



Managing Entity for a Financing Program aiming at the promotion of private initiatives in green mini-grids improving access to electricity in Kenya



Mapping the barriers of
GMG market
development / Impact of
GMG on BoP Markets
and Social Inclusion

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In association with





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Executive summary of Social Inclusion Project

This project “Mapping the barriers of GMG market development / Impact of GMG on BoP Markets and Social Inclusion,” was one of the first projects commissioned by the GMG facility and was designed to ensure that issues of inclusion were considered at the very beginning of the programme.

The key objectives around this were to ensure that all stakeholders in the industry were consulted and that this project identified the key areas that the facility had to focus on through its lifetime to ensure that communities were treated fairly and had a voice in the decision making process. (Please see original scope from the project plan in the appendices)

Practical Action Consulting managed this project with the support of I-dev.

A Participatory Market Systems Development (PMSD) approach was adopted to undertake the process involving a range of activities.

The key activities that happened were

1. Interviews key Stakeholders:

15 key organisations were contacted and the summaries are in an appendix. They ranged from Minigrid developers, commercial and donor funders, government and regulators and other supply chain actors like equipment manufacturers.

The importance of these interviews was to get a good sense of what the key challenges and issues are from various perspectives in the minigrid industry. This helps to shape the discussions with the communities and when bringing stakeholders together.

All the summary of the interviews are presented in Annex 1

2. Interviews and Market Mapping with communities

2 communities were selected and 2 days were spent in each community. The first day was spent speaking to focus groups in the community, either women’s groups, youth groups or business groups. The second brought together representatives from each of those groups and a market map was developed from the perspective of the community. The purpose of this was to work out the relationships between market actors and in particular where there were problems and opportunities to change the flows to make the relationship better for communities.

Whilst this took place with communities, they were asked to select 2 representatives to come to an event in Nairobi.

These representatives arrived a day before the workshop and the PMSD team worked with them to prepare them for the workshop and in particular how to articulate their opinions in a room full of different stakeholders.

The summary of the meetings with communities is in Appendix 2.

3. One day PMSD workshop in Nairobi

As a way of bringing the key players and issues together, Practical Action convened a workshop at the Silver Springs hotel in Nairobi.

24 people attended including community representatives, minigrid developers, commercial and donor funders and equipment manufacturers. A list of attendees is presented in Annex 5.

The day involved a very interactive approach with attendees developing new market maps in 2 separate groups. This followed on to identify the key barriers in the map between actors and then culminated in prioritising the areas for immediate support from the GMG facility.

Appendix 4 shows the grid which highlights the top 5 areas for further interventions.

Key priorities for GMG Facility around Social Inclusion

1. Access to Finance

The number 1 area that all workshop participants thought was the most important to tackle was the lack of finance for consumers and small businesses.

This resonated with communities who struggle to pay for connections and appliances and with developers who find that they need to create a high demand for energy to ensure financial viability.

Also key to explore here are how systems can be developed to help the most vulnerable and disadvantaged in every community.

Next steps:

A ToR will be developed outlining a route to new possible sources of financing for these target clients. The fund is unlikely to use GMG money but instead source finance and partnerships with existing financial players.

2. Productive Uses

Communities wanted to have more knowledge and skills (and of course finance – see above) so that they could use the new energy to add value to various products – in particular agricultural value chains.

Developers saw this as a gap in their knowledge and saw the benefits of supporting consumers to be able increase local incomes through new businesses.

Next Steps:

A ToR will be developed which will look at 2 levels of support in this area.

Firstly a toolkit that can be used by developers to improve their knowledge of the steps involved in selecting new value chains, developing a business plan and costing in the investment and returns for the consumers, community and developer. There could even be some training courses to help roll this out

Secondly a new services offering will be developed for a developer that wants a more bespoke service. This will involve first hand consultancy in value chain analysis, business planning, demand analysis (energy and other products) to help clients develop a fully worked plan to bring in a new product line

3. Industry Indicators

Measuring performance across different companies within an industry is a very hard thing to do, in particular when there is no standard set of indicators.

Participants in the workshop felt it was important to ensure that key indicators – especially those around social impact – were developed so that it could be ensured that companies could be evaluated against each other and those with the best track record of impact could be identified.

Interestingly investors also articulated a need to have a standard set of indicators which they can use to understand not only social impact, but also energy produced and used, system performance, financial performance and so on.

Next steps:

A ToR will be developed to create a small set of indicators for the Kenyan mini grid market (also for use potentially further afield). These should be easy to collect, objective and easily verifiable.

Key also will be develop a strategy for industry adoption and in identifying a long term host for this information

Appendix 1: Stakeholder Meetings

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: AlphaMundi

Date of meeting: 28th March 2017

Location of meeting: 14 Riverside

Present:

1. William Githu - AlphaMundi
2. May Yego - I-DEV International

Background on AlphaMundi:

AlphaMundi Group Ltd is a commercial entity based in Switzerland and exclusively dedicated to Impact Investing profitable investments that generate substantial net benefits to society. Are keen on renewable energy sector. Invest in past proof of concept and commercially viable businesses. Have invested single solar home solutions. Have in the past spoken to Powerhive and Powergen.

Key challenges:

1. Not a clear path on what happens when the national grids comes to the same geography as a mini-grid.
2. High cost to end consumer which doesn't align with impact funders.
3. Unclear break-even point. What is the point at which a mini-grid becomes profitable and at what connections number.

Solutions/ recommendations:

1. Aggregate funders in the sector to create a sector wide subsidy (private sector focused).
2. GMG could de-risk sector through a loss-guarantee facility allowing for increased investment.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: CrossBoundary

Date of meeting: Tuesday, 28th March 2017

Location of meeting: Skype Call

Present:

1. Gabriel Davies – Associate, CrossBoundary
2. Patrick Watson – I-DEV
3. Gerald Njugi – I-DEV

Background on CrossBoundary: Provides investment advisory services across all sectors in fragile and frontier markets for clients such as governments, development finance institutions, private equity firms, Fortune 100 companies, and research institutions.

In 2015, CrossBoundary raised \$8M for their CrossBoundary Energy Fund I, the first dedicated investment fund for Commercial and Industrial solar in Africa that finances renewable generation projects (0.1MW-10MW)).

Key takeaways:

1. They are doing a similar mapping exercise with The Rockefeller Foundation
2. To get to tariff parity for private developers (unified tariff charged by KPLC) average spend per user (ASPU) spend needs to be at least \$15 per month
3. Getting precedent via a portfolio of projects first (mainly financed through grants-like funds) will allow monitoring and strengthening the case with the government of Kenya.
4. GMG could fund data collection in the mini-grid sector to de-risk the sector since there is a general lack of industry data.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: DOB Equity

Date of meeting: 29th March 2017

Location of meeting: ABC

Present:

1. Mercy Mutua - DOB Equity
2. Paolo Mele - Practical Action
3. May Yego - I-DEV International

Background on DOB

DOB Equity is a leading Dutch family office investing in impactful, innovative and scalable businesses in East Africa. DOB Equity has offices in Nairobi, Dar es Salaam and in the Netherlands.

DOB provides at least USD 4M per transaction in equity. They have capability to do follow on investments and provide TA facility. They are a patient capital provider i.e. can stay in a company for a very long time without an exit, over 8 years.

Within the renewable energy sector they have invested in PowerGen, Barefoot and Mkopa.

Key challenges:

1. Misalignment between funds available for the sector and the sector financing needs. Sector requires more long term focused funds. Infrastructure funds.
2. Regulatory concerns. Providing electricity to the population is a government mandate and it may look like the mini-grids are trying to embarrass KPLC and Govt. Very difficult for mini-grid to get licensing in Kenya. Tanzania is a more favourable regulatory environment.
3. Not a clear path on what happens when the national grids comes to the same geography as a mini-grid.
4. Very high energy cost to end consumers.
5. Low population density.
6. The use of solar batteries requires one to have a sort of diesel back up.
7. The lack of local entrepreneurs, senior management and technical skills within the sector.

Solutions/ recommendations:

1. The sector and more specifically private developers needs to start engaging the Government and the County Government early enough (pre-development) to avoid conflict. County government support/ buy in is key to ensure continuity even when national grid arrives.
2. Setting up strong and impactful mini-grids will “force” the Government to engage with private sector.
3. A multi-product solution may be a good approach for developer to address the generation cost and low productive uses concern in a community i.e. mini-grid for the trade centre coupled with solar home solutions for the surrounding households. This requires engagement between the different players within the off grid energy space.
4. Require commitment from the private sector developers to increase local senior managers and skills within their companies.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: EED Advisory

Date of meeting: 24th March 2017

Location of meeting: EED offices along Milimani Road

Present:

5. Murefu Barasa - Managing Partner, EED
6. Kevin Wafula - Senior analyst, EED
7. May Mumo - IED
8. Paolo Mele - Practical Action
9. Francis Wainaina - Practical Action

Background on EED

EED Advisory is a consulting firm with a focus on renewable energy assignments within the region. The firm was involved in undertaking some initial feasibility work that led on to the design of the GMG facility. This also involved site visits to some of the mini grids i.e. in Ogembo (a Powerhive site) among others.

Key challenges:

1. Pricing/cost of power – In comparison to on-grid power, higher costs are borne by mini-grid communities. (i.e. US\$ 0.15-0.2 against US\$ 80 per KW). With the Government of Kenya looking to ensure that all citizens pay the same for power, mini-grids will struggle to be sustainable without additional financial support or subsidies.
2. Low productive use - Upfront costs for mini-grid power are low as the costs are loaded up on the monthly fee. This can result in significant costs for households especially in the ASALs limiting use of the power generated. To enhance the use of the power, mini-grids need to explore productive community use through energy for local businesses, irrigation of farms etc.

Solutions/Recommendations:

1. Subsidies and social funds channelled to the private sector to de-risk their investments and enable them to provide affordable power to the communities.

2. Stimulate productive use of energy by communities i.e. use of energy for business, irrigation etc. This can also be through addition of value to equipment that can use the mini-grids power sustainably i.e. fridges, television sets etc.
3. Continuous innovation resulting in economy along the value chain i.e. remote monitoring systems, improved storage, mobile payments, low human interaction with the systems that there by drives the operational costs and prices down.
4. Use of mini-grids as back-up systems in areas accessed by the grid. The clientele at these locations may not object to paying a premium for the service.

Other important points made:

1. EED has undertaken a study that shows a small window exists within which energy from mini-grids proves economical. Beyond this, acquiring gensets is more economical. As such very few productive uses can be sustainably supported by mini-grids. However companies like Husk power, Biashara Energy, SunCulture among others are still working through this model.
2. On the Last Mile project, there has only been a 10% increase in demand for power even with the substantial increase in connections.
3. Tariffs applied by mini-grid developers or operators can be very complicated and vary from one project to another.
4. The draft Energy Bill has some important opportunities for the sector i.e.
 - Mini-grids can buy power from Kengen/IPPs to supplement their demand
 - IPPs (maybe large mini-grids) can wheel power through the available infrastructure
5. County governments especially in the ASAL areas of Kenya can use their devolved resources to develop mini-grids to enhance energy access in their jurisdictions. As such they are potential partners with the private sector in developing mini-grids.

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Stakeholder Meeting Notes

Stakeholder: GIZ-Prosolar

Date of meeting: 2th March 2017

Location of meeting: GIZ offices- Westcom Point

Present:

1. Jasmine - GIZ
2. Alice Amayo -GIZ
3. Florian Simonsen - GIZ
4. Paolo Mele - Practical Action
5. Patrick Watson - I-DEV International
6. May Yego - I-DEV International

Background on GIZ:

GIZ should be a key ally for GMG given they have (or are):

- Managing the Results Based Financing for Mini-grids. Funded by DFID to support up to 20 mini-grids with grants of up to 50% of capex. Incentives paid upon pre-agreed results e.g. successful construction. Cooperating with BBK to provide incentives. Fund size is £2.1M.
- Invested and developed a pilot isolated mini-grid program i.e. Talek Power in Narok. Project is owned by the County government and managed by PowerGen.
- Developed a process for community education, engagement and communication of their interest, potential opportunities and community education. The community is able to determine, aggregate and communicate their interest.
- Conducted an M&E on use or evolution of usage of electricity since installation (*we should get a copy*).
- Developing a demand generation analysis (*we should keep in touch on this*).
- Attaching a consultant to work on formulating policy from all the studies done.

Key challenges:

1. High costs incurred by project developers. There is currently no funding in the market to cover the difference between the cost reflective traffic and uniform traffic required by Government.

