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Community-based management of energy infrastructures in the ACP-region

Experiences from EU-supported projects 2007-2019

7 AFFORDABLE AND CLEAN ENERGY

17 PARTNERSHIPS FOR THE GOALS

ACP-EU Energy Facility *Monitoring*

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DANISH ENERGY MANAGEMENT DEM FOR SUSTAINABLE IMPACT

The ACP-EU Energy Facility (http://energyfacilitymonitoring.eu)

This discussion paper is one in a series of discussion papers based on experiences from the ACP-EU Energy Facility (EF).

The EF was established in 2005 to co-finance projects on increasing access to modern and sustainable energy services for the poor in African, Caribbean and Pacific (ACP) countries, especially in rural and peri-urban areas. 173 project proposals have been granted co-funding from the EU for a total of 0.4 billion euros; 50% of the total project-budgets of 0.8 billion euros.

The projects have been, and are being, implemented in the period 2007-2021 with 90% of projects completed in 2019. The projects cover a wide range of technologies:

Electricity grid-extensions in rural and peri-urban areas, hydro-powered mini-grids, solar and hybrid-solar mini-grids, stand-alone solar solutions for businesses, households and public institutions, portable solar equipment mainly used for lighting, clean energy solutions for cooking such as improved firewood and charcoal cook stoves as well as biogas, biofuels for electricity generation, and capacity development of public institutions in the energy sector.

Among the 173 Energy Facility projects, experiences from 28 have informed this discussion paper.

Danish Energy Management (DEM) has been granted the contract of providing technical assistance for the monitoring of the EF projects in the period 2011-2019. This discussion paper is based on information and data gathered during this period as well as current research and experience from other development interventions.

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Introduction

This discussion paper raises some of the key considerations on involving local communities in the management of infrastructures for rural electrification in the ACP region by drawing on lessons from the ACP-EU Energy facility projects implemented 2007-2019.

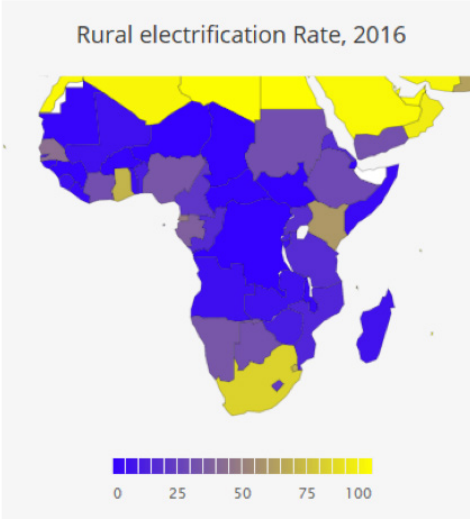
Community-based management within rural electrification is connected to the Sustainable Development goals **SDG7 (access to affordable, reliable, sustainable and modern energy for all)** with special reference to ***target 7.1: "By 2030, ensure universal access to affordable, reliable and modern energy services"*** and **SDG17 (partnership for the goals)** with special reference to ***target 17.17: "Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships"***

The paper starts by describing the scene for community-based management within the context of global efforts to secure access to sustainable energy for all. It then goes on defining community-based management vis-à-vis other business models, based on scientific literature and reports as well as experiences from the ACP-EU Energy Facility. Strengths and weaknesses are identified, and conclusions drawn to provide recommendations.

Background

While global electrification rates are steadily increasing, it is estimated that 1.1 billion people – 14% of the global population – do not have access to electricity (IEA: 2017). Around 84% of those without electricity access reside in rural areas and more than 95% of those living without electricity are in countries in sub-Saharan Africa and developing Asia.

Figure 1: Rural Electrification Rate. Energy Outlook 2017



Despite efforts to provide access to electricity in rural areas in Sub-Saharan Africa, the proportion of population with access to power could significantly decrease as the population is estimated to increase by 50% in 2030 (compared to 2010).

Faced with this challenge, efforts to electrify rural areas have focused on decentralised electricity provision, often in the form of mini-grids, due to the cost of national grid extension.

