

Kenya

Last Mile Connectivity Program



Source: Presentation for the World Bank
(http://cega.berkeley.edu/assets/miscellaneous_files/CEGA_Energy_REPP_June2015.pdf)

A government initiative to connect Kenyan households to the national electricity grid.

The Government of Kenya (GoK) has introduced a series of projects to stimulate economic growth and create jobs. They include the Last Mile Connectivity Program (LMCP), which aims to ensure everyone has access to electricity by 2020.

The project focuses on rural areas and slums where connectivity is poor. People who do not have access to electricity are unable to achieve the same standard of living as the households that do, and they have limited access to economic opportunities.

Connecting low-income households to electricity in rural areas has been a challenge for decades. This is because of the “high costs of supplying rural and peri-urban households” with electricity, a “lack of appropriate incentives”, “weak implementing capacity”, “population growth”, and the “cost of the internal wiring of consumers’ premises”¹.

The Last Mile Connectivity Program addresses some of these challenges by lowering the cost of connection from USD 398 (KES 35,000) to USD 171 (KES 15,000)² per household, with the help of subsidies. Subsidised loans are also available for households unable to afford this subsidised connection fee.

This project illustrates how to overcome the so-called “last mile”³ by reaching out to groups in society that did not benefit from previous electrification projects in Kenya. It also identifies socioeconomic and technical complexities that may need to be addressed in the long-term.

The Last Mile Connectivity Program follows the African Development Bank’s (AfDB) gender and social inclusion strategies for enhancing social benefits and implementing complementary activities. It also follows the environmental and social governance requirements of the National Environment Management Authority of Kenya (NEMA) and the World Bank.

¹ Development of a Power Generation and Transmission Master Plan, Kenya, (Lahmeyer International GmbH, 2016)

² Exchange rate used as per Economics of “Last Mile” Electrification study, (Lee, Miguel, & Wolfram, 2015)

³ In this case, the “last mile” in Phase I of the Program referred to the final connection to unserved households living within 600 metres of an existing transformer. In later phases, this was expanded to also include new transformers and the extension of the low-voltage network.

Project Overview

Key words	Affordability, access to electricity connection, pro-poor, rural
Sector	Energy
Background	The Last Mile Connectivity Program improves access to electricity in slums and rural areas in Kenya and aims to help achieve universal access. In April 2018, 73% of the population had access to electricity* ¹ .
Size	Phase I – III: USD 450 million total Phase IV: EUR 180 million
Stage	<p>Phase I: Financed jointly by the GoK with USD 150 million loan from the AfDB. It involved connecting households located within 600 metres of an existing transformer.</p> <p>Phase II: Financed by the GoK with USD 150 million loan from the World Bank. Targeted areas on the outskirts of cities and towns. Involved the installation of new transformers and the extension of the low-voltage network.</p> <p>Phase III: Financed by the GoK with USD 150 million loan from the AfDB. Involved the installation of new transformers and the extension of the low-voltage network.</p> <p>Phase IV: Financed by the GoK with EUR 90 million loan from the French Development Agency (Agence Française de Développement (AFD)), EUR 30 million grant from the European Union (EU) and EUR 60 million loan from the European Investment Bank (EIB). Involved increasing connections to distribution transformers and the installation of additional transformers.</p>
Why of interest	<ul style="list-style-type: none"> • Initiative aimed at increasing access to electricity in urban and rural areas • Study of rural households on sensitivity to price and demand for electrification • Specialised loan packages for people unable to afford the subsidised connection fee • Proximity of new transformers to public facilities in all communities, e.g. local health clinic to ensure connectivity
Project objectives	<ul style="list-style-type: none"> • Respond to the most urgent needs of the rural population regarding electricity connectivity • Support the country's objective to reach universal access by 2020 • Increase affordability by providing subsidies and loans, and lowering the connection fees
Project Lifecycle Assessment	<p>Project preparation – identifying the transformer location, consulting with the communities, and conducting surveys on technical readiness and project design, including budget.</p> <p>Project procurement – national legislation exists in Kenya to promote inclusion in procurement practices (however its implementation has not been assessed in this case study)*².</p> <p>Construction – stakeholder engagement, connecting households, fee collection and loan agreement as necessary.</p> <p>Project monitoring and evaluation – monitoring of active household connections and loan repayments.</p>

