



Original research article

System building in the Kenyan electrification regime: The case of private solar mini-grid development

Mathilde Brix Pedersen*, Ivan Nygaard

UNEP DTU Partnership, DTU Management Engineering, UN City, Marmorvej 51, 2100 Copenhagen, Denmark



ARTICLE INFO

Keywords:

Institutional work
Solar PV
Mini-grid niche
System building
Kenya

ABSTRACT

Given the growing interest in the ability of the private sector to contribute to the goal of providing universal access to energy in developing countries, this study sets out to investigate the practices and business approaches of private actors in the emerging niche of private mini-grid development in Kenya. The paper's analytical focus is on how niche actors are influencing and creating change in the incumbent electrification regime of grid extension to strengthen and expand the niche for private mini-grids. The analysis shows that, in addition to internal niche processes like the alignment of expectations, learning and network building, niche actors actively engage in various forms of institutional work. The greatest emphasis here is on regulatory institutional work in order to influence legal and economic frameworks, but niche actors also engage in cognitive institutional work to enhance acceptance of the niche technology by constructing a shared world view between niche and regime actors. Interestingly, niche actors also engage in normative work to establish positive normative associations with the private-sector model, like equity and social justice. The research concludes that in this case institutional work is collective work drawing on different mandates and relying on different skills and resources.

1. Introduction

As part of the current international push to eliminate energy poverty, decentralised options like mini-grids have become established as a crucial part of the effort to achieve universal access to modern energy services by 2030 [1,2]. Mini-grids are highlighted as the missing link between large-scale national grid extensions and small-scale solutions like solar home systems and lanterns, being estimated to deliver forty percent of the new capacity needed to meet the goal of universal access [1]. Rural electrification has traditionally been a matter for state bodies. However, local government bodies and international actors are increasingly stressing the importance of private-sector involvement if the goal of universal access by 2030 is to be met [3,4].

Mini-grid development has a long history in Sub-Saharan Africa.¹ In Kenya mini-grids are primarily diesel-driven systems set up by the government to connect rural market centres and towns far from the existing grid and projects to provide electricity to communities based on small-scale hydro, PV and wind, alongside systems introduced by NGOs, research institutions and faith-based organisations [9]. More recently, the technological focus has shifted toward solar-powered systems due to technological advances, price falls [10,11] and new

mobile payment and monitoring solutions [12,13].

A new aspect in this sector is the emergence of private firms which have started operating solar-powered, village-sized mini-grids in rural areas. This started in Kenya in 2011, but it has since spread to other countries in SSA. These firms resemble each other in being small, start-up enterprises founded by expatriate engineers and business people, their core business being to deliver power through mini-grid systems to rural consumers. The emergence of this group of privately owned firms using new technology and new business models can be conceptualised as an electrification niche that is starting to challenge established ways of planning, regulating and 'doing' electrification in Kenya – what we here call the 'electrification regime'.

While village-based, donor-driven mini-grids have been relatively well researched [14–16,7], knowledge of private-sector involvement in mini-grid development in Sub-Saharan Africa is limited. Research is emerging on the barriers to attracting private-sector involvement in rural electrification [17,18], but sector-wide empirical investigations into firm-level processes of technology diffusion are not available.

In this paper, we aim to shed light on the emerging phenomenon of privately owned mini-grid firms, which are expanding by combining innovative technologies and business models, and to focus on how these

* Corresponding author.

E-mail address: brix@dtu.dk (M.B. Pedersen).

¹ Since the turn of the millennium, village-size mini-grids have been established in more than two hundred villages in West and North African countries such as Burkina Faso, Mali, Senegal and Morocco [5–8]. In East Africa, until recently village-size mini-grids have not had the same spread, and by 2016 being fewer than fifty [9].

companies are creating options for expansion by challenging the existing electrification regime. In studying this emerging phenomenon, the paper aims to provide an empirical contribution and to generate research questions for further research on private mini-grid development. More specifically, we investigate the practices and business approaches of these private firms, how they ‘do business’, what their strategies are, and how and why they engage in influencing the existing regime in order to diffuse their innovations and strengthen this specific electrification niche.

The structure of the remainder of this paper is as follows. Section 2 provides a brief account of electrification in Kenya. Section 3 presents an integrated analytical framework based on the multilevel perspective (MLP) and the concept of institutional work. Section 4 outlines the research methods that underpin the study. Section 5 presents the electrification regime and examines the semi-coherence and inherent conflicts within it. Section 6 presents empirical findings showing how system building takes place in the private mini-grid niche. Section 7 discusses how the four niche actors are conducting institutional work, deploying different strategies and using different skills to influence institutional settings at the regime level so as to create change in the system. Section 8 concludes the paper.