Some of the first mini-grids in Sub-Saharan Africa were established and managed by local communities, with the support for NGOs. In the 1990s in Burkina Faso – one of the pioneering countries – only mini-grids operated by local electricity cooperatives were authorised and eligible for subsidy from the Rural Electrification Fund. Community-managed mini-grids have been established across the ACP-region

often at the initiative of NGOs, and in many cases, actively supported by government institutions. Community-based mini-grids have also been extensively promoted in Latin America and Asia[1].

Experience from community-based management of energy infrastructures shows that technical- and organisational management and commercial viability are significant challenges in this model: A study of three hydropower mini-grids in the Cameroon found that one was functioning well after 4 years while the other two failed due to poor management and the lack of support from the community. All of them relied on external funding for major repairs[2]. A study of multifunctional platforms in West Africa finds that 35% were not functioning after four years, mainly due to socio-organisational problems. The majority of the still-functioning platforms had ceased to be managed by community women's groups and were instead managed by an operator[3].

During the last decade, the energy sector in the ACP-region has increasingly encouraged the private sector to take a stronger role in the delivery of energy services. Changes in policy and regulation, technology development in PV, and the arrival of mobile money have paved the way for new business models. The trend is significant in the Solar Home Systems (SHSs) and smaller solar PV equipment markets, but also in the management of mini grids. The arrival of private companies that are assumed to be more technically and financially capable reduces the role of the community in the management of the system due to the need to become commercially viable in a short period of time.

There does however appears to be a place for community engagement and involvement in the energy sector. Kenya is a country that attracts many private investors as Independent Power Producers (IPPs), which has also stirred local conflict to the extent where Power Africa has developed a guide for community engagement[4]. Community-based mini-grids are also still being promoted for instance in areas that are not attractive for either the utility or private companies, which is the case in many remote areas[5].

This discussion paper will contribute to that discussion by analysing the experiences from projects supported by the ACP-EU Energy Facility. In the next chapters we will take a closer look at how community-based management has been applied in the Energy Facility.

Different management regimes applied in the Energy Facility projects

The management regimes adopted by Energy Facility partners follow three main models: community-based management, private company business model and a hybrid model combining the two.

Community-based management

Under the community-based management framework, the mini-grid or energy service centre, is operated by a local committee that has been established to operate the mini-grid and manage the finances. The management committee may be formalised as an association or a cooperative, or may be an internal structure in a village association that comprises the whole village. Once construction has been completed, the ownership of the infrastructure can be transferred to the committee, association, etc. or a public structure, such as a municipality, government agency or ministry. Licenses and authorisations required to operate the mini-grid and collect payments are often attributed to the community association.

[1] Alliance for Rural Electrification (ARE). 2014.

[2] Mungwe, Jerome et.al. 2016

[3] Nygaard. 2009

[4] Power Africa 2018.

[5] ARE. 2014.

The strength of this model is that, there is a vested interest for the community in keeping the mini-grid operational, even if it is not profitable for them, as the electricity is used for other income generating activities and in general improves the quality of life. However, technical, financial and human capacity constraints have a significant influence on the success of this model.

The tariffs or fees applied in this model are often decided by the management committee or in an annual general meeting held by the association, but in practice very few changes in tariffs have been actioned once they are established. Depending on the national regulatory framework, tariffs may need to be approved by the regulatory authority, a process that the management committee is rarely able to engage in without support. Tariffs can also be imposed by the government.

Community-based management	
Advantages	**Challenges**
✓ Low cost of operation	÷ Small scale makes it difficult to reach economies of scale needed to cover costs and reinvest
✓ Can operate with smaller negative profits due to local commitment	÷ Needs continued support due to lack of capacity for technical and financial management
	÷ Higher risk of being affected by local conflicts impacting resulting in loss of revenue

The EF project, *Electrification des communautés rurales avec des Micro-réseaux de Génération d'Energie Solaire Photovoltaïque Autogerés dans la Région de Zanzan (Côte d'Ivoire)* is an example of a community-based mini-grid.

A mini-grid has been constructed in 7 villages where a local association and management committee (the Board of the association) has been established. The association employs two local staff: A technician whose main task is to clean the PV panels, refill batteries with water, and perform maintenance on the diesel generator, and an administrator that collects fee payment and recharges the meters. The 7 village associations are federated in a joint association that is meant to employ a Technical Manager and a Head of Finance.

