



## **Commercial yet social: The practices and logics of bringing mini-grid electricity to rural villages in Kenya**

**Pedersen, Mathilde Brix; Wehrmeyer, Walter; Nygaard, Ivan**

*Published in:*  
Energy Research & Social Science

*Link to article, DOI:*  
[10.1016/j.erss.2020.101588](https://doi.org/10.1016/j.erss.2020.101588)

*Publication date:*  
2020

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*  
Pedersen, M. B., Wehrmeyer, W., & Nygaard, I. (2020). Commercial yet social: The practices and logics of bringing mini-grid electricity to rural villages in Kenya. *Energy Research & Social Science*, 68, Article 101588. <https://doi.org/10.1016/j.erss.2020.101588>

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# Commercial yet social: The practices and logics of bringing mini-grid electricity to rural villages in Kenya

## Abstract

Private mini-grid developers, which deliver power to rural communities in developing countries through for-profit business models, represent an alternative organisational model compared to traditional state-led, donor-led or community-driven models of rural electrification. However, as the 'private model' covers many different ways of doing business, this paper seeks to broaden our understanding of its complexities. This is done by using insights into organisational hybridity as a defining characteristic of organisations that have a dual mission consisting of social and economic aims and by applying the analytical concept of institutional logics. The paper explores how four different mini-grid firms in Kenya draw on both a *commercial logic* and a *social welfare logic* in their everyday operational activities in order to achieve their goals. By studying the practices, activities and sense-making of the four firms, as well as the effects of these practices in the targeted areas, the paper illustrates how some firms by prioritise one logic over the other, while other firms blend the two logics in their work. The paper finds that firms using a blending approach seem to derive synergies from integrating the two logics into their work. However, more research is needed to improve understanding of this link and of the organisational drivers that underpin each approach.

**Key words:** institutional logics, hybridity, rural electrification, private model, mini-grids, Kenya

# 1 Introduction

There are currently 600 million people living without access to electricity in Sub-Saharan Africa[1]. Electricity provision in rural areas through so-called mini-grids has long been established as an important link between individual household solutions (like solar home systems) and large-scale grid extensions as a way of achieving universal access to electricity [2]. Compared to individual household solutions, mini-grids are seen as providing more development benefits due to their better ability to support productive use [3]. Furthermore, private-sector involvement and the leverage of private-sector funds to achieve scale have been stressed as crucial if the goal of sustainable energy access for all by 2030 is to be met [4,5]. Although electricity provision is traditionally seen as a basic public service delivered by the state, the current situation in many developing countries suggests that the utility-led model, with national grid extension as its primary form of electrification, will not succeed in delivering universal access in the near future. At the same time, private firms are emerging globally that deliver electricity to poor rural households by implementing off-grid solutions like solar lanterns, solar home systems as well as mini-grids through for-profit business models [6,7].

We know from a growing body of research investigating various aspects of economic and operational sustainability of such private models that the private mini-grid model is able to deliver power to rural communities through for-profit models even at a cost that is competitive to grid-extension [8,9]. Functional aspects of the private mini-grid model in regards to aspects such as system sizes, service levels, payment models, cost levels are well-understood [10–13]. However, research show that private mini-grid development is highly dependent on conducive policy frameworks and regulation. Studies highlight particular regulatory gateway barriers hindering private sector engagement such as lack of legal frameworks in case the central grid were to be extended to an area that is already covered by a mini-grid [7,14] as well as proposing specific policy instruments for increasing private investments into the sector, including reconfiguration of national subsidy schemes - that often favour the national utility - in order to increase private sector participation in the sector [15–17].

Governments through policy setting are thus to balance the demands of private sector with the needs and demands of its populations in terms of development impact and just electricity provision. While the body of knowledge on private sector engagement in rural electrification is growing, knowledge of particular and contextualized business processes, i.e. firms' 'ways of doing business' in a particular community, is limited. Detailed insights into how private energy-service providers operate in practice and what sets these business models apart is relevant for policy makers in their effort to design regulation and support mechanisms that favours not only private sector but also maximise the social outcomes for the rural populations being served.

Private firms that choose to pursue a social mission through commercial activities operate in a sphere of competing social and economic aims [18]. What constitutes appropriate goals and legitimate means to achieve one aim may not constitute appropriate goals and legitimate means to achieve the other. Behind private mini-grid firms' functional goals of connecting people to electricity lies the social goal of catalyzing social impact by improving people's lives. At the same time, firms are driven by the goals of achieving financial viability and of delivering a return on investments to their investors. The direct act

of providing access to electricity might constitute a legitimate mean to achieve a social goal. However, the way in which firms conduct their business to achieve this goal may expose trade-offs between social and commercial aims at different levels in firms' business models. As opposed to the tangible outcome i.e. the electricity connection, these trade-offs may be manifested in ways that are not immediately apparent. So far, there are no empirical studies addressing the potential dilemmas resulting from private delivery of rural electrification at the village level focusing on the part of the businesses model concerned with customer-firm relationships. It is therefore of empirical interest to explore how mini-grid firms operate and what the effects are of their different practises. Against this background, we set out to demonstrate how the business of bringing electricity to rural areas is played out differently across a small number of emerging private firms and to answer the following question: how do private mini-grid firms draw on competing logics through their ways of doing business and what are the implications at the village level?

Following the introduction, Section 2 presents the analytical framework and outlines the available logics identified in this case study. Section 3 describes the methods underpinning the study. Section 4 provides a contextual overview of rural electrification in Kenya as well as a presentation of the four firms that constitute the case for this study. Section 5 presents the findings. Section 5.1 show how mini-grids and mini-grid firms are discursively constructed by themselves and their environments through the use of narratives drawing respectively on the commercial and social welfare logics. Based on an analysis of the logics that underpin the practices and decisions of the four firms, as well as the effects of these practices on communities, Section 5.2 shows how two groups firms are responding differently to the logics that are available to them. Section 6 discusses the two types of responses identified including the institutional embeddedness of the firms. . Section 7 concludes the paper.

## **2 Analytical framework: institutional logics in hybrid organisations**

The inherent organisational complexities of balancing social and economic aims [19,20] opens up for the conceptualisation of mini-grid firms as hybrid organisations [21–23]. The identity and work of such organisations is characterised by their being shaped and guided by multiple institutional logics. Institutional logics are the taken-for-granted social prescriptions that guide actors' behaviour [24–26]. In relying on multiple institutional logics, such organisations play two or more 'games' at the same time and 'engage with multiple audiences that prescribe different and, at times, conflicting demands' [21 p. 1]. Although mini-grid firms often neither identify nor perceive themselves as social enterprises with an explicitly dual mission [27–29], nor explicitly develop business models with a dual or triple bottom line [30], they operate in a hybrid reality between social and economic aims. Section 5.1 will show how mini-grid firms are subject to such hybridity. As highlighted by Pache and Santos (2013), hybrid organisations need to find ways to deal with the multiple demands to which they are exposed. Institutional logics are instantiated in and carried by individuals through their actions, tools and technologies [31], and institutions (that is, "cognitive, normative and regulative structures and activities that provide stability and meaning to social behaviour" [32 p.33]) are being reproduced through the everyday activities of individuals (ibid.). Practice and action at the individual level are thus micro-level

manifestations of logics [31,33]. Therefore, by looking at the everyday operational activities performed by individuals in pursuing the various firms' goals, we can gain insights into how these firms respond to the logics available to them. Section 5.2 will do exactly that by showing how mini-grid firms draw on different logics by analysing their everyday operational activities.

Inspired by Pache and Santos [18], we have identified two ideal-type logics to guide the analysis: *the commercial logic* and the *social welfare logic*. The commercial logic refers to the actions and practices of a firm that is seeking to optimise the economic viability and efficiency of its business model. The enacted commercial logic is thus directed towards the good of the firm and is a manifestation of the market logic (see Thornton [26]). In enacting this logic, the focus of the firm is its own self-interest, its activities and practices being tailored towards increasing its organisational efficiency and profit. This logic directs attention away from the customer, their circumstances and the wider community to focus attention instead on the firm itself and how its actions measure up to standards of economic efficiency.

The logic of social welfare, by contrast, is oriented towards the interests of the targeted community. Here the firm is accountable to the community it serves. This logic is enacted by the firm's activities and practices being directed at supporting and optimising social and human welfare and development. The logic represents the firm's actions and practices in seeking to increase democratic participation, increase the firm's accountability towards the community, and secure equal access to both electricity and information. This logic is thus to some extent a manifestation of the state logic [26], in which the cognitive attention of the firm's actors is directed towards the good of the community, democratic participation, the rights of citizens and human rights.

The ways in which firms - through their actions - draw on these logics reveal insights into the variations across the firms. According to the literature, strategies for responding to hybridity can take different forms in either to separate or to reconcile logics [18]. A separation strategy refers to when an organisation symbolically endorse practices prescribed by one logic while actually implementing practices promoted by another logic (decoupling) [34,35]. This strategy is often used to manage situations where external pressure is misaligned with internal practises [18]. A reconciliation strategy refers to when an organisation blend or combine practices taken from different logics into a single organization [19,36]. It is commonly concluded that this strategy can secure endorsement by field-level actors and, at the same time, achieve effective performance [36].

By analysing how four firms draw on the commercial logic and the social welfare logic, this paper shows how one group of firms separate logics by prioritising one over the other and another group of firms reconcile by blending the two logics in their work.

### 3 Methods

The logics of private solar PV mini-grid actors are explored by means of a qualitative, country-specific, multiple-case study conducted primarily through exploratory and in-depth interviews. At the time of data collection (mid-2015), the four firms being examined for this study, were the only four firms active in Kenya developing mini-grids for rural electrification. Because of the limited existing knowledge about this organisational form, the four cases are considered to be of intrinsic interest and value [37]. The aim was therefore to generate data that will provide insights into particular firms, their business models and the experience of their customers. Exploratory and semi-structured interviews were instrumental in revealing

insights into how firms 'do business' by exploring their respective processes, functions and everyday activities. Firms' staff were, for example, asked to describe the ways in which they collaborate with other firms, select new sites and engage with customers. Interviews were designed to act as a 'conversation with a purpose' [38], which entailed a process of evolution from interview to interview, as new insights were acquired and new themes emerged. This also permitted a focus on exploring conflicts and tensions at the levels of policy<sup>1</sup>, firm operations and end-users, which in turn was instrumental in revealing the strategies and logics of the different actors [39]. For example, firm actors were asked to reflect on the tensions between their social and economic aims, as well as to share examples of difficulties in their work.