*¹ Kenya leads East Africa peers in access to electricity, (Kenya Power, 2018, May 8)

*² More details on government procurement legal requirements can be found at <https://www.agpo.go.ke/pages/about-agpo>

Project Description

In 2015, the government announced the Last Mile Connectivity Program to provide universal access to electricity by 2020. The ambitious strategy, which is being rolled out in phases, was developed based on international good practice and experience. It achieves economies of scale and aims to provide five million new connections in five years, primarily targeting informal settlements in urban areas and low-income households in rural areas. It has contributed to Kenya having one of the world's fastest rates of progress on the Sustainable Development Goal (SDG) 7 on access to electricity⁴. At the end of April 2018, 73.4% of people in Kenya had access to electricity, up from 56% in 2016⁵.

A study on barriers to electrification in rural Kenya in 2014⁶ identified that electrification rates were very low, despite previous significant investments in grid infrastructure. Taking a large sample of households, the study identified that half of the unconnected households were "under grid"⁷, or clustered within just 200 metres (m) of a low-voltage power line, where connecting to the grid should be relatively low-cost. It highlighted the potential opportunity to reduce energy poverty by targeting "last-mile" connections (the final stage of the electricity system) in "under grid" communities and argued that "to leverage existing infrastructure and economies of scale, subsidies and new approaches to financing connections are necessary".

Key challenges to achieving the goal of universal access include people's ability to afford the connection fee, their ability to pay electricity bills and the cost of wiring the house. Prior to 2015, the connection fee of USD 398 (KES 35,000)⁸ was considered high, relative to most households' annual income of below USD 1,000⁹. Residents in most low-income areas were unable to afford the cost of electrification, and viewed electricity as a luxury, which affects their willingness to pay. Households in rural areas prioritise spending on food and clothing and may prefer to spend their disposable income on social and leisure activities.

The absence of electricity due to affordability, income and willingness to pay may affect people's quality of life, and it prevents households from pursuing income generating activities. Children and other certain groups in society (e.g. women) trying to enhance their skills or take part in educational activities have fewer hours per day to read or study because they do not have quality lighting. Communities without access to electricity have a limited ability to operate health centres at night, which is essential for pregnant women and the critically ill. Furthermore, without electricity, health centres cannot operate basic electronic laboratory equipment or the fridges that store vaccinations and other items.

Working closely with the Rural Electricity Authority (REA), a group of researchers conducted a randomised evaluation to measure the price sensitivity of electricity connection. After gathering baseline data, the Ministry of Energy announced it would help families to get connected at a cost of USD 171 (KES 15,000). The Phase I criteria for applicants to enjoy the low connection fee was that the household needed to be within 600 metres of an existing transformer.

Though the poverty line was not explicitly considered during the community selection or prioritisation process for the Last Mile Connectivity Program, the communities were identified with the help of constituency representatives and the Members of the County Assembly. Many of these communities that do not have access to electricity are poor and have limited opportunities to improve their skills or engage in additional income-generating activities.

Given the financial and technical constraints, many Kenyans (off-grid and "under the grid") may obtain energy from private sector providers that have pioneered pay-as-you-go (PAYG) distribution models for off-grid solar devices and mini-grids¹⁰. The complementary interface of off-grid solutions with traditional grid extension has been recognised by the Government of Kenya and the World Bank. Both institutions support the Kenya Off-grid Solar Access Project (KOSAP), launched in 2018. Its aim is to expand electricity services to under-served areas through mini-grids and off-grid solar devices. KOSAP will run alongside the Last Mile Connectivity Program.

⁴ Tracking SDG7: The Energy Progress Report 2018, pages 2-3 (The World Bank, 2018a)

⁵ The World Bank Database shows that in 2016, the overall electrification rate in Kenya was 56% (with the rural electrification rate being 39% and urban 77.6%).

