



Community Power
from Mobile



Safaricom



Safaricom – Kenya – Feasibility Study

Mobile connectivity has extended beyond the reach of the electricity grid. The mobile industry is unique in the size and reach of its power infrastructure, penetration rates and brand power, providing an opportunity for unprecedented scale in impacting lives. GSMA's Community Power from Mobile programme seeks to identify the opportunity and stimulate activity with solutions that are scalable and commercial.

There are currently 34 million people in Kenya who lack formal access to energy¹ and over 19 million off-grid mobile SIM connections². Put simply, many Kenyans have a phone before they have a place to charge it.

In June 2012, the GSMA with the support of the International Finance Corporation (IFC), began working with Safaricom to evaluate the opportunity to improve access to energy services for their customers while improving the business case to serve off-grid areas. What follows is a summary of the key findings of the study.

1 <http://www.worldenergyoutlook.org>

2 GSMA estimate, 2012

With the power of the Safaricom brand and coverage, there is potential through its network, retail channels and mobile payment service (M-PESA) to enable better phone charging facilities and other energy services, so stimulating economic activity in off-grid communities and delivering cost-savings to the network plus revenue uplift.

The feasibility study has shown Safaricom to be well-positioned to explore outsourcing to third party energy service companies for power and security services, where community power is not in place.

Recommendations

From the study, 2 key recommendations are made:

- Issue a tender to evaluate ESCOs, based on organisational and technological strengths, to power the 47 existing sites which will not be connected to the grid in 2013, to provide significant cost savings and deliver energy services to surrounding communities.
- Continue to evolve commercial and social impact matrices to track the impact all models for community energy services in order to drive growth and build a strategy around multiple technologies and delivery models.

Safaricom recognises the opportunity for cost savings through an outsourced model for fully managed power services for their towers, and the benefits of innovative business models that also improve community energy services. Whilst subscribers living in rural communities often have their phones switched off for 40% of the time to conserve battery life, and the lengths they go to charge their phone, the impact of enhancing the distribution base for off-grid energy services through Safaricom's infrastructure is unprecedented.



Introduction

Just 5% of the Kenyan population lives outside mobile coverage but up to 84% of households are without formal grid electricity. The addressable off-grid mobile market equals 67% of all mobile connections in Kenya.

Mobile connections are expected to keep rising with mobile service available in 40% of the country, covering over 95% of the population³. The large majority of the population live in rural areas (approximately 76%) where grid power distribution and reliability remains poor. Even where accessibility is an option, affordability for (formal) grid connectivity is an obstacle. All mobile value added services (VAS) that a mobile can deliver, such as access to medical advice and mobile wallets, in rural areas have energy requirements at a high cost. The number of mobile subscribers living without easily accessible electricity in Kenya is set to increase unless off-grid energy services improve dramatically.

At the same time energy is the backbone of the mobile industry. Operators' spend on energy is increasing due to 3 key factors:

- Price per kWh due to rising diesel costs
- Off-grid diesel theft
- Security

The wide adoption of mobile services by underserved populations provides an opportunity to develop energy solutions at a scale never before seen, leveraging both human and physical infrastructure and innovative payment technologies for both socioeconomic and commercial advantages.

Mobile can improve access to basic community services via:

- Innovative models that service the mobile tower as an anchor client
- Leveraging existing mobile delivery channels
- Mobile payments and pay-as-you-go consumer financing
- Machine-to-machine implementations (e.g. remote activation, monitoring of systems, data collection)

Country Background: Kenya

Kenya is part of the East African trading block and lies on the equator, with the Indian Ocean to its south east and shares borders with five countries: Tanzania to the south, Uganda to the west, South Sudan to the north west, Ethiopia to the north and Somalia to the north east. Kenya has a land area of 580,000 km² and a population of about 40 million.

Kenya has a varied climate ranging from a warm and humid coastline, savannah grasslands inland, temperate forested and hilly western region and an arid and semi-arid landscape in the north east. The edge of the Great Rift Valley has many lakes including Naivasha, Nakuru and Elementita, and substantial geothermal activity. 6% or 4,100 km² of Lake Victoria forms part of the country's western border.



Source: Google Maps

Economic Data

The table below shows a comparison between Kenya and three of its neighbouring countries; Uganda, Ethiopia and Tanzania in respect to key social-economic indicators. Kenya currently has the highest GDP per capita in East Africa, the 2nd smallest population and the strongest Human Development Index (HDI). Almost 32 million people, about 76% of Kenya's population, live in rural areas which puts demands on the geographical reach of grid electricity.

