CLEAN ENERGY SOLUTIONS CENTER
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Best Practices for Regulatory Frameworks for Solar Powered Mini-Grids, Part 1

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Hugo Lucas Porta Hello, ladies and gentlemen. I'm very happy to welcome you to the session on Solar Mini Grid Best Practices for Regulatory Framework. Once again I would like to thank for their support the International Solar Alliance and the Clean Energy Solutions Center; they are making possible these training sessions.

Some background for me. Before I joined Factor in 2010 I had been director for policies and finance within the International Renewable Energy Agency, IRENA. There I was responsible for the design of energy access with a program for the agency. Previously as a Spanish civil servant I had been involved in many national and European operations for the promotion of renewable energies and energy efficiency policies.

In today's lecture we are continuing with the model on off-grid, solar off-grid, and we are continuing with the lectures devoted to solar mini-grids. So we will go into the details today on how to set the right regulatory framework to promote solar mini-grids.

In this module we will, as always, start with a brief description and definition of what the solar mini-grids are and afterwards jump into the main body of the presentation. Don't forget at the end of the presentation you will be given the chance to test your knowledge with a little quiz.

The learning objective which this module aims to provide can be divided into three parts. First off we will learn about the regulatory and policy framework of mini-grids more generally. This is followed by a discussion on energy sector components, and more specifically on energy policy. Finally we will talk about economic policy and the relations with respect to mini-grids. Keep

in mind that this is part one of the two-part module on mini-grids regulation and policies.

A quick back up of the kind of technology we are talking about. A mini-grid, also sometimes referred to as a micro-grid or isolated grid, can be defined as a set of electricity generators and possibly energy storage systems interconnected to a distribution network that supplies electricity to a localized group of customers. Mini-grids offer an alternative that entirely avoids many of the challenges that new and expensive grid infrastructure investment requires. Mini-grid systems are becoming increasingly competitive compared to the cost of traditional grid expansion programs and are a key component in achieving a universal access to electricity for all. The reason for this are the rapidly decreasing costs of the technology, increasing the liability on a solid deployment record, all of which have strengthened the case for the federated adoption of mini-grid solar solutions across the world.

The main body of this model is divided into three parts. It will begin with an introduction and then will slowly work through the different perspective of regulatory frameworks for solar mini-grids.

The mini-grid policy and regulatory framework comprises dividing rules, strategies, institution, and associated [inaudible] of mini-grid sector. It is developed and adopted by public body, including parliament and government agencies, and it determines whether how mini-grids development take place as well as whether and through which models mini-grids are developed, implemented, and operated. The principle of mini-grid policy and revelation should in the best case be stable and long-life, clear and comprehensive, accessible, cost effective, and efficient, light-handed and simplifying as well as transparent and predictive.

Main mini grid policy questions include the discussion of whether or not to integrate mini-grids as an option for rural electrification, which approach to implement, how the purchase is to be financed, whether or how many grids have subsidized, as well as which electricity tariffs are to be applied. During this and the following model we will try to find potential answers to all these questions.

Regulation is always based on principles, either intended or unintended ones. This slide gives a short overview of recommended policy to follow for the design and implementation of mini-grids regulation. A stable policy under regulatory environment is the basis for a structure in investment determined needs. Needed to investor require assurance that both micro-scale on a specific level of traditional support mechanism would remain stable and predictable for the life of the project. There is nothing that makes investor both is the numbers, prospective more nervous than the feeling that the regulatory environment may shift beneath them once they have already committed to the project.

An incomplete or unclear mini-grid policy on regulatory framework will hinder rather than foster mini-grid rollouts. This would be fully clarity on permitted tariffs, license and permit requirements, import duties, VAT,

company taxes, and other possible incentives and subsidies, as well as for the policy and regulatory discussed in the next sessions. The process by which regulatory decisions on these issues are reached should be clear and standardized for all transactions.