2. Upfront connection cost, limit the households from directly connecting to the grid.
3. Not a clear path on what happens when the national grids comes to the same geography as a mini-grid.
4. Kenya government not clear on strategy. Seems to be leaning towards the multi-distributer model but has shifted to a single utility model with the \$150m World Bank funding.
5. Specific challenges faced by community at Talek community include:
 - i. The Mpesa integration and the initial challenges related to that.
 - ii. Slow response from operator to complaints.

Solutions/ recommendations:

1. The Talek has managed to charge cost reflective tariffs KES 70 per KWH. The project was able to make a business case for the cost base and got the community by in/agreement for the higher traffic. ERC is an independent entity and is able to approve varying rates although needs to manage political pressure from the Ministry. User dynamics also vary and the private mini-grid developer needs to address question why other grid connected consumers are charged differently and assure better reliability than the national grid.
2. The Talek project has witnessed a lot of subcontracting of power where, business that are connected to the grid subcontract to 5 household consumers. This presents an alternative model to be considered by private developers with regards to reducing the connection fees.
3. Management /service contracts with KPLC may be a good solution when the national grid arrives to the min-grid target areas.

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Stakeholder Meeting Notes

Stakeholder: Kenya Renewable Energy Association (KERA)

Date of meeting: Wednesday, 29th March 2017

Location of meeting: Intercontinental Hotel, Nairobi

Present:

1. Kamal Gupta - Schneider Electric
2. Paolo Mele - Practical Action
3. May Yego - I-DEV International
4. Patrick Watson - I-DEV

Background on KERA: Founded in 2002 by members of the Renewable Energy Resources Technical Committee of the Kenya Bureau of Standards (KEBS), KERA is an independent non-profit association, dedicated to facilitating the growth and development of renewable energy business in Kenya.

Amongst its key roles are promoting the interests of members of the renewable energy industry among government, public sector, the general public and any other organizations that may impact on the development of the industry and the creation of a forum for the dissemination and exchange of information and ideas on matters relating to renewable energy development and utilization in Kenya.

Key takeaways:

- a) KERA has a working group of mini-grid actors.
- b) Simplest solution for private mini-grids is where KPLC collects money from power consumers.
- c) Technology advancement could have a big impact on mini-grids success in general.
- d) Access to training for communities through capacity building is key in driving up consumption of power through productive uses.
- e) Local leadership interference (politics) in mini-grid projects sometimes hinders development of mini-grids.
- f) Having priority uses in a community for example social amenities such as schools, hospitals especially when the power is not enough for all.

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Stakeholder Meeting Notes

Stakeholder: Kenya Power (KPLC)

Date of meeting: Wednesday, 5th April 2017

Location of meeting: Electricity House, Nairobi CBD

Present:

1. Eng. Henry Kapsowe - Chief Engineer (Off Grid) at Kenya Power
2. Francis Wainaina - Practical Action
3. Gerald Njugi - I-DEV International

Background on Kenya Power: The Company owns and operates most of the electricity transmission and distribution system in Kenya and sells electricity to over 4.8 million customers. It is listed on the Nairobi Securities Exchange. Listed national utility firm is majority owned (50.1%) by the Government of Kenya (GoK) with private investors holding the remaining 49.9% equity stake. The firm currently operates and maintains 20 mini-grids (mainly thermal/diesel-fired plants) around the country majority of which are in the ASAL region and targets to add 3 more sites/mini-grids by the end of 2017.

Key challenges:

1. Inability for mini-grids to break even at uniform tariff.
The cost of putting up and operating mini-grids is significantly high (due to the high cost of diesel and other O&M cost) and it is almost impossible to recoup the investment amount if the mini-grid was to charge the uniform tariff for private developers. KPLC mini-grids are actually owned by REA (KPLC does the O&M work) and the only reason they are sustainable is due to cross-subsidy whereby the all Kenya Power customers across the country bear the cost of running the mini-grids (i.e. captured in the uniform tariff). That means that electricity consumption in the existing KPLC mini-grid systems is heavily subsidized through the tariff structure (cross subsidies).
2. What happens when the grid arrives?
The timing of the grid arrival is outside KPLC's control as this is mainly decided by the REA, the Ministry of Energy and Petroleum (MoEP) and in some cases political influence at both the county and national level. This uncertainty poses a big risk for the private developers due to the cut-off/significant reduction of cash flows post-grid arrival.

There are various possibilities/options available for the mini-grids when the grid arrives such as:

- a. Become a Small Private Distributor (SPD)
- b. Sign a PPA with KPLC and become an IPP
- c. A combination of (i) and (ii)
- d. Sell the infrastructure to KPLC (this is very unlikely due to the quality standards / base load)
- e. Move assets to a new site (the cost of doing this might be prohibitive)

3. Problems with grid-integration

To-date there hasn't been a single successful integration of an off-grid mini-grid upon arrival of the national grid. This has mainly been due to the low quality of the distribution network that in most cases do not meet the KPLC standards. Case Study: The Mpeketoni Electricity Project (MEP) in Lamu County that was community owned but the infrastructure had to be abandoned when KPLC put up their mini-grid.

4. Pricing/Tariff

Most of the mini-grids are located in areas where the ability to pay for the power is limited due to the social economic situation within such areas. As such the tariffs are high compared to the grid costs.

Solutions/Recommendations:

a) Access to cross-subsidy structure for private developers

- ✓ One of the possible solutions to enable sustainability of the mini-grid framework especially in low density areas (with minimal potential for substantial productive uses and low ability to pay) is to work out a structure where the private operators enjoy the same cross-subsidy benefits as KPLC for example, the cost of operating the mini-grids (both KPLC and private owned) is factored in the uniform tariff applied across the country.
- ✓ Since there are many private operators this could be done at the mini-grid association level and then channelled to individual operators.

b) Adoption of SPDs model in grid areas

- ✓ The currently regulatory framework provides for bulk purchasing of power by Small Private Distributors (SPDs) from Kenya Power or other IPPs. The bulk supply tariff is normally set by the ERC. This structure has a potential to reach a large number of households who are within the grid areas but have no access to electricity. Case Study: Two Rivers Mall buys bulk electricity from Kenya Power and retails the same to its tenants.

- ✓ This model is a potential ideal solution for ‘What happens when the grid arrives?’ for the private mini-grids
- c) To enhance use of the mini-grid power, the developers should target productive users whose main concern is availability of the resource and are willing to pay irrespective of the cost.

Other important points made:

1. AFD (through the GoK) is providing €33M to Kenya Power to help introduce or increase the renewable energy component making them hybrid plants (mainly wind and solar) to at least 23 sites.
2. The World Bank's Kenya Off-Grid Solar Access Project (K-OSAP) for Under-Served Counties has allocated c. \$45M for mini-grids which will be deployed by the Rural Electrification Authority (REA) and Kenya Power. Financing is expected to come through in May/June 2017 with 120 sites already identified as potential beneficiaries of the funds.
3. There is ongoing work to develop a framework that will enable SPDs. ERC can provide more information on that.

It is important to stress that the official we met did not view mini-grid developers as competitors to KPLC and seemed rather welcome to a collaborative approach in providing access to Kenyans.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: Ministry of Energy & Petroleum (MoEP)

Date of meeting: Monday, 10th April 2017

Location of meeting: Nyayo House, Nairobi CBD

Present:

1. Eng. Mungai Kihara – Engineer, Renewable Energy at MoEP
2. Francis Wainaina – Practical Action
3. Gerald Njugi – I-DEV International

Background on Ministry of Energy and Petroleum (MoEP): The Ministry is in charge of policies to create an enabling environment for efficient operation and growth of the sector. It sets the strategic direction for the growth of the sector and provides a long term vision for all sector players. Some of the key objectives of the MoEP is to;

- i. Increase electricity access country wide to.
- ii. Increase the uptake of power
- iii. Grid / off-grid network extension so as to achieve energy access of 70% by 2017 and universal access by 2020.

Key Points:

a) Review of Feed-in-Tariffs (FiTs)

The ministry has set up a taskforce (now in advanced stages) to review the FiTs so as to incorporate energy auction in the country which presents a good opportunity for mini-grids.

b) National Electrification Strategy (NES) underway

The ministry with the help of US-based firm, the National Rural Electric Cooperative Association (NRECA) is developing the National Electrification Strategy which is being complemented by Geo-Spatial mapping of the country to inform areas, resources and strategies for electrification by either grid extension (including last mile connections), mini-grid or any other distributed such as stand-alone systems.

c) Regulatory issues

i. Differentiated (cost-reflective) tariffs out-lawed

The ministry reaffirmed their commitment to ensure that a uniform tariff is charged by all players in the country. He mentioned that the only reason some private developers have been issued with temporary retail licences (by ERC) with higher tariffs (the tariffs are approved annually) was for data collection purposes and to facilitate piloting of various mini-grids projects to assess viability

ii. Equalisation Fund and cross-subsidies

He acknowledged that the Ministry is aware that private mini-grids are almost unsustainable without subsidies for them to charge the unified tariff and that the government was considering enabling the private operators access subsidies from the equalisation fund in the same manner that KPLC cross-subsidies. This process in the early stages of development.

iii. Small Private Distributors (SPDs)

He mentioned that the Small Private Distributors (SPDs) model is provided by the law and might be exploited by private companies in enabling the GoK to achieve densification in grid areas. However, this will only work for lower voltage transmission systems of between 66kv and 132kv e.g. what Two Rivers has done or for high industrial consumers though these types of consumers would prefer to buy directly from KPLC.

(NB: He recommended that we could get more details and insights from Eng. Ngatia

(gerald.ngatia@erc.go.ke) and Eng. Oketch from ERC)

iv. What happens when the grid arrives

He mentioned that even though there are various options available for private operators of mini-grids; (1) KPLC buying assets (2) PPA model (3) modular model movable to another location, the biggest challenge is that the technical standards of the private operators do not match those of KPLC.

Other important points made:

1. Kenya has been experiencing a decline in the average spend/revenue per user of electricity and consumption per capital at the national level mainly because majority of the last mile consumers/beneficiaries (over the last few years) are either using very minimal power or no power at all besides the free tokens (usually 30 tokens/units) as part of the Last Mile Programme/package. There is need for a campaign or outreach program on productive uses of power in these areas to drive up consumption.

(NB: He recommended that we could get more details and insights from Agnes Obala, an Economist at KPLC).

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Stakeholder Meeting Notes

Stakeholder: PowerGen Renewable Energy (“PowerGen”)

Date of meeting: Thursday, 30th March 2017

Location of meeting: PowerGen’s offices in Karen, Nairobi

Present:

1. Johannes Holst – PowerGen
2. Francis Wainaina – Practical Action
3. Gerald Njugi – I-DEV International

Background on PowerGen: PowerGen was founded in 2011 to address the challenges of renewable energy and energy access in East Africa (Kenya and Tanzania). PowerGen has built 40 micro-grids in East Africa (over 20 mini-grids in Kenya, of which they operate 8, with approximately 200 customers in total). All of these mini-grids are powered by solar PV and have a capacity below 10kWp per unit all of which are standardised and modular.

In 2016, PowerGen closed \$4.5M Series A with DOB Equity, AHL Ventures, and private investors including Marc Beuls, former President and CEO of Millicom International Cellular and Billy Harbert, CEO of BLHarbert International. The investment was meant enable PowerGen to expand their current micro-grid portfolio, connecting over 7,500 customers, including households and micro-small and medium enterprises and giving power to nearly 50K people within the two years.

Key challenges:

1. Regulatory:
 - a. Grid licencing has a lot of uncertainties and approval takes long.
For example, PowerGen applied for a licence in July 2016 and this has not been issued to date. Within that time 700 connections have been made by the company in Tanzania.
 - b. Lack of standards for mini-grids
ERC could develop and enforce technical and safety standards for mini-grids by borrowing this framework from other established jurisdictions such as the US.
 - c. Unsustainable Tariff framework i.e. the unified/common tariff is unsustainable without appropriate steps to compensate the private developers of mini-grids due to high cost of developing and maintaining the mini-grids.

- d. Uncertainties about when and what happens when the grid arrives.
- e. Heavy licencing/permitting requirements regardless of the size of the project
Currently any site irrespective of size undertakes very detailed studies (e.g. EIA) similar to those of large power plants. The cost for this is thus passed on to the users (through the tariff) resulting in higher user cost of power to mini-grids energy consumers.

2. Financing:

- a. Donor programmes and funds are crowding the space and making it hard for the private sector to compete i.e. the Last Mile Connections Program providing cross/cost subsidies to near grid users. For the private sector to be involved universal subsidies even for private developers need to be provided.
- b. Lack of coordination among donor programs - There are also a lot of interventions by various donors working in the mini-grid space in Kenya. Better coordination by donors can unlock larger grants and funding for the private sector within the mini-grids space or at least have interventions that complement each other.
- c. There are uncertainties over the size and nature (solar, hydro, wind etc.) of the mini-grids market i.e. the number of households that represent a target market for mini-grids in Kenya is not known with certainty (no reliable statistics).

