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Risk Management for Mini-Grid deployment in Rural Areas

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Abstract

A significant challenge for mini-grid deployment is a communication and language gap between mini-grid developers and investors about mini-grid risks and their management. While investors usually think in financial risk/return dimensions and are often unaware of the specific challenges in the field of mini-grid electrification, project developers and mini-grid operators have immense expertise in overcoming these specific challenges in terms of preventing threats but often do not use risk management tools as usually expected by bankers and investors.

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Keywords: Risk Management, Mini-Grid; Rural Development; Rural Electrification; Risk Mitigation

1. Risk Management for Mini-grids

1.1 Introduction

For the year 2014, the International Energy Agency (IEA) estimated the number of people without access to electrical energy at 1.3 billion. The IEA also forecasts that in Africa, the number of un-electrified people will probably even increase from 589 million to 689 million. This estimate is mainly caused by population growth being higher than the increase in the electrification rate. Private investments in renewable energy have increased significantly worldwide over the years 2004 to 2012 demonstrating a market opportunity resulting from the falling prices of individual technologies like Solar Photovoltaic.

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Benefitting from these trends, the decentralized electrification sector is also seeing an emergence of investor interest. Improving policy and regulatory frameworks in certain regions is drawing the attention of entire business communities and requiring the electrification industry to engage in the sector more actively and with greater professionalism. With increased private sector interest in the operation of rural electrification facilities and higher accountability requirements by financiers, the pressure to develop strategies that reduce the risk of electrification schemes failing is high. Trends like these are expected to facilitate more professional engagement of rural electrification actors and draw more investment to the rural electrification sector. Today, holistic business models are already being piloted around the world. Rural electrification project developers in East Africa and South Asia are innovating by taking different stakeholder demands into account and catering to various types of customers, leveraging managerial expertise and employing solid financial planning.

1.2 Scope for Risk Management

Mini-grids offer a promising approach for rural electrification due to the fact that they can serve the demand for electricity of households, public services and local economy in rural and remote areas. Nevertheless, mini-grid developers and operators have to invest a lot of effort in order to ensure the effective functioning of the system and if necessary recover investments. By offering a reliable source of electricity, mini-grids can also create an impact on livelihoods in rural areas by enabling productive uses and thus supporting the development for small businesses and micro-enterprises. Managing productive loads on a mini-grid system is another task which requires appropriate strategies and business model adjustments. If operated effectively and efficiently mini-grids are able to provide the necessary infrastructure to foster local economic growth at a competitive cost. The financial viability of mini-grids often improves with the streamlining of functions of the operator and the economy of scale achieved through larger demand for electricity and high number of customers.

Translating this great potential into a real business success story has turned out to be extremely challenging. Deployment of mini-grids involves complex financial and organizational questions which can be assigned to challenges in the fields of sales, technology and finance. A successful business model satisfies the demand of the customers with high quality and 24/7 availability based on sound pricing models, and relies on adequate funding. Ideally, the funding should be both from the private and public sectors, and regarding the technology it should operate reliably and be easy to maintain.

1.3 Basic aspects of risk management

At the present time, there is no general valid risk management approach for mini-grids available. Different industries elaborated their own strategies and approaches according to their requirements and specific understanding of risks. BASEL III, for example, is a concept to mitigate financial risks related to banks, COSO ERM is widely used by the industry whereas the ISO 9001 classification focuses on issues related to quality management. As rural electrification markets display a high degree of complexity, it is obvious that this sector requires its own tailor-made risk-management approach. It has to be pointed out that risk management processes are generally faced with underlying basic challenges, (see figure 1) such as complexity, uncertainty and lack of awareness.

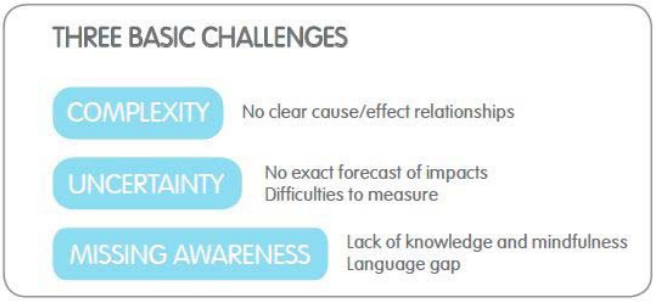

Figure 1: Basic challenges of risk management

1.4 Major risks of mini-grid operations

Risk management is not meant to completely rule out all risks but to point out benefits from changing established procedures, for example:

- Early recognition of crucial risk driving factors;
- Maintaining a balance between chances and risks;
- Initiating focused actions at an early stage to limit risk exposure;
- Opening up options for new projects.

