

Best Practices for Regulatory Frameworks for Solar Powered Mini-Grids, Part 2

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Hugo Lucas Porta Hello, ladies and gentlemen. I'm very happy to work on you to today's session on solar mini-grids best practices for regulatory frameworks part two. I would like to thank the International Solar Alliance from the Clean Energy Solutions Center, who facilitated this webinar series.

Some background for me before I joined its faculty in 2010, I have been Director for Policies and Finance of the International Vienna ANC Adina. I work responsible for the sign of the actors whether in work or in guidance. Previously, as a Spanish civil servant, I have met both in many national and apparent regulations for the promotion of the newer energies many differences.

In this lecture, we are continuing the discussion on many greats from the previous lecture and dig deeper into regulatory and policy frameworks. In this lecture, we will as always start with a brief description and definition of what a solar mini-grid are and afterwards—now, into the main body of the presentation. Don't forget that at the end of the presentation, you will be given the chance to test your knowledge with a little quiz.

11 objectives which this lecture aims to provide will consist of the mission components of the overall enabling environment, which we have started to look at in the previous work environment. Specifically, the learning objective can be divided into four parts. First off, we will continue to finish looking at the energy sector governance aspect which we have now covered so far. Customer and the mentor relations as well as the license and contact of the relations. This is followed way by a discussion of support instruments, mainly financial support sectors, company assistance, more broadly.

With backup of the can 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 solution network that supplies electricity to our localized group of customers. Mini-grids offer an alternative that entirely avoids many of the challenges the new and expensive infrastructure investment require. Mini-grid systems are becoming increasingly competitive compared to the costs of traditional grid and station programs.

Our key component in achieving universal access to electricity for all. The reason for this are the rapidly decreasing costs of the technology, increasing reliability and a solid deployment of rigor, all of which have strengthened the case for the affiliated adoption of mini-grid solar solution across the world.

The main body of this motion is divided into four parts. We will slowly work through the remaining perspective on regulatory frameworks. Technical relation is required for all operator models to ensure safe and reliable operations for the protection of customers without being obstructive for many developers' operators. For those of you who are wondering what operator models I am referring to, please have a look at the first part of these two-part model.

Technical relation for mini-grids should be signed, published and controlled by one responsible regulator. And soon, have the following specifications. Minimum technical systems for mini-grids generation and the solution networks including minimum safety requires, alloy well, boil touch and frequency variation as well as ammonia distortion, operating and maintenance requirement. And, thirdly, safe and gross interconnection between utility and the mini-grids aligned with industry standards.

Systematical standards should be specifically decided for the rollout contest but should be aligned with the national utilities standard. It may also be necessary to adopt the safety standard to the rollout contest on mini-grids. Regular countries of mini-grids and their evidence to technical relations as well as very fine incompliance with regular solution codes and standards before becoming a rationale and continuing with ongoing technical monitoring required. It is both hours for four months based subsidies can be linked to the evidence of these standards.

Efficient components can both provide not only the smooth functioning but also reliability of the businesses. International standards can be used to safe work, quality and sustainability. The International Electro-technical Commission, IEC, technical specification areas 62257 is a comprehensive set of standards cooperating the technical and organizational aspect of mini-grids. This is standards to provide a comprehensive and logical framework for the design, installation and maintenance of mini-grids with a particular emphasis on safety, user friendliness and efficiency. Moreover, the standards give an overview on important contractor questions and technical implementation plans. On the other hand, business plans, financial scheme and the rate of civil services such as embedding the project into the community are not covered by this series.

The IEC 62257 Series serves as a tech lease for good practices. Following these recommendations can ensure that project developers pursue a comprehensive, logical framework. However, the IEC 62257 cannot guarantee that project developers make the right decision, for example, in terms of dimension. For quality assurances purposes, it is useful to keep in mind the specific IEC standards for specific components, notably those for keeping models imparted. The most important ones are shown here in the right, blue box. IEC standards 61215 and IEC standards 61646 are connected with quality for crystal silicon traversal photo type models and tin field terrestrial prototype models, respectively. And IEC 61730 is confirmed with safety of the models including requirements for construction and testing. Also for PV models, it is important to have Sony testing for the performance and the deficit which lower competition.

Quality of service has three main components. Quality of the product, quality of supply and quality of commercial service. Quality of product refers to the technical parameters stated in the technical relation, such as the frequency and mortgage of electricity and also to the quality levels of energy generated on these three models. Quality of supply refers to the availability of hours per day and continuity, in short, of blank hours of supply. Quality of commercial services includes measures such as the number of days to connect a household, resolve complains and reconnect costs.