Indicator	Kenya	Ethiopia	Uganda	Tanzania
Population	41,609,728	84,734,262	34,509,205	46,218,486
GDP (US\$)	33,620,684,016	31,708,848,033	16,809,623,489	23,705,302,063
HDI	0.509	0.363	0.446	0.466
Urban/Rural %	22/78	18/82	13/87	26/74

Source: World Bank

Within the country the poorest districts lie on the border regions in the north and northeast close to or neighbouring Somalia and Ethiopia, with the weakest infrastructure and greatest security risks.

Telecoms in Kenya



The table below shows the current mobile landscape in Kenya. There are four mobile network operators with Safaricom significantly ahead as market leader. Approximate markets shares in 2012: Safaricom – 64%, Airtel – 16%, Orange – 11% and Yu – 9%⁴.

Mobile Penetration/Connection (%)	66
Mobile Coverage (% of Population)	95
Mobile Coverage (% of Geographical Area)	38
GSM Base	28,080,771
Number of MNOs in the market	4

Source: Wireless Intelligence, Q2 2012

Airtel Africa acquired Zain Kenya in 2010 and sparked high competition in airtime costs, driving operator strategies of low revenue per minute and high volumes. Safaricom's mobile money service, M-PESA, launched in 2007 and currently has the largest user base (over 16 million) in Kenya compared to other mobile wallets and has an extensive rural reach.

Energy Access in Kenya

The grid has an installed base of 1,240 MW which is largely made up of thermal and hydropower and 2MW planned for development from geothermal and wind power. The cost of electricity (on-grid) is approximately KES 20/kWh, consisting of a base price of KES 5.6/kwh (commercial) plus charges and adjustments⁵.

Off Grid Energy Access



Off-grid fuels in the form of diesel and kerosene, used for lighting and cooking, are priced respectively at US\$ 1.25 per litre (KES 106) and US\$ 1.01 per litre (KES 86)⁶. Rural households spend between US\$10.00 and US\$ 14.12 per month (KES 850 – 1200/-) on lighting alone with the main energy source for tin lamps and lanterns, kerosene, priced at a greater premium with increased distance from cities and town.

The table below shows the formal urban and rural electrification rates both on an individual and household basis with the informal access to electricity increasing urban electrification by potentially 10-20%⁷.

4 Wireless Intelligence, 2012

5 Kenya Power and Lighting Company

6 <http://www.businessweek.com/news/2012-10-14/kenya-energy-regulator-raises-gasoline-diesel-kerosene-prices>

7 World Bank

% Electrification (People)	16
% rural electrification	4
% urban electrification	42
% Electrification (Households)	23
% rural electrification	51
% urban electrification	5

Source: IEA, 2012

The Rural Electrification Authority (REA) is mandated by Government to increase the rate of rural electrification with high quality and affordable solutions, promoting the use of renewable energy. The Energy Regulation Commission issues permits and licenses under the Energy (Electricity Licencing) Regulations of 2010 including the renewable energy sector. A permit is required for below 3,000 kW, and a license required for power plants exceeding 3,000kW.

In the private sector there is a growing number of energy companies manufacturing and/or distributing alternative energy services or devices, largely reliant on solar power technology, but faced with the challenge of reaching off-grid customers through a broad distribution base.

Access to Phone Charging in Kenya



The average cost of charging a phone in urban Kenya is US\$0.25 and reaches nearly US\$0.30 in rural locations (KES 20/- to KES 30/-). Weekly phone charging costs average at US\$ 3.75 (KES 320/-) with an added cost for travel⁸.

Studies in Kenya have found that customers are charging their phones three times a week on average and typically a charging business can serve over 100 customers per week, offering a significant revenue opportunity for an entrepreneur⁹.

Rural ARPU (Average Revenue per User) in Kenya is significantly lower than blended national ARPU¹⁰. Safaricom's subscribers living off-grid could be spending as much on charging their phones as they are on using them, and initial field research showed it to be as high as 80%. This presents a huge opportunity to convert expenditure on phone charging, a significant portion of the total cost of ownership, into spending on actual phone usage (or other productive activities) with cheaper phone charging facilities.