The empirical data used in the study therefore comprise in-depth, exploratory interviews with three groups of participants: i) twelve interviews with ten staff from four mini-grid firms (at least two people from each firm); ii) eleven interviews with key informants with knowledge of the firms and the sector in general, including policy-makers, regulators, the parastatal distribution company, non-governmental organisations and independent actors; and iii) sixty-two interviews with end-users and non-connected neighbours in four villages (see Appendix A for an overview of the interviewees). Interviewees in the first two categories were selected through snowballing starting with a few known experts and identifying others through them. For the group of end-users and non-connected households selection of interviewees was inspired by Bierschenk and Olivier de Sardan's [40] method for identifying strategic groups in fieldwork. Data were collected with the aim of identifying and covering as many strategic groups as possible. The two main strategic groups identified were those of connected and non-connected households. In order to identify further strategic groups, initial interviews were made with key persons in the village (shopkeepers, landlords, persons of influence, etc.), who could be expected to possess information that could lead to the identification of further strategic groups. The strategic groups that were identified included (in addition to connected and non-connected households): i) landlords, ii) tenants, iii) affluent households (owners of restaurants, hotels, shops, etc.), and iv) poor households. The aim of the data generation process was thus to represent respondents from each of these groups and to shift between the groups from one interview to the next in order to cover and possibly expand the number of strategic groups along the way. While the objective of this approach is to improve external validity, selection bias was not entirely eliminated as we were relying on our local village guide in the selection process.

Supplementary data include observations at four mini-grid sites, one for each firm. Interviews with firms' staff and key informants lasted between thirty minutes and two hours, were conducted in English, recorded and transcribed. Interviews with customers and their non-connected neighbours lasted approximately twenty to thirty minutes, were conducted using an interpreter, and documented by means of hand-written notes.

Data were collected over a two-month period in 2015 and were part of a larger PhD research project on rural electrification through private models [7,41–43]. Further, data were generated from secondary sources, including grey literature, popular media reports and information from firms' websites.

---

<sup>1</sup> The firms' strategies for influencing the policy level through institutional work is addressed by Pedersen and Nygaard (2018)

Transcripts, notes and documents were subjected to qualitative analyses at different stages. First, an open and inductive coding exercise was carried out to explore how firms were discursively constructed. This included firms' representations of themselves, as well as how mini-grid development was represented by actors in the broader environment, such as development practitioners, policy-makers and the public media. This led to the description of two main narratives, which, in combination with established logics in the existing literature, were used to develop a characterisation of two ideal-type logics. Secondly, firms' practices were coded according to aspects of their business models. The analysis focuses on relations between the firms and their respective customers and is therefore organised according to the business-model aspects of 'customer segments', 'channels' and 'customer relationships' [44]. 'Customer segments' refers to the different groups of people or organisations that an enterprise aims to reach and serve. 'Channels' refers to how firms communicate with and reach their customer segments, collect payments, raise awareness, help customers evaluate their products and provide post-purchase support. 'Customer relationships' refers to those relationships a firm establishes with its customers, including customer acquisition, retention and increasing sales. Thirdly, each firm's practices were coded according to the prevailing logic underpinning them. Firm practices were subjected to a closed coding scheme in which sense-making, language used, rationales and activities were coded in accordance with the two logics. This led to the identification of two different ways in which firms enact the logics, namely either by blending the two logics, or by prioritising one over the other (see Appendix B for illustrations of coding and data). Finally, practices and approaches within each of the business-model aspects were then linked to their effects as observed and reported by end-users in the villages. The analysis is based on both reflexive and non-reflexive representations of the logics, taking into account both how firms talked about their practices, and how the logics we have identified become manifest, unintentionally, through their practices.

## **4 The empirical context**

This section will start by describing the evolution of rural electrification in Kenya as well as outline recent developments including the entry of private mini-grid firms in the sector. Secondly, the four firms that constitute the case for this study will be presented.

### **4.1 Rural Electrification in Kenya**

Like its neighbours, Kenya has historically been struggling to increase its electrification rates especially for its rural population. In the past, rural electrification in Kenya was guided by the overall priority given to the industrial and productive sectors [45] with the costs of electrifying sparsely populated areas being regarded as too high to be prioritized [46]. Mini-grid development has primarily taken the form of diesel-driven systems set up by the national utility to connect towns far from the existing grid as a complement to grid extension efforts. In addition to these public mini-grids, a small number of community-based mini-grid systems with a substantial subsidy element have been implemented by NGOs, research institutions and faith-based organisations [42]<sup>2</sup>.

---

<sup>2</sup> 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 [69–71]. In East

Although increased rural electrification was one of the objectives behind the deregulation and unbundling of the energy sector in the 1990s, progress was slow the following years. The first tangible sign of prioritizing rural electrification came with the establishment of a Rural Electrification Authority (REA) in 2006. The following years, however, REA's mandate was limited to the electrification of public facilities like trading centres, secondary schools and health centres. Thus, although its work led to an increase in electrification by raising the connectivity rates of public facilities, overall rural connectivity rates remained low at 7% and urban rates at 60% in 2014 [47].

In 2011, following a steep fall in solar PV prices, general increase in the quality of renewable energy technologies and increased use of mobile phone technology, an IEA report stated that 40 % of all needed capacity to achieve universal access by 2030 was expected to come from mini-grids. These developments led to increased interest for mini-grids in general and for privately financed mini-grids in particular. From around 2011-2012, Kenya saw a small number of new private firms starting to operate solar-powered, village-sized mini-grids in rural areas responding to the new and optimistic expectations to the market. This new interest in mini-grid development happened alongside the ongoing market expansion and diffusion of solar home systems where mini-grids were seen as a next step in providing quality power for productive uses in off-grid areas.

In 2015, the Kenyan government set an ambitious goal of universal access to electricity by 2020 through its last mile connectivity project and it embarked on a dual policy of grid expansion and implementation of mini-grids [7,48]. In 2018, the target of universal access was changed to 2022 through the Kenya National Electrification Strategy. While the energy sector was opened up to private mini-grid development through liberalisation of energy regulation, there were yet no specific mini-grid policies in place to guide private sector participation. The active mini-grid firms were thus operating a smaller number of sites at a pilot status with the authorities. From 2012, the Kenyan government, with support from donor organisations, embarked on drafting a new policy to regulate the mini-grid sector to allow for private companies to be included in the sector, and to ensure a uniform tariff for all Kenyans [7]. However, developments toward a clear policy framework to support private actors were slow. Despite slow progress on the policy side, in 2015, the monopoly of the national utility was broken when the first private mini-grid developer got licenced to distribute and sell power directly to customers (ibid). Around the same time, in 2015, the government initiated the Last Mile connectivity project to expand the national grid in which households within 600 meters of existing transformer stations were connected at highly subsidised connection fees. This project was financed by the World Bank and based on findings from a large university study that showed how large populations living 'under the grid' were not connected to electricity [46]. In the years from 2014 to 2017 impressive progress was made in increasing connectivity rates. In 2017, rural connectivity rates had reached 68% and urban rates 90% [49]. These figures were primarily achieved by connecting customers already within reach of the national grid while the hype around large scale roll-out of mini-grids by private sector was slowly deflating.

---

Africa, until recently village-size mini-grids have not had the same spread, being still fewer than fifty by 2016 [42].



By 2017, 13 million people were still without access to electricity and programmes like the Kenya Off-grid Solar Access Programme<sup>3</sup> - initiated in 2018 - highlights the sustained need to activate the private sector to achieve universal access for all. Also, the energy bill, drafted in 2015, was finally approved by parliament in early 2019 and is laying the basis for more private sector involvement in the sector, although still in non-concrete terms. Better knowledge of the private sector model is thus timely as such knowledge can feed into existing and future mini-grid programmes that seek to engage private sector players.

## 4.2 Mini-grid firms in Kenya (The Case)

The basic business model of the four firms covered in this study, was to provide electricity to rural populations, at a profit, through technologically advanced solar-powered mini-grids, a service for which customers paid a tariff per unit used via their mobile phone. Firms 1, 2 and 3 had own portfolios of projects which they developed on a build and operate or build, own and operate basis. These mini-grid firms resembled each other in being small, start-up enterprises founded by foreigners. The fourth firm was a special purpose vehicle of a larger donor organisation (see below for more information). Firm 3 operated in ethnically homogenous villages in the Western highlands of Kenya. Villages were approximately in the size of 200-300 households with people relying on subsistence farming and coffee and tea growing. Firm 1, 2, and 4 operated primarily in market villages in Masai country. These market villages were characterised by ethnic heterogeneity as people gathered in these villages to trade and conduct business based on the economy surrounding the Masai community. Such market places vary in size and may hold between 50 and 500 households. Business may include grocery shops, food, drinks and accommodation businesses, service shops like hairdressers, shoe repair and phone charging and businesses like welders and millers.

The kWh price were set at cost-reflective tariffs. This means that tariffs were set a level where the capital cost (solar panels, batteries, mounting structures, distributions lines, meters etc.) and operational costs of the mini-grid would be paid back over a certain period of time. As the firms did not receive support in the form of subsidies (except to some extend firm 4, see more info below), the tariffs were relatively high compared to national uniform tariff of 20 US cent per kWh (see Table 1). However, the firms delivered a service (electricity) that competed with very expensive alternative energy sources (such as batteries, kerosene and diesel). The tariff model was thus developed to strike a balance where people were paying less on a monthly basis for their energy uses than before. While this is true for the larger majority of people in the villages some people are simply too poor to connect to the system at all as they cannot afford the approximately USD 10 upfront connection cost and use too little energy for it to make economic sense for them to shift from traditional energy sources to electricity.