Solutions/Recommendations:

- ✓ Standards for mini-grids - ERC could develop and enforce technical and safety standards for mini-grids by borrowing this framework from other established jurisdictions such as the US.
- ✓ Grid arrival and integration - The government should ensure predictable and clear procedure for transition and integration once the grid arrives e.g. agreed on price that KPLC would pay/users would pay upon grid arrival as is the case in Tanzania. Also, there needs to be a clear structure to compensate private operators for losses (foregone cash flows) incurred due to 'pre-mature' arrival of the grid.
- ✓ Tariff framework - The government should recognise importance of private mini-grids in achieving universal access to power in Kenya and hence ensure that the private developers access the same level of subsidies as the national utility in enforcing the unified/equitable tariff.
- ✓ Licencing Framework - The government should reconsider permits applicable for mini-grids such as Environmental Impact Assessment (EIA), this should be proportional to size of plant.
- ✓ Market sizing and nature - The GMG Facility might consider financing a study to unveil / define this in terms of data, preferences and consumer behaviours across

the regions across Kenya. This will make it easy to profile the risks and opportunities in the market hence easier to pitch to investors.

Other important points made:

1. Solar technology is preferred for mini-grids by investors due to:
 - a. No moving parts (hence low O&M costs).
 - b. The certainty in the resource (sunlight).
 - c. Well understood and low risk infrastructure.
 - d. Innovations in technology driving costs down.
 - e. Generally cheap nature of the materials in comparison to hydro or geothermal or wind.
2. Hybridisation of mini-grids enhances the number of connections and is economical than having a purely green mini grid. This also ensure that there is stable and reliable (no down time) power supply especially for businesses. This is especially common with solar and wind mini-grids since there are varying levels of sunlight and wind respectively meaning that the battery/storage charge levels varies. Hence, most of these mini-grids will normally have a back-up diesel generator.
3. The role of developers in the KOSAP programme and procurement of providers by Kenya Power are contentious issues that need to be ironed out. The sites selected by KOSAP will potentially lock out private sector players from the remaining feasible mini-grid sites in the country. What does that mean for the players developers?

The GMG Facility as well as the developers association should be involved in the discussions leading up to the launch of the programme. Possible solutions would be for the developers to tender for the sites but be allowed to design, construct, operate and charge for the energy supply. The procurement process needs to be transparent to avoid corrupt players from getting the sites.

4. Sam Slaughter (co-founder and CEO) was instrumental in setting up of the mini-grid developers association in Kenya and TZ known as Africa Mini-grid Developers Association (AMDA)
(See Principles and Charter Terms of AMDA attached)
5. The concept of SPDs by developers working to unlock the lack of access in areas covered by the grid should be considered and regulated. The benefits from these are clear i.e. smart metering, improved though distributed storage, better customer care, increased

use of renewable energy in the grid and of course increased demand due to active connections.

The GMG Facility might consider leading the dialogue with the regulator, KPLC and the ministry aimed at including the grid covered areas within the mini-grids market. Having this regulated on i.e. included in the Energy Bill for instance would be a significant achievement in unlocking private sector participation in energy access in KE. Can the GMG also consider piloting a case study on SPDs?

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: RVE SOL

Date of meeting: 27th March 2017

Location of meeting: Skype

Present:

1. Vivian Vendeirinho - Founder and Chair of the Board, RVE SOL
2. Patrick Watson - I-DEV
3. Gerald Njugi - I-DEV
4. Paolo Mele - Practical Action Consulting

Background on RVE SOL

RVE SOL is a developer of mini grids that has been working in Kenya since 2011.

In terms of development they have recently identified 140 potential new sites which have now been reduced to 50 on the basis of proximity to grid, existence of CBO, density of population, willingness to pay etc.

Site assessments have been carried out at 20 of these and they hope to commission 10 before Christmas 2017. With a further 35 more next year. Each will be around 20-25KW and cover around 150-200 customers. Approximate cost per site is \$150-200k.

These sites will only be viable with the 70% subsidy from GMG. This will also help them test different tariff models.

Key challenges / notes:

Sidonge

They have one key site in Sidonge, Busia which is 8KW and connects 6 businesses and 54 households. Households generally fall into 2 categories 450 kes/month or 800 kes/month

Licensing – they have a license from ERC but have to keep renewing it each year – last year it took 9 months to renew. This worries investors. The license allows them to sell at 65/kes/kwh.

Business model needs to accommodate seasonal differences in income.

They are looking at a programme of demand stimulation through supporting 10(?) new businesses to set up. They are working with E4I for this.

They have added potable water and biogas for cooking as services they are selling to community to increase revenue streams and will be expanding this to cover more houses and even start bottling and selling the water outside the village.

They set up a Power Management Committee (PMC) which manages the site. The chair is given a small stipend and acts as the first line of support for any problems.

Never had a theft of equipment or fraud – put down to community being so involved.

They have recently tried a blended approach by linking with equatorial sunpower and provided 60-70 solar lanterns to outlying houses not reached by the minigrid.

They conducted a social impact study in 2015 and found out that:

- Malaria rate is down – anecdotally due to higher disposable income and increased purchasing of nets
- School attendance up by 180% - again as disposable income is up and parents can buy uniforms
- School grades up by 35%
- Increase productivity in Cassava yields – TV information give knowledge of varieties that can harvest twice per year.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: Statera Capital Limited

Date of meeting: Tuesday, 28th March 2017

Location of meeting: Skype Call

Present:

1. David L. Ross - MD, Statera Capital
2. Paolo Mele - Practical Action
3. Patrick Watson - I-DEV International

Background on Virunga Power: Statera Capital is an impact investment banking that invests and advises on investment and transactions for large profitable companies and projects that benefit the environment (especially in the renewable energy sector), economy, and people throughout Sub-Saharan Africa. In mini-grids sector, they have advised on over \$100M worth of subsidy programs in Kenya, Tanzania, and Rwanda and have been hired by GIZ to write a book about financing of mini-grids in Kenya. In addition they were part of the team for mini-grid regulation enhancements for the government of Kenya and formed part of the team that structured the GMG Facility.

Key challenges:

1. Illegality of the sector without government support
Currently, majority of the mini-grid developers/producers in Kenya are operating without licences or with interim licences (normally one year renewable licences). This has made the mini-grid sector very risky for external investors. In addition, the regulatory framework for mini-grids is to a large extent unclear at the moment.
2. Need for significant subsidies for sustainability
To achieve tariff parity, the mini-grid developers would require significant subsidies/grants (at least 60% of the cost) – similar to the ones available to KPLC. Even the government owned mini-grid are struggling to stay afloat due to high cost of development & connection vs very low number of connections and productive uses in those areas.
3. Change in government

It is unlikely that there will be any further regulatory clarity from now until after the general elections in August 2017. In addition, it is unlikely that differentiated tariffs will be a priority for the new government. This means that there are minimal chances of any new real investment occurring in mini-grids sector in Kenya for the next 1-2 years at the minimum.

4. Competition from solar home systems and grid power

The mini-grid sector in Kenya is faced by real competition from solar home systems and extension of the main grid power both of which are significantly cheaper.

Solutions/Recommendations:

- ✓ Lobbying for an interim waiver period - The GMG facility should consider pushing for a waiver of enforcement of regulation for at least 24 months so as to allow the flow of funds / investments into the sector while we await (and pursue) a favourable change regulation/legislation for the mini-grid sector.
- ✓ Downside protection - External investor in the renewable energy sector normally require an IRR of approximately 15-18% and as such it might be useful to explore various ways of mitigating loss of investment due to the high risk and uncertainty in the sector.
- ✓ Use of “Enhanced Solar Home System” instead on mini-grid - The mini-grid developers should consider/explore other models which do not fall under the category of mini-grids from a regulatory perspective such as the enhanced solar home systems. This model has been successfully rolled out in Rwanda by [MeshPower](#). It is cheaper to develop and is easily ‘portable’ or ‘transferrable’ to a different location one the main grid arrives.
- ✓ Focus on demand generation initiatives.

Other important points made:

- i. Tanzania is more attractive for mini-grid investments since it’s easier to get a distribution licence than it is in Kenya.
- ii. Institutional investors usually shy away from mini-grids due to;
 1. The perceived high risk.
 2. Unclear regulations/policies
 3. Lack of investor knowledge.
 4. Lack of track record/success stories in the sector.

Majority of funding between pre-feasibility and financial close is normally grants or grant-like funds from DFIs, Impact Funds or government funded institutions.

- iii. Reduction/subsidy of the upfront/initial capex costs has minimal effect on the return on investment (PPA cash flows have the most impact on the returns).
- iv. Most mini-grid producers operate a pre-paid model mainly to manage their cash low cycle and have not explored the marginal effects of having a post-paid model.
- v. Power wheeling is a large opportunity for densification in rural areas. They pay 5c and sell for 9c. The spread then pays for the infrastructure and maintenance.

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: SunFunder

Date of meeting: 30th March 2017

Location of meeting: Zoom Call

Present:

1. Avi Jacobson - Global Investment Officer at SunFunder
2. Francis Wainaina - Practical Action
3. Gerald Njugi - I-DEV International

Background on SunFunder

SunFunder is a solar finance business based in San Francisco and Tanzania with a mission to unlock capital through crowd funding from institutional & accredited investors for solar energy in emerging markets. They provide short-term inventory finance (up to \$300K), working capital (\$100K-\$2M+) and structured asset and project finance (\$2M+) loans to leading off-grid solar companies and grid deficit solar projects mainly in East Africa but also global focus to help them scale deployments of solar energy systems and catalyse growth in the sector.

In 2016, SunFunder closed a "beyond-the-grid" solar fund worth \$15M from the US government's Overseas Private Investment Corporation (OPIC) and has plans to grow the fund to \$50M.

They have invested in: Greenlight Planet, D.Light, Off Grid Electric etc.

Key challenges:

1. Acknowledged that there is a mismatch between loan tenors and project cash flows for mini-grid projects. For example, SunFunder typical loan tenor is up to 4 - 4.5 years which does not suit mini-grid business model which require more patient capital. This has restricted them to stand alone/solar home systems businesses. However, such funds with shorter tenor may be used for getting more connections i.e. densifying (post-development capex stage)
SunFunder is in early stages mobilising for longer term funding 8-12 years that might be more appropriate for mini-grids.

2. Lack of sufficient industry data: Most investors shy away from the sector because they feel that the sector is too risky because of very scanty information/data of proven mini-grids models (what works and what doesn't work).

Solutions/ recommendations:

GMG Facility maybe needs to invest in mini-grid sector information gathering, management and dissemination so as to provide regular updates on:

- ✓ lessons learnt,
- ✓ what is working within the mini-grid space,
- ✓ what are the risks,
- ✓ 'wins' (as they are achieved) within the regulatory/policy space

Other Points:

SunFunder is moving their offices to Nairobi from TZ in July 2017

GMG Social Inclusion Project

Stakeholder Meeting Notes

Stakeholder: Virunga Power

Date of meeting: Friday, 24th March 2017

Location of meeting: Virunga offices at ABC Place

Present:

4. Laurent Nahmias-Léonard - Founder, Virunga Power
5. Patrick Watson - I-DEV International
6. Gerald Njugi - I-DEV International

Background on Virunga Power: Virunga Power is a Kenya-registered rural utility development firm developing a 7.8 MW IPP hydro power plant (Meru, Mt Kenya region) with an associated mini-grid for the local community, who are also shareholders in the IPP through a CBO. They have conducted a grid study that concludes that it will reach approximately 3,800 connections. An unused 26 kW network constructed by UNDP will also be incorporated into this mini-grid. They are among the 5 firms that have already been shortlisted for TA/Grant by IED for the GMG Fund.

Key challenges:

1. Uncertainty/Risks surrounding the arrival of the national grid.
 - i. Private risk (unpredictability of cash flows) - Tend to charge higher tariffs to maximize the cash flows before the arrival of the cheap national grid.
 - ii. Regulatory risk – It is not clear what should happen when the grid arrives in terms integration process (FiTs applicable) and compensation for foregone/missed cash flows of the project.
 - iii. The revenues from the PPA tariff covers the development cost but not the end-user connectivity costs (normally between \$600-800 or more) and hence the need for grant funding for densification.
2. Community related
 - i. Getting community buy-in/backing for a mini-grid project can be very difficult: 5-10% as free carry (through a CBO) to the community (duration of PPA normally 20-25 years) and thereafter, they give 100% of the project back to the community whose life is approximately 60 years.