8 GSMA field research, 2012

9 GVEP Phone charging study

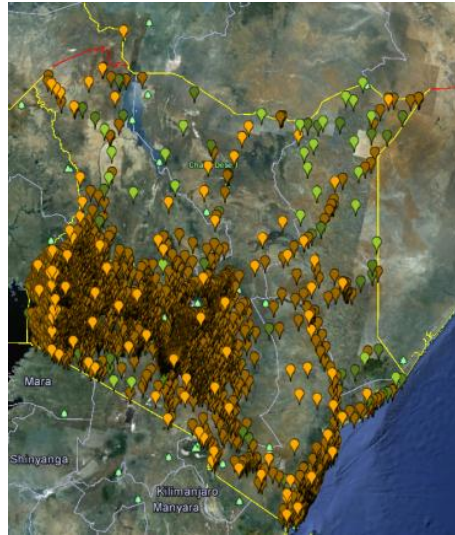
http://www.gvepinternational.org/sites/default/files/phone_charging_businesses_report_with_gsma_final_for_web_0.pdf

10 Safaricom Sustainability Report, 2012, states FY 2011/12 revenues were US\$1.2 Billion (KES 107 Billion) and a total of 19.1 Million customers

Approach to Feasibility Study and Results

The objective of the Feasibility Study was to assess Safaricom's off-grid tower network and retail agents to evaluate the opportunity to offer community energy services in a way that's scalable and commercial.

Safaricom's Network



Safaricom's network provides extensive coverage with concentration in the southern and western urban area. On the Google Earth map (left), brown indicates towers on-grid, yellow for diesel sites and green for off-grid towers. The majority of green power sites are located in remote locations.

Mobile Infrastructure

At the time of the study, Safaricom had a total of 2,500 towers providing coverage to about 90% of the population, with increased capacity in high populated areas, extending coverage along transport routes and servicing expanding remote settlements. Over 90% of the mobile operator's towers are on grid and thus there is a relatively small opportunity for Safaricom to extend energy services from its towers across its network. 28 towers currently provide free community energy services including phone charging, lighting, street lighting and water pumping¹¹.

Identifying Addressable Off-Grid Markets

There is a need to integrate the provision of basic energy services in future rollouts as Safaricom looks to serve smaller communities in more remote and sparsely populated areas. Through this study it was identified that the largest addressable off-grid populations are within remote districts of Turkana, Mandera and Wajir and also in less remote but poorly electrified districts.

During the study, 47 off-grid sites are found to offer feasible commercial opportunities for provision of community power in partnership with an ESCO. Of these, 34 sites are run on diesel generators, 7 on solar and 10 on solar and wind hybrids. Priority sites were identified in accordance to perceived community demand for services based on aerial imagery (count and density of rooftops/households) within 2km of sites and household electrification rates (2009 Census data). The average household electrification rate of the districts in which the 47 sites are located is 9%. 8 of the top 9 sites are within refugee settlements where there is relatively dense and expansive housing.

Reducing Site OPEX

When identifying opportunities to reduce OPEX on powering sites it was found outdoor diesel sites are most costly and offered Safaricom the greatest opportunity from outsourcing power supply for cost savings. Towers with the greatest cost saving potential are situated within Bungoma, Tana River, Embu and Meru. Other sites with high potential cost savings for power and security are near refugee settlements.

Since the completion of the study, extensive improvements are underway in collaboration with Vodafone Group's Innovation Centre to increase the efficiencies of the power supply through advanced hybrid battery specifications. In 2013 the total of hybrid/renewable sites

is planned to increase to 180, from 97 at the time of this study.

Distribution Networks

There are opportunities to leverage Safaricom's extensive rural dealer and retail network for the distribution of energy products and services to regions which lack electricity. For this channel, a pilot case was evaluated for charging services at retail vendor outlets to identify revenue opportunities for Safaricom and create a rationale for location selection. There is an unmet demand for phone charging services as well as other energy services which have the potential to drive economic activity within rural and semi-rural areas. A revenue opportunity also exists for the community if site kiosks are operated by an agent entrepreneur.

Those districts with the best opportunity to offer community power from retail outlets were defined by:

- The districts covered by Safaricom
- The off-grid addressable market
- Population density (Census 2009)

The results indicated that a sizeable opportunity exists to leverage distribution networks. Four regions in particular (Kakamega, Meru, Bungoma and Kisii) where grid electrification is very low and community demand is high, have an addressable market large enough to make a significant impact on monthly ARPU.

Fenix International¹², manufacturer of the solar powered energy storage solution the Readysset, has completed successful trials with Safaricom to distribute units through its channels and reach off-grid mobile subscribers.

Mobile Payments for Energy Services

The scale of delivering energy services through its distribution channels and leveraging mobile technology poses a huge opportunity for Safaricom, and has already forged a leading position as a partner in new and exciting energy service solutions. Safaricom announced a commercial partnership in October 2012 with M-KOPA¹³, a Nairobi-based company making clean energy affordable to customers across Kenya by combining machine-to-machine technology and mobile payments to offer customers the chance to purchase solar energy equipment on a pay-as-you-go basis.