Community meeting in one of the mini-grids in the project in Côte d'Ivoire. Photo: Danish Energy Management (DEM)

This way of grouping local mini-grids together is referred to as 'clustering' in the Sustainable Energy Handbook developed by the Technical Assistance Facility (TAF) of the EU, as a cost-saving model[6]. In the case of these seven mini-grids, the cluster approach was the best way to ensure adequate revenue to pay for the technical and financial staff. Tariffs were established by the implementing NGO and approved by the regulatory authority. The NGO had also defined the organisational framework, including the statute for the local associations and federation.

[6] TAF 2016.

One year after the completion of implementation, the local associations were performing regular maintenance and revenue collection well. However, the financial management was not strong and there was no forecasting of future expenditure on replacement of inverters, batteries etc. The federation however was still not in place and the required staff had not been recruited. While the local associations were well functioning, it seemed unlikely that they were able to manage the mini-grids without external support in the long run.

The project, *Projet d'électrification Rurale dans le Brakna – PERUB*, applied the community-based management model to local energy service centres called "plateformes solaires", a locally developed concept that builds on the UNDP-concept of a community-managed "Multi-functional platform" (MTFP). The difference being that the MTFP uses a diesel motor to power different equipment mostly for processing of crops and the solar platform uses solar PV to power electrical services: Cold storage, entertainment, phone charging etc.

The world-famous football player, Ronaldo, is painted on the face of the energy service center to advertise one of the main attractions: UEFA champions league football. PERUB-project in Mauritania. Photo: DEM

In PERUB, 25 isolated villages in Mauritania were equipped with an energy service centre and a local management committee established to run them. User fees were established by the implementing NGO and could later be changed by the local committees. The government agency for rural infrastructure development, APAUS, was the formal owner, and responsible for replacing components for which they had contracted a local company.

Five years after the project had ended, the 25 platforms performed quite differently: A few were well organised and had managed to replace faulty batteries and keep the services in greatest demand going: Television and cold storage. In many other locations, technical faults had not been repaired by either the local committees or the company contracted by APAUS. The building was still used for social gatherings and as a local kiosk.

The general experience in the EF is that it is not possible to train local communities to manage the mini-grids without continuous local support. In the project, *Rural Energy Activating Livelihoods*, in Sierra Leone for instance, community members were trained but a few years after project exit, many of the trainees had left the communities. In general we see the following challenges for community-based infrastructure:

1) The technical capacity of community members trained in the EF projects is often sufficient to maintain equipment, install new connections and do smaller repairs, but not sufficient to detect major faults – for instance in the wake of a lightning-strike – or to replace components.

2) The financial capacity of the committees in charge of O&M is limited to bookkeeping rather than financial management per se, where the committee has a financial overview of costs vis-à-vis a business plan and a long-term forecast that includes future needs for replacement of components.

3) Social conflicts are an important challenge. As Nygaard (2009) explains: Rural villages are not necessarily homogenous entities but have a history including divisions and conflicts that come into play when different groups within the community compete for donor resources[7]. Community managed infrastructure will automatically become an issue in a local conflict if such conflicts arise. The consequences for the mini-grid could be conflicts within the management committee that affect performance, a reduction in demand if parts of the community refuse to support the mini-grid business, or attempts by people in positions of power - for instance traditional leaders or local mayors – to take control of the management committee or simply seize the equipment.

4) Community-managed infrastructure is often opted for when the business case is not feasible. The characteristics of the local economies are crucial for the business model[8]. In areas where subsistence farming is the only economic activity, besides small shops and workshops, the mini-grid will lack significant off-takers, a factory for instance, that can guarantee a stable base load and income for the mini-grid.

In addition, the financial capacity of the end-users whose income varies with seasonal activities and who are prone to risks, such as failed harvests, makes it difficult to secure enough income to set aside adequate funds for future replacements of components, especially if there is no significant anchor-client[9].