Policy and regulatory frameworks will seek to ensure that the points of contact for permitting, technical, and financial support are easily accessible and available, as the [audible] should be able to contact the agencies that are key to implement the project. Regulations, procedures, and potentially researching the latest creation and session costs for the project developer, which are particular critical for a smaller developer, after all, mini-grids run on the razor's edge of commercial viability.

It is this paramount importance to design a mini-grid policy and regulatory framework that is cost effective and efficient. A regulatory framework that minimize [inaudible] delays for granting licenses and permissions, responding to increase, or providing audit support. In general for some mini-grid the less regulation is often the better, not more regulation, specifically with the small mini-grids, for instance a capacity below 0.5 megawatts. Very small mini-grids can be a symptom for [inaudible] relation, as it is the case in Tanzania and [inaudible] from mini-grids 100 kilowatts.

Regulatory decision will be transparent first, independent of power supplies and prevent government interference in day-to-day operations. Furthermore, regulatory decisions on similar issues should be consistent with previous decisions to give data credibility to the regulatory process. Incentives for mini-grids should allow a level playing field between rural electrification technologies and between alternative energy sources or potential cost-effective mini-grid technologies, so we consider it in a mini-grid policy regulatory framework.

If a mini-grid policy and regulation can be decided the basic political decision will have to include mini-grids in the rural electrification strategy has to be made. Following this further strategic decision have to be taken before going to the detailed planning of regulation and its implementation. The decision relates to the unit [inaudible] approach to be adopt centralized versus decentralized; and from financing, government versus private; and tariffs, group subsidized versus cost [inaudible] tariff, each of which is discussed afterwards. These decisions that remind which mini-grids operate on models can be applied in a country. Sometimes it may also be beneficial to support more than one operator model. In other words is decision a [inaudible] starting point, since there are simple answers sequentially throw out the policy and regulatory framework.

Most governments, particularly in Africa, have developed national electrification strategies following either the centralized or decentralized approach. In a centralized approach national government entities such as public utility electrification INCs or ministry undertake electrification alone or together on national [inaudible] stations, usually the primary means to electrification, with mini-grids playing a major role. With the decentralized approach private and community players take over the electrification of areas

far from the national grid, but are often still supported by public institutions in the planning, implementation, and operation of the mini-grids. Mini-grids can be an integral part of both approaches.

In the centralized approach either a public utility is giving them a way to store and operate mini-grids or the state can own and operate generation and distribution of related access. In the decentralized approach private companies or communities are allowed to own and operate generation, distribution, or both type of assets. Following both models in parallel is possible, but requires more effort and capacity, including very specific policy instruments and regulation to clearly define the roles and responsibility for our access. Governments have to decide which approach to follow or whether to pursue both tracks at the same time. Mini-grid deployment can be affiliated if the regulatory processes are streamlined and actors are giving the necessary tools and guidance for developing and implementing mini-grids. Levels of governments in both [inaudible] and types of operation models are interdependent and determine the pace and eventual success of implementation of mini-grids. Support instruments, like subsidies, tax breaks, et cetera, can accelerate the rollout.

Upfront financing of mini-grids can be provided by the public sector, the private sector, communities, or foreign donators, both public and private. Public financing is the primary approach for the centralized track using utilities under national list of both electricity actors. The decentralized track usually involves other financial actors. This is mostly done out of necessity; public budgets are limited and investment costs of providing electricity assets is high. It is widely acknowledged that for providing universal and electricity access private investment is needed in the more developing countries. Private investment is more easily attracted by private operators. Community contributors are also important, as they improve a project's financial sustainability.