For each of the three quality of service areas, five basic assigned questions have to be answered. What quality of service will be able to regulate? What minimum levels of services will be required for each quality of services we mentioned? Who sets the standard? How are the standards monitored? How are the standards enforced? The quality of services regulations can be established and implemented by the regulator or a renewable energy alliance. In all cases, the regulatory alliance in both must establish quality of services standard that are realistic and affordable to all parties and that can be monitored and enforced. The regulators should establish a maintenance and a contract point for customer complaints.

Mini-grids, especially renewable-energy based mini-grids, are usually in better maintained frame compared to traditional or conventional energy usages. Our local regulator system ability can be ensured if we protect the standards and norms in order to show the effectiveness of such standards, policymakers have to understand the full scope of environmental impacts with respect to mini-grids deployed. Generally, one can distinguish between direct impact, indirect impacts and community impacts.

Guided impacts include, for instance, net use and net use change. This impact applies to the solution lines over houses, access roads and related issues include, for example, soil in the ocean and what the pollution for construction or deforestation that contributes to habitat loss for wildlife and economic loss for communities such as in terms of foot services that's controlled, weather, storage and ocean control. Localized pollution is another serious direct issue entailing, for example, fire pollution such as from fossil fuels, bio-energy or water and soil contamination from waste and byproducts such as from bio-energy, fossil fuels, matter leakage. Further, material waste management

requires special attention and depending on the type of battery used in solar and wind systems, there could be hazardous materials such as lead or lithium that need a special handling in these process systems. Battery manufacturers realize the hazardous effects of batteries and have started sending out setters to recycle them. Finally, water condition or impoundment can be an issue with high-powered facility that use them to storage river water and pressure wash, which may alter the water's location and flow. Water condition or impoundment can affect people as well as plants and wildlife that depend on access in their locations. Serious and also bad water quality can change land's usages.

Indirect impacts. Material pollution can entail indirect impacts. For example, as the power pollution required the mining of silica or metals and the solar-panel manufacturer preface can produce additional toxic waste. From the fuel source, further indirect impacts can arise such as with biomass-based energy, which involves a combustion as the face of to innovate electricity, which has impacts on air quality, water use and lifecycle of our _____. Finally, the end use of industry may have indirect impacts from increased use of materials and the pollution water streams.

Community impacts. Even when direct or indirect environmental impacts are minimal for a single mini-grid, several mini-grids can result in significant community impacts. For example, batteries from area storage for a single mini-grid can be contained without causing significant pollution. However, handlers of batteries in an area with no assistance for a cleanup or disposal can lead to significant soil and water contamination with, when this involves community help. Another simple is the ongoing debate from the community for the environmental impacts of bio-energy initiatives. Driving impacts home, global foot and use systems. Foresee this in requirements for conducting environmental impact assessment should be straightforward, simple and clear. Obtaining an environmental approval should be prompt when all the requirements are fulfilled and procedures are observed.

Depending on specific policy decisions on the operating model, specific licenses permitting construction and contractual—for instance, BPAs requirements—have to be qualified. These requirements should be adapted to look at circumstances and the size of the regulated min-grid. Also, keep in mind, there are more micro-grids, for instance, below a capacity of 100 kilowatts to face less standard, less licensing and less contractual requirements. Licenses or premises give the non-exclusive right to generate, distribute and sell electricity in some countries or necessary activities for operating a mini-grid are included in one relation. In others, a license for generation and a separate concession for distribution of electricity sales are required.

The optional or operator of the mini-grid or in the BDR ordinance, an operator of distribution or generation asset in the case of high-rate operator models must have the legal right to assist and to generate, transmit and distribute electricity services. And then, attend our conference with the license granted to the national utility had to be resolved. These rights are best granted by the responsible regulator or ministry. In some countries, the

responsible regulator could also use simplified registration for assistance under a specified capacity size. Generation permits and licenses may be granted on an exclusive or non-exclusive basis. The licensee regime should always specify the role and duties of the providers, set information field requirements and assure consumer protection mechanisms.

Both permits and licenses can include the set of the conditions, like land-use permits or environmental assessment and a specified operating conditions, for example, service quality on tiny specifications. The licensee regime should also have to take into account the rights of generation and distribution assets governor in case the main grid connects to the mini-grid. The process to acquire licenses or payments should be clear and cost effective in order to reduce transaction costs for mini-grid developers. Permanent acceptance from obtaining a license or permit for small mini-grids such as, for example, can be seen in Tanzania up to 100 kilowatt and Maui up to 20 kilowatt reduces transaction costs and thus increases financial reliability of pilots.