5) Tariffs are regulated and in general, they are not cost-reflective covering operational expenditure in the longer term. This is either because the community does not want to charge tariffs that are considered too high or because the regulator or the government agency that is the formal owner of the structure, does not allow cost-reflective tariffs. The setting of tariffs is politicised which often overrides the need to cover operational expenditure.

[7] Nygaard, A. (2009), Title of document, publisher.

[8] See also the in-depth study of EF projects in Tanzania and Madagascar that examines the socio-economic impact of mini-grids.

[9] An anchor client is an end-user whose demand for electricity is high and can provide a stable source of revenue for the mini-grid.

Community workshop for PV systems. Photo: Facilidad Sur Solar.

Private company business model

The perspective of national governments on private mini-grids are very different from country to country, both in terms of their willingness to authorise their operation and consider them when rolling out the national grid. This risk can lead to stranded assets, a significant risk for investors. The lack of support from government institutions is a limiting factor for mini-grids in several countries.

Some of the above-mentioned challenges for community-managed infrastructure are related to the business model. A private company is generally expected to possess the technical and managerial skills needed. Social conflicts might not affect a private company if it is owned and staffed by outsiders to the community to the extent it will affect a community-managed business.

But the challenges related to the local economy and the purchasing power of the end users are similar. The additional challenge is the need to cover staff salaries and secure a return on investment. Privately operated energy infrastructure are often established through a BOT-model (Build-Operate-Transfer) or BOOT-model (Build-Own-Operate-Transfer), where the private company builds and operates the mini-grid on a 10- to 20-year concession. This creates an incentive on the part of the private company to invest in additional generation capacity if demand increases. In this model, the local community has less opportunity to influence how the mini-grid is operated and issues that occur are the responsibility of the operator to resolve: faulty meters, poor payment rate, vandalism, etc.

Tariffs in this model are either set by the company and may need to be approved by the national regulator, typically based on a proposal from the project developer.

Private company business model	
Advantages	**Challenges**
✓ Professional technical and financial management	÷ Requires a larger profit margin to be financially viable to cover staff costs and return on investment
✓ Incentive to reinvest if demand increases	÷ Users are not organised and local commitment will often be lower to support the operation of the infra-structure
✓ Short decision-making processes: The arrangement is clearer between operator and customer and service levels can be set	÷ Increased risk that the operator and community are at odds over services or payment

The Energy Facility has also supported mini-grids in the private company model. Yeelen Kura in Mali is managing several EF mi-ni-grid projects based on the same model: Fee-based monthly payment for either a mini-grid connection or an electricity service provided by a SHS[10]. An external evaluation has documented high satisfaction among the clients and a generally well-function-ing business, however, the longer-term viability could not be assessed.

Maintenance. Photo: Yeelen Kura.

[10] Scaling up access to modern electricity services on a regional scale in rural Sub-Saharan Africa by means of a fee for service business model and Augmenter et consolider l'accès aux services d'électricité modernes dans les régions de Ségou et Sikasso, par le biais de kits photovoltaïques et mini-réseaux hybrides solaire PV-diesel et sur la base du modèle "Fee for service"

While clients are generally satisfied, they also find the services costly especially compared to the tariffs applied by the national utility – Electricité du Mali (EDM) – and a few municipalities have lobbied for the government to intervene and bring their village under EDM's tariff regime with success. This is just one example of the private business model being at odds with the utility.

Another example is Rift Valley Energy which has benefitted from two EF projects to develop hydropower mini-grids in Tanzania[11]. The business model combines revenue from local communities and sale of surplus production to the national utility, TANESCO. The anchor client is a local tea factory.

View on the river from the powerhouse of the Mwenga hydropower plant. Photo: DEM

Among the EF-projects, the business model here is among the soundest. The main challenge is securing payment from TANESCO. Rift Valley Energy recognised that the connection fees and high tariffs were a barrier to uptake, and therefore lowered these to below TANESCO rates. Their approach was to build their customer base to scale while generating income from feeding into the grid.

There are two marked differences between the above-mentioned examples and what is generally experienced among community-based management: The scale of the activity and the professionalism in the approach. In the case of Mwenga, the anchor client is ensuring longer-term sustainability but, as the examples also show, it very much depends on the conditions offered by national governments.

