



Community Power from Mobile



TNM – Malawi – 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, distribution channels, penetration rates and brand power, providing an opportunity for unprecedented scale in impacting lives.

There are currently 13 million people in Malawi who lack access to energy¹ and over 3 million off-grid mobile SIM connections²; essentially many have a phone before they have a place to charge it. The potential for increasing revenues per user simply through better phone charging equates to US\$12 million/ year within the Malawi market.

In April 2012, the GSMA with the support of the International Finance Corporation (IFC) began working with TNM (Telekom Network Malawi) to evaluate the opportunity to improve access to energy services for their customers, through their tower and retail infrastructure, while improving the business case to serve off-grid areas. The purpose of the feasibility study was to assess the viability of TNM's network to provide modern energy services to

¹ <http://www.worldenergyoutlook.org>

² GSMA estimate, 2012

off-grid communities in Malawi. GSMA's Community Power from Mobile programme seeks to identify the opportunity and stimulate activity with solutions that are scalable and commercial.

It is clear from our research and analysis that TNM is well positioned to explore partnerships and opportunities to deploy community power services whilst improving their business case off-grid:

- Cost saving potential: through an Energy Service Company (ESCO) model provide power to towers and delivery community energy via a mini-grid or energy hub that shares the power equipment
- Using existing distribution channels and technology for micro-payments: Develop partnerships with household and kiosk-based solar services companies across current and new agent networks.

Recommendations

From the study, three recommendations have been made:

- Issue a tender for ESCo's to power 16 current BTS sites predominantly in Nkhota Kota, Salima, Ntcheu and Mzimba districts, and for future expansion of the network in Mangochi, Mzimba, Kasungu, Dedza and Mulanje. The goal will be to provide complete site energy, security services and community energy services for phone charging, lighting and other productive uses.
- Explore distribution and marketing partnerships with providers of kiosk and household solar devices and solar home systems, focusing in the districts of Mangochi, Mzimba, Kasungu and Dedza.
- Use commercial and social impact matrices to track the effects of community energy services in order to drive growth and to subsequently build strategy around various technologies and delivery models.

Introduction

Just 16% of the Malawian population is without mobile access but up to 80% of households are without grid electricity.

Currently mobile telecommunications services are available in 74% of Malawi.³ Mobile connections are expected to keep rising, with TNM reporting a 32% increase in subscriber growth from 2011-2012⁴. The large majority of the population lives in rural areas (~75%) where grid power distribution and reliability remains poor. Even where grid accessibility is an option, affordability is a barrier for many communities. All value added services (VAS) in rural areas, where mobile penetration is relatively low, have energy requirements at a high cost. Unless off-grid energy services improve dramatically the number of mobile subscribers living off-grid will undoubtedly increase.

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 connectivity has extended beyond the reach of the electricity grid and central water utilities. The mobile industry is unique in the size and reach of its power infrastructure, distribution channels, penetration rates and brand power, providing an opportunity for unprecedented scale in impacting lives.

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)

³ Wireless Intelligence, 2012

⁴ TNM Corporate Annual Report, June 2012

Country Background: Malawi

Malawi is a landlocked country in south-east Africa and is bordered by Zambia to the north-west, Tanzania to the north-east, and Mozambique on the east, south and west. The country is separated from Tanzania and Mozambique by Lake Malawi.

Malawi is over 118,000 km² (45,560 sq. mi) with an estimated population of more than 13,900,000. Its capital is Lilongwe, which is also Malawi's largest city; the second largest city is Blantyre followed by Mzuzu.



Source: Google Maps

Malawi is among the world's least-developed countries. The economy is mostly agriculture based with a largely rural population. The Malawian government depends heavily on international aid to meet development needs and has programs focused on expanding the economy, improving education, health care and environmental protection.

Economic Data

The table below shows a comparison between Malawi and four of its neighbouring countries; Tanzania, Zambia, Zimbabwe and Mozambique, in respect to key social-economic indicators. Malawi sits slightly below average in comparison to these countries in relation to the social economic indicators, with the second lowest GDP and a notably smaller proportion of the population living in urban areas.

Over 12 million people, 80% of Malawi's population, live in rural areas which puts huge demands on the geographical reach of grid electricity. Within the country the poorest districts are Nkhota Kota and Nsanje in the southern and central regions respectively.