Traditional license providing exclusivity for a few years to conduct proprietary activities such as an assessment study, financial instructing, non-inquisitional construction are beneficial to the development of mini-grids and also make the process of obtaining general businesses' documents such as incorporation, tax registration, a bill of permit easier. However, case by case exceptions for licensee for pilot project are counterproductive, as they create confusion around developers and could encourage corruption. This could also prevent mini-grid owners from growing and formalizing their businesses, raising finance or selling their businesses.

A concession is a contract between a public and private entity granting exclusive right to invest, operate and maintain the distribution assets and sell electricity to end users for a given number of years in a specified geographic service area. In this area, the holder of the concession also has an investment operation and maintenance responsibility for a specified time. Thus, a concession also binds the private operator to deliver a specific quality of services in a certain number of connection or electrified population.

Holding the concession for the specified area often entails federal terms. For instance, a guarantee that no other partners are allowed to develop mini-grids in the same area, preferential type of arrangement and possibly financial incentive. Concessional schemes, which allow concessions for larger areas for competitive bidding, allow the holder to bond and cluster many projects and reach scale fast. Segregation of mini-grid projects increases efficiency in planning, financing, proper administration, equipment, supply, operational maintenance and also reduce individual project costs. And it improves the overall profitability.

In general, governments should ensure that the size of a service area and the terms of concession are suitable for local conditions and should not grant indefinite exclusive rights. The concession is usually a wire through a competitive bidding scheme which should deliver the lowest of our costs for the most connections. The bidding can, for example, be based on a fixed subsidy level from the government with bidders competing on the number

of connections and the level of service they will provide. As the goal is to provide our fastest electricity, the competitive bidding scheme should be technology nature to increase the feasibility of project developers.

Ladies and gentlemen, a quick reminder where we are right now. In the first part, we have talked about, A, energy policy and, B, economic policy regulation. So far, in the second part, we have talked about, C, customer and regulator relation and, D, licenses and contract regulation. We will now shift the focus to appropriate instruments which aim to support the energy sector maintenance and the fiscal policies and regulations, mainly, E, the financial support and, F, technical assistance.

Financial and economic aspects play an important role in promoting the development of safe operation of mini-grids. Policy and regulations can help to regulate and ensure long-term stability of cash flows for operator models. The main influencing factors include consumers' payment. For example, that is in connection fees, government support and, for example, grants and subsidies, finance streams for investors. In other words, equity and loans and other fiscal incentives such as stocks, _____, performance policies, et cetera. The role of policymakers and regulators is not only to establish this instrument but also to approve mini-grids which are eligible for funding or support. This is _____ relative education found which it provides grants and subsidies.

E1, grants and subsidies. Subsidies and grants are financial support instruments that incentivize actors to provide electricity regions and to population groups that lack the financial means to afford the full cost of electricity by themselves. In general, for mini-grids, the combination of subsidies, studies and connection fees has to cover all costs including the planning, implementation and operation of the mini-grid in order to enable long-term operation. Subsidies may also result in lower tariffs for customers. The signing a grant and subsidy regime is challenging but essential.

Grants and subsidies should be affordable for the country to allow a scaling up between a few project pilots and updating of existing mini-grids. In most countries, this means our subsidies should be as low as possible and as high as necessary. In general, subsidies have to be high enough to allow affordability for customers to increase electricity access and thus increase electricity demands and improve the economics of the electricity system, which in turn can attract more investment.

Further, a dedicated agency—most often a relative indication firm—has to manage these grants, approve eligible mini-grids and monitor the proper use of these funds. For mini-grids, these grants or subsidies can be provided during the project planning, pay investment phase. For example, for civility status, business plan development, technical planning, capacity building and professional costs during implementation construction. For example, capital subsidies, connection subsidies all during operation, for instance, as operational subsidies or tariffs _____.

Subsidies can also be made available to the mini-grid operator about reaching certain milestones which in that case one will refer to as result-based subsidies. It is further recommended to include provisions for finishing out the grant and subsidies scheme.

Access to debt is one of the key challenges for mini-grid developers. There are various mechanisms to facilitate lending, each of which may support by policy and regulation. These include publicly-backed debt facilities to eliminate or reduce the need for commercial lenders with market research and requirements, long guarantees to offset the fall risks assumed by lenders such as commercial banks, politically rich institutes on the right, country risk, currency exchange rate risks, mitigation instruments and broader insurance to cover commercial and other risks.

A publicly backed debt or credit enhancement facility may provide or facilitate long-term, low-interest loans that commercial lenders will not offer on their own and may be administered by a national public entity. One example is through the planning investment marks in the UNA performing platform, which will provide projects with the means of credit enhancement, results from financial support, technical assistance and debt finance needed to become bankable for commercial investors and lenders.