3. Regulatory framework

- ii. There seems to be a better acceptance from the Government of Kenya for hydro mini-grids compared to Solar and Wind which are considered as intermittent sources of energy while hydro is generally stable (base load) and cheaper/competitive (between 8 and 9 \$ cents/KWh).

Solutions/Recommendations:

- ✓ Community ownership:

Local ownership of the project and rural focus ticks the social impact focus that enables them to get access to grant/social impact funding.

- ✓ Customer mix:

Customer mix (households vs businesses/industrial/commercial) is very key in determining the success of a mini-grid. Commercial usage has to be significantly higher, at least >10% of total consumption and the households' productive use potential has to be reasonably high and easy to estimate.

- ✓ Competitive advantage

The mini-grid should target to supply power at a lower cost than the national grid thus enabling the mini-grid to remain competitive once the national grid arrives.

- ✓ Consumer finance

Partnership with SME-focused banks such as equity bank; and other financial services providers to SMEs helps to give consumer finance for productive use equipment (milling, incubator, cooling plant, water pumps, milking machines etc.).

- ✓ Compensation Fee

The mini-grid operators require some minimum level of compensation due to the foregone cash flows as a result of the unforeseen early arrival of the national grid or adverse changes in the policies.

Other important points made:

- i. Tanzania is more attractive for mini-grid investments since it's easier to get a distribution licence than it is in Kenya
- ii. Institutional investors usually shy away from mini-grids due to:
 1. The perceived high risk.

2. Unclear regulations/policies.
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 4. Lack of track record/success stories in the sector. Majority of funding between pre-feasibility and financial close is normally grants or grant-like funds from DFIs, Impact Funds or government funded institutions.
- iii. Reduction/subsidy of the upfront/initial capex costs has minimal effect on the return on investment (PPA cash flows have the most impact on the returns)
 - iv. Most mini-grid producers operate a pre-paid model (mainly to manage their cash low cycle) and have not explored the marginal effects of having a post-paid model
 - v. Power wheeling is a large opportunity for densification in rural areas (they pay 5c, they sell for 9c – the spread then pays for the infrastructure and maintenance)

GMG Social Inclusion Project

Dirakho Community Visit

Day 1: FGDs with community members

Community Profile

- Dirakho community is in Funyula sub-county, Busia Country in Kenya's Western Region.
- The community is represented by Dirakho Community Based Organisation (CBO), created in August 2015 with a focus on community empowerment, food security and health.
- The community has 177 households with costs averaging 2,350 KES/month to a max of 4,250 KES/month related to energy generation (including kerosene, firewood, candles, etc.), from which a maximum of 29% is related to electricity/light consumption (candles, kerosene, phone charging).
- There are currently about 13 SMEs and two productive energy users in the community – two operational posho mills and learning institutions (Early Childhood Development (ECD) nursery school and a village youth polytechnic).
- 1km away from the nearest Kenya Power connection/consumer
- The CBO had organised the community into three groups in anticipation of our visit. As such we undertook focus group discussions with women, men and the youth.

Mini-grid Properties

- REVSOL is the mini-grid developer
- Solar technology will be employed

- Number of users to be supported has not been finalized on. However, over 100 HHs had registered for the project as at the time of our visit.
- The developer will undertake a consumer willingness to pay survey in two weeks as part of project development. Energy 4 Impact are also anticipated to build the capacity of the community on the mini-grid though this has not been finalised on with the developer.
- The developer will manage and operate the mini-grid for five years, train a community representative on the same before handing over the mini-grid fully to the CBO/community.
- It is anticipated that the project will be completed in the next 6-9 months.

FGD Notes:

Respondents	Summary of Key Insights
<p>CBO Management</p>	<p>The management team comprised of a team of 6-10 committee members including several women holding key positions.</p> <p>The mini-grid was just one of their initiatives with other projects in agriculture and education also being implemented by the CBO.</p> <p>There were plans to have separate committee to deal with issues relating to the mini-grid.</p> <p>General questions:</p> <p>The CBO management team demonstrated high levels of awareness regarding the new system and had been involved by the developer during the pre-feasibility phase.</p> <p>They also understood the nature of the system, the technology, location of the site and process to be followed.</p> <p>Pricing concerns:</p> <p>There was consensus that a mobile based payment mode would be convenient. With a staggered payment method for the initial costs being favoured. There were concerns that a few members of the community did not have mobile phones or that some members especially the elderly are not registered with mobile money services.</p>

	<p>Having information from the Sigonde mini grid operated by REVSOL, the team was aware that the monthly payments would be reasonable but still higher than KPLC costs. There was consensus that the cost was not a limiting factor considering the benefits the community would derive including a water processing facility to be set up as part of the mini-grid by the developer.</p> <p>There were concerns on whether the mini-grid power could meet the needs for “heavy loads” such as; poshomill, tailoring units, agro-processing mills for cassava. In addition, there were concerns as to whether the initial costs would be as high as those for Dlight and Mkopa SHS vis a vis the community’s ability.</p> <p>Productive uses:</p> <p>The CBO wanted to purify the water for sale (Diragho water) and also sell biogas</p> <p>The CBO would also come up with various economic activities i.e. welding center, carpentry shop, value addition facilities for their agricultural produce etc.</p> <p>The CBO would also construct commercial shops for rent that would have electricity.</p> <p>Women had the following views:</p> <ul style="list-style-type: none"> ○ The power would help market businesses continue late into the night ○ Introduce new businesses for charging phones ○ Reduce costs at the village posho mills ○ Enhance cooking i.e. ovens for baking cakes <p>Ownership and management:</p> <p>The CBO mgt team was quite aware of their role in management of the facility and that this would be handed to them after 5 years.</p>
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<p>Men</p>	<p>The CBO had organised for the men in the community to meet us separately. This was a group of 15-20 of mostly older men with clout in the community.</p> <p>General questions:</p> <p>Some of the men were aware of the project and system to be set up by RVESOL. Most could recall a mzungu (Vivian) who met the community and explained to them the project and how it could enhance their lives.</p> <p>Pricing concerns:</p> <p>There were concerns that higher prices would keep most users out of the project. However, most of the men were aware of the rates charged at the Sidonge mini-grid ran by REVSOL and were of the opinion that this was reasonable.</p> <p>The nature of payments elicited mixed reactions from the participants with most favouring a monthly fee based on use rather than a fixed rate based on the number of equipment in your HHs.</p> <p>Productive uses:</p> <p>The men were interested in larger grandeur projects such as welding, value addition plants i.e. mills and water bottling.</p> <p>Ownership and management:</p> <p>The men were also aware that the community would manage the mini-grid and that one of them would be trained on how to operate and maintain the facility.</p>
<p>Women</p>	<p>The CBO had also organised for the women in the community to meet us separately. This was group was the largest comprising of 33 women of mixed background and age.</p> <p>General questions:</p> <p>Most were familiar with the upcoming plans of setting up a micro grid in the community, however, their participation seemed more passive; eg, on the matter of whether they were involved in identifying the</p>

	<p>land where the mini-grid would be set up they replied that they were not and had “let” the men do it instead.</p> <p>Concerns:</p> <p>Most were not aware on how much they would pay and wished to know how much it would cost, and this was because they said they have limited means and wanted to know if they could be able to afford the electricity.</p> <p>Productive uses:</p> <p>Women were interested in the following productive activities: Running a chicken hatchery, Operating a Salon(Beauty Parlour) & Barber Shop, Running a posho mill, and operating a bakery.</p> <p>Social and Gender:</p> <p>Women noted that they foresaw social changes as a result of the micro-grid(electricity) to include:</p> <ul style="list-style-type: none"> • Enhanced security hence they have assurance that they could send children to the shops in the evening • That husbands would come home early(to watch evening news, etc) • Children’s academic performance would also improve
<p>Youth</p>	<p>By comparison this was the smallest group, with participants totalling to 14 and of this, 11 were male and 3 female.</p> <p>General questions:</p> <p>They were all in agreement that they are aware of the upcoming micro-grid system, albeit, they received the news via grapevine and not from any formal gathering/meeting.</p> <p>Concerns:</p> <p>They had concerns that the older generation do not understand much about solar technology and this could likely cause them to have fears which would derail the project.</p> <p>There were no concerns raised over pricing or mode of payment that would be used and this is could be because they are technology savvy</p>

	<p>and have some form of livelihood. However, there were concerns over the intermittency of solar and whether that could cause power outages and whether if the power outages occur, if they would still be expected to pay for electricity.</p> <p>Productive uses:</p> <p>The male youth were interested in: Welding, Phone Charging, and Barbershop</p> <p>The female youth were interested in: Hatchery, Tailoring, & Bakery</p> <p>Ownership and management:</p> <p>They youth seemed not to be aware of the ownership and management details and this was partly because they have never participated in the formal meetings when the developer was around.</p>
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Appendix 2: Community visits

GMG Social Inclusion Project

Olenarau Community Visit

Day 2: Market Map

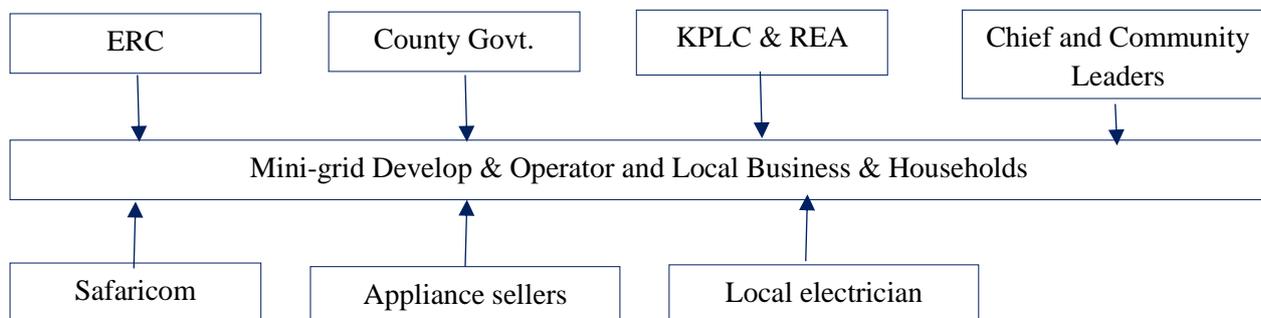
Attendees

- 10-15 Community representatives (business and household consumers)
- I-DEV
- PAC
- Steamco regional coordinator

Structure of Day 2 activities

- Introduction & definition of purpose of Worksop
- Market map
- Discussion of the key challenges experience and suggestion of potential solutions

1. Market Map



Stakeholder	Role
ERC	Gave approval to the mini-grid operator to set-up Set the conditions for operations i.e. environment requirements etc.
County Govt	Provide information on the potential sites 4 site selected from the 6 suggested. Selectin criteria included; population size, mobile connectivity etc.

	County also provided intro to community leaders
Chief and community leaders	Pont of contact with the community, local businesses and households
Safaricom	Payment facilitators
Appliance sellers	Located in Olenarau, Kajiado ad Nairobi Provider the equipment (bulbs, blow dryers, extension cables)
REA	Have conducted surveys on benefits
Local electrician	Extension wiring

Key takeaway: The community were not fully aware of the other key actors along the chain.