Due to the high tariff levels customers could only use electricity for low-end tier services (like lighting, phone charging, fans, refrigeration, TVs, etc.) at a cost which was lower than what they would pay for alternative sources of energy like generator sets and

---

<sup>3</sup> KOSAP is a USD 150 million, five year programme (2018-2023) implemented by Ministry of Energy, the Rural Electrification Authority and the national utility KPLC Financing comes from the World Bank and USD 40 million are earmarked for mini-grid development. Initially, 121 identified mini-grids sites are to be developed in a public-private partnership.

kerosene. The tariff levels did not allow the customers to use electricity for full high-end-tier energy services (e.g. welding or milling) at a cost that is lower than individual diesel-generated electricity. Using electricity for welding, at a kWh rate of say 2 USD, is simply more expensive than using a generator set, while lighting up a house using a lightbulb is cheaper than using a kerosene lamp. Thus, the tariff model, with high per kWh tariffs, worked because people used few watt/kilowatt hours per month. A low-end consumer used approximately 1-2 kWh per month and a high-end consumer used approximately 4-8 kWh per month. Higher levels of consumption (for example for cooking) would thus quickly become unaffordable. The use of 1 kWh equals the use of one 11W light bulb for three hours per night for one month. Several of the firms were experimenting with varying tariff levels according to consumption levels.

The four firms had developed different business models, reflecting their various levels of access to capital. Firms 1 and 2 had developed a model according to which they built and in some cases operated the mini-grids, but only at the demand of clients who had access to capital. This is in contrast to firm 3, which built, owned and operated its portfolio of mini-grids. Firm 3's business model thus requires substantial capital for investment in new projects, and the firm's expansion was made possible due to strong affiliations with tech-finance communities overseas and success in raising commercial finance in the form of venture capital and equity capital. Firm 4 deserves special explanation, as it was donor-funded and was being implemented by a donor with the purpose of testing and demonstrating the private mini-grid model. The firm was a so-called special purpose vehicle (SPV) set up as a private entity in trust. It operated on a full commercial basis, albeit with one hundred percent subsidy on investment in the grid and a subsidy on interest rates for the production assets. This explains firm 4's lower tariff level. Thus, firm 4 represents a variation of the private model that differs from the others in that it received a subsidy on investment, and because of its interaction and knowledge-sharing with the development actor that provided the funding. The characteristics of the four companies, which accounted for all the operational private firms in the sector in 2015, are provided in Table 1.

**Table 1. Key features of the firms in the study**

Firm	Year Founded	# Sites <sup>4</sup>	Mini-grid size (kW <sub>p</sub> ) <sup>5</sup>	Connections per mini-grid	Tiers <sup>6</sup>	Tariff USD /kWh <sup>7</sup>	Mode of operation
1	2011	12	1.4-6	10-20	Tier 2	2-5	Build and operate
2	2012	3	1.4-6	10-20	Tier 2	1.8-4	Build and operate
3	2011	4	10-50	200	Tier 2	3-5	Build, own and operate
4	2014	1	40	220 <sup>8</sup>	Tiers 2-4	0.7-1	Build, own, operate and Transfer

## 5 Findings

Before diving into the actions and practices of firms (in section 5.2), section 5.1 illustrates, how private mini-grid firms are exposed to multiple demands and operate in a hybrid reality where multiple logics are available. Mini-grid development is debated and framed by a broad field of global actors, including development practitioners, bureaucrats, policy-makers, researchers, investors and the media, as well as by the mini-grid developers themselves through self-representations on websites and in the media. Narratives and representations of phenomena are selective use of language based on cognitive and normative frames constructed by those who use it [50,51]. To show the hybridity and duality in the representation of mini-grid development, section 5.1 presents two narratives that are based respectively on the commercial logic and the social welfare logic. This is followed by Section 5.2 that zooms in on firms' practices and actions to show how firms respond differently to these logics.

---

<sup>4</sup> Restricted to those systems owned by the firm.

<sup>5</sup> KW-peak is the potential maximum production capacity of the solar PV mini-grid system. The mini-grids all have battery storage and can therefore provide a larger peak load, for example, at night, and some have diesel back-up generators. Firms 3 and 4 have installed one mini-grid per village, while firms 1 and 2 have installed one or more mini-grids per village.

<sup>6</sup> Tier 0: no capacity; tier 1: very low capacity (minimum daily supply capacity: 5 watts, 20 watt-hours); tier 2: low capacity (70 watts, 275 watt-hours); tier 3: medium capacity (200 watts, 1kWh); tier 4: high capacity (800 watts, 3.4 kWh); and tier 5: high capacity (2000 watts, 8.2kWh) [72].

<sup>7</sup> Range dependent on consumption.

<sup>8</sup> At the time of data collection (September 2015) twenty connections were in place and two hundred more were planned to follow and have since been installed.

## 5.1 The hybrid representation of mini-grids and private mini-grid development

The two narratives each consist of a broader global narrative about private mini-grid development, as well as of the self-representations of the four firms. These mini-grid narratives are presented below.

### **Techno-economic narrative: *mini-grids as technical wonders and profitable business cases***

The techno-economic narrative is a manifestation of the commercial logic. It is based on arguments concerning the reasons or premises that have made mini-grids a realistic alternative compared to other forms of rural electrification, such as grid-extension, home-based systems or pico-lighting options. Technical advances in solar-cell components and storage technologies have both increased performance and reduced costs [52], while technical advances in the area of telecommunications have made it possible for firms to do remote monitoring, obtain real-time data and manage payments effectively [6,53]. These advances have made such systems economically viable in ways unseen before, and solar-powered mini-grids have proved to be more economically viable in many cases, specifically for off-grid areas with low-density populations, compared to diesel-powered mini-grids and grid-extension [9,15,54,55].

Private mini-grid firms draw primarily upon a techno-economic narrative in their self-representations. Firms highlight the importance of proving viability as an organisational goal: *'I think we see the most important goal as proving financial viability'*.<sup>i</sup> They also emphasise the importance of their highly advanced and novel technical solutions as one of the reasons turning their businesses into a success: *'Our core product, a microgrid management platform, combines a range of technologies (including smart metering, data analytics, mobile money, a web-based management app) and applies them to deliver solar electricity in a way that's never been done before.'*<sup>ii</sup> The solution is even highlighted as being smarter and more technologically advanced than conventional energy distribution systems: *'[the firm's] technology turns any solar installation into a utility service more advanced than you can find in most OECD cities.'*<sup>iii</sup> The close link between technological innovation and economic viability in the case of private mini-grid developers is emphasized by the Ashden,<sup>9</sup> which highlights how the underlying technology of a mini-grid firm *'stands to tip the balance in expanding access to electricity by making micro-grids an investable proposition.'*<sup>iv</sup>

Private mini-grid firms typically frame their demonstrations of a viable business case as a condition for attracting investors. A firm's ability to be profitable is dependent on its technological product, which in turn is crucial to attracting commercial finance and scaling up operations. One developer expressed the connection between technological innovation and economic viability in this way: *'[the firm's] technology and data-driven approach to microgrid development and operations will enable the formation of a new asset class. It will enable us to cost-effectively reach tens of millions of people in rural villages unserved by grids while offering strong risk-weighted returns to investors.'*<sup>v</sup> Further, *'A key driver of these investments is no doubt the role of remotely controlled and monitored solar*

---

<sup>9</sup> Ashden is a global platform promoting and rewarding sustainable energy entrepreneurs who annually make awards for innovative solutions.

equipment, enabling flexible payment models and the collection of valuable electricity consumption data.<sup>vi</sup>

### **Rural development and social impact narrative: *mini-grids as a way to achieve universal access to electricity and to catalyse rural development***

The rural development and social impact narrative is a manifestation of a social welfare logic that uses arguments highlighting the positive outcomes of access to energy for productive use. These arguments stress the social benefits of mini-grids and of electricity from mini-grids as a *'life-changing alternative'* to diesel generator sets, kerosene lamps and charcoal as power sources.<sup>vii</sup> Since mini-grids can provide sufficient electric power to support productive uses [56,57], they are highlighted as a more advanced solution compared to solar home systems and pico-lighting systems [56]. By offering opportunities to improve people's lives and alleviate poverty, the link between access to productive energy and rural development and poverty reduction has received considerable attention from international development actors and governments over the years [57–59]. As expressed by SE4ALL [60]: *'Without access to modern energy, it will not be possible to achieve the Sustainable Development Goals for reducing poverty, improving public health and broadening the reach of education'*. These arguments are aspirational in nature and tend to highlight the potential impact of mini-grid implementation, rather than actually evaluated impacts. This includes how access to productive energy is linked to benefits such as cleaner, safer homes, lives of greater dignity and less drudgery, better quality health and education, and the potential for better livelihoods through local income generation [59]. Likewise, the potential of mini-grids to impact positively on whole communities through *'village-wide'* distribution networks [61] provides an argument that supports the narrative of mini-grids as a superior solution to individual solutions like pico-systems or SHS. Media reports in both the traditional and online media specialising in energy issues emphasise the community aspect of mini-grids: *'[the firm] is harnessing the power of mobile [money platforms] to bring affordable electricity access to rural, off-grid communities'*<sup>viii</sup> and *'[...] grassroots sustainable energy provided to off-grid communities, often forgotten about by big business, can create jobs, pay for education and transform lives.'*<sup>ix</sup>

Through self-representation, private mini-grid developers use this narrative as a way of legitimising their area of business both to external stakeholders and internally. Here they draw upon arguments involving notions of morality and justice by highlighting how their firms are *'providing access to those who need it most,'*<sup>x</sup> securing *'better lives for the most vulnerable people'*<sup>xi</sup> and *'transforming people's lives.'*<sup>xii</sup> Customers' stories are presented on firms' websites to communicate the ways in which their businesses are improving people's lives by highlighting how *'[c]ustomers are now able to light their homes longer to work or to study'* and how they *'benefit from increased access to information, entertainment, and connection via radio, television, stereo, and satellite dish.'*<sup>xiii</sup> Although mini-grid firms are primarily seeking to demonstrate economic viability, their businesses are also built on a sense of purpose that they are doing business for a good cause: *'For us at [the firm] the sense of purpose runs particularly strongly [...] We watch in real time from [...] HQ as these people tune in for the Sunday afternoon Premier League match or switch on their irrigation pumps. In terms of positive career affirmation, it doesn't get much better than that.'*<sup>xiv</sup> Thus firms view themselves as providers of solutions to achieve these development impacts through *'good business': '[the firm owner] believes the way that you improve the lives of people [...] is not through charity, but with good business [...] We're of the camp that*

*believes that if people value something, then they will pay for it [...] We think the way to really achieve development results is to [...] design a great product that they love, that works for them and gets them on board with a business.'*<sup>xv</sup>

By sketching the two narratives of how mini-grid development is debated and framed by a broad field of global actors, including mini-grid actors themselves, this section has illustrated how mini-grid firms are operating in a hybrid reality where both commercial and social welfare logics are available to firms.