⁶ Barriers to Electrification for "Under-Grid" Households in Rural Kenya (Kenneth Lee, E. B., 2014)

⁷ "Under the grid" refers to households that are close to a low-voltage line, and should be able to connect at a relatively low cost, but for various reasons may still not be connected.

⁸ Exchange rate used as per Economics of "Last Mile" Electrification study, (Lee, Miguel, & Wolfram, 2015)

⁹ Rural Electric Power: Evaluation of Household Electricity Connections in Kenya, Innovation for Poverty Action and Kenya Power (Innovations for Poverty Action (IPA), 2015)

¹⁰ Knowledge from Atkins' ongoing energy access projects in East Africa and experts based in Kenya. In Kenya, it is estimated that over three million off-grid solar devices have been distributed since 2014, Off-Grid Solar Market Trends Report 2018 (Global Off-Grid Lighting Association (GOGLA), 2018).

The LMCP illustrates a number of Action Areas on inclusive infrastructure. Most relevant from an inclusivity perspective is the effort to optimise the electricity connection fee to make access more affordable to households not yet connected to the grid, relevant to the Action Area on **Affordability and Optimising Finance**. The project features elements of policy (Action Area: **Policy, Regulation and Standards**) and of active community engagement (Action Area: **Stakeholder Identification, Engagement and Empowerment**). The focus is on 'energy poverty', often in low-income communities, while separate consideration was given to specific groups, such as women and children.

Key Practices Identified and Applied



AFFORDABILITY AND OPTIMISING FINANCE

Statement of the issue in relation to inclusion and brief introduction

Prior to 2015, the electricity connection fee, at a fixed price of USD 398, was unaffordable for households in low-income areas. In addition, households had to pay the upfront in-house wiring costs¹¹, buy electric appliances and pay the electricity bills. Many people viewed the connection as a luxury and were not willing to pay for it, even if they could afford it¹².

In many low-income households, the electricity they use will be for lighting. Based on 2005 and 2006 data, the median monthly expenditure per household on kerosene for lighting was USD 1.55 (KES 156), while the median expenditure on electricity per household was USD 3.30 (KES 332)¹³. The difference created a perception that electricity costs are high, and many households preferred the cost of continued use of kerosene for lighting.

The demand for electricity connections remained low, especially in rural areas, because of the economy, household income and expenditure structure. The need for food and clothing was prioritised over the use of electricity. Even when households were given financial assistance and offered subsidised connection fees, the electrification rate in rural areas was just 39% in 2016¹⁴.

There were other challenges too, including a shortage of investment and difficult geography.

¹¹ The household needs to engage a qualified electrical contractor who is registered by the Energy Regulatory Commission to do the wiring and issue the commencement of work certificate, completion of work certificate and wiring certificate.

¹² Experimental Evidence on the Demand for and Costs of Rural Electrification, (Lee, Miguel, & Wolfram, 2016)

¹³ Household Lighting Fuel Costs in Kenya, (Ondraczek, Stöver, Lay, & Jacobson, 2012).

¹⁴ Electrification rate in Kenya, (The World Bank, 2018b)

The communities are remote and far apart, which led to higher construction, implementation and operating costs. Private sector participation was limited due to the higher risk of financial loss and the large investment needed with uncertain return.

How inclusivity has been addressed

The identified practice is the lowering of the electricity connection fee and the availability of loan products to help increase the access rate.

Selection of communities

Communities were selected by constituency representatives and Members of the County Assembly (MCA), who shared the information with the Rural Electricity Authority (REA). The key criteria were whether the community already had access to electricity and its technical readiness¹⁵. Before houses could be connected, they needed to be technically ready, and cables and power points had to be installed before construction work started. The prioritisation of communities depended on the county's willingness to support certain communities. The REA's priorities were based on technical rather than social criteria – for example, Phase I included households within 600 metres from the existing grid, and in Phase II, this was extended to include all communities one to two kilometres from the existing grid. The second criterion to be met was a minimum population density per new transformer (included in Phase II), which had to be within a 600-metre radius of that transformer. The location of the new transformer was determined following a survey.