2. Challenges

Challenges	Solution (if available)
<p>1.Tariff Clarity</p> <p>Unable to determine how much they would need to pay for certain level of electricity. Would prefer the Mkopa model where its xx amount per day this would enable them to better plan their expenditure. Also what happens in emergencies?</p> <p>The operator has piloted fixed charger per period in other sites. However this has created difficulty due to the increased usage by consumer.</p>	<p>The consumer to understand their usage for example how much you are consuming over what duration when utilizing which appliances.</p> <p>The fixed rate is maybe available for those who have consistent usage.</p> <p>Downside of a fixed rate is, the consumer will still pay even when not utilizing e.g. when travelling.</p>

<p>2. High Cost</p> <p>Significantly higher than KPLC</p>	<p>The cost charged is similar or lower to the previous sources of power i.e. generator, kerosene, solar inverters.</p> <p>The operator is offering high quality; most consistent power that is also payable in smaller chunks e.g. KES 20.</p>
<p>3. Tariff non-discrimination</p> <p>Similar tariff charged for households and consumers</p>	<p>There exists a price decrease with increased consumption. A sort of discount.</p> <p>Operator to verify all commercial uses are on a “commercial” or discounted tariff</p>
<p>4. Fluctuation in the cost of electricity</p>	<p>The operator fluctuates the traffic from time to time to try determine the “optimal” point where the cost to operator and benefit to consumer align</p> <p>Communication to the consumer during this fluctuations would be helpful</p>
<p>5. Delays in receiving electricity once payments are made</p> <p>Mainly due to network connectivity issues</p>	<p>When the user receives the payment confirmation, then through Manman (on ground point of contact) send the message to operator who will remotely switch back the power</p>
<p>6. Payments Challenges</p> <p>There is no M-pesa in the community, so they have to rely on people who have pre-existing balances or wait to go to the main town- Kajiado</p>	<p>The community to take initiative and set up an M-Pesa agency (this however maybe difficult due to the connectivity issues)</p> <p>Perhaps also the developer can look into an “Okoa” stima model i.e. electricity on credit and payment before the next purchase.</p> <p>Kenya power and Safaricom are actually piloting a similar project.</p>

<p>7. More power capacity to support heavier uses e.g. welding</p>	<p>The developer is required by the regulator to install circuit breakers for safety. However if the user notifies the developer then the circuit breaker can be adjusted to support heavy usage.</p> <p>Additionally, if the need exceeds the current systems, the developer has capability to increase system (have done this in other sites)</p>
<p>8. One person payment system</p> <p>Only one registered number can pay for electricity causing challenges when that person is outside network range</p>	<p>To change the details in the system to the main consumer of electricity. In the case of a rental property to the tenant</p>
<p>9. Sublet power & meter sub users</p> <p>Difficulty in assessing uses by sub-users in commercial and rental property</p>	<p>The rental property to have own power meter</p>
<p>10. Power for households outside the town centre</p> <p>Difficulty in trenching</p> <p>300 meter limit</p>	<p>Community to engage single home solutions providers e.g. Mobisol</p>

Key takeaways:

- Strong communication and interaction key to development of productive uses.
- Payments structure a key issue. How to pay, whose pay, how much and the system relied on to pay.
- Tariff awareness.

GMG Social Inclusion Project

Dirakho Community Visit

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Mini-grid Properties

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<p>CBO Management</p>	<p>The management team comprised of a team of 6-10 committee members including several women holding key positions.</p> <p>The mini-grid was just one of their initiatives with other projects in agriculture and education also being implemented by the CBO.</p> <p>There were plans to have separate committee to deal with issues relating to the mini-grid.</p> <p>General questions:</p> <p>The CBO management team demonstrated high levels of awareness regarding the new system and had been involved by the developer during the pre-feasibility phase.</p> <p>They also understood the nature of the system, the technology, location of the site and process to be followed.</p> <p>Pricing concerns:</p> <p>There was consensus that a mobile based payment mode would be convenient. With a staggered payment method for the initial costs being favoured. There were concerns that a few members of the community did not have mobile phones or that some members especially the elderly are not registered with mobile money services.</p> <p>Having information from the Sigonde mini grid operated by REVSOL, the team was aware that the monthly payments would be reasonable but still higher than KPLC costs. There was consensus that the cost was not a limiting factor considering the benefits the community would derive including a water processing facility to be set up as part of the mini-grid by the developer.</p> <p>There were concerns on whether the mini-grid power could meet the needs for “heavy loads” such as; poshomill, tailoring units, agro-processing mills for cassava. In addition, there were concerns as to whether the initial</p>

	<p>costs would be as high as those for Dlight and Mkopa SHS vis a vis the community's ability.</p> <p>Productive uses:</p> <p>The CBO wanted to purify the water for sale (Diragho water) and also sell biogas.</p> <p>The CBO would also come up with various economic activities i.e. welding center, carpentry shop, value addition facilities for their agricultural produce etc.</p> <p>The CBO would also construct commercial shops for rent that would have electricity.</p> <p>Women had the following views:</p> <ul style="list-style-type: none"> ○ The power would help market businesses continue late into the night ○ Introduce new businesses for charging phones ○ Reduce costs at the village posho mills ○ Enhance cooking i.e. ovens for baking cakes <p>Ownership and management:</p> <p>The CBO management team was quite aware of their role in management of the facility and that this would be handed to them after 5 years.</p>
<p>Men</p>	<p>The CBO had organised for the men in the community to meet us separately. This was a group of 15-20 of mostly older men with clout in the community.</p> <p>General questions:</p> <p>Some of the men were aware of the project and system to be set up by RVESOL. Most could recall a mzungu (Vivian) who met the community and explained to them the project and how it could enhance their lives.</p> <p>Pricing concerns:</p> <p>There were concerns that higher prices would keep most users out of the project. However, most of the men were aware of the rates charged at the</p>

	<p>Sidonge mini-grid ran by REVSOL and were of the opinion that this was reasonable.</p> <p>The nature of payments elicited mixed reactions from the participants with most favouring a monthly fee based on use rather than a fixed rate based on the number of equipment in your HHs.</p> <p>Productive uses:</p> <p>The men were interested in larger grandeur projects such as welding, value addition plants i.e. mills and water bottling.</p> <p>Ownership and management:</p> <p>The men were also aware that the community would manage the mini-grid and that one of them would be trained on how to operate and maintain the facility.</p>
<p>Women</p>	<p>The CBO had also organised for the women in the community to meet us separately. This was group was the largest comprising of 33 women of mixed background and age.</p> <p>General questions:</p> <p>Most were familiar with the upcoming plans of setting up a micro grid in the community, however, their participation seemed more passive. For example, on the matter of whether they were involved in identifying the land where the mini-grid would be set up they replied that they were not and had “let” the men do it instead.</p> <p>Concerns:</p> <p>Most were not aware on how much they would pay and wished to know how much it would cost, and this was because they said they have limited means and wanted to know if they could be able to afford the electricity.</p> <p>Productive uses:</p> <p>Women were interested in the following productive activities: Running a chicken hatchery, Operating a Salon (Beauty Parlour) & Barber Shop, Running a posho mill, and operating a bakery.</p>

	<p>Social and Gender:</p> <p>Women noted that they foresaw social changes as a result of the micro-grid(electricity) to include:</p> <ul style="list-style-type: none"> • Enhanced security hence they have assurance that they could send children to the shops in the evening • That husbands would come home early(to watch evening news, etc) • Children’s academic performance would also improve
<p>Youth</p>	<p>By comparison this was the smallest group, with participants totalling to 14 and of this, 11 were male and 3 female.</p> <p>General questions:</p> <p>They were all in agreement that they are aware of the upcoming micro-grid system, albeit, they received the news via grapevine and not from any formal gathering/meeting.</p> <p>Concerns:</p> <p>They had concerns that the older generation do not understand much about solar technology and this could likely cause them to have fears which would derail the project.</p> <p>There were no concerns raised over pricing or mode of payment that would be used and this is could be because they are technology savvy and have some form of livelihood. However, there were concerns over the intermittency of solar and whether that could cause power outages and whether if the power outages occur, if they would still be expected to pay for electricity.</p> <p>Productive uses:</p> <p>The male youth were interested in: Welding, Phone Charging, and Barbershop</p> <p>The female youth were interested in: Hatchery, Tailoring, & Bakery</p> <p>Ownership and management:</p>

Managing Entity for a Financing Program aiming at the promotion of private initiatives in green mini-grids improving access to electricity in Kenya. Quarter 2, 2017 Report. 30 June 2017.

	<p>They youth seemed not to be aware of the ownership and management details and this was partly because they have never participated in the formal meetings when the developer was around.</p>
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GMG Social Inclusion Project

Dirakho Community Visit

Day 2: Market Map

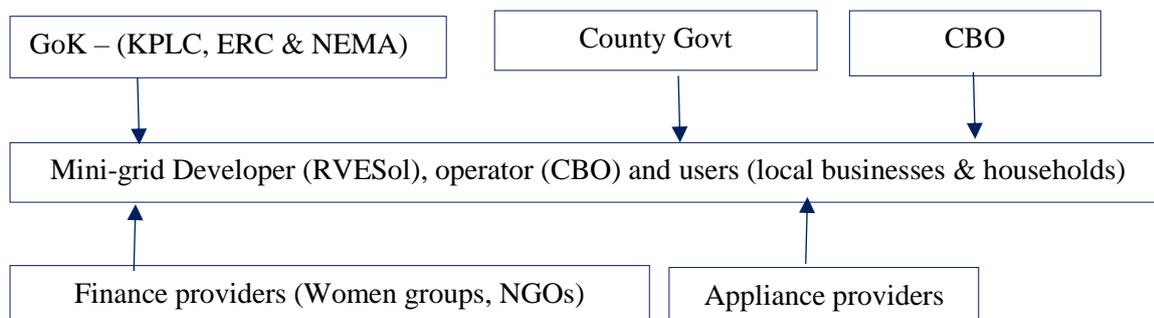
Attendees

- 17 Community representatives (women, entrepreneurs and youth)
- Dirakho CBO management
- Practical Action Consulting
- 2 RVE.SOL Kenya project representatives

Structure of Day 2 activities

- Word of prayer
- Introduction of participants
- Definition of purpose of the workshop
- Market mapping exercise
- Discussion on the key challenges experienced and suggestion of potential solutions

1. Market Map



Stakeholder	Role
ERC	Permits to the mini-grid operator and tariffs approval
KPLC	Manage the national grid which is 1-2 Km away from the community Potentially a competitor to Durakho power/CBO that will manage the minigrid
NEMA	Provide environmental approvals for the minigrid project

County Govt	<p>Approve way leaves for the power lines</p> <p>Support the CBO with equipment to clear the way leaves</p>
CBO	<p>Dirakho community based organization (CBO), which engages the grid developer in matters: community liaison, mobilization, and engagement. In their model, the grid operator has proposed to transfer part of ownership and management to this CBO.</p> <p>During the market mapping exercise, we asked the participants' opinion on the role of the CBO in the development and management of the CBO. The feedback received include: community liaison, engagement, micro-grid management, etc. it is important to point out that some of the participants were officials of the CBO and did articulate their envisioned roles to the rest of the participants.</p>
Micro-Grid Developer (RVESOL)	<p>Setting up the micro grid, procuring the materials required to set up the micro-grid, provide technical expertise in the setting up of the micro grid and managing the micro-grid.</p>
Community	<p>This includes the individual households and businesses that would utilize the electricity from the micro-grid. During the discussions, participants envisioned the role of the community to include: provide land where the micro grid would be set up, provide security to the micro-grid system, provide labour (hand help), manage the system, utilize electricity.</p>
Various financiers	<p>Identified as SACCOs, table banking providers, Chamas/groups, NGOs i.e. One Acre Fund that can provide resources to community members to enable the benefit from the project</p>
Appliance sellers	<p>Located in Bumala, Busia and Kisumu</p> <p>Provider the equipment (bulbs, blow dryers, extension cables)</p>

Key takeaways:

The session was held in a classroom at the Nangina polytechnic. In order to familiarize the participants with the PMSD market mapping tool, we employed the concept of “know-to-unknown” by asking participants to draw the cassava value chain. Cassava is a common plant

in the region and all participants were farming it in their lands. While making the participants relate to the cassava value chain we delved into the micro-grid value-chain, where they were asked to suggest all players and activities that would go into developing, managing the micro-grid as well as services required to avail electricity to their homes.

Our approach involved grouping the participants into two and three and asking them to discuss and after which they would jot down their responses on sticky notes which would be posted on the manila paper.

It is important to point out the following:

- The developer had engaged the community intensively as part of the prefeasibility and feasibility process. As such, the CBO management were quite aware of the mini-grid market system. This was also attributable to community visits to a similar operational mini- grid at Sidonge by RVE Sol that was about 10 Km away.
- The other community members on the other hand, were not sure of the roles of the actors especially at the influencer level. In retrospect, this was not unusual since in most instances it is the micro-grid developer who engages these actors for permits etc.
- The participants were well versed with what would be involved in the middle section of the map. i.e., how the service or rather electricity would flow, and who will be involved at each stage. However, there were finer details which they had not yet discussed with the grid operator such as:
 - What would be the upfront cost;
 - When the installation will be done; and
 - What would be the terms of engagement between the CBO and the micro grid company.
- Participants identified activities in the middle section to be; installation and management of the micro grid system by the micro grid developer as well as wiring of the households by technicians. The bottom section of the map would include the following support services:
 - Micro-credit to pay upfront costs from CBO table banking;
 - Micro credit from chamas; and
 - Shops selling electricity using products.

The upper section of the value chain, included the following actors:

- County Govt – to provide permits for distribution-line/pylon set-up;
- GoK/Ministry of lands – for permission to use community land for the project;
- Kenya Power – To allow set up of distribution lines;

- ERC- to provide installation permits; and
- Dirakho CBO – to provide community liaison services.

2. Challenges

Challenges

Power costs and financing

1. Initial cost of power

This could hinder some consumers from subscribing to the micro-grid system as they would deem it unaffordable and this was the reason why the participants insisted on knowing how much it would cost them to have use electricity from the micro-grid system.