## **5.2 Logics in action: prioritising between or combining logics**

We now turn to the micro-level processes of how firms draw on these logics by zooming in on their actual practices and actions on the ground in their efforts to serve their customers, that is, in the parts of their business models that are concerned with customer segments', 'channels' and 'customer relationships. While the firms resemble each other in many ways in terms of their aim of delivering electricity to rural populations as well as their product and technology, our analysis shows that mini-grid firms respond to the logics available to them in two ways; either by prioritising the commercial logic in their work or by blending the two logics in their work. These different ways of responding to competing logics will be elaborated below.

### **5.2.1 Commercial logic guiding the work of the firms**

Prioritisation of the commercial logic above the logic of social welfare is primarily seen in the practices of firm 1 and 2 as will be unfolded in the following. In prioritising the commercial logic, the firms reflect the expectations of the social welfare logic in terms of its symbols and language, but in its day-to-day practice they continue to operate in line with the commercial logic.

#### *Customer Segment*

Site selection and customer acquisition are, for firm 1 and firm 2, based on criteria that reduce the risk of investment, such as: i) remoteness from existing infrastructure, thus reducing the risk of the grid meeting the mini-grid; and ii) economic activity in the area and a demonstrable demand for power by individual households, thus reducing the risk of non-payment. Within selected rural market towns, these firms mainly connect small businesses (shops, restaurants etc.) or in some cases households that have a demonstrable demand for electricity, usually through their involvement in some kind of trade or business.<sup>xvi</sup> Although there is no set minimum threshold for connecting a household, only households with a 'decent load' will be connected.<sup>xvii</sup> New customers need to demonstrate what is regarded as a viable level of demand from the firm's viewpoint: a desire by people to connect based on recommendations from already connected neighbours is not a convincing argument on its own.

This practice of selecting which villagers to connect and which not is thus based on the criterion of economic viability and represents a risk-minimizing and optimization strategy. The practice of connecting households that demonstrate a decent demand for power reflects the firm's interest in acquiring customers who have an actual demand for power. It is based on the consideration that those who are already consuming power (for

example from a diesel genset) will constitute a viable customer group capable of generating immediate revenue for the firm and will increase their demand for electricity over time in order to improve or grow their businesses, which will in turn further improve the viability of the site. These firms are thus connecting the ten to forty most energy-consuming households within a village through one or more mini-grids per site.

### *Channels and Customer Relationships*

Managing expectations of community members and community leaders become an important strategy in order to uphold this practice of connecting only some in the village. This include communicating clearly to customers, as well as to other stakeholders such as village leaders and local government, the firm's goal of being economically viable in order to foster understanding and acceptance of their aims and hence of their strategy of connecting only parts of the village: *'So far we've done a good job of like managing expectations, so we never say everyone is going to get power [...] I think people generally understand that, like, if you want to get connected you need to demonstrate that you can use power.'*<sup>xviii</sup>

To communicate and reach its customers, firm 1 and firm 2 uses an individualised, one-to-one communication strategy. In the sales phase, head-office field staff visit the sites and go from door to door in an effort to sign up potential customers. The field team engages directly with individual households by interviewing potential customers about their current energy use and demand and to explore their interest in and support for the idea of becoming connected to the mini-grid system. By using an individual communications approach, the firm can retain control over which households in the community to approach and reduce risk by ensuring that only the most energy-consuming households are informed of and offered an opportunity to be connected (commercial logic).

While connections are carried out initially by professionally trained electricians, firm 2 highlights how it allows people to do their own connections: *'We have actually had some people who [...], like, from their own initiative connect their neighbours from their houses and they just split the bill, like: we think that's great, you know; we are generating the power, so we want it to get used'*.<sup>xix</sup> This practice reflects a commercial logic in which the opportunity for the firm to increase its revenue is given a higher priority than making sure that all connections are done correctly, safely and according to the right specifications, as with the social welfare logic.

With regard to after-sales service, two practices are observed. One is to use a site agent to act as an intermediary between the firm and its customers and the second is to use a direct customer phone line linking the connected customers to the main office. Both practices represent an approach in which the firms focus primarily on the connected households and thus limit their interaction with the broader non-connected community. A site agent is a person living in the village in which the firm is operating and who is paid to be the point of contact for the firm. The site agent thus acts as a link between the firm and its customers but is not an employee of the firm. Customers do not have direct access to the firm, but they receive text messages directly from it if there are technical problems with the system. Using a site agent can therefore be seen as a way not only of streamlining the firm's operations, but also of controlling the flow of information by using one-way communications and thus establishing an arms-length principle with their customers to minimise resource-consuming interactions with them (commercial logic). The second practice of using a direct customer phone line linking the connected customers to the main office offers a personalised form of assistance whereby each customer has direct access to

the firm. By introducing a customer care phone, firm 1 has established a direct connection between its customers and the head office through which all connected customers are able to contact a dedicated member of staff at the firm whenever they experience a problem or have a question. However, those in the village who are not connected do not have access to the firm and thus do not have access to information about the system, the prospects of being connecting in the future, etc.

### **Effects of practices driven by a dominant commercial logic**

In communities where enactment of the commercial logic predominates in firms' practices, three patterns of effects emerged from the interviews: i) uneven dissemination of information; ii) competition among community members and information capture by gatekeepers; and iii) entry barriers and lock-in effects.

In communities where an individual approach to communication is used exclusively and where only some of the community are connected, there is unequal access to information, those who are connected having better access than those who are not.<sup>xx</sup> A second effect that is closely linked to the low levels of information available and the uneven dissemination of information in the community is internal competition within the community and information capture by gatekeepers. Access to electricity may increase income-earning opportunities for those who are connected to the mini-grid, who therefore acquire an incentive to exclude others from being given access. For example, this was the case for mobile-phone charging: with more households being connected to electricity, people become capable of charging their own phones, as well as starting their own phone-charging businesses, thus increasing the degree of competition in the community.<sup>xxi</sup> It was observed that this competition created resistance on the part of the connected households to new households becoming connected, as households with a productive business (e.g. hairdresser, phone-charger, a bar) had a competitive advantage over households that were not connected and that relied instead on their own generators for power. This issue of competition between connected and non-connected households led to another observed conflict of interest on the part of one site agent in acting as a representative of the firm on the one hand and protecting his own personal interests on the other. As a businessman already relying on generator sets, the site agent's connection to cheaper mini-grid power had enabled him to increase his income from his business of charging mobile phones. In his position as a firm's site agent, on the other hand, he had been given the task of exploring and collecting the names and phone numbers of those who were interested in becoming connected. This information would be used by the firm to determine whether an expansion of the system would be viable. However, although according to the firm a fair number of people (10-15) had expressed an interest in becoming connected at the time of the study, the site agent explained that he had *'been too busy to collect names and numbers of people who was interested and to report back to the [the firm]'*.<sup>xxii</sup> This shows the risk of potential information capture in situations where communications between the firm and community members are mediated by people with vested interests.

Furthermore, the approach of connecting only some members of a community was observed to be creating an entry barrier to non-connected households that it had not been deemed viable to connect when the system was initially introduced. Although a household may become eligible for connection over time, it may not be viable or feasible for the firm to connect it. As highlighted by a villager who was living in a rented house at the time of



registration and later built her own house in which she ran a small business (a bar), she was refused connection at her own request, even though she could demonstrate her ability to pay.<sup>xxiii</sup> This suggests that exhibiting a 'decent load' and one's ability to pay is not enough to obtain connection to an already operational system. Connection will happen only at the firm's discretion, and in order for it to be viable for it to make the necessary reconfigurations to the system, scale up the capacity and take the other measures required to connect new households, a certain minimum number of interested households is needed. While solar-powered mini-grids are highlighted for their positive characteristics of being modular [42,62] and are thus easy to scale according to need and additional loads, this modularity is conditioned by the existing configuration of the system. It may also be determined by new investments in the form of, for example, additional solar panels, battery storage etc.

Furthermore, due to the unpredictable nature of future increases in demand, it is not possible for the firm to give any indications of a timeline for making new connections, leaving those who are interested in being connected in a situation of uncertainty.<sup>xxiv</sup> Lastly, there is the risk of a potential lock-in: as these firms operate in areas far from existing infrastructure, it is unlikely that the national utility, KPLC, will extend the national grid into these areas in the near future. Furthermore there is a risk that these areas may even be bypassed by KPLC and other competing private operators in the future due to the fact that a mini-grid developer is already operating there. Although having an area connected by KPLC does not necessarily mean that all households in that area will be connected, it still presents a possible dilemma that certain parts of a community are unable to acquire access to power even though the community is already being served by a mini-grid developer.

### 5.2.2 Blending of logics

Blending of logics is primarily seen in the work of firm 3 and 4. By blending, the firms incorporate elements from both logics not only in symbols and language but also in day-to-day practices related to its operational activities. These practices will be unfolded in the following.