Indicator	Malawi	Tanzania	Zambia	Zimbabwe	Mozambique
Population	15,380,888	46,218,486	13,474,959	12,754,378	23,929,708
GDP	326	509	985	274	428
HDI	0.400	0.466	0.430	0.376	0.322
Urban/Rural % (2010)	19.8/80.2	26.4/73.6	35.7/64.3	38.3/61.7	38.4/61.6
Electrification rate (%)	9	14	19	42	12
Rural electrification rate (%)	1	1	3	10	1

Source: World Bank

Telecoms in Malawi

The table below shows the current mobile landscape in Malawi. There are two mobile network operators: TNM's market share is 48%⁵. MTL is a CDMA network operator and a shareholder in TNM.

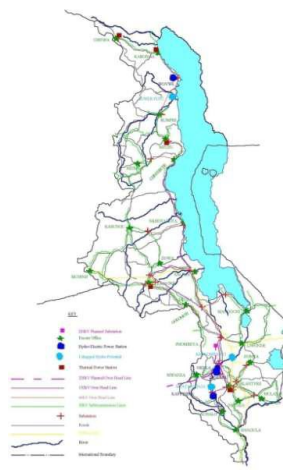
Mobile Penetration/Connection (%)	26.48
Mobile Coverage (% of Population)	94
Mobile Coverage (% of Geographical Area)	79
GSM Base	4,139,000
Number of MNOs in the market	2

The two operators together provide 80% coverage to the whole country. Both TNM and Airtel also share 25 towers; 8 towers in TNM's off-grid locations with 4 expecting grid connection. Airtel launched Airtel Money in February 2012.

Energy Access in Malawi

Although the electrification rates have been low in Malawi, particularly in rural household (1% in 2009), it is now estimated that due to grid expansion electrification is now up to 20% though it is seldom affordable and reliable.

The grid has an installed base load of 284mW with plans to reach 348mW by end of 2012.⁶ Currently, ESCOM is the only company selling electricity and hydro power is used to generate approximately 94% of the country's energy; the remaining is generated from thermal energy. Although ESCOM's transmission grid is fairly extensive (figure below⁷), it carries a high rate of loss - approximately 28%⁸. This inadequacy can be attributed to a number of supplier-rated factors including: lack of competition in the sector, inability to generate a sufficient amount of energy, non-functioning power plants and the policies that relate to rural extension and safety.



In off-grid locations, the primary source of energy for cooking is firewood/charcoal and paraffin for lighting (kerosene is used less as there are few distribution points and the income is much lower in comparison to selling other fuels). At the time of press⁹, diesel is trading at MWK 644 per litre (US\$ 1.79) at wholesale and MWK 683 per litre (US\$1.90) at retail outlets. The wholesale price for paraffin is MWK 591 per litre (US\$ 1.64)¹⁰. Families often spend around 6,000MWK/month on batteries and lighting (candles, kerosene and paraffin) and 70% of them walk up to 1km to buy their lighting sources. As a result, most

5 TNM, January 2013

6 Government of Malawi Energy PPP Project Concept Paper

7 ESCOM, 2012

8 Malawi: Rural Energy and Institutional Development Paper (World Bank)

9 <http://www.faceofmalawi.com/2013/02/tough-times-persist-as-pump-prices-go-up-again/comment-page-1/>

10 Exchange rate for Malawian Kwacha: US Dollars = 360:1 (<http://www.xe.com/currency/mwk-malawian-kwacha>)

families only light their homes for 2-3hours a day.¹¹

The Rural Electrification Authority (REA) has set out three key objectives which are outlined in the Malawi Growth and Development Strategy (2006-2011)¹². These include:

- To reduce the number and duration of blackouts
- To increase access to reliable, affordable electricity in rural areas and other targeted areas
- To improve coordination and the balance between the needs for energy and those of other high growth sectors such as tourism and mining

In the private sector there is a growing number of energy companies manufacturing and/or distributing alternative energy services or devices, which large rely on solar power technology. The challenges these companies face for reaching off-grid communities is the requirement for a broad distribution base as well as getting licenses for generation, distribution and operation of mini-grid energy companies.

Access to Phone Charging in Malawi

The average cost of charging a phone in off-grid Malawi is 800 MWK/month (about US\$0.3 per charge), with additional spend on time and travel. Phone charging businesses can take on average 35,000 MWK/month.