Determination of an affordable connection fee

Prior to the Program, the initial connection fee was USD 398 per household. In 2014, the World Bank, the Berkeley Energy and Climate Institute, and the Development Impact Lab, together with the Rural Electricity Authority (REA) and Kenya Power, responded to concerns that it was too costly. They conducted research to support the REA's estimate of a more appropriate connection fee and set up a database for subsequent projects. To support this process, a baseline survey was conducted in relation to 150 installed transformers¹⁶ in Busia and Siaya counties, identified as locations with vulnerable groups, in terms of economic development, low electrification rate and relative high-density population.

¹⁵ Technical readiness means the number of households that already have the required electrical distribution network inside the house.

¹⁶ Selection criteria included the following: distance between any two transformers was at least 1.6 kilometres, each transformer is an REA project and the transformer must have been in use for at least one year.

The research team visited communities and conducted surveys to build a sample database, which consisted of 12,001 surveyed unconnected households. As per the REA construction cost management plan, households that were within 600 metres of a transformer and also no more than 400 metres away from a low-voltage line were selected from this database. Based on that threshold, 2,504 households in total (including 2,289 unconnected and 215 connected) were studied in more detail to understand electricity spending patterns and preferences.

According to the results, each unconnected household had an average of 2.99 young people and the monthly lighting spend was USD 5.52, in comparison to USD 15.38 for the connected household. The research results showed that the demand for connection declines rapidly with an increase in connection fee. The theoretically accepted price point concluded from the survey was much lower than the price set by policymakers. Despite large investments in grid infrastructure in the past, the rate of connectivity was low even for relatively well-off households and businesses.

The focus of the practice addressed in this case study is on the connection fee only and does not consider the general electricity tariff and its affordability¹⁷.

Implementation

Reduced connection fee

In May 2015, the Ministry of Energy and Petroleum announced a reduction in the electricity connection fee from USD 398 to USD 171, which was enabled by public investments and subsidies. The lower connection fee is only applicable to households in communities covered under the Last Mile Connectivity Program, for which the Government of Kenya secured USD 364 million in funding from the African Development Bank, the World Bank and the European Investment Bank.

For those households unable to pay the connection fee at the time of connection, they can pay in instalments over three years. This translates to payments of USD 4-5 (KES 416) per month, which will be added to their monthly bill after they successfully apply for a Stima Loan¹⁸. The rationale for reducing the cost of the connection fee was the economies of scale that could be achieved – when one

¹⁷ The applicable electricity tariff for the 50-1500KWh usage band is KES 22.77 for domestic use. This is a significant increase from KES 16.18 in 2008. Since a peak in July 2014, the government aims to further reduce the tariffs through the introduction of new, low-cost power generation sources.

¹⁸ The Stima Loan Program has not been specifically created for the Last Mile Connectivity Program, however households covered by the project can make use of it. All customers are required to deposit 20% of the borrowed amount and pay an administration fee of 5%. They are advanced a loan valid for 24 months with no interest charges. Repayment of the loan commences one month after connection. (Kenya Power, 2018, September 12)

additional household connects, the cost per household becomes less expensive. The experimental average total cost (ATC) curve prepared by the research team showed the budgeted ATC per connection decreased as the proportion of the community connected increased. The ATC dropped dramatically from USD 3,500 per installation with no connections, to USD 1,000 with 15 homes connected¹⁹. This finding had major implications for the design of the project:

- the location of the transformer needed to cover as many households as possible, with a mandatory requirement to also connect a health centre; and
- the identified transformer coverage was limited to a 600-metre radius due to the technical limitations of the transformer and voltage loss.

The exact location of the transformer (and consequently, the households covered within the 600-metre radius) was determined following a site survey by the REA, which designed the network grid, prepared the budget and defined material requirements.



POLICY, REGULATION AND STANDARDS

How inclusivity has been addressed

The identified practice is the establishment of an independent energy regulator and an oversight authority tasked with enhancing connectivity and promoting socioeconomic development.

Implementation

Independent regulatory body

The most relevant legislation in relation to the project is the Kenya Energy Act No. 12 of 2016. It set up the Energy Regulatory Commission (ERC), an independent regulator responsible for formulating licensing procedures, issuing permits, making recommendations for further energy regulations, setting and adjusting tariffs, approving power purchase agreements (PPAs) and preparing national energy plans.