#### *Customer segment*

Firm 3 and 4 follow practices of site selection and customer acquisition based on high population densities and low proximity to existing infrastructure, as well as the goal of connecting as close to 100% of the households within the chosen area as possible. While those companies that follow the commercial logic see the 'connect all' strategy as expensive (because of the high cost of installation) and as a risk-prone strategy (because of a low ability to pay), a representative of firm 3 made sense of the 'connect all' strategy in three ways, drawing on a combination of the commercial and social welfare logics. The first argument is based on keeping the costs of new connections low. The more mini-grid sites the firm builds within a geographical area, the lower the contracting, operational and management costs (commercial logic). A second argument is based on the firm's aim of building good relationships with the communities they serve and stresses the need to gain the acceptance of the whole community. By prioritising the connection of everybody within the community, despite the lack of a viable demand from low-consuming customers, the firm gains acceptance in the community and builds its legitimacy in the areas where it works. This argument is rooted in a belief that the economic success of the firm *depends* on

social welfare, thus prompting use of the two logics to create synergies between the two goals. One practice that was observed to ensure high connection rates within a particular village is to leave two vacant connections for each new sub-hub the firm installs.<sup>xxv</sup> This means that for every 18 households that are connected to the mini-grid 2 lines are left vacant for potential new subscribers. A collective buy-in from community members is highlighted as important in order both to gain access to the cheapest options (e.g. wiring across landowners' land) and to make sure that no one is left out. *'They have to have a realistic chance of getting access to this, otherwise then you don't get complete ownership of the micro-grid by the village, and then you will have elements in the village that will oppose why they were left out, so that's key.'*<sup>xxvi</sup> While the higher cost of connecting everyone is reflected in the higher tariffs charged by firm 3, the firm has set up a tariff system in which no consumer should pay more for electricity than the current alternatives for the low-end tier services (TV, phone-charging, lighting). This increases low-end consumers' ability to pay. Furthermore, the tariff system is arranged so as to mitigate the negative economic impact on the firm of connecting low-consuming customers by having high-consuming customers effectively subsidizing the connection of the otherwise unviable low-consuming customers.

Thirdly, by actively pursuing saturation in the areas in which it operates, firm 3 avoids a situation in which a large unconnected group will be left without the opportunity to connect in the future. Here the social welfare logic is nicely aligned with the commercial logic of having access to a larger customer base in the future from which to draw valuable data and to which to sell additional energy-consuming products or services to increase the firm's revenues.

### *Channels and Customer Relationships*

To communicate with and reach its customers, firm 3 and 4 primarily uses 'barazas' or open-air meetings as a platform to engage as many in the community as possible at one time. This strategy is combined with door-to-door visits to solve individual problems, as well as to reach all connected households for training purposes.<sup>xxvii</sup> Open-air meetings are used during all phases of project development. This includes the initiation phase to provide information about the firm, phone numbers, tariff and connection fees, how to pay the bill, business numbers, connection procedures etc., and the operational phase for training purposes and for the ongoing exchange of information between customers and the firm. By applying a collective communication approach, the firms reaches its customers efficiently by spreading information to more people at once, as well as minimizing the risk of misinformation being spread (commercial logic). At the same time, the firms supports public participation by the whole community by providing people with an opportunity to speak out and ask questions, as well as promoting the open and inclusive diffusion of information throughout the served community (social welfare logic). The two logics are thus congruent and provide synergies in supporting the overall aim of connecting as many customers as possible. Communal decision-making is therefore used as a tool to arrive at collectively agreed decisions between the firm and community members. In a move to organise households into clusters to form a single substation, firm 3 involved the interested households by assigning them the task of forming the groups themselves. In this way the firm transferred ownership of the process to the community, as well as the responsibility for creating a commonly accepted solution.

Communal meetings were also used as a participatory exercise in order to include community members in decision-making processes and to increase ownership with regard to specific decisions and the project in general. Issues such as where to place the mini-grid system (panels and container for hardware) and the process of organising households into clusters for a connection sub-hub were facilitated through joint meetings in the village. While communal meetings are not a safeguard against the influence of vested interest, these communal approaches show social welfare measures, including democratic participation and inclusive decision-making, being used to leverage the firm's efficiency and viability goals, thus also demonstrating how the two logics are enacted in combination. Furthermore, firm 4 implemented formal procedures to increase community members' influence over the project process itself. Practices such as establishing a project committee with balanced gender representation and setting up complaint procedures were made to foster accountability of the project on the part of community members and to increase consumer rights within it (social welfare logic).

Firm 3 emphasises the importance of community members having their own individual connections: *'Each wants their own individual connections because they want to have control over their spending, and they do not want to be cut off because somebody else did not pay their portion or anything like that. So we find it best if everyone has access and control over what you are going to consume and what you are going to pay.'*<sup>xxviii</sup> This shows how the interests of the community are served and how the sense of control by customers individually constitutes the basis for the decision to connect, thus reflecting the social welfare logic in the firm's sense-making over how customers should be connected.

Lastly, with regard to ongoing engagement with customers, firm 3 has established local offices and firm 4 has hired local staff to act as site managers. Firm 3 has employed staff local to the specific villages in which it operates, including site managers who are responsible for the everyday operations and management of the sites. It has also opened an office within a fifty-kilometre radius of its current sites, enabling it to have daily or weekly personal interactions with the communities it serves, depending on nature and urgency of the issues to be solved. By following this practice, the firm has in-house staff responsible and readily available in the area to fix problems. In contrast to the site agent, the site manager is a formal employee of the firm who gives customers easy access to it. As one customer expressed it: *'I called [the site manager], and he sent a technician the next morning. He fixed the problem.'*<sup>xxix</sup> Firm 4 has set up an office in the actual market village in which the mini-grid has been installed. Here the firm integrates the need for customers to have easy and equal access to itself (social welfare logic) with efficiency and quality concerns in having its own trained staff, who are trusted by the community and are readily available in the area (commercial logic).

### **Effects of practices driven by a blended logic**

In communities where firms enact the blended logic, three main patterns of effects emerged from the interviews: i) high levels of trust and goodwill towards the firm on the part of community members; ii) information-sharing and diffusion in the community; and iii) an opportunity for community members to exert power over the firm.

By following a strategy of connecting as many households as possible within an area, regardless of individual energy demand, and by creating a collective buy-in to the idea of establishing the mini-grid in the village, firm 3 has gained a good reputation and general goodwill from the people in the community. Although 100% connectivity may be the goal,

this is difficult for the firm to achieve due to issues of affordability on the part of some residents who cannot afford the connection fee, as well as in parts of the community where the cluster of households is not big enough to start up a sub-hub. Negative views about a firm can arise from its failure to connect individual households that have already paid their connection fees but are not yet connected, for example, due to a lack of space for new connections in the sub-hub or too few people in an area to start up a new sub-hub.<sup>xxx</sup> However, by including as many households as possible, the firm can manage to evade *'strong dissenting voices within the community'*<sup>xxxii</sup> and establish a generally positive view of itself within the community.<sup>xxxiii</sup> This goodwill towards the firm is reflected in its acceptability and in the willingness of landowners to cooperate, for example, when the firm needs to take wiring across their land. Also, the use of local staff underpins the view that the firm is trustworthy as far as the community members are concerned. Customers highlighted how their personal link to a member of the firm's staff (*'he was my neighbour', 'he's like a son to me', 'he is my son'*) fostered a high degree of trust, both in the novel concept of establishing a mini-grid in the village and in the firm itself.<sup>xxxiii</sup>

In villages where barazas are used to communicate with customers, there is a greater degree of information-sharing and diffusion in the wider community. Using communal meetings as a forum where people can ask questions and share their views has led to exchanges of ideas and information among community members.<sup>xxxiv</sup> People discuss the positive and negative aspects of the possibility of accessing power, which in turn gives the firm insights into the circumstances in which it is accepted or resisted within the community in general. A firm 4 representative highlighted the experience of how bringing people together in large communal meetings fostered a higher degree of interaction and free discussion among them. People had a tendency to speak more freely in communal meetings compared to one-to-one discussions and gained *'strength'* (i.e. the courage to confront the firm with critical questions) from being in a larger group.<sup>xxxv</sup>

However, this generally observed greater availability of information is also conditioned by the nature of the served community. Firm 3 operates in a relatively small community (approximately 200-250 households) with a high degree of ethnic homogeneity. In this community attendance at the regularly scheduled meetings was high, apparently fostering information-sharing among village residents.<sup>xxxvi</sup> Firm 4 was operating in a larger market village (approximately 500 households) which was ethnically diverse. Here barazas were complemented with door-to-door visits to increase access to connected households, as communal meetings were often not well attended.<sup>xxxvii</sup> This was explained by the fact that most people in the market village owned a shop or had a business to attend to during the daytime.

This greater availability of information, combined with the opportunity for a large part of the community to get connected, also means that competition and information capture are less evident in these communities. Instead, deploying easily accessible firm staff has fostered more equal access to information in the community, as the site manager was often present.

Lastly, increased information dissemination and *'strength in numbers'* seems to increase customers' ability to exert power over the firm. In one case a group of customers who were experiencing problems with their connection managed to put pressure on the firm by organising a boycott of power usage. As the firm was automatically alerted to any irregularities in power usage etc. through its automatic remote monitoring system, it quickly became aware of the changed patterns of usage in the village. In this way, customers

exerted their power to get the firm to respond quickly by taking action to solve the problem.<sup>xxxviii</sup>

## **6 Reflections on the two types of responses to competing logics**

This section discusses the two types of responses we have identified, as well as the wider institutional embeddedness of the firms in relation to the ways in which they respond.

The two firms representing the hybrid form in which the commercial logic is dominant are both rooted in the business sector (firm 1 and 2). Furthermore, they have developed a revenue-driven business model in which they sell mini-grid projects to clients who have access to capital. This strategy is to some extent conditioned by a barrier for these firms in scaling up funding for their own mini-grid portfolios. The revenue-driven model represents a short-term business strategy in which each mini-grid sold to a client represents an income that can fund new project development. Thus, drawing on both the commercial and the social welfare logic in the firm's self-representations can be seen as a way to gain legitimacy from a broad spectrum of actors in the mini-grid field (investors, the public, governments, etc.). Conversely, prioritising the commercial logic over the social welfare logic in its actual business activities can be seen as way for the firm to respond to pressures from investors to prove the economic viability of projects in the short term in order to secure resources [34].