During this discussion they drew comparison with Pay as you go systems (PAYGO) which are common in the community, and agreed that only a few members of the communities could afford the KES 2,500 that was required for one to own such a system.

2. Nature of payments

Participants also mentioned that if subsequent payments were not tailored to match the community's economic activities then it was likely that some would not manage such payments and hence this would hinder them from using electricity from the micro-grid. For example, one mentioned that he is only able to make weekly payments since this is how he is paid, another lady mentioned that she gets her income after selling farm produce and this was likely to happen every 12 weeks, others mentioned that they were casual labourer's and were able to make daily payments.

3. Mode of payment

They noted that the most convenient means of payment would be mobile money (m-pesa) however they pointed out that there are still some members of the community who either had no phones or had not subscribed to mobile money services and yet they would wish to be connected to the micro-grid system and so this would likely be a barrier to their uptake of electricity.

4. Source of funds

On where members would borrow money, it became apparent that the CBO table banking option was not enough to lend out to every member of the community/or rather to everyone who wanted to borrow and so it was likely that some would have to wait till the first batch of users repay their loans before could access the loans. It was suggested that they be linked to other micro-credit providers.

Kenya Power

Kenya Power as the dominant market player could sabotage the development and usage of the micro-grid system by introducing their power to the Dirakho community or perhaps cancel permits already issued to the micro-grid developer.

Relations between the CBO, grid developer and community could lead to failure of the micro-grid system.

This was elaborated as follows:

- In the event the CBO fails to engage the community effectively then this would likely mislead the micro-grid developer.
- When the terms of engagement between these two parties clash then the conflict could render the micro-grid plans null and void.
- Poor relations among the community members was also likely to hinder progress of the micro-grid system since if some felt that they did not wish to be part of the system then they were likely to oppose the pylons passing across their farms stalling project implementation.

Availability of appliances

Some participant raised concerns on the matter of availability of electricity using products and equipment. The concern was expressed as not knowing the correct wattage for bulbs, etc.

Further, it was a concern that the more sophisticated energy using equipment, especially for productive use were likely to be sourced in other towns far away from the community, and this would likely slow the uptake of electricity.

Customer awareness on the micro-grid system

It became apparent that there were concerns on the technology's ability to sustain heavy loads, questions like whether the system would sustain a posho mill, welding machine, blow drier etc. were common.

In addition participants wanted to understand the safety measures that would be put in place to ensure that houses won't burn down etc. It was clear that there was misunderstanding on the technology in place vis-avis how it compared with Kenya Power.

Olenarau Community Visit

Day 1: One on One Interviews with Households and Businesses

Community Profile

- Located 28 Kms off the Kitengela-Namanga highway or 28 Kms off Kajiado town
- ~2kms away from the nearest Kenya Power connection/consumer
- Has had electricity for the past 3 years
- From various interviews it's estimated that it took 2-3 months from the first engagement with the mini-grid provider to having electricity within the premise. The process involved: survey- community engagement- registration – selection of land to locate the mini-grid- trenching- wiring and metering
- 31 connected users (majority being businesses within the town centre) although during the visits a number of community members currently not connected expressed interest to be connected
- The operator required an upfront connection fee or “commitment fee” of KES 1,000 from each user/ consumer
- Mini-grid located on agreed upon community land, for which the operator pays annual rent of KES 12,000
- Have 1 on the ground community “liaison” with the operator whose the main point of contact for the community in case of any challenges
- A number of new business ventures that were not there before are now available since the arrival of the mini-grid i.e. Saloon, Fridge
- The size and the activity level in the community have increased since mini-grid arrival
- Main economic activity: sand harvesting, livestock farming

Mini-grid Properties

- SteamCo is the mini-grid operator
- The mini-grid is a 3Kw
- Solar
- 300 meter limit
- Can only support 30 users (although depending on the demand of community the operator can increase the size)
- Payment through M-pesa paybill function (although there was no m-pesa operator within the community due to connectivity challenges)
- Payment of a certain meter/ connection can only be done through one registered phone number.

Interview Notes

Respondent	Summary Key Insights
<p>Julius</p>	<p>Profile:</p> <p>Operates a barber shop and phone charging business</p> <p>Pays KES 100 for every 3 days</p> <p>Doesn't own the shop from which he operates, therefore pays through the electricity through his land-lord</p> <p>Doesn't have electricity at his own as its outside the mini-grid range</p> <p>Benefits of the mini-grid:</p> <p>Previously used a solar panel, with a battery and inverter. Steep upfront cost of purchase i.e. ~KES 30k then. Limited uses during cloudy and rainy months. The inverter required constant repairs.</p> <p>Is now able to operate for longer hours.</p> <p>Was able to expand his business to include phone charging business</p> <p>Flexibility in working hours- can work very early/ very late not dependent on sun-light hours</p> <p>Has witnessed an increase in customer numbers due to the increase of the activity in the town-centre since electricity arrived</p> <p>Challenges:</p> <p>High cost of electricity</p> <p>Delays in getting electricity even after payment due to poor connectivity/ network challenges</p> <p>Difficulty in making payments when the land-lord/ property owner is not available or un-reachable</p>
<p>Mama Wamaoyo/</p>	<p>Profile:</p>

<p>Mama Lawrence</p>	<p>Owns a grocery store also owns a number of commercial rental properties</p> <p>Part of the church women's group</p> <p>Part of the group that was engaged prior to the set-up of the mini-grid</p> <p>Pays KES 100 for 7 days (in the grocery store)</p> <p>Benefits of the mini-grid:</p> <p>Previously used a lantern</p> <p>Increased working hours</p> <p>Increased visibility of the store and products within the store</p> <p>Increased activity in town centre</p> <p>Increased security</p> <p>Value proposition for rental houses</p> <p>The church now has equipment's i.e. microphone, speakers, keyboard</p> <p>Challenges:</p> <p>High cost of electricity. Cost paid differed from what was implied would be the cost during the engagement phase.</p> <p>Tried setting up a TV viewing business (e.g. for sports) but the business economics did not add up due to the high costs</p> <p>Has been trying to get connections for the new rental property, she has been developing but has faced difficulty</p> <p>Difficult to sub-let electricity for the rental properties due to lack of traffic clarity ...how much electricity does XX amount of money give..</p> <p>Would like to see the grid expanded to support other productive uses e.g. welding</p>
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	<p>Feels that there is lack of proper communication between the mini-grid operator and community especially commercial electricity consumers</p> <p>Delays in getting electricity even after payment due to poor connectivity/ network challenges</p>
<p>Mrs Alphonce</p>	<p>Profile:</p> <p>Mother</p> <p>Runs a small time business of pastry – mandazi, etc. Makes pastry and distributes to the retail businesses</p> <p>Husband has a motor cycle business</p> <p>Extended the electricity from the house to the kitchen</p> <p>Uses electricity mainly for lighting and TV</p> <p>Pays KES 50 per day</p> <p>Considers electricity a luxury item</p> <p>Benefits of the mini-grid:</p> <p>Previously used a lantern</p> <p>Increased working hours for the pastry business</p> <p>Increased security</p> <p>Feels has improved quality of life for her children</p> <p>Made it easier for her as a mother when the children were young and she constantly had to wake up at night</p> <p>Has kept her and her larger family up to date with national state of affairs and news</p> <p>Challenges:</p> <p>Has to rely on the husband to pay the electricity although she is the main consumer and has the willingness to pay</p>

<p>Lawrence</p>	<p>Profile</p> <p>Business Retailer/Also runs a Cyber Café – Does Printing/Photocopying/ Phone Charging, and has extended the electricity to his home which is next to his shop.</p> <p>He is a husband and a father.</p> <p>Has had electricity since the mini-grid was deployed in Nov 2015 and was part of the community group that was consulted during pre-feasibility on matters regarding</p> <p>Main electronic equipment include: Fridge, TV and lights</p> <p>He pays an average of KES 200 per day</p> <p>Benefits of the Mini-Grid</p> <p>The micro-grid has allowed him to expand his business operation hours, and added a fridge to his shop and so now he is able to sell cold sodas.</p> <p>He believes that the arrival of the system has improved his children’s school performance; security and has led to an increase in population.</p> <p>Challenges:</p> <p>On the matter of consumption, this grid operator does not measure in terms of units so Lawrence did not know how much per se he consumes.</p> <p>Network outage causing for payment messages not to be transmitted to the operator’s server and therefore the system cuts off electricity to his building despite having paid.</p> <p>He would like to set up a welding machine but can’t because the power usage is too high beyond what the mini grid can offer/support.</p>
<p>Faith</p>	<p>Profile</p> <p>Mother, runs a small time business of pastry – mandazi, etc</p>

	<p>Has had electricity since the mini-grid was deployed in Nov 2015</p> <p>Before the arrival of the mini grid she was using a genset and kerosene lamp for lighting</p> <p>Her main electronic equipment includes TV, Lights, Radio, and Phone-Charging</p> <p>On atypical day she pays KES 50 for use of lights and TV</p> <p>Her spending priorities include phone charging and watching news</p> <p>She makes payment every day and sometimes several times in day depending on the usage but prefers regular payment for proper financial planning on her part.</p> <p>Benefits of the Mini-Grid</p> <p>Before arrival of the mini-grid she was making do with a genset which would cost her maintenance and fuel costs (Ksh 150/Liter – 2015).</p> <p>Arrival of the mini-grid has improved her children’s academic performance and has also changed the social landscape so that now there are more activities at night, business have extended their operating hours and overall security has improved.</p> <p>New businesses have come up due to the presence of the new energy e.g salons.</p> <p>Challenges</p> <p>Lack of M-pesa agent and so she relies on fellow customers who have float in their phones to avail the same to her, otherwise she is forced to travel to Kajiado to top up her m-pesa.</p> <p>Need to electrify households which are further away from the grid since she noted that some of her kin would also like to enjoy the use of the mini-grid system</p>
<p>Magdalene and Daniel</p>	<p>Profile:</p>

	<p>Couple; they run a Salon and Barber Shop; They also do phone charging. They have rented a shop which is connected to the mini-grid.</p> <p>The consumption level for the Barber Unit is KES 100/Day and that of the Salon ranges from KES 200 – KES 600 per day.</p> <p>The main electronic equipment at their premises include: Blow-drier, Hair-drier, Shaver.</p> <p>Before the arrival of the mini-grid he was using pico-solar kits tied to a battery system to operate the shaving kit. The wife said that she never did any hairstyles that involved use of electricity and was only limited to braiding and cornrows.</p> <p>Benefits of the Mini-Grid</p> <p>Increase in population and extended business operating hours</p> <p>In comparison, the current system is cheaper sinc previously, to run the pico solar unit, they would buy a battery worth KES 40000 and accessories worth KES 5000, but the system would only last for 6 months Currently their spending priority is for Radio and the salon and barber shop equipment</p> <p>Challenges</p> <p>They had concerns over the lack of metering system, and lack of consumer interphase between them and the grid operators.</p>
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GMG Social Inclusion Project

Olenarau Community Visit

Day 2: Market Map

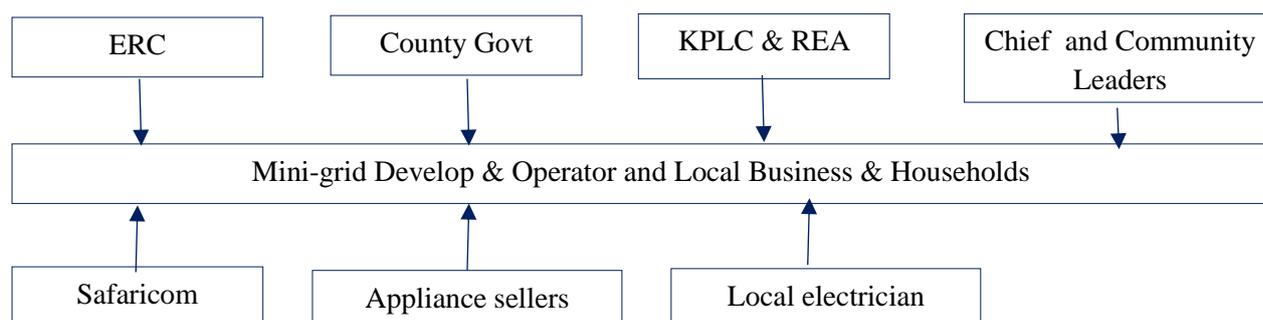
Attendees

- 10-15 Community representatives (business and household consumers)
- I-DEV
- PAC
- Steamco regional coordinator

Structure of Day 2 activities

- Introduction & definition of purpose of Worksop
- Market map
- Discussion of the key challenges experience and suggestion of potential solutions

1. Market Map



Stakeholder	Role
ERC	Gave approval to the mini-grid operator to set-up Set the conditions for operations i.e. environment requirements etc.
County Govt	Provide information on the potential sites 4 site selected from the 6 suggested. Selectin criteria included; population size, mobile connectivity etc. County also provided intro to community leaders
Chief and community leaders	Pont of contact with the community, local businesses and households
Safaricom	Payment facilitators

Appliance sellers	Located in Olenarau, Kajiado ad Nairobi Provider the equipment (bulbs, blow dryers, extension cables)
REA	Have conducted surveys on benefits
Local electrician	Extension wiring

Key takeaway: The community were not fully aware of the other key actors along the chain.