¹⁹ "Last Mile" Electrification study, (Lee, Miguel, & Wolfram, 2015)

Electricity oversight and promotion authority

Most relevant for the Last Mile Connectivity program is the Rural Electrification Authority (REA), established to enhance rural electrification in the country. As part of the program, the REA oversees the connection of potential customers located near installed transformers supplying public utilities. The REA became operational in July 2007 with the mandate of accelerating the pace of rural electrification to promote sustainable socioeconomic development.

Energy legislation

Under the Energy Act, the REA is tasked to undertake the following functions:

- manage the Rural Electrification Program Fund;
- develop and update the rural electrification master plan;
- promote the use of renewable energy sources including small hydro, wind, solar, biomass, geothermal, hybrid systems and oil-fired components, considering the specific needs of certain areas. For example, the potential for using electricity for irrigation and support for off-farm income generating activities;
- implementation and sourcing of additional funds for the rural electrification program; and
- management of the delineation, tendering and award of contracts for licences and permits for rural electrification.



STAKEHOLDER IDENTIFICATION, ENGAGEMENT AND EMPOWERMENT

How inclusivity has been addressed

The identified practice is the establishment of a dedicated stakeholder engagement team to coordinate with local leaders and members of the community.

Implementation

Community engagement

Public consultations aimed at understanding project impact and benefits, risks and potential mitigation measures started in January 2014.

Before any construction work could start, local communities and other stakeholders were consulted. The same group also participated in screening residents' actual electricity demand, identifying potential technical constraints to determine the key issues and agreeing how to address the concerns of various parties.

The REA assigned a team of consultants to undertake stakeholder engagement. The team worked with the local Member of the County Assembly and community leaders to organise regular gatherings where all households without access to electricity (including the most vulnerable, such as women and the households with the lowest income) were invited²⁰. At the end of the meetings, the team recorded the names and contact details of attendees. By doing so, the team established communication channels that they could use to secure buy-in as the project developed.




Communities located more than one to two kilometres from the existing electricity grid were not considered for electrification. Households located outside the 600-metre radius of the transformer were also unlikely to benefit. If a household beyond the 600 metres wished to be connected, a request could be made to Kenya Power. Subsequently, a survey would be conducted to identify how many other potential customers could benefit from the connection. A proposal for connecting them as part of a wider scheme is then made to spread the cost of connection among all the potential customers²¹.

Overall community engagement activities identified were general in nature. The case study has not identified any specific focus on women, young people or the extremely poor.

²⁰ The project follows the Environmental and Social Impact Assessment (ESIA) guidelines of the National Environment Management Authority (NEMA) of Kenya.

²¹ Last Mile Connectivity Program Q & A, (Kenya Power, 2018)

Benefits Realisation

Identified benefit	Benefit description
 <p>Increasing affordability and accessibility</p>	<p>The reduction of the connection fee from USD 398 to USD 171 increases the affordability of electricity. Furthermore, the Government of Kenya cooperates with external financiers to provide low-income families who cannot afford the fee with a loan package, allowing them to make payments by instalments through the Stima Loan Program. The following targets for the LMCP were set for each phase and progress is ongoing:</p> <p>Phase I: 314,200 households targeted</p> <p>Phase II: 312,500 households targeted</p> <p>Phase III: 385,700 households targeted</p> <p>Phase IV: 397,000 households targeted*¹</p>
 <p>Social equity and social stability</p>	<p>Access to electricity reduces social inequality, although this alone does not address all challenges to achieving social equity.</p> <p>Connecting communities to health clinics improves public access to health care services and further reduces disparities with other connected communities.</p>
 <p>Reducing poverty and income inequality</p>	<p>Communities targeted under the project are poor. Access to electricity increases their living standard through improved lighting, the ability to power electronic equipment, and their ability to pursue revenue generating and leisure activities. Nonetheless, a direct link between access to electricity and reduced income inequality could not be established in this case study.</p>

*¹ Last Mile Connectivity Program Q & A, (Kenya Power, 2018)

Stakeholders

Key beneficiaries	Role
Communities without electricity access, poor people in rural areas	The key role of these groups is to be present in the engagement and consultation process and participate in the project while sharing their views and concerns. As the main target group and beneficiary, this group is viewed as the key stakeholder. The households who cannot afford the connection fee are involved in the consultation before construction work, and they are provided with a subsidised price and financial assistance (if they are unable to afford the connection fee, they are allowed to pay through instalments for a period of three years).