Public sector must reconcile institutional, political, and financial reliabilities. We roll out development aspiration and then of achieving the highest possible rate of electricity access. Governments are assigning roles and responsibilities to specific public bodies to support mini-grids and are sometimes creating a new public agency to assume previously assigned responsibilities. In general, mini-grid institutional stakeholders who have specific responsibilities are clearly allocated to a singular or to a low-high cost effectiveness and [inaudible]. It is the role of the ministry of financing to decide rural electrification target to try a mission, to decide and administer national energy policy and plan, and to define rural electrification strategy, including the selection of the operation model. Further, the minister is responsible to administer [inaudible] resource allocation and to understand the mini-grid regulatory and institutional framework. The finance ministry takes the role of the treasury; it provides the rural electrification budget, builds and coordinates grounds and conventional loans, provides input on national electricity tariffs and subsidies and determines the stability of investment policy on this [inaudible].

Then as [inaudible] facilitates the implementation of rural electrification targets vision and mission from [inaudible] and implement standard economic [inaudible] relations. It is also mediate in this put and provide in a by sorted function to other entities. The National Environment Agency insists that the mini-grid meets a national environmental standard and is responsible for issuing licenses and the monitoring of compliance with environmental relations. The rural electrification agency is responsible for driving implementation of selected national operator models and in some cases performs a specific regulatory task. Also in manage related project cycles, channel loans and grants for mini-grid projects, for instance, for a rural electrification fund. The rural electrification agency is also required to monitor and evaluate mini-grid projects and develop edification plans.

Last but not least, regional authorities, they have [inaudible] have responsibilities, including the provision of support for identification of targeted areas, they authorize use and award building permits and issues utilization permits. They promote mini-grid programs and facilitate contact with electricity uses. Finally, they support the training on forming of capacities.

We will now identify and discuss policy and regulatory instruments for mini-grids. The policy and regulatory instrument are embedded in a [inaudible] process of designing and implementing a mini-grid policy and regulatory framework. This process can follow [inaudible] parts, led by the decision and action from policymakers and regulators. An overview of the main linkage between the different policy and regulatory level is given in this graph. Many instruments are linked and their effectiveness and efficiency depend on other instruments. In this graph the two parts cited in red represent the [inaudible] to policy and regulatory instruments, which include all the foundation elements that have to be in place to allow the development and operation of mini-grids. The gray-shadowed box in the bottom represents politic policy and regulations that help us get rollouts farther and fast. Without these key actors maybe were looked at to participate in advance or might wait for other players to pave the way before they start investing. We now go through this component in alphabetical order, but just bear in mind that this was part of the two-part model with only with global docs A and B.

A1. National energy policy defines objective, identifies priorities, and aligns the product guidelines for sector development. This might encompass the energy sector as a whole or focus on a specific sector, such as electricity and electrification. A key element and a pillar of public support of a national electrification policy in general or mini-grids in particular is the political aim for a universal national electricity access. Setting targets and backing them are political by providing the necessary framework and resources needed to focus action by the involving stakeholders.

Another essential aspect is the split decision to integrate solar and mini-grids into the rural electrification approach. So simply the policy should identify appropriate operator models in the respective country context as each of the four basic operator models will delete the private community and hybrid.

For solar mini-grids require a specific policy support. The energy electrification policy does lay the ground for the entire enabling environment, which is further operationalized at the subsequent levels.

If national electricity of this target are not to be achieved stakeholders need a plan to get there. For rural areas this plan should at least indicate grid and off-grid areas on the basis of the state of their tools, including the IS-based special planning software. Thus if this is beneficial for the solar mini-grid developer, it's the ministry of energy assisted by the national electrification agency develop a rural electrification master plan. This electrification strategy must apprise will easily be basic on data about the system or potential income-generation capacity of the benefits of rural electrification. Now this stems from the main grid, the population density, equity between geographic areas and the local energy resource potential and cost.

Energy, electricity, or renewal energy laws or access publish the legal and institutional framework for public planning and the implementation and enforcement of the relation for rural electrification in general and mini-grids in particular, usually through an act of parliament. They lay down the responsibility for important actors and provide the basis for any specific regulation and promotion instruments. All the instruments present us in the nexus light and the second part of this model needs this legal foundation, as well as public institutions to implement energy and electricity laws and design and enforce energy regulations.