Of the two firms representing the blended hybrid type, firm 3 is rooted in the business sector and firm 4 in the social sector. The firm with roots in the social sector is the only one to enact what could be said to be a 'pure' form of the social welfare logic in elements of its business model (e.g. by implementing complaint procedures). This variation may be explained by the fact, highlighted by Thornton and Ocasio [63], that occupational groups and professions are powerful carriers of institutional logics and that professionals socialized into a given institutional logic therefore carry this logic over into other fields. Although the firm was set up as a separate entity in trust with a CEO recruited from the private sector, it is still deeply embedded in social-sector institutions, which guides its decision-making. In terms of resources, this firm is fully financed by its donors. This shows how the blending of logics might be determined by a wider context, including access to donor finance, the conditions set by the donor and the firm's rootedness in the social sector.

In the case of the blended hybrid firm with roots in the business sector (firm 3), the logic of social welfare is not a dominant part of its organisational identity. However, in practice the firm enacts this logic through its work, but only in combination with the commercial logic. By blending the two logics, the firm does not compromise on its goal of being an economically viable firm. Rather, it combines the two logics in such a way that they reinforce each other in obtaining synergies (e.g. to connect everyone, but also to adopt a tariff structure that mitigates the negative economic impact of connecting low-consuming customers on the firm). The synergies created between the two logics thus seem to be a decisive factor in its blending approach. This firm has strong affiliations with tech-finance communities overseas and has had several successes in raising commercial finance in the form of venture capital and equity capital; it therefore needs to conform to constraints on resources to a lesser extent. Instead, through its access to large-scale funding, its few but

significant strategic partnerships with large players in the sector and its affiliation with symbolically significant climate advocates, it has been able to pursue a long-term strategy by scaling up its business and making strategic recruitments based on long-term investments.

So, despite its strong affiliation with the business sector, which might create the assumption that it mainly relies on the commercial logic, its access to human resources and patient capital has allowed it to pursue an integrated business model in which the short-term goal of connecting everyone (social welfare logic) is fully compatible with its long-term goal of scaling up the business (commercial logic). This finding of the symbiotic embodiment of multiple logics within a commercial and competitive hybrid recalls the work of Battilana and Dorado [19], who identify similar results in the case of a micro-finance institution that blended 'banking' and 'development' logics in synergistic ways, thus allowing it to achieve its financial *and* social goals simultaneously. The need for private firms to pay attention to the social dimension of technology diffusion in order to achieve sustainability is well-established [64]. This study provides a novel way of analysing these connections. While the blending strategy has led organisations in other fields to strike a sustainable balance between social and commercial logics, it remains to be seen how these firms in the Kenyan mini-grid sector will perform in the long term.

## 7 Conclusion

By investigating global narratives, firms' self-representations and their practices on the ground, this paper has demonstrated that both the commercial and the social welfare logics are available to mini-grid firms, and how more particularly such firms respond to the competing demands of these logics through their practices in bringing power to off-grid villages. We demonstrate, by zooming in and analysing firms' practices in regards to their customers, that firms differ according to how they respond to available logics. The study found that one group of firms enacts the commercial logic as the primary logic guiding its decisions and practices, while the second group of firms combine these two logics in their work.

The first group of firms, although including the language of social welfare in their self-representations, maintain a strong commercial logic in their business models as they practise them. In this way the formal idea of creating social impact is merely loosely coupled to concrete decisions and actions in day-to-day work activities [34]. The second group of firms enacts a blend of the two logics and seems to seek synergies actively between the two in pursuing their commercial goals. Our findings further suggest that private firms with access to sufficient and patient capital may have better conditions for creating synergies between the two logics through blending, while firms with resource constraints are more prone to respond to the immediate demands of the commercial logic.

While the study is based on a few cases, with only two firms representing each group, these four firms represent all mini-grid firms that were operating in Kenya at the time of our data collection and thus provide interesting empirical insights into the sector. The development trajectory for these firms is uncertain, however, and it is still too early to judge which of the hybrid forms will create economic sustainability for them in the long term. Nonetheless the presence of these two hybrid forms is significant in that it feeds into previous research on organisational responses to hybridity which have been shown to be

driven by a need for organisations to maximise their legitimacy, increase their resources and conform to external pressures from particular field-level actors[65]. While the study shows that under some conditions the social welfare and commercial logics may not compete so much as be complimentary and create synergies for the firm, the strategy of blending is not a choice that is available to all firms. Our findings show that, while access to donor funding, donor prescriptions and cultural embeddedness in the social sector explains the strategy of blending to some extent, it does not explain why purely commercial firms choose to blend. The approach that involves the blending of the two logics seems to be driven by sense-making within the firm that blending creates synergies for it in the longer term and therefore that it is a strategy suitable for companies with access to patient capital and with a focus on long-term investment. However, those firms that enact a commercial logic as their predominant logic favour the prescriptions of more powerful and more dominant logics in their business models [66], including pressure for short-term returns on investment.

Taking note of the low number of firms that have been in business for only a few years, it is too early to provide rigid policy recommendations from this study. However, the patterns identified of firms responding differently to the logics available to them is likely to be true in other settings as well. Based on the study, we can hypothesize: i) that firms based on capital from investors with a long term outlook, such as e.g. institutional investors and other investors with a strong focus on corporate social responsibility, would be more inclined to act according to the blended logic than companies that are dependent on short term profit maximizing funds and ii) that access to subsidies and different types of capital with different risk profiles is an important factor determining the extent of blending, and that public-private partnerships, including cross-subsidies, donor funding and government capital, create better opportunities for companies to act in accordance with the blending of the two logics.

The policy implication of the first hypothesis, would be to favor companies with a long term investment horizon, but such recommendation seems difficult to operationalize in terms of regulation. More realistic to operationalize is the policy implication of the second hypothesis, namely leveling the playing field between public and private actors by means of new regulations, to ensure a tariff for electricity from private mini-grids that is comparable to tariffs for the publically owned main grid. Such regulations could include targeted donor-financed subsidies on investment, in combination with cross-subsidies from existing consumers to reduce the tariffs in mini-grids. Subsidies could take the form of result based finance where a fixed amount per connection is dispersed upon commissioning of the project. Further, regulations should be put in place to support public-private partnerships in which options for future integration of private mini-grids into the national grid should be laid out. These recommendations are in line with those put forward by local mini-grid stakeholders including NGOs and private sector players [67,68]. In addition, various social requirements could be included as targets for the regulation of mini-grid operators, such as targets for the percentage of households to be connected and requirements of effective complaint structures.

These recommendations are preliminary, so if the private sector is to be instrumental in creating positive development outcomes in respect of electrification and to avoid adverse effects, it is important to continue research along the lines set out in this paper. This should be aimed first at substantiating the above hypothesis, but also at understanding how appropriate business models can be advanced, how they can be

regulated, and what the effects are at the local level. This opens up a path for more research into i) the organisational drivers and specific circumstances that underpin an approach where the social and commercial logics are both integrated into business models; ii) the policy designs, regulations and support schemes that may support this particular approach; and iii) more in-depth field studies of the implications for rural dwellers as well as iv) follow up research on the same four firms to understand the longer term effect of the different approaches.

## 8 References

- [1] IEA, WEO 2019 Electricity Database, International Energy Agency (IEA), 2019. <https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>.
- [2] IEA, World Energy Outlook 2011. Energy for All: Financing access for the poor, OECD/IEA, Paris, 2011.
- [3] S. Bhattacharyya, D. Palit, Mini-grid based off-grid electrification to enhance electricity access in developing countries: What policies may be required?, *Energy Policy*. 94 (2016) 166–178. <https://doi.org/10.1016/j.enpol.2016.04.010>.
- [4] T.S. Schmidt, N.U. Blum, R. Sryantoro Wakeling, Attracting private investments into rural electrification - A case study on renewable energy based village grids in Indonesia, *Energy Sustain. Dev.* 17 (2013) 581–595. <https://doi.org/10.1016/j.esd.2013.10.001>.
- [5] A. Malhotra, T.S. Schmidt, L. Haelg, O. Weissbein, Scaling up finance for off-grid renewable energy: The role of aggregation and spatial diversification in derisking investments in mini-grids for rural electrification in India, *Energy Policy*. 108 (2017) 657–672. <https://doi.org/10.1016/j.enpol.2017.06.037>.
- [6] D. Schnitzer, D.S. Lounsbury, J.P. Carvallo, R. Deshmukh, J. Apt, D.M. Kammen, Microgrids for Rural Electrification : A critical review of best practices based on seven case studies, United Nations Foundation, 2014. <https://rael.berkeley.edu/publications/>.
- [7] M.B. Pedersen, I. Nygaard, System building in the Kenyan electrification regime: The case of private solar mini-grid development, *Energy Res. Soc. Sci.* 42 (2018) 211–223. <https://doi.org/10.1016/j.erss.2018.03.010>.
- [8] J. Hazelton, A. Bruce, I. MacGill, A review of the potential benefits and risks of photovoltaic hybrid mini-grid systems, *Renew. Energy*. 67 (2014) 222–229. <https://doi.org/10.1016/j.renene.2013.11.026>.
- [9] S. Szabó, K. Bódis, T. Huld, M. Moner-Girona, Energy solutions in rural Africa: mapping electrification costs of distributed solar and diesel generation versus grid extension, *Environ. Res. Lett.* 6 (2011) 034002. <https://doi.org/10.1088/1748-9326/6/3/034002>.
- [10] S. Bhattacharyya, *Rural Electrification Through Decentralised Off-grid Systems in Developing Countries*, Springer London, London, Heidelberg, New York, Dordrecht, 2013. <https://doi.org/10.1007/978-1-4471-4673-5>.
- [11] D. Palit, A. Chaurey, Off-grid rural electrification experiences from South Asia: Status and best practices, *Energy Sustain. Dev.* 15 (2011) 266–276. <https://doi.org/10.1016/j.esd.2011.07.004>.
- [12] S. Bhattacharyya, Mini-grid based electrification in Bangladesh: Technical configuration and business analysis, *Renew. Energy*. 75 (2015) 745–761.