Institutional stakeholders and partners	Role
Rural Electrification Authority (REA)	REA is a government entity charged with implementing the Rural Electrification Program and has been operating since July 2007. It is responsible for the project design, procurement and construction of the new electrification systems in the communities. When the projects are complete, they are handed over to Kenya Power.
Ministry of Energy	The ministry is charged with the development of energy resources for national development and ensuring every Kenyan has access to electricity by 2020.
Kenya Power and Lighting Company (KPLC)	Kenya Power, also referred to as Kenya Power and Lighting Company (KPLC), is a limited liability company with a 50.1% public controlling stake which transmits, distributes and retails electricity to customers throughout Kenya.
African Development Bank (AfDB)	Financier of the loan package provided to the Government of Kenya, which is partly used to provide subsidies to households that cannot afford the cost of the connection fee.
World Bank	Financier of the loan package provided to the Government of Kenya in support of Phase II of the Program, which covers all 47 counties targeting peri-urban areas.
Agence Française de Développement (AFD)	Financier of a loan package provided to the Government of Kenya in support of Phase IV of the Program, which involves the maximisation of existing distribution transformers and the installation of additional ones.
European Investment Bank (EIB)	Financier of a loan package provided to the Government of Kenya in support of Phase IV of the Program, which involves the maximisation of existing distribution transformers and the installation of additional ones.
European Union (EU)	Provider of a grant to the Government of Kenya in support of Phase IV of the Program, which involves the maximisation of existing distribution transformers and the installation of additional ones.

Lessons Learned

Success factors

Reducing the electricity access connection fee is the key success factor. The baseline study of willingness to pay was conducted at the planning stage, early enough to influence the overall project design and to determine an affordable fee. As a result, the Government of Kenya lowered the price by almost 60% for certain households and provides a loan package to finance the upfront cost.

Stakeholder engagement in the project planning and assessment process was important. Stakeholders were consulted during the project planning and implementation stages.

The cost-benefit trade-off finding was also crucial. The average total cost per connection decreases as the number of people connected increases, hence the requirement to have a minimum number of households within a 600-metre radius of the transformer. There is a clear cost/benefit ratio. The downside is that households beyond the 600-metre radius do not get electricity access, creating exclusion. They can submit a special request and will be issued with a proposal to be connected, but with associated costs. People can then decide to accept the proposal or wait until subsequent phases are implemented.



Figure 1. Customers completing household surveys. Source: Presentation for the World Bank (http://cega.berkeley.edu/assets/miscellaneous_files/CEGA_Energy_REPP_June2015.pdf)



Figure 2. Kenya Power installs prepaid meters, Source: Presentation for the World Bank (http://cega.berkeley.edu/assets/miscellaneous_files/CEGA_Energy_REPP_June2015.pdf)

Key challenges

Public funding constraints are a key challenge for Kenya's infrastructure development authorities in general. Low population density and low incomes in rural areas lead to higher investment requirements. The remote location of the projects and uncertainty over payments from households add to the problem.

A lack of detailed socioeconomic data in gender, income levels and age makes it difficult to develop specific solutions for vulnerable groups. The collection of detailed and disaggregated data is costly and requires a long-term perspective to realise benefits.

Cost of electricity access is still high for many households. Although affordability has increased, in many poor households, household incomes still do not cover the payments required to maintain a connection and willingness to pay is low, given other priorities such as food and clothing. In households where there is limited use and affordability of electrical appliances, it may be appropriate to consider lower levels of access than the grid connections, such as household solar, which allows for lighting and phone charging.

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Interviews

Interview with Esther Ruto (18 June 2018), General Manager Technical Services with Rural Electrification Authority, Last Mile Connectivity Program. (A. Keller, Interviewer)