Very important part of all this whole mini-grid and [inaudible] environment is the tariffs. Tariff set. Tariff is any charge, fee, price, or rate that has to be paid for electricity purchase. The regulation of tariffs is central to the viability of any solar mini-grid business. The design of tariffs highly depends on regulation and on available financial support, such as subsidies of service as well as on expectation for return on equity for utilities and private operators. Factors such as population density, electricity demand also influence the economy of mini-grids and need to be considered while setting the tariffs. Generally tariffs and connection fees together with subsidies must strike a balance between commercial viability of the [inaudible] projects and consumers' availability and willingness to pay.

Tariffs will aim to attract private parties to invest in mini-grids. Also they should make solar mini-grids for now sort of viable and sustainable. Tariff can also pursue to support economic development and improve living standards in the villages. They may enable better understanding of mini-grids operation. In there, however, the tariff main challenge is to balance sustainability enough for availability.

Generally policymakers must find solar mini-grid tariffs that are suited to strike a balance between commercial viability and consumer serviceability with means to pay, as we said before. However, since electricity generation costs for mini-grids are higher than grid tariff a politically equity issue arises regarding wherever or how to subsidize electricity in a higher rate for off-grid people.

We will now look to a couple of options available. A uniform national electricity tariff with equal tariff for mini-grids and national grid consumers throughout the country, which usually implies cross-subsidization for rural electricity customers. Cost-reflective tariffs for mini-grids on a national level, which is a national concession to a different electricity tariff for mini-grid customers. An incremental introduction of cost-reflective tariffs is started on a local level in order to determine whatever is practical and sustainable, however, this is high-risk of shown for project developers.

With cost-reflective tariffs only the people consuming electricity provide the remedies for recovery related to investment innovation and maintaining costs. The equity issue comes into play here; why should the rural pool pay a higher price for electricity and the fundamental service it provides when the [inaudible] and upper class enjoy electricity that is subsidized by the country as a whole? On the other hand, rural communities are generally willing to pay a fair price for consistent electricity power. After all, consumers need electricity much more than they need low tariffs, yet purely cost-reflective tariffs are relatively high for mini-grids, even though they may be the most cost-effective solution for setting up electricity access in many regions.

With a uniform national tariff the main question is who's subsidizing metering tariffs? Is it the whole population through [inaudible] financed by government budgets or assisting customers through high electricity tariffs? Indeed, electrification in most countries was and is financially supported by governments and subsidizing mini-grids can be the best option to provide quality electricity wherever mini-grids are more appropriate than the available alternatives. Finding a combination of both to call them in is probably the most pragmatic solution for the scaling of electrification.

We also have to face a second challenge—is how we are going to set our tariffs. The most common approach is to set the retail tariff based on energy. So the customer will pay for the energy to consume, they will pay for each kilowatt/hour. Of course in this case the metering is required. It has this approach sort of advantage—this you don't need to set limiters in the households. And also there is a great incentive for energy efficiency. Nevertheless, you will need readers and of course you bear the risk of customers' "unpayability." This is why afterwards you can set a post-paid or a pre-pay system, so to reduce the risk of customer unpayability you could set a prepay system where customer buys energy before consumption.

A second option is to set the tariff based on capacity. This option is also known as a flat-rate subscription tariff, where the customer pays a maximum power amount. In this case an overcurrent device is required, or a load limiter. The main advantage is that no meter is required, no bill calculation, no meter reading requirements. The main disadvantage is the high charge per kilowatt/hour, so we don't know how much it's going to be the value for each energy unit. You don't have any efficiency incentive and this discourages any productive use since the load is limited. In this case it has to be implemented within a prepaid system.

