification Programme (MAREP; See Information Sheet No.1b). It is primarily funded by a levy on energy sales (i.e. liquid fuels, electricity and gas). There is scope within the Act to broaden this purpose to cover a range of activities in relation to rural electrification, cutting across a range of technologies and scales, and including off-grid electrification. Currently, the Government is exploring whether mechanisms can be put in place to fairly and effectively utilise the Rural Electrification Fund to benefit a wider range of activities than it currently does. If the scope of beneficiaries and the remit of the fund is significantly expanded, the Government will consider as to whether or not a separate rural energy or renewable energy agency should be established as the delivery body for these projects. This ties in with the direction in the National Energy Policy to, 'Create the Rural Electrification Authority as a semi-autonomous legal entity under an Act of Parliament and that its mandate includes renewable energy activities' as well as the UN Sustainable Energy for All (SE4All) Action Agenda which indicates that a renewables agency should be established[7].

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6 See *List of Standards Governing Renewable Energy Technologies Available from MBS*

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