¹³

Malawi's telecoms market in urban areas is reaching saturation point, while the rural market is picking up at 30%¹⁴. The biggest challenge for rural areas is access to energy which, as a result, limits minutes of use because subscribers have to preserve battery life and so keep their phones off.

An opportunity presents itself here whereby expenditure on phone charging, a significant portion of the total cost of ownership, can be converted into spending on actual phone usage (or other productive activities) with cheaper phone charging facilities, if electricity was more accessible.

Approach to Feasibility Study

The objective of the feasibility study was to assess TNM's tower network and retail & distribution networks to evaluate the opportunity of offering community energy services in a way that's scalable and commercial.

TNM's network is evenly distributed across the provinces with coverage extending to 74% of the country, equating to 84% of the population¹⁵. At the time of this study, TNM had 365 towers, 65 off-grid and 300 on-grid. The 65 off-grid sites are being considered for green power analysis though 16 of these will be connected to the grid by the end of 2012.

¹¹ Energy Access in the Southern Region of Malawi' (MuREA)

¹² <http://www.ndr.mw:8080/xmlui/handle/123456789/206>

¹³ GSMA field research, 2012

¹⁴ <http://www.communicationsafrica.com/mobile/malawi-telecom-operators-tap-into-low-income-rural-market>

¹⁵ Wireless Intelligence, 2012



Mobile Infrastructure

TNM's current off-grid presence provides an opportunity to extend community power from tower infrastructure and future network expansions. New green power installations can incorporate community power requirements into the planning phase. The following three factors were taken into consideration prior to identifying potential sites:

- Sites staying off-grid in 2012 (49)
- Sites within 1-2km from an off-grid community (39)
- Sites off-grid (65)

It was found that 16 sites were suitable for enabling community power either via an energy hub or mini-grid. These sites were then ranked in accordance to the potential impact of community power and their priority for green power. The top 5 sites identified were within Nkhota Kota, Salima and Mzimba districts and several others clustered in the Ntcheu district.

Further, sites were highlighted to TNM that should be priorities during future network expansion opportunities where the infrastructure can be leveraged for community power. These criteria used here included:

- Size of the addressable rural off-grid market
- Population density (2008 Census¹⁶)
- Off-grid tower coverage numbers (TNM)

There are also opportunities outside of the 16 priority sites highlighted so this list should not be considered absolute. In the Mulanje district, for example, Escom partners are already operating. This district has the highest population density, but has huge problems accessing energy, in particular the untapped hydro-power potential. TNM can explore a partnership to leverage local community expertise and reach an addressable market of approximately 332,000.

Distribution networks

Sales and distribution channels can support energy access initiatives as it provides customers with phone charging services at retail outlets, resulting in revenue opportunities for retail entrepreneurs as well as leveraging product companies for co-promotion and distribution. There is an opportunity for TNM's rural dealer and retail network to be used for the distribution of energy products and services to regions which lack electricity. Being a trusted brand, providing co-branded products and extended services to off-grid subscribers

is a further opportunity; these can include TNM branded phone charging services and village phones. The criteria used to assess possible markets for this included:

- Districts currently served by TNM
- Size of the addressable market
- Population density (2008 Census¹⁷)

Analysis highlighted four regions that should be targeted which together have an addressable market of 1.9 million which equates to an estimated annual ARPU of US\$6.6 million. 10 regions have population densities of less than 100 people per km² and so will require more innovative business models to serve these communities.

Mobile Money and e-payments

The opportunity for micro e-payments as an enabler for energy services is in part driven by high volumes of small payments of off-grid domestic and small business energy services. In spite of this, evidence shows that consumers at the base of the pyramid are willing to pay more for convenience.

Micropayments can support energy access initiatives with a “Pay As You Go” model that allows for flexibility of payments and remote transactions, providing consumer financing to eliminate the prohibitively high upfront costs needed to acquire the equipment for a solar home system. It also allows remittances to be sent wirelessly to the mobile money account of the persons using the micro-utility system. Micro-payments using Mobile Money Services transform the affordability of an energy service

Energy business partners can be a great source of logistical support, particularly for scaling the use of mobile money agents. In Malawi, the market opportunity exists as there is good mobile signal but poor or no-grid availability. Also, where there is grid distribution electricity will be most affordable with a mechanism for small pre-payments.

TNM can pilot innovation in Malawi by partnering with local distributors and trialling technologies that have already been developed for other African Markets.

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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