[11] Mwenga 3 MW Hydro Power Plant and Mwenga Hydro Rural Network Extension into the Kihansi Basin

The regulatory framework is critical for the private sector managed model, particularly in terms of tariff setting. There are two approaches adopted generally: to set cost-reflective tariffs, which may have consequences for revenue generation; or to set lower tariffs to achieve scale, requiring some form of subsidy until commercial viability has been reached. The technical and human capacity available to the private sector ensures that they can focus on getting the model to work in the long-term and not only maintaining the status quo.

The best direct comparison between community-based management and the private company business models is evident in the project *SETUP: Services Energétiques et Techniques à Usage Productif au Bénin* that promoted Multifunctional platforms (MTFPs) in Benin. Through a careful selection process, both private operators and community groups were selected as beneficiaries.

A post project visit five years after the project implementers exited showed that most MTFPs were still operational based on pressing palm fruit seeds to produce red palm oil for sale in neighbouring Nigeria. However, the privately operated MTFPs were better maintained and had benefitted from additional investments by the owner, for instance storage facilities for stocking palm tree fruits. The community-based groups had the same ideas but were struggling with replacing spare parts and had still not saved enough to further invest. Here the scale of the activity was similar, also the technical capacities of the managers was comparable, but the decision-making process was more effective in the privately-owned MTFPs, particularly concerning making longer-term investments.

The multifunctional platform promoted in the project SETUP. Here, managed as a family owned business. Photo: DEM

The hybrid model

The hybrid model combines community-based management with either private company management and/ or public management (for instance a rural electrification agency or a rural electrification fund).

The hybrid models applied in the EF-projects generally follow the principle of a tri-party agreement: Community, service company, government- or local authority. The government authority is often the owner of the assets but in some cases, the community association is the owner and the public partner merely has a role in securing good management practices.

The hybrid model tries to combine the main advantage of the community-based model, that has low operating costs and high level of local support (under the condition that the community is well-organised and not plagued by internal conflicts) with the technical and managerial capacity of the private sector.

The private company oversees operations and – in all the cases promoted in the Energy Facility – clustering of several mini-grids or service centres is applied to reach an economy-of-scale. On the side of the communities, an umbrella association – for instance a federation of local community associations – is established to serve as the point of contact for the operator and public authorities.

In this way, challenges in the technical and financial capacity are mitigated, as the private company would have the scale of operations needed to maintain a qualified technical and financial management team. However, this can only occur if the energy demand and financial capacity of the clients are sufficient to maintain a stable profit. As in the case of the pure private company business model, contextual factors concerning the local economy are still a challenge.

However, in the hybrid model, involvement of the local committee can mitigate this challenge. The local management committee could act as employees for the company and be responsible for fee collection, day-to-day maintenance, customer point of contact and acquisitions, all of which should lower the cost for the company. Local employment enhances a sense of local ownership. In some cases, a social fund has been established financed by a nominal tax on the tariff, which the community association can decide to use to support connections of low income households, for instance.

Hybrid model	
Advantages	**Challenges**
✓ Professional technical and financial management	÷ Requires a larger profit margin to be financially viable to cover staff costs and profit to the service company compared to the community-based model
✓Local commitment can be withheld especially if members of the community are employed	÷ Decision-making processes takes longer time (compared to 100% private management)
	÷ Private company does not have a strong incentive to invest
	÷ Is challenging to ensure effective collaboration between all parties

The small PV power plant in one of the villages electrified by the project in Burkina Faso. Photo: DEM

The EF-project, *Programme d'électrification solaire en milieu rural dans la Province du Zoundwéogo*, is one example of the hybrid model. Seven villages in two municipalities benefitted from a PV mini-grid. A village committee was established in each village, and two cooperatives created - one for each municipality – that had the village associations as members. A private company in the capital city won the one-year management contract, which included a stipulation that a community member must be employed to provide day-to-day maintenance. The same technician also performs interior installation work for the end users, and the company handles maintenance from the meter to the generation plant. The local committee is in charge of revenue collection, a portion of which is saved for long-term replacement costs in the cooperative's bank account, and the other goes to the company.