2. Challenges

Challenges	Solution (if available)
<p>1. Tariff Clarity</p> <p>Unable to determine how much they would need to pay for certain level of electricity. Would prefer the mkopa model where its xx amount per day this would enable them to better plan their expenditure. Also what happens in emergencies?</p> <p>The operator has piloted fixed charger per period in other sites. However this has created difficulty due to the increased usage by consumer.</p>	<p>The consumer to understand their usage i.e. how much are you are consuming over what duration when utilizing which appliances.</p> <p>The fixed rate is maybe available for those who have consistent usage.</p> <p>Downside of a fixed rate is, the consumer will still pay even when not utilizing e.g. when travelling.</p>
<p>2. High Cost</p> <p>Significantly higher than KPLC</p>	<p>The cost charged is similar or lower to the previous sources of power i.e. generator, kerosene, solar inverters.</p> <p>The operator is offering high quality, most consistent power that is also payable in smaller chunks e.g. KES 20.</p>
<p>3. Tariff non-discrimination</p>	<p>There exists a price decrease with increased consumption. A sort of discount.</p>

<p>Similar tariff charged for households and consumers</p>	<p>Operator to verify all commercial uses are on a “commercial” or discounted tariff</p>
<p>4. Fluctuation in the cost of electricity</p>	<p>The operator fluctuates the traffic from time to time to try determine the “optimal” point where the cost to operator and benefit to consumer align</p> <p>Communication to the consumer during this fluctuations would be helpful</p>
<p>5. Delays in receiving electricity once payments are made</p> <p>Mainly due to network connectivity issues</p>	<p>When the user receives the payment confirmation, then through Manman (on ground point of contact) send the message to operator who will remotely switch back the power</p>
<p>6. Payments Challenges</p> <p>There is no M-pesa in the community, so they have to rely on people who have pre-existing balances or wait to go to the main town- Kajiado</p>	<p>The community to take initiative and set up an M-Pesa agency (this however maybe difficult due to the connectivity issues)</p> <p>Perhaps also the developer can look into an “Okoa” stima model i.e. electricity on credit and payment before the next purchase.</p> <p>Kenya power and Safaricom are actually piloting a similar project.</p>
<p>7. More power capacity to support heavier uses e.g. welding</p>	<p>The developer is required by the regulator to install circuit breakers for safety. However if the user notifies the developer then the circuit breaker can be adjusted to support heavy usage.</p> <p>Additionally, if the need exceeds the current systems, the developer has capability to increase system (have done this in other sites)</p>
<p>8. One person payment system</p> <p>Only one registered number can pay for electricity causing challenges when that person is outside network range</p>	<p>To change the details in the system to the main consumer of electricity. In the case of a rental property to the tenant</p>

<p>9. Sublet power & meter sub users</p> <p>Difficulty in assessing uses by sub-users in commercial and rental property</p>	<p>The rental property to have own power meter</p>
<p>10. Power for households outside the town centre</p> <p>Difficulty in trenching</p> <p>300 meter limit</p>	<p>Community to engage single home solutions providers e.g. Mobisol</p>

Key takeaways:

- Strong communication and interaction key to development of productive uses.
- Payments structure a key issue. How to pay, whose pay, how much and the system relied on to pay
- Tariff awareness

Appendix 3: Workshop Report

Practical Action Consulting hosted a Participatory Market Sector Development (PMSD) workshop on the 10th May at the Silver Springs Hotel, Nairobi.

It was attended by 24 people:

4 Community representatives (plus 2 community workers linked to developers RVE SOL and Steamaco)

4 representatives from developers

6 representatives from public and private Funders / NGOs

1 Manufacturer and 1 National body (KEREA)

7 representatives from Practical Action and I DEV

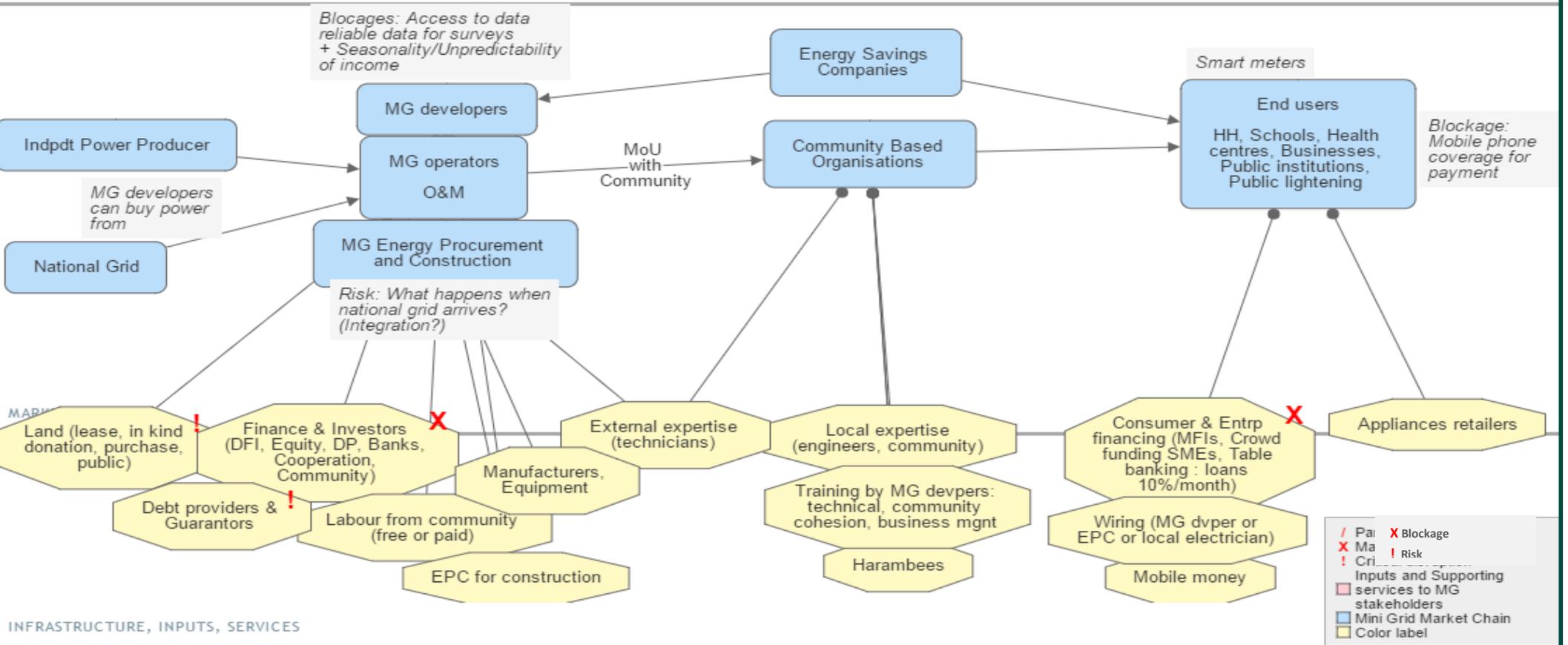
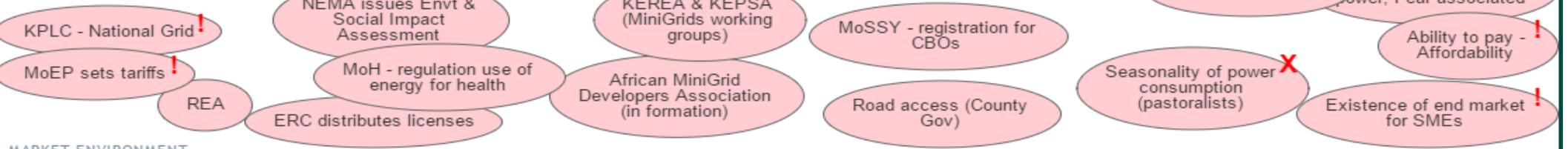
The key objective was to prioritise the key areas where the GMG facility can focus on in the future to ensure better social inclusion in the areas of Mini Grids

The main priorities as identified by the participants were:

1. Access to finance – for SMEs and consumers
2. Financing models to support the most disadvantaged in communities
3. Data standardisation – key indicators for energy and social impact
4. Non energy services for communities
5. Productive uses for increasing incomes

The next steps will be to develop a series of Terms of Reference (in conjunction with the GMG facility) which will flesh out the new work streams to be developed to overcome the key barriers and issues identified.

MiniGrid Market System Mapping, Kenya



Key priorities for community engagement and social inclusion

Key issue No. 1: Tariffs

#	Issue	How to resolve the issue	Concerned stakeholder
1.	Connection fee	Segment users after undertaking an Ability To Pay (ATP) survey	Developers/ESCOs, Energy Regulatory Commission (ERC), Ministry of Energy and Petroleum (MoEP)
		Provision of subsidies	Government of Kenya (GoK), donors and Development Finance Institutions
		Linkages with credit providers	Developers/ESCOs
		Allow for installment payments	Developers/ESCOs
		Subsidy provided across the sector (On and Off grid)	GoK, donors,DFIs
2.	Energy user fees	Tariff framework developed for all mini-grid technologies	GoK, ERC
		Recurrent subsidies provided (capex and opex)	GoK, donors,DFIs
		Banding of customers done at the HHS level	Developers/ESCOs, ERC
		Allow for pre-pay options in making payments	Developers/ESCOs

Activities to be included at the formative community engagement phase:

- ATP surveys – note seasonality of community income
- Assessment of the economic activities and energy value addition possibilities
- Capacity enhancement/education on energy use, demand creation etc. by the CBO
- Advance payment of connection fees possibly via the CBOs

Key issue No. 2: Non Energy (electric) Services

#	Non energy services	Stakeholders involved and/or likely to support change
1.	Water purification, pumping, irrigation (including sourcing for infrastructure i.e. pipes and knowledge transfer)	Developers, CBO, County Government
2.	Cooking (Clean cook stoves and biogas)	Developer, CBOs, NGOs
3.	Library equipped with computers	CBO,NGO, Kenya Library Association
4.	Vocational training centers	County government
5.	Health centres	NGO, County government, Ministry of Health
6.	Access to finance for HHs (appliances, wiring and connection fees)	MFIs, crowd funding, churches, CBO, NGOs
7.	Access to equipment and appliances (Radios, TVs, fridges, fans etc.)	Developer partnering with appliance manufacturers/distributors
8.	Money transfer services enabling payment of user fees	GSM network operators i.e. Safaricom, Equity Bank

		Developer opening MPESA shops/enabling sub agents
9.	Recreational centers i.e. video halls	County Government
10.	Enable value addition and set up markets for agro-produce	SACCOs, County Government, NGOs

Key issue No.3: Productive Uses

Role of Developer in supporting/enhancing productive uses:

1. Install a power station with sufficient capacity to support productive equipment such as welding etc.
2. Set up a battery charging station so that people on the micro grid could operate it and charge batteries for those who are beyond the micro-grid – *other solutions for those not able to connect to grid?*
3. Pump water to a common storage area such as a water kiosk and residents could use the water to irrigate their crops and earn income from the farm produce
4. Do public lighting on business areas/ markets as a measure of extending business operating hours
5. Light up or connect shops set up in the location where the mini-grid has been installed – barbers, internet café, entertainment centre
6. Support with value chain and finding market for goods and services leaving area
7. Link to organisations providing technical and business training

Next actions for GMG facility

1. Engage on access to finance for SMEs, and consumers. Likely to focus on household appliances, agricultural processing equipment and other micro businesses (barber, entertainment etc). Develop fund or partner with existing finance providers.
2. Engage on cost reflective tariffs. To be addressed through working on regulatory environment, have a more coherent mini-grid regulation. Note- importance of working closely with GIZ and their existing work.
3. Understand and standardise best practices around data and surveys (pre and post construction). Engage with developers and funders to create a standard energy and impact indicators.
4. Explore “non-electricity services”. What are the best ways to promote and include these in the Mini Grid business models?
5. Explore ways of supporting social inclusion. Possibly, methods of cross subsidy within a CBO. Raising funds externally - from other activities. For connection and ongoing costs. Research health and other cash voucher schemes
6. Engage with county governments to make difference between what is County/CBO responsibility on social services such as public lighting, health and education – GMG role to support?
7. Develop “out of the box” productive use business models. These should have the flexibility to be able to be easily adapted for specific local context.