- <https://doi.org/10.1016/j.renene.2014.10.034>.
- [13] M. Moner-Girona, M. Solano-Peralta, M. Lazopoulou, E.K. Ackom, X. Vallve, S. Szabó, Electrification of Sub-Saharan Africa through PV/hybrid mini-grids: Reducing the gap between current business models and on-site experience, *Renew. Sustain. Energy Rev.* 91 (2018) 1148–1161. <https://doi.org/10.1016/j.rser.2018.04.018>.
  - [14] S.D. Comello, S.J. Reichelstein, A. Sahoo, T.S. Schmidt, Enabling Mini-Grid Development in Rural India, *World Dev.* 93 (2017) 94–107. <https://doi.org/10.1016/j.worlddev.2016.12.029>.
  - [15] M. Moner-Girona, R. Ghanadan, M. Solano-Peralta, I. Kougias, K. Bódis, T. Huld, S. Szabó, Adaptation of Feed-in Tariff for remote mini-grids: Tanzania as an illustrative case, *Renew. Sustain. Energy Rev.* 53 (2016) 306–318. <https://doi.org/10.1016/j.rser.2015.08.055>.
  - [16] C. Muchunku, K. Ulsrud, D. Palit, W. Jonker-Klunne, Diffusion of solar PV in East Africa: What can be learned from private sector delivery models?, *Wiley Interdiscip. Rev. Energy Environ.* 7 (2018) 1–15. <https://doi.org/10.1002/wene.282>.
  - [17] F. Polzin, F. Egli, B. Steffen, T.S. Schmidt, How do policies mobilize private finance for renewable energy?—A systematic review with an investor perspective, *Appl. Energy.* 236 (2019) 1249–1268. <https://doi.org/10.1016/J.APENERGY.2018.11.098>.
  - [18] A.-C. Pache, F. Santos, Inside the hybrid organization: Selective coupling as a response to competing institutional logics, *Acad. Manag. J.* 56 (2013) 972–1001. <https://doi.org/10.5465/amj.2011.0405>.
  - [19] J. Battilana, S. Dorado, Building Sustainable Hybrid Organizations: the Case of Commercial Microfinance Organization, *Acad. Manag. J.* 53 (2010) 1419–1440. <https://doi.org/10.5465/AMJ.2010.57318391>.
  - [20] A.-C. Pache, F. Santos, When Worlds Collide : the Internal Dynamics of Organizational Responses, *Acad. Manag. J.* 35 (2010) 455–476. <https://doi.org/10.5465/AMR.2010.51142368>.
  - [21] M. Raynard, R. Greenwood, Deconstructing Complexity: How Organizations Cope with Multiple Institutional Logics, *Acad. Manag. Proc.* 2014 (2014) 12907. <https://doi.org/10.5465/ambpp.2014.132>.
  - [22] B. Doherty, H. Haugh, F. Lyon, Social Enterprises as Hybrid Organizations: A Review and Research Agenda, *Int. J. Manag. Rev.* (2014) 1–20. <https://doi.org/10.1111/ijmr.12028>.
  - [23] C. Skelcher, S.R. Smith, Theorizing Hybridity: Institutional Logics, Complex Organizations, and Actor Identities: the Case of Nonprofits, *Public Adm.* 93 (2015) 433–448. <https://doi.org/10.1111/padm.12105>.
  - [24] R. Friedland, R.R. Alford, Bringing society back in: Symbols, practices, and institutional contradictions, in: W.W. Powell, P.J. DiMaggio (Eds.), *New Institutionalism Organ. Anal.*, 1991.
  - [25] R. Suddaby, R. Greenwood, Rhetorical strategies of legitimacy, *Adm. Sci. Q.* 50 (2005) 35–67.
  - [26] P.H. Thornton, W. Ocasio, M. Lounsbury, *The Institutional Logics Perspective: A New Approach to Culture, Structure and Process*, Oxford University Press, Oxford, 2012.
  - [27] M.T. Dacin, P.A. Dacin, P. Tracey, Social Entrepreneurship: A Critique and Future Directions, *Organ. Sci.* 22 (2011) 1203–1213. <https://doi.org/10.1287/orsc.1100.0620>.
  - [28] J.G. Dees, A Tale of Two Cultures : Charity , Problem Solving , and the Future of Social Entrepreneurship, (2012) 321–334. <https://doi.org/10.1007/s10551-012-1412-5>.

- [29] F.M. Santos, A Positive Theory of Social Entrepreneurship, (2012) 335–351.  
<https://doi.org/10.1007/s10551-012-1413-4>.
- [30] S. Schaltegger, E.G. Hansen, F. Ludeke-Freund, Business Models for Sustainability: Origins, Present Research, and Future Avenues, *Organ. Environ.* (2015) 1–8.  
<https://doi.org/10.1177/1086026615599806>.
- [31] W.W. Powell, J. a. Colyvas, Microfoundations of institutional theory, *SAGE Handb. Organ. Institutionalism*. (2008) 276–298. <https://doi.org/10.4135/9781849200387>.
- [32] W.R. Scott, *Institutions and organizations*, SAGE, Thousand Oaks, CA, 1995.
- [33] C.M. McPherson, M. Sauder, Logics in Action: Managing Institutional Complexity in a Drug Court, *Adm. Sci. Q.* 58 (2013) 165–196.  
<https://doi.org/10.1177/0001839213486447>.
- [34] P. Bromley, W.W. Powell, From Smoke and Mirrors to Walking the Talk: Decoupling in the Contemporary World, *Acad. Manag. Ann.* 6 (2012) 483–530.  
<https://doi.org/10.1080/19416520.2012.684462>.
- [35] J.W. Meyer, B. Rowan, Institutionalized Organizations : Formal Structure as Myth and Ceremony, *Am. J. Sociol.* 83 (1977) 340–363.
- [36] R. Greenwood, M. Raynard, F. Kodeih, E.R. Micelotta, M. Lounsbury, Institutional Complexity and Organizational Responses, *Acad. Manag. Ann.* 5 (2011) 317–371.  
<https://doi.org/10.1080/19416520.2011.590299>.
- [37] R.E. Stake, *The art of case study research*, Sage, Thousand Oaks, CA, 1995.
- [38] J. Mason, *Qualitative Researching*, SAGE Publications, London, 2002.
- [39] J.-P. Olivier de Sardan, *Anthropology and Development: understadning contemporary social change*, Zed Books, London and New York, 2005.
- [40] T. Bierschenk, J.-P. de Sardan, *ECRIS: Rapid Collective Inquiry for the Identification of Conflicts and Strategic Groups*, *Hum. Organ.* 56 (1997) 238–244.  
<https://doi.org/10.17730/humo.56.2.p132305hm65w4676>.
- [41] M.B. Pedersen, Rural electrification through private models, the case of solar-powered mini-grid development in Kenya, *PhD Diss. Manag. Eng. Tech. Univ. Denmark, Copenhagen, Denmark.* 1 (2017) 1–143.
- [42] M.B. Pedersen, Deconstructing the concept of renewable energy-based mini-grids for rural electrification in East Africa, *WIRE Energy Environ.* 5 (2016) 570–587.  
<https://doi.org/10.1002/wene.205>.
- [43] U.E. Hansen, M.B. Pedersen, I. Nygaard, Review of solar PV policies, interventions and diffusion in East Africa, *Renew. Sustain. Energy Rev.* 46 (2015) 236–248.  
<https://doi.org/10.1016/j.rser.2015.02.046>.
- [44] A. Osterwalder, Y. Pigneur, *Business model generation: A handbook for visionaries, game changers, and challengers*, Wiley, Amsterdam, 2010.  
<https://doi.org/10.1523/JNEUROSCI.0307-10.2010>.
- [45] R.P. Byrne, *Learning drivers: Rural electrification regime building in Kenya and Tanzania*, PhD Thesis. University of Sussex, 2009.
- [46] K. Lee, E. Brewer, C. Christiano, F. Meyo, E. Miguel, M. Podolsky, J. Rosa, C. Wolfram, Barriers to Electrification for “Under Grid” Households in Rural Kenya, *Dev. Eng.* 1 (2016) 26–35. <https://doi.org/10.1016/j.deveng.2015.12.001>.
- [47] IEA, *World Energy Outlook 2015 - Electricity Access Database*, International Energy Agency (IEA) and The Organisation for Economic Co-operation and Development (OECD), 2015.
- [48] Government of Kenya, *National Climate Change Action Plan (Kenya): 2018-2022*.

Volume 3: Mitigation Technical Analysis Report, Ministry of Environment and Forestry, Nairobi, 2018.