12 <http://fenixintl.com/>

13 <http://www.m-kopa.com/>

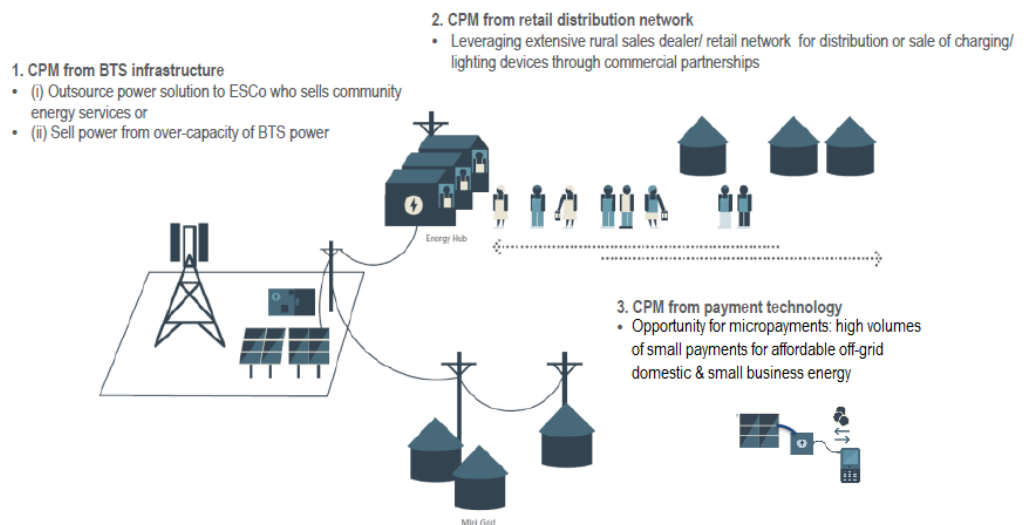
Defining Community Power from Mobile

Over 1.3 billion people lack access to electricity. In many emerging markets mobile network operators have become adept at generating their own off-grid power as mobile penetration has outpaced the growth of the electricity grid. Community Power from Mobile (CPM) works to leverage the scale of mobile technology and infrastructure to improve the case for off-grid telecoms and provide millions of underserved people access to vital energy services.

Since the launch of the programme in November 2010 the evolution of the original concept - that excess power from mobile towers is used to provide energy services to surrounding communities - has given way to the definition of three channels for the delivery of services that leverage strengths of the mobile operator. These three channels are depicted in the Figure 1 below:

Mobile can provide energy access through three channels

Potential impact on ARPU for off-grid customers is 14%+



The wide adoption of mobile services by underserved populations provides an opportunity to develop energy solutions at a large scale, leveraging human and physical infrastructure and innovative payment technologies. This will also improve the business case for off-grid telecoms by:

- growing revenue streams
- improving base station security
- charging mobile phones for increased usage
- out-sourcing power provision to third party companies to achieve lower cost of power

What do CPM Trial and Commercial Deployments Look Like?

Trials and commercial deployments engage mobile operators in a variety of ways:

- Using their network of airtime vendors and partners to supply energy solutions to their customers
- Committing to be a stable 'anchor' client to a third party energy service company powering both the base station and community
- Providing excess power from their towers to the community for small needs like charging up mobile handsets, large household batteries and rechargeable lanterns
- Providing their mobile money services to pay for energy services supporting a Pay-As-You-Go model for the consumer

How Does GSMA Work to Help Grow the CPM Sector?

The team aims to help the development of Community Power from Mobile initiatives

worldwide with an understanding of their geographic context. We seek to:

- Raise awareness through knowledge sharing and convening, publication of case studies and business case development
- Partner with mobile network operators and tower companies to conduct feasibility studies and establish trials
- Develop relationships with private investors and provide technical assistance for due diligence in to the rural ESCO sector by interested investors with the aim to support longer term rural ESCO success

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About Safaricom Corporate

Safaricom provides a comprehensive range of communication services under one roof to over 19 million subscribers. These services include mobile and fixed voice and data services on a variety of platforms. It has the widest 2G and 3G network with a growing fibre cable footprint to deliver the country's fastest broadband service.

Safaricom pioneered commercial mobile money transfer globally through M-PESA, the most successful such service anywhere in the world. Launched in March 2007 as a money transfer service, it now has over 16 million customers and over 60,000 agents countrywide

About the GSMA

The GSMA represents the interests of mobile operators worldwide. Spanning 220 countries, the GSMA unites nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, Internet companies, and media and entertainment organisations. The GSMA also produces industry-leading events such as the Mobile World Congress and Mobile Asia Congress.

About Mobile for Development - Serving the underserved through mobile

Mobile for Development brings together our mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. We identify opportunities for social, economic impact and stimulate the development of scalable, life-enhancing mobile services.

For more information on the GSMA's Community Power from Mobile programme, please email cpm@gsma.com