Loan guarantee provided by national banks or special facilities to commercial lenders may compensate the lender in the event of a fall. Political risk insurance available, for instance, for the World Bank's Multiple Investment Warranty Agency or African trade insurance may protect commercial lender against the risk of our public utility or other government entity failing to perform on its contractual obligations. Insurance for commercial and other known political risks while utilizing another sector have largely now been deployed for Africa mini-grid projects due to the smallest scale of mini-grid projects. High concession costs and the lack of assistance or balance sheets of most of developers. However, significant underlying commercial and political risks remind in an entity of a mini-grid model that an African countries and other countries.

Currency exchange risk can be an issue when large amounts of local currency receive votes that found operators dead and the local currency begins. The best and actual solution will be to borrow local currency in the first place in order to reduce financial currency finance assistance company. Governments' committees, Dutch private investment in mini-grids should actively engage in responding and _____ the all with the state holists identifying some other way to address this risk and establish precedents. Such precedents will lead to an increasingly applicable and scalable finance advantage.

F1. Technical needs and a technical system. The following slides are like instruments and activities that policymakers can introduce to improve capacity on three levels. On the individual level, on the concessional level and for the neighboring environment in relation to mini-grids. Capacity can be defined as the stability of people or organizations in a society to manage their affairs successfully. Capacity development can be defined as the preface whereby people and organizations in a society create about or strengthen or

maintain capacity overtime. Technical assistance can be provided for the general public in the form of a winner racing for the workforce in the form of additional training for the mini-grid project developers by providing information, guidance and recommendations to finance an institution as well as to the public institution that are in charge with the aforementioned instrument at the different levels. Technical assistance can be aided and provided by a national public entity, by a separate colleague or by different national or international actors on specific activities.

Technical assistance may address a range of areas. Awareness operations and promotions to provide information to the general public. This may include cost information and cooperation of different knowledge on projects, realistic grid extension plans, explanation of purity areas for grid connection and the data in which villages can be expected to connected to the grid. This information will allow them to make an informed decision on the accepting of mini-grids.

A specific human capacity has to be developed to implement, manage, finance and regulate mini-grid projects. Governments can facilitate finance, training and capacity development. The training curricula should depend on the vocation and be based on some technical, managerial, financial and military knowledge of mini-grids. Accurate data is essential because policy, regulation and project planning should be based on the reality on the ground and on current government plans. The most important data for project developer is obtaining information on the national grid extension plans, data on the local economic situation of communities and households as well as the total renewable resources and ways are also beneficial for policymakers, regulators and project developers.

Also public institutions need the capacity to implement policy regulations. This requires clear responsibilities, adequate financial resources and qualified managerial staff. Technical assistance measures to build additional capacities should first assess the situation. Subsequently, identify areas of integration and finally implement or assign capacity development activities such as training, seminars, exchange programs, et cetera.

We continue the list. The following areas are also potential points to be addressed. For instance, for the directed technical assistant is the promotion of semantic public networks. There are generally barriers, public institutions in both regulating and supporting the mini-grid sector. Thus, institutionalized and regular meetings of decision makers in the public institutions that are responsible for the implementation of mini-grid policies and regulations—for instance, on a quality basis—is advice and can be supported by technical assistance measures.

Furthermore, technical assistance can provide developer guidelines legally through a stakeholder consultation process. The contender will typically be on national definition and classification of mini-grids, a start of relevant electricity access and renewable energy policies, laws and regulations, instruct of relevant non-electricity sector policies, laws and regulations, location of fiscal and holding incentives of mini-grid development,

descriptions of the project development and approval process, definition of licensing processes and requirements, descriptions of applicable tariff and technical regulations.

Technical assistance can also coordinate the important instruction between international donors, finances and authorities that augmented and complex reporting requirements in both considerable transaction costs for mini-grid operators and from what I've seen with reporting is they're reporting considerably. Technical assistance may also support community involvement. The higher the participation of the community, the more likely it is that the mini-grid will be effective. Communities can be involved in position and procedures should be in place for communities to find guidance and, if needed, effect changes.

With concluding remarks, the mini-grid policy and regulatory framework comprises the binding rules, the strategies, institutions and also sets processes like the brand of mini-grid sector. It is developed and adopted by public bodies including parliament and government agencies. And it reminds when or how mini-grid development will take place as well as whether and through which models mini-grids are developed, implemented and operated. In this second part, we have learned that customer-regulator relations and standards are necessary for maintaining quality of services across all dimensions while also auditing to sustainability concepts. We have also learned that the supporting instruments with policy makers can allow or are highly important in order to allow project developers to develop on a scale of businesses profitable and sustainable. Especially in rural settings, this is important as neighboring environments are lacking and inadequate.

With this, we are coming to an end. I would like to thank you for your attention. As always, I would like to ask you to test your understanding with the following small quiz.