It is still too early to tell how this model will work in practice. The two potential challenges lie in the ability of the community committees to resist temptation of spending the reserve fund, and the short-term contract with the private company, which means that there is no incentive to invest or make longer-term decisions to improve the business plan. They were, for instance, bound by contract to maintain staff in the local area, which they did not respect. It is also difficult to see the viability in the arrangement and there are no consequences of not fulfilling this condition.

The seven villages also had very different demand profiles but the same installed capacity: In one village, the mini-grid could clearly need additional panels while other villages could settle for less, as their consumption was very low. But to move panels from one village to another is a very difficult decision to take in a community association; this would be much easier to do for a private company, but in this hybrid model, it was not in their prerogative.

Another example comes from the project *Électrification rurale décentralisée interrégionale en Mauritanie (ERUDI)* which was the successor to the PERUB-project described earlier. ERUDI promoted a version of the solar platform that included more income generating activities (tailoring, hairdressing, milling and welding) with a tripartite hybrid management model between APAUS (the government agency), the community association established by the project and a private company.

APAUS led the call for proposals for the concession contracts, where several platforms were grouped in lots so as to reach economies of scale. Costs were reduced by hiring a local community member for day-to-day operation and maintenance routines. In most cases, this technician also owned the small retail kiosk as part of the platform, providing phone charging and photocopying.

Revenues were expected to come from the local entrepreneurs who used the services and the tariffs to be applied were already established in the tender document based on calculations made by the implementing NGOs. However, the winning companies soon complained over the lack of revenue: The many services that the platforms offered were not being utilised much and one company refused to operate at a loss and took a swift decision to cancel the salary of the local employee while still expecting him to operate the platform; in return he did not need to pay a fee for his phone charging service. This naturally raised debate.

The private companies in the ERUDI project introduced mobile money as an additional service in the solar platform. Photo: DEM

The Alliance for Rural Electrification calls the hybrid model "the most interesting, but the hardest to define"[12]. The EF does offer interesting hyrid models. For instance the project *Conformación de Cooperativas electricas para la gestión de servicios en barrios pobres de la zona Este de la República Dominicana* where local community groups in peri-urban areas were trained to perform maintenance for the utility which created income for them and lowered costs for the utility.

But general experience from the Energy Facility projects show that it is difficult to strike the right balance between roles and responsibilities of the different parties and there is a risk of ending up with a hybrid model that combines the main weaknesses of the different players rather than their strengths. A few lessons can be drawn from the Energy Facility projects:

[12] ARE. 2016.

1) Ensure that the services offered are commercially viable. One way is to include the private companies at a very early stage perhaps even as co-investors.

2) A clustered model is recommended, but do not expect community members to feel the same sense of ownership and to have the same ability to take difficult longer term decisions, where a cooperative or association covers multiple villages, than they can do when it only involves their own village. Community engagement works best at the very local level.

3) Roles and responsibilities of the different parties should of course be written down and officially recognized, but the reality on the ground will to a large extent define them. For instance:

   a. Do not expect private companies to fulfill conditions that are not profitable and, from their point of view, not necessary. If such conditions are important, define clear penalties.

   b. A long-term contract does not necessarily ensure the private company to think long term: If revenues are limited, the incentive to invest is limited too no matter the length of the contract.

   c. If unsatisfied, local communities might have very little bargaining power vis-à-vis the private company because the number of energy service companies is limited in most ACP-countries and rural communities are not the most attractive markets: the company can walk away, the community cannot.

   d. Private companies might not be able to do much about non-paying customers if- for instance – it is the local community that handles revenue collection. Clear procedures for non-payment must be established and repeated.

Table 1 below summarises the main features of each of the three business models.