- [49] IEA, WEA 2018 Electricity Database, (2018).
- [50] E.M. Roe, Development narratives, or making the best of blueprint development, *World Dev.* 19 (1991) 287–300. [https://doi.org/10.1016/0305-750X\(91\)90177-J](https://doi.org/10.1016/0305-750X(91)90177-J).
- [51] F. Boamah, Imageries of the contested concepts “land grabbing” and “land transactions”: Implications for biofuels investments in Ghana, *Geoforum*. 54 (2014) 324–334. <https://doi.org/10.1016/j.geoforum.2013.10.009>.
- [52] ACORE, Renewable Energy in Sub-Saharan Africa: Opportunities & Challenges, American Council on Renewable Energy (ACORE), 2015. <https://acore.org/wp-content/uploads/2017/12/Renewable-Energy-in-Sub-Saharan-Africa.pdf>.
- [53] M. Franz, N. Perterschmidt, M. Rohrer, B. Kondev, Mini-grid Policy Toolkit: Policy and Business Frameworks for Successful Mini-grid Roll-outs, EUEI-PDF, Eschborn, 2014. <http://www.minigridpolicytoolkit.euei-pdf.org/downloads.html>.
- [54] IED, Low Carbon Mini Grids: Identifying the gaps and building the evidence base on low carbon mini-grids, Innovation Energie Développement (IED), Francheville, 2013.
- [55] N.U. Blum, C.R. Bening, T.S. Schmidt, An analysis of remote electric mini-grids in Laos using the Technological Innovation Systems approach, *Technol. Forecast. Soc. Change*. 95 (2015) 218–233. <https://doi.org/10.1016/j.techfore.2015.02.002>.
- [56] SE4ALL, Global Tracking Framework, Sustainable Energy for All (SE4ALL), 2012. <http://trackingenergy4all.worldbank.org/reports>.
- [57] UNDP, Towards an “Energy Plus” approach for the poor: a review of good practices and lessons learned from Asia and the Pacific, United Nations Development Programme (UNDP), Bangkok, 2011. [http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable\\_energy/towards\\_an\\_energyplusapproachforthepoorareviewofgoodpracticesand.html](http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/towards_an_energyplusapproachforthepoorareviewofgoodpracticesand.html).
- [58] ARE, Hybrid Mini-Grids for Rural Electrification: Lessons Learned, Alliance for Rural Electrification (ARE), Brussels, 2011. [https://ruralelec.org/sites/default/files/hybrid\\_mini-grids\\_for\\_rural\\_electrification\\_2014.pdf](https://ruralelec.org/sites/default/files/hybrid_mini-grids_for_rural_electrification_2014.pdf).
- [59] Practical Action, Poor people’s energy outlook: Key messages on energy for poverty alleviation, Practical Action Publishing, Rugby, UK, 2014.
- [60] SE4ALL, Energy Access, Web page, 2018. <https://www.seforall.org/energy-access> (accessed December 19, 2018).
- [61] ARE, Rural Electrification with Renewable Energy: Technologies, quality standards and business models, Alliance for Rural Electrification (ARE), Brussels, 2011. [https://www.ruralelec.org/sites/default/files/are\\_technological\\_publication\\_0.pdf](https://www.ruralelec.org/sites/default/files/are_technological_publication_0.pdf).
- [62] D. Palit, Solar energy programs for rural electrification: Experiences and lessons from South Asia, *Energy Sustain. Dev.* 17 (2013) 270–279. <https://doi.org/10.1016/j.esd.2013.01.002>.
- [63] P.H. Thornton, W. Ocasio, Institutional logics, in: R. Greenwood, C. Oliver, R. Suddaby, K. Sahlin (Eds.), *Sage Handb. Organizational Institutionalism*, SAGE Publications, 2008: pp. 99–129. <https://doi.org/http://dx.doi.org/10.4135/9781849200387>.
- [64] J.M. Eder, C.F. Mutsaerts, P. Sriwannawit, Mini-grids and renewable energy in rural Africa: How diffusion theory explains adoption of electricity in Uganda, *Energy Res. Soc. Sci.* 5 (2015) 45–54. <https://doi.org/10.1016/j.erss.2014.12.014>.

- [65] M.L. Besharov, W.K. Smith, Multiple Logics in Organizations: Explaining Their Varied Nature and Implications, *Acad. Manag. Rev.* 39 (2014) 364–381.
- [66] W. Ocasio, N. Radoynovska, Strategy and commitments to institutional logics: Organizational heterogeneity in business models and governance, *Strateg. Organ.* 14 (2016) 1476127015625040-. <https://doi.org/10.1177/1476127015625040>.
- [67] GIZ, Mini-Grid Regulation and Practical Experiences from Kenya, Powerpoint presentation, Nairobi, 2016. <https://www.giz.de/fachexpertise/downloads/2016-en-kenya-regulation-experiences-jasmin-fraatz.pdf>.
- [68] AMDA, Africa Mini-grid Developers Association (AMDA) SMART RBF Program Recommendation, Africa Mini-grid Developers Association (AMDA), Nairobi, 2018.
- [69] I. Nygaard, T. Dafrallah, Utility led rural electrification in Morocco: combining grid extension, mini-grids, and solar home systems, *Wiley Interdiscip. Rev. Energy Environ.* 3 (2015) n/a-n/a. <https://doi.org/10.1002/wene.165>.
- [70] I. Nygaard, The compatibility of rural electrification and promotion of low-carbon technologies in developing countries - the case of Solar PV for Sub-Saharan Africa, *Eur. Rev. Energy Mark.* 3 (2009) 1–34.
- [71] I. Nygaard, Institutional options for rural energy access: Exploring the concept of the multifunctional platform in West Africa, *Energy Policy.* 38 (2010) 1192–1201. <https://doi.org/10.1016/j.enpol.2009.11.009>.
- [72] IEA, World Bank, Progress Toward Sustainable Energy 2015: Global Tracking Framework Report, 2015. <https://doi.org/10.1596/978-1-4648-0690-2>.

## Appendix A. Overview of interviewees

Function/title	Affiliation	# interviews
<b>Firm representatives<sup>10</sup></b>		
Planning and construction manager	Firm a	1
Site manager	Firm a	1
Director	Firm b	1
Procurement and O&M manager	Firm b	1
Founder and owner	Firm c	1
Business development associate	Firm c	2
Operations officer	Firm c	1
Intern	Firm c	1
Head of software	Firm d	2
Field manager	Firm d	1
<b>Key Informants</b>		
Chief officer, Corporate planning	KPLC	1
Head of off-grid sites	KPLC	1
Assistant technical officer, Renewable energy	ERC	1
Director, Electricity	ERC	1
Energy engineer, Renewable energy	MoE	1
Engineer, RE department	REA	1
Engineer, Corporate planning	REA	1
Technician, RE department	REA	1
Project assistant	NGO	1
Community engagement officer	NGO	1
Head of East Africa division	Private firm	1
<b>End users and non-connected neighbours</b>		
Individual interviews	N/A	62
<b>Total interviews</b>		<b>85</b>

<sup>10</sup> Firm letters, and firm numbers in text does not correspond

## Appendix B. Coding and data illustration

Business model aspect	Practice	Data illustration			Hybrid type
		Social welfare logic	Economic viability	Blended logic	
Customer segment	Connecting only the most energy consuming HH	N/A	<p><i>"So we definitely focus on the businesses [in the villages] just like from a financial perspective [...] We would want to connect everyone that is going to have a decent load [...] They must be doing some trade, kind of trade or business [...] If somebody only has a light bulb for example we probably wouldn't connect them"</i> (interview #2, firm d)</p> <p><i>"our staff will go to the ground [...] to determine whether it is worth attending because it is a cost so we have to determine will they be people who will buy power or is it out if they just feel we want because my neighbour has"</i> (interview # 3, firm d)</p>	N/A	Prioritising economic viability over social welfare logic

Business model aspect	Practice	Data illustration			Hybrid type
		Social welfare logic	Economic viability	Blended logic	
	Saturating an area	<i>"if some people are excluded then how are you addressing the gap?" (interview #5, firm a)</i>	<i>I mean there will be more demand for power because you will be using these devices that consume a lot of power [...] you have provided a competitive edge if within your network you provided internet and these healthcare services and KPLC wants to come and take over that network. [...] They [the customers] will just say no thank you [...] So, it protects your interests. (interview #5, firm a)</i>	<p><i>"They have to have a realistic chance of getting access to this, otherwise then you don't get complete ownership of the micro-grid by the village, and then you will have elements in the village that will oppose why they were left out, so that's key." (interview #5, firm a)</i></p> <p><i>"the lower consumer will use very little and then will pay about only KES 300-400 maximum. So at that rate it is not enough to recover the cost of infrastructure over the life of the project. So ideally that consumer is not profitable, we are losing money on him but the customer who is consuming more and is paying KES 1000 he is paying more than the recovery rate we need to get from him". (interview #5, firm a)</i></p>	Blending social welfare and economic viability logic

- 
- <sup>i</sup> Staff interview # 2 firm 2
  - <sup>ii</sup> Popular media news article, 2015, related to firm 3
  - <sup>iii</sup> Popular media news article, 2015, related to firm 2
  - <sup>iv</sup> Popular media news article, 2015, related to firm 2
  - <sup>v</sup> Popular media news article, 2015, related to firm 3
  - <sup>vi</sup> Press release, 2014, firm 3
  - <sup>vii</sup> Popular media news article, 2015, related to firm 1
  - <sup>viii</sup> Popular media news article, 2015, related to firm 2
  - <sup>ix</sup> Popular media news article, 2015, related to firm 2
  - <sup>x</sup> Research organisation's blog post, 2015 related to firm 2
  - <sup>xi</sup> Firm website, 2014, firm 3
  - <sup>xii</sup> Popular media news article, 2015, related to firm 2
  - <sup>xiii</sup> Firm website, 2015, firm 3
  - <sup>xiv</sup> Popular media news article, 2015, related to firm 2
  - <sup>xv</sup> Popular media news article, 2013 related to firm 2
  - <sup>xvi</sup> Staff interview #2 and #4, firm 2 and 1)
  - <sup>xvii</sup> Staff interview #2, firm 2
  - <sup>xviii</sup> Staff interview #2, firm 2
  - <sup>xix</sup> Staff interview #2, firm 2
  - <sup>xx</sup> Village interview #1 and #3
  - <sup>xxi</sup> Village interview #4
  - <sup>xxii</sup> Village interview #1
  - <sup>xxiii</sup> Village interview #2
  - <sup>xxiv</sup> Village interview #2, #9 and #21)
  - <sup>xxv</sup> Staff interview #12, firm 3
  - <sup>xxvi</sup> Staff interview #5, firm 3
  - <sup>xxvii</sup> Key informant interview #11
  - <sup>xxviii</sup> Staff interview #5, firm 3
  - <sup>xxix</sup> Village interview #49
  - <sup>xxx</sup> Village interview #53 and #56
  - <sup>xxxi</sup> Staff interview #5, firm 3
  - <sup>xxxii</sup> Village interview #49, #58 and #59
  - <sup>xxxiii</sup> Village interview #49, #51 and #59
  - <sup>xxxiv</sup> Village interview #48, #51 and #58



---

xxxv Key informant interview #11

xxxvi Staff interview #12, firm 3 and village interview #48 and #51

xxxvii Key informant interview #11

xxxviii Village interview #48