Less useful but also possible is to set the retail tariffs based on services. Here the energy is not sold anymore per unit of energy consumed, but it is based on the service they provide. So how, for instance, how many kilograms can be treated in a mill or how much water can be pumped. The advantage is they require precise and adequate calculation of prices, it relates energy to other activities, so also it relates energy to incomes, which make more affordable. But of course, once again, we are hiding the real price for kilowatt/hour and there is no incentive for energy efficiency. The system is billing post or prepay.

Finally, the last possibility of setting a tariff is per device. So people will pay in advance in relation with how many devices they are powering. This is used to reduce initial costs and to start electrification from a very basic and low level. There is no need for metering, but on the other hand it is needed to do expansions very regularly to be sure that the people is not increasing the number of devices. So you either need equipment also for tariff reduces the grid consumption and also you can know in advance more or less how much is going to be your consumption, but nevertheless still so little incentive for efficiency because you pay for the device and you don't care if your device is not efficient. And it discourages also productive uses and of course it hides, once again, what is the price, what should be the real price of each kilowatt/hour. In this case the billing, it has to be prepay.

Before we talk about the components C and D from the initial [inaudible] books on the top left, we'll now have a look at the fiscal policy and the regulation part, the top right box. Fiscal policy and regulation can support mini-grid implementation through low taxes and import duties affiliated to depreciation or subsidies. Tax on income, combined profit, sales, properties, value-added, or other taxes would not exceed the level of conventional grid supply and can be reduced further to stimulate the solar mini-grid market. The same holds true for import duty, taxes and fees, which can be reduced or consolidated for solar mini-grid equipment, a component in the [inaudible] part [inaudible] market. In general the lower these taxes on import costs the lower solar mini-grid electricity tariffs can be. Accelerated depreciation allows a lower tax burden in the early years of the project. This appreciation should also be allowed for us if they are provided through grants, as this has to be replaced at the end of the lifetime. These fiscal rules should be clear and reliable to improve investor trust.

This table provides some further information and explanation on the respective instruments. Real life examples can be found in different parts of the world. An example of the beneficial income tax treatment can be found in [inaudible] Sri Lanka, where a five-year income tax holiday applies to power generation for using renewable energies. In Madagascar, according to their tax code, investment in renewable energy can benefit from a reduction in corporate income taxes given in to 50 per cent of the investment and the taking. Also in Madagascar equipment from the production of renewable energy is sent in from the value-added tax. In Brazil companies producing electrical energy from wind, solar, and high-[inaudible] enjoy reduced import taxes. Once again in Madagascar, also investment in equipment can be

depreciated at an alternative rate of 50 per cent of the net value. And finally in Nepal an arrangement has been made to refund VAT to small hired projects developed and operated by community based on cost [inaudible] committees that do not elect to take the [inaudible] rate on import tax.

So it will also be noted that while these instruments apply to generally all of the early introduce operator models, they represent only a subordinate role for the utility approach. For the hybrid, private, and community operator model they are, however, important tools.

Ladies and gentlemen, we will stop here and come to the end of this model. In this model we have looked at the energy policy and fiscal policy and regulation. In the following session we will continue with this customer environmental regulation, licenses, and contract regulations, as well as with the support instrument.

Concluding remarks. The mini-grid policy and regulatory framework comprised abiding rules and strategies, institution and associated process that govern the mini-grid sector. It is developed and adopt by public body, including parliament and government agencies, and it determines whether or not how solar mini-grid development takes place as well as whether and through which models solar mini-grids are developed, implemented, and operated.

The principles of solar mini-grid policy and regulation should in the best case be stable and long-life, clear and comprehensive, accessible, cost effective and efficient, light-hearted and simplified, as well as transparent and predictable. We have so far only learned about the first couple of policy instruments, but already it is clear that their respective success is a function of context and intelligent implementation.

With this we are coming to an end. I would like to thank you for all our attention and I'm hoping to be able to welcome you again on the second part of this model. As always, I would like to invite you to test your understanding with the following small quiz. Thank you very much.