Table 1: The three general models of mini-grid management implemented in the Energy Facility projects

	Community-based	Hybrid	Private company
Tarrifs / fees	Decided by the community's committee or public authority	Established in tri-party contract: Community-company-public authority	Decided by the company or public authority
Local day-to-day manager	Member of the committee	Employee of the company; often also a committee-member	Employee of the company
Main strength	Local ownership	Professional technical- and management capacity at company-level	Professional technical- and management capacity Long term incentive to invest
Main weakness	Insufficient technical- and management capacity	Low profitability Low incentive to invest	Low profitability Risk a negative reputation among public authorities and local communities

The role of NGOs

A large number of the Energy Facility-supported mini-grids and other energy infrastructures have been established through initiative of a Non-Governmental Organisation (NGOs). The nature of these NGOs is diverse: Most have a strong technical basis and have experience in energy for many years; others have their core expertise in other sectors of social development and incorporate energy as part of the solution. Some NGOs are performing three roles: i) promoters of new technologies applied in new contexts with an emphasis on research and development of technology; ii) advocates for energy access for the poor and emphasise communication and policy actions; iii) bolstering other development activities in the same geographical zone.

In most cases, NGOs have designed and developed the EF-supported projects. The operations of the infrastructure in the community-based and hybrid models require continual follow-up and support, a responsibility the NGOs often acknowledge but, in many cases, have difficulties fulfilling if they do not have funding for other activities in those areas. In the hybrid model, the terms of contract and tariffs are often developed by the NGO and, in this case, their continued participation after the project is required for instance as a permanent member of the Board.

Several NGOs also use a private company model, where the NGO have established a company to run the mini-grids. Yeelen Kura in Mali is an example of this where a Dutch NGO continues to support them and sister companies in other ACP countries. This approach tackles the risk inherent in handing over the responsibility of management to a local community or a hybrid model. On the other hand, if the private company business model is what it takes, why involve NGOs?

The general experience from the Energy Facility concerning this question is that it is very difficult to draw general conclusions on the role NGOs are playing in the energy sector because they are very different. For the infrastructure projects, the best results seem to come from projects where NGOs collaborate with energy service providers at a very early stage, letting the energy service provider influence decisions that will affect their long-term business plan. The project, Programme Rhyviere II - (Réseaux hydroélectriques villageois, énergie et respect de l'environnement), is an example of that.

When it comes to community-based management, NGOs are generally most successful in creating longer term impact with low cost equipment. The project Accès à des services énergétiques modernes et durables au Mali used women's groups to organise the distribution of small PV equipment and efficient cooking stoves and similar approaches has been applied in Eastern Africa by several projects. In the EF, there are several examples of community-based mini-grids being managed competently by local committees, but without continued follow-up, support, and reinvestments by new NGO or government projects, they stand a small chance as there is rarely a sufficient revenue stream to finance major repairs and replacement of components.

Figure 2: The different roles NGOs take in the energy infrastructures supported by the Energy Facility

In most cases:	In many cases:	In a few cases:
Project initiator	Technical designer	Owner
Facilitator of funding	Oversees construction and installation	Operator
Capacity-building of local communities	Member of the board also after the project	

Conclusions

Community-based management of energy infrastructure, especially mini-grids, is the subject of many scientific studies, reports and guides. The ACP-EU Energy Facility (EF) offers experience to that continued discussion that is unique in the sense that community-based management has been applied in many ACP-countries and employing various technologies.

The main conclusions are that:

1) It is possible to build energy infrastructure in rural areas in the ACP-region and train local communities to manage them on a basic level, but the prospects for long-term sustainability are not positive without continued support.

2) The three main reasons for community-managed infrastructures to fail are i) local conflicts, ii) lacking technical or organisational capacity, iii) insufficient revenue stream due to the nature of the local economy. Where there is a tradition for effective community collaboration, this can facilitate a community-based model.

3) If the main issue is limited local revenue streams, a private company business model will probably not be able to run autonomously without some form of subsidy. Clustering of sites can go some way to addressing this by establishing an economy-of-scale.

4) Hybrid management models – mixing a community-based regime with private company management - could solve some of the inherent problems in both models, but experiences from the EF points out that the different actors in such models have different vested interests and it is more complex in reality than it looks on paper. Under the condition that a sufficient revenue stream can be secured, the best experience comes from the private sector business model.

Recommendations

1. The basic foundation of the business model is a good understanding of local value chains: The smaller the local economy, the smaller should the equipment be that is promoted and vice-versa.

2. Before choosing management model: Analyse existing experience in the country or region with community-based management, private operation and hybrid models.