An empirical survey conducted for this purpose has identified a wide range of risks affecting mini-grid development and operation. Evidence shows that three particular types of risks pose the most significant challenges for the further development of the mini-grid sector and should be well addressed and tackled with appropriate tools. (please see figure 2)

	Definition	Tools for risk mitigation	Approaches
Political risk	The risk that an investment's returns could suffer as a result of political changes or instability in a country	Political Risk Insurance	Relation Management with Public Authorities
Payment risk	The risk that the off-taker reduces or stops payment	So far not available for respective projects	Holistic Business Models
Risk of resource price variability	The risk that the price of energy sources increases (e.g. biomass, diesel)	So far not available for respective projects	Hybridisation of Mini-Grids

Figure 2: Three major risks of mini-grid operations

1.5 Risk management measures to overcome major risks

Political risks differ in each country and affect businesses in general. Political risk maps or security risk maps, for example like the ones developed by the company "Controlrisks", could be useful to get a first insight when entering new markets. At national level, some political risks can be covered by insurance instruments, however the ones that are usually available are designed primarily for large-scale projects

and can be hardly accessible for small- and medium-size projects like mini-grids. Nevertheless, some instruments are available from Overseas Private Investment Corporation (OPIC) or the Africa Trade Insurance Agency (ATI-ACA). For the time being, insurance instruments specific to mini-grids remain largely unavailable. Although policy regulations at national level are improving in some countries, small regional or local mini-grid projects often face a regulatory framework which is not always clearly determined. An important measure for dealing with political risks is to engage and build the trust of local authorities. The continuous involvement and consultation of local authorities during the development and implementation of mini-grid projects is an approach which has proven successful in ensuring fruitful cooperation and successful mini-grid operation. Additionally in the case of the impending arrival of the national grid, project developers and/or mini-grid operators should seek the dialogue with the responsible authorities at the earliest point to develop an appropriate strategy. To generate cash flow even with the arrival of the national grid, a feed-in tariff may often be an optimal solution to overcome this risk.

The **payment risk** or risk of non-payment is one of the most important threats mini-grid projects have to overcome. Efforts that can mitigate such risks can be incorporated in various stages of the design and operation of a mini-grid. First, customers need to be made aware of the consequences of non-payment such as supply cut-off or penalties due to delayed payments. Secondly, mini-grid developers could also contribute to increasing their customers' ability and willingness to pay by promoting productive use of electricity and hence increase the income of the customers. Additional awareness creation measures, such as the high costs of traditional fuels and the negative health impacts of fossil fuels like kerosene could reduce the risk of non-payment. Ease of settling bills and non-bureaucratic procedures for getting a connection and paying for electricity consumed can improve the rate of tariff collection. Furthermore, the utilization of smart metering systems equipped with tamper protection or in combination with incentives for electricity use, could also contribute to stabilizing payments and cash flows. Further solutions to overcome such problems includes establishing an appropriate customer relationships management systems, and ensuring that conflicts are resolved via established community institutions and/or and involvement of relevant stakeholders like village leaders or village power committee management.

The risk of **resource price variability** has to be considered for systems using diesel gensets or biomass gasification facilities. As the price of diesel in rural areas is closely linked to international prices, national fossil fuel policies and local factors like transportation costs, mini-grid project developers relying on diesel generators have relatively few opportunities of mitigating the risk of increasing diesel prices once the system is installed. During the design stages of hybrid mini-grid projects, the share of diesel can be adjusted in order to reduce the exposure to price volatility risks. Project developers, who implement biomass-based energy facilities, need to ensure that the price is stable over time. In this case appropriate mitigation strategies could be:

- Establishing close relationship to local biomass supply sources;
- Creating dependency by supplying the supplier (waste-ash as fertilizer); and
- Offering bargain electricity price for biomass suppliers (instead of pay for biomass).

2 Copyright

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Biography

David Manetsgruber is currently employed at the University of Applied Sciences Neu-Ulm as research associate. Over the last years he gained intensive experience in Countries all over South-East Asia and Sub-Saharan Africa by coordinating diverse projects and conducting several studies in the field of rural development.

Prof. Dr. Bernard Wagemann is Professor at the University of Applied Sciences Neu-Ulm and head of the competence center of business management. Moreover he is also Co-Director of the Institute for Decentralized Electrification, Entrepreneurship and Education.