2. The context of electrification

Since the establishment of the rural electrification programme in 1973, rural electrification in Kenya has been guided by the overall priority given to the industrial and productive sectors [19]. The cost of expanding the grid to rural areas has been considered prohibitively high, while demand for energy in rural areas has been regarded as too low to be financially viable [20]. Rural electrification has been driven by public funding that is highly reliant on foreign aid, especially from USAID, the US development agency. Despite a reorientation towards targeting the poor more effectively through its ‘New Directions’ policy in the 1970s, particularly in rural areas [19], rural electrification rates remained low in the following decades, being still below four percent by 2003 [21].

With the de-regulation and unbundling of the energy sector in the 1990s, in which a framework was set out for opening up the sector to the private sector, and the further restructuring in 2006, with the establishment of a Rural Electrification Authority (REA), the government stated its intention to prioritise rural electrification. However, REA’s mandate was limited to the electrification of public facilities like trading centres, secondary schools and health centres, leaving the surrounding households unconnected. Thus, although REA’s work has led to an increase in electrification by raising the connectivity rates of public facilities from 25% in 2008 to about 68% in 2016 [22], overall rural connectivity rates remain low. While national electricity rates rose from 9% in 2003 to 20% in 2013, rural electrification rates remained low at 7% in 2013 (IEA). Likewise, the stock-listing of the distribution company, Kenya Power (KPLC), in 2006 further solidified its role as a company accountable to its investors, leading to a continued and increased focus on urban industrial customers [23].

3. Conceptualising regimes, niches and institutional work in electrification

This section provides the conceptual framework used in this paper. The first section introduces the Multilevel Perspective (MLP) on sustainability transitions, which is used as an overall framework for analysis, and it defines and provides an empirical delineation of the electrification regime and the electrification niches that have been identified. The second section describes the conceptual framework for analysing and making sense of system-building through institutional work, which is central to the research question.

3.1. The multilevel perspective

The multilevel perspective (MLP) [24,25] was developed in a European context to analyse how transitions towards sustainability take place following complex, interactive processes at the three levels of landscape, regime and niche. Recently, and in some cases rather uncritically, this framework has also been adopted for research in a developing country context, which typically differs from the situation in European countries in terms of a weaker state apparatus, less transparency and lower levels of legal enforcement, and relatively high levels of economic and social inequality. Of special importance is the circumstance that external donor interventions play an important role and developing countries typically rely more on foreign sources of technology, knowledge and financial resources than is the case for developed countries.²

Being aware of these challenges in adopting the MLP framework in a developing country context, and paying special attention to the roles of donor interventions and of the foreign sourcing of technology, this paper applies the MLP framework to explore the development of the private mini-grid niche and the processes at work in the Kenyan electrification regime. The MLP emphasises that the alignment of processes at these multiple levels is important in grasping the nature of transitions [27] and that ‘both niche processes [...] and changes in the incumbent regime are necessary for understanding the innovation journey of a new technology’ ([28]: 581). According to Raven [28], the greatest prospect for niche expansion and up-scaling is when stability in the niche increases in combination with a situation of relative instability in the regime.

In the literature, there are no clear prescriptions for how regimes and niches should be delineated empirically, but as Markard and Truffer stress ([29]: 607), this is important and should be done in a manner that is as ‘clear and explicit as possible in order to fully unfold the analytical power’. We acknowledge the multidimensionality of regimes and niches [24], and in this paper the regime and niches are delineated according to: domain of application, technology, business model and ownership. On this basis, we have drawn up three niches for electrification, which are evolving in competition to the mainstream electrification regime in Kenya. The delineation of the niches and the regime is described below, and visualized in Fig. 1.

3.1.1. The electrification regime

The electrification regime is characterised by KPLC’s continued management and control of distribution in grid-connected areas and in mini-grids established in smaller and larger towns located far from the main grid. In this regime, the plan is to reach new consumers through the extension of existing grids operated by KPLC. The focus on connecting industrial users and grid extension is still there, but the Last Mile Connectivity project, launched by the Kenyan Government in 2015 with support from the African Development Bank and the World Bank, is in essence a push to increase connectivity rates among low-consumption households as well by offering highly subsidised connection fees to people living within 600 m of existing transformer stations. This project was mandated to raise national connectivity rates to 70% by 2017 [30].

Within this regime, REA continues to focus on electrifying market centres, schools and health clinics. These are in some cases supplied by individual solar systems, but mainly by extending power lines to target the schools and health centres. In 2016, REA was mandated to establish 25 mini-grids in the smaller towns, which after commissioning are meant to be handed over to Kenya Power for continued operation and management [31]. An important characteristic of the electrification regime is the uniform tariff for all customers. This means that customers

² For a further discussion of the literature critically addressing the challenges in adopting the MLP framework in a developing country context, see e.g. Hansen et al. [26].

Download English Version:

<https://daneshyari.com/en/article/6557364>

Download Persian Version:

<https://daneshyari.com/article/6557364>

[Daneshyari.com](https://daneshyari.com)