3. Feasibility studies often underestimate costs and overestimate revenue: Seek economies-of-scale where possible for instance by clustering several mini-grids and have one company or association manage them all.

4. Establish whether the tariffs or fees are cost-reflective and can sustain the business model in the long-term. They are probably not, meaning that continual post-project support is most likely a necessity.

5. Explore relevant paths of involving local communities taking advantage of i) existing local community structures, ii) traditional authorities, iii) organisational models known by the community, for instance those used in agricultural activities, such as associations.

6. Manage expectations and clearly define roles for all partners involved.

7. Incorporate pay-as-you-go meters to reduce the challenges of revenue collection in any community-based model.

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Annex

Energy Facility-supported projects that this paper is based on

Project No	Project Title	Country
2007/195-951	Catalysing modern energy service delivery to marginal communities in Southern Africa	Malawi; Mozambique; Zimbabwe
2007/195-954	Community Managed Renewable Energy Program For Rural Ethiopia	Ethiopia
2007/195-963	Mwenga 3 MW Hydro Power Plant	Tanzania
2007/195-965	Conformación de Cooperativas electricas para la gestión de servicios en barrios pobres de la zona Este de la República Dominicana	Dominican Republic
2007/196-003	Projet d'électrification Rurale dans le Brakna – PERUB	Mauritania
2007/196-005	Programme rHYviere- Madagascar (Réseaux hydroélectriques villageois, énergie et respect de l'Environnement)	Madagascar
2007/196-011	SETUP: Services Energétiques et Techniques à Usage Productif au Bénin	Benin
2011/231-781	Providing Solar Home Systems (SHS) to the rural and peri-urban population of the region of Gabú in east Guinea-Bissau on a fee-for-service basis	Guinea-Bissau
2011/231-830	Programa Comunitário para Acesso a Energias Renováveis	Guinea-Bissau
2011/232-092	Enabling 18.000 people to access sustainable small-scale solar power in 2 districts of Cabo Delgado	Mozambique
2011/232-430	Renewable energy for local development	Guinea-Bissau
2011/232-617	Électrification rurale décentralisée interrégionale en Mauritanie (ERUDI)	Mauritania
2011/263-711	Rural Energy Activating Livelihoods	Sierra Leone
2011/279-783	Pico-hydro électricité au service du développement rural (PHEDER)	Madagascar
2011/280-322	Best Options for Rural Energy and Access to Light and Electricity (BOREALE)	Madagascar
2012/279-396	Programme d'électrification solaire en milieu rural dans la Province du Zoundwéogo	Burkina Faso
2012/283-253	Electrification des communautés rurales avec des Micro-réseaux de Génération d'Energie Solaire Photovoltaïque Autogerés dans la Région de Zanzan (Côte d'Ivoire)	Cote d'Ivoire
2014/340-491	Promoting Renewable Energy Services for Social Development in Sierra Leone (PRESSD-SL)	Sierra-Leone
2014/340-559	Hydroelectric Energy for 20 Isolated Rural Villages in the Ludewa District, Tanzania	Tanzania
2014/340-907	Mwenga Hydro Rural Network Extension into the Kihansi Basin	Tanzania
2014/343-320	Programme Rhyviere II – (Réseaux hydroélectriques villageois, énergie et respect de l'environnement)	Madagascar
2014/343-742	Développement durable par les énergies renouvelables (DPER-Sud Est Sénégal)	Senegal
2014/348-266	Scaling up access to modern electricity services on a regional scale in rural Sub-Saharan Africa by means of a fee for service business model	Mali, Guinea-Bissau, Uganda
2014/351-389	Electrification Rurale Décentralisée des Provinces du Ziro et du Gourma (ERD ZIGO)	Burkina Faso
2014/352-384	Augmenter et consolider l'accès aux services d'électricité modernes dans les régions de Ségou et Sikasso, par le biais de kits photovoltaïques et mini-réseaux hybrides solaire PV-diesel et sur la base du modèle "Fee for service"	Mali
2014/353-422	Light Up Liberia	Liberia
2014/353-458	Light up our Futures	Liberia
2014/353-512	Accès à des services énergétiques modernes et durables au Mali	Mali