Appendix 4: Grid for prioritization of new activities

Area for further TA	Description	Ideas for future work	Key stakeholders to involve	Priority
Access to finance – for SMEs and consumers	<p>Much funding has been focused on developers in minigrids recently. Consumers and Developers now understand that if customers can get funds for energy efficient household appliances and productive machinery for SMEs then the impact on the community will be greater. Looking at finance mechanisms in other value chains e.g. agro.</p>	<p>Create an industry level revolving loan facility through which SMEs (micro-enterprise financing) can borrow for productive uses and consumer can borrow for TVs, fans, fridges etc (appliance financing).</p> <p>This could be:</p> <ol style="list-style-type: none"> 1. direct lending from the facility 2. through a 3rd party (local banks, MFIs) 3. A hybrid of (1) and (2) above 4. investment could be used as a first loss /guarantee facility– which would unlock more 3rd party finance <p>Note there is some interest here from other sources</p>	<p>Financial institutions, investors, developers, Multi and bilateral funders (AFD)</p>	<p>High</p>
Financing models to support the most disadvantaged in communities	<p>There seems still to be a 2 tier approach in villages where, the richest get connected and poorest don't. Some communities have developed informal methods to support the most vulnerable.</p>	<p>Examine different models e.g. cross subsidising across communities, creating a CBO fund to pay all/proportion of costs. Work with developers to look at tariff structures to support disadvantaged households</p>	<p>Communities, developers, other subsidy models, grant facilities (health, education, cash transfer etc)</p>	<p>Medium</p>

<p>Data standardisation – key indicators for energy, financial and social impact</p>	<p>Each developer has developed their own indicators for measuring success. These are normally around finance, energy and impact. Impact measures in particular are varied and donors and investors have expressed an interest in creating some standard indicators in order to be able to compare organisations</p>	<p>Develop a set of core indicators which are standard for Kenya (and wider). This could be an industry tool (database) accessible to all players in the industry. These will have to be easy to collect, totally objective and could also become a condition of subsidy / funding.</p>	<p>Developers, Investors, ERC?</p>	<p>High</p>
<p>Non energy services for communities</p>	<p>When a minigrid arrives, communities are looking to have support from the developer in more areas than just energy – e.g. education, health, water, finance, productive uses</p> <p>Whilst these are not currently always in the developer’s remit, they may need to consider them more if there mini grids is to be successful</p>	<p>Note productive uses on its own below</p> <p>Investigate models for cooking solutions, water solutions (potable, washing, agricultural and for livestock) which developers can either deliver or more likely introduce a 3rd party to the community to deliver.</p> <p>Education and health offerings are also important but offer a less clear business model for developers.</p> <p>Investigate and make partnerships with local providers in both private and public sector.</p>	<p>Developers, County governments, NGOs, SMEs in energy access, equipment suppliers</p>	<p>Medium</p>

Managing Entity for a Financing Program aiming at the promotion of private initiatives in green mini-grids improving access to electricity in Kenya. Quarter 2, 2017 Report. 30 June 2017.

<p>Productive uses for increasing incomes</p>	<p>Communities want to develop new businesses – particularly in the agriculture and livestock sectors. They are looking not only for finance, but also skills, training and access to markets</p>	<p>Develop an industry level customisable approach or tool to productive uses and demand creation.</p> <p>Either develop number of open source briefings / business models on viable business models which use energy from mini grids. Developers could receive training on the methodology</p> <p>Or codify a product / service that developers that can call on under the facility in a similar way to Powerhive</p>	<p>Developers, Agriculture / livestock specialists, county governments</p>	<p>High</p>
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Appendix 5: List of Workshop attendees

	Name	Organization	Designation	Email Address
1	Carolina Barreto	PATRP: Power Africa	Beyond the grid advisor	Caroline.barreto@patrp.com
2	Rita Laibuta	AFD	GMG Facility	Laibutar.ext@afd.fr
3	Caroline Jo.	PowerGen		cjo@powergen-re.com
4	Florian Simonsen	GIZ	Prosolar, project advisor	Florian.simonsen@git.de
5	Tom Adcock	Kenergy	COO	Tomas.adcock@kenergyrenewables.com
6	Nakul Sharma	I-Dev	Associate Fello	Nakul.sharma@idevinternational.com
7	Gerald Njugi	I-Dev	S. Associate	Gerald.njugi@idevinternational.com
8	Noemie de la Brosse	Practical Action	Inclusive Market Consultant	Noemie.delabrosse@practicalaction.org.uk
9	Jechoniah Kitala	Practical Action	PAC/Energy Manager	Jechoniah.kitala@practicalaction.or.ke
10	Cliff Owiti	K.E.R.E.A	Coordinator	administrator@kerea.org
11	Brenda Muindi	DOB Equity	Investment intern	Brenda@dobequity.ul
12	Hayo Afman	DOB Equity	Investor	hayo@dobequity.ul
13	Lameck Odidah	Steamaco	E.A. Region Manager	Managerlameck@steama.co
14	Lawrence Koriat	Steam Co	CBO	lawrencekoriat@gmail.com
15	Patrick Henry Ojiambo	D.C.B.O	Secretary	Henryojiambo94@gmail.com
16	Stephen Makholi	RVESOL	Kenya Projects Coordinator	Stephen@rvesol.com
17	Beth Okioga	Kenergy Renewable	Project developer	Bertha.okioga@kenergyrenewable.com

Managing Entity for a Financing Program aiming at the promotion of private initiatives in green mini-grids improving access to electricity in Kenya. Quarter 1, 2017 Report. 25 April 2017.

18	Sammy Borothi	Schneider Electric	Project Coordinator Solar Business	Sammy.borothi@schneider-electric.com
19	Paolo Mele	PAC	facilitator	Paolo.mele@practicalaction.org.uk
20	Micah Njirawe		Kajiado	725276967
21	Vincent Ochieng	Dirakho CBO		
22	Francis Wainaina	Practical Action	Energy Advisor	720974423
23	Pepin Tchouate	Power Africa	Regional Advisor	732213031
24	Elizabeth Njoki	Practical Action	Energy	723949128

Appendix 6 – Original Proposal

Provisional Technical Assistance Programme N°2.

February 2017 Technical Assistance Title: Mapping the barriers of GMG market development / Impact of GMG on BoP Markets and Social Inclusion.

General Description

In order to better comprehend the GMG market in Kenya, especially the related social aspects, it is proposed that a team comprised of members of Short term experts from the Managing Entity, in close cooperation with the Team Leader, conduct a facilitated sector mapping process with particular focus on BoP market dynamics and social inclusion.

The work will build on the analysis done by ECA/EED prior to the inception of the project. The Managing Entity feels a first-hand, deep dive analysis is critical to the successful execution of the project. Further, the proposed work shall seek to strengthen the analysis of BoP market dynamics and social inclusion conducted previously and aim to update the information gathered by ECA/EED more than a year ago; a life time in a rapidly changing sector.

The Managing Entity team strongly feels that given the size and the scope of the GMG facility (and the considerable impact it can have if successful) that this analysis is worthwhile to develop a firm foundation and in-depth insights first-hand so that we ensure that we fully understand all of the nuanced factors that will drive or hinder the sectors success (and the Facility's). Additionally, face to face meeting with many of the key actors in the sector will be incredibly valuable for building the necessary connections and contacts within each critical stakeholder group (companies, investors, gov't, dev agencies, communities, etc), as well as beginning to build trust with each group and to ensure that they are all heard from and feel included in the process.

As part of the process a workshop will be held which will not only sketch a more detailed breakdown of the principal actors and stakeholders in the sector, but will also address their motivations and address the social impacts which are a section of the Manual of Procedure of the GMG Facility. The sector mapping workshop and process will follow a Participatory Sector Market Development (PMSD) approach. It has been proposed that Practical Action Consulting (PAC) will lead this work with support from I-DEV and IED. The workshop is planned for March 2017 with attendance from stakeholders across the Kenyan mini-grid sector and will result in a clear market systems map that defines each of the areas for technical support across the

sector, as well as identify and begin to develop strategies for addressing the sector's most critical barriers through a collaborative and highly interactive process.

The final deliverable for the work will be;

- 1) A Technical Assistance plan, developed collectively by the participants in the workshop and establishes a clear road map for addressing the sectors critical barriers through a series of targeted TA interventions
- 2) Specific plans and proposals for the Technical Assistance needs identified in 1) ready for submission to AFD and implementation.

Description of Tasks

Step 1 - Obtaining the voices of the consumers

The Team will select one community with an existing mini-grid systems and run a day of interviews, workshops and meetings to better understand the needs and perspectives of this critical consumer/ stakeholder group including overall demand, needs and priorities for household, community and commercial energy, key actors and social/cultural norms that may drive or impact demand, and identify key areas of opportunity and risks that may GMG operators may face. Different groups will be formed to make sure that all segments of the community are covered for example, businesses, community uses, women's groups, local leadership structures and both formal and informal community leaders.

The Team will then replicate a similar exercise in a community that has been identified for a future mini grid coverage under other programs, but as of yet does not have access to electricity.

Representatives of each community will then join the collaborative sector strategy workshop in Nairobi to ensure the community is an active participant in the development of intervention and TA strategies that will be critical for the success of the project. Inclusion of the right community members in the sector-wide analysis and planning that will be done during the workshop will also be key for building trust and obtaining the buy-in of the formal and informal leadership in target communities.

Step 2 - 360 Degree Sector Analysis - Individual meetings with key stakeholders

The Team will then build on and update the work conducted by ECA/EED during preparatory phase via interviews with relevant stakeholders from across the GMG sector. The interviews will include representatives from each of the critical sector groups including GMG developers, consumer finance providers, payment systems suppliers, the Ministry of Energy, Rural

Electrification Authority, private sector investors, banks, critical donors and sector funders (e.g. World Bank), and if relevant equipment manufacturers. The preliminary information and data gathered will provide key insights and guidance for the stakeholder workshop, as well as build direct relationships between the long-term project team and the actors most critical for the sector's (and GMG facility's) success in the short, medium and long-term.

Step 3 - One-day, Participatory Market System Development workshop with key stakeholders in Nairobi

The participatory workshop will be designed to identify and map out the key challenges and potential barriers that mini-grid developers and consumers will face and will aim to develop potential solutions and strategies to address each. These issues are likely to cover regulatory issues, financing, consumer payments, licensing, local planning, demand generation and similar issues, amongst others. The workshop will be facilitated by experienced PMSD facilitators from PAC.

The analysis conducted in the previous steps and the insights developed during the workshop will inform the development of a detailed map of the sector and identify the main barriers to growth identified through the workshop mapping exercise. The analysis will culminate in a plan which will outline the key areas for support/intervention and propose technical assistance programs for each.

Step 4 - Recommendations and Development of Terms of Reference for TA Interventions

The analysis from each of the steps above will result in the development of specific technical assistance proposals which will target each of the key barriers identified. Proposals will be related to community engagement and impact, the inclusion/development of finance mechanisms and vehicles for GMG operators and/or consumers, the development of clear and concise regulatory and licensing policies that will be beneficial to the GMG operator as well as others.

Inputs (Expertise Required)

Profile	Category	Senior Junior	Name	Total man days
Financial expert	International Short Term	Junior	Gerald Njugi May Mumo	29
Financial expert	International Short Term	Senior	Jason Spindler Patrick Watson	14
Social expert	Key Expert	Senior	Lydia Muchiri	10
Social expert	National expert	Junior	Elizabeth Njoki	10
Market Specialist	International Short Term	Senior	Al Cunningham Paolo Mele	24
Market Specialist	International Short Term	Junior	Noémie de La Brosse	4
Energy Specialist	International Short Term	Junior	Mattia Vianello	3
Total Estimated Input (man day)				94

Other Expenses (based on evidence)

In addition to the above days, 3 International Travels will be required plus a budget for room hire for 1-day workshop (max. €1,400).

Output (Deliverables)

- Meetings with 2 communities with mini-grid systems.
- Multiple meetings in Nairobi with representatives from all key stakeholder groups.
- Facilitation of 1-day workshop in Nairobi.
- Workshop analysis and sector mapping.
- Clear understanding of the challenges that may limit the success of the GMG sector in Kenya and the development of concise strategies for addressing those challenges and mitigating potential risks through the GMGF program activities.
- Terms of reference for specific Technical Assistance interventions in the areas of social inclusion, market and business development and financing.

Proposed Schedule

March - May, 2017.