Off-grid Handset Charging

By Michael Nique, GSMA

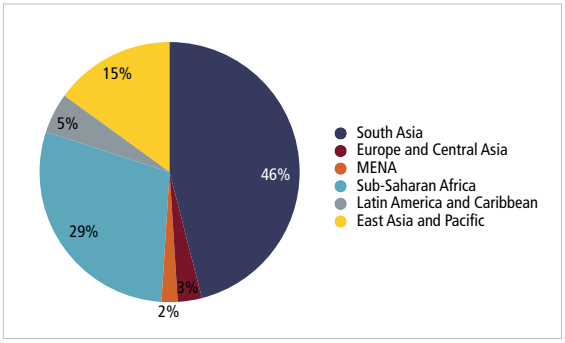
New energy harvesting solutions are crucial in developing countries; most people living in urban areas have access to the electricity grid, but in more rural areas the majority of the population have unreliable grid access or no access at all in very remote rural communities. It is estimated that around 1.6 billion people[11] live beyond the electricity grid meaning that they do not have convenient access to mobile phone charging options.

To create momentum and foster innovation around solar phones and off-grid handset chargers, the GSMA is currently working on a project with operators to address these off-grid charging issues. Amongst other objectives, this project aims to build a knowledge sharing platform accessible to all on the GSMA website as well as to provide operators with advisory services on how to tackle off-grid charging issues.

Key Market Data

GSMA estimates that 600 million mobile subscribers live in off-grid areas today; these subscribers live mostly in two regions, South Asia and sub-Saharan Africa, where the rural percentage of population remains high. The lack of access to electricity represents a major hurdle for subscribers living off the grid when it comes to contacting their relatives, calling the doctor when someone is sick and many other services they would otherwise have access to, for example, mobile banking, weather and price information for farmers.

Figure 1: Regional Off-grid Connections



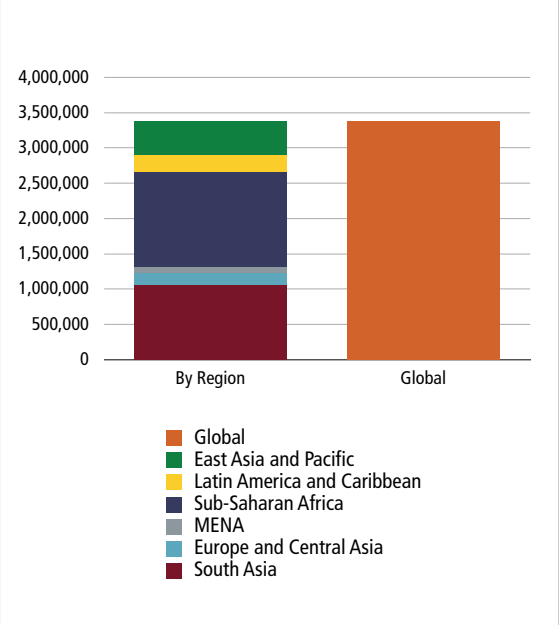
Source GSMA

[11] Source: UNDP
[12] Source: Digicel based on field studies

The GPM Programme also believes there is a commercial reason for mobile operators to deploy off grid charging solutions. Trials in Haiti and Madagascar suggest that when off grid subscribers acquire mobile charging solutions, usage and the average revenue per user (ARPU) increases by 10% to 14%[12].

Incremental revenue opportunities range from US$83 million per year in the Middle East and North Africa (MENA) region, to US$1.36 billion per year in sub-Saharan Africa; on a country level, India is accounting for the majority of these incremental revenues worldwide with an estimated US$778 million. Overall, the total increase in revenue resulting from charging solutions, based on a conservative 10 % ARPU increase per country, amounts to US$3.38 billion for the 600 million off-grid subscribers in 2010.

Figure 2: Incremental Revenues Per Year from Charging Solutions (Million US$)



Source: GSMA

This ARPU increase can be explained by the transfer of the expenditure subscribers spend on charging their phone on airtime. Indeed the main current solution for off grid mobile subscribers to charge their phone is to travel to the nearest "Phone Shop" run by a local entrepreneur. However this process is costly and time-consuming.

Figure 3: A Charging Shop in Kisoro, Uganda

Source: GSMA

For part of this project, the GSMA is currently conducting field studies to better understand the economics and user experience of the charging process for off grid subscribers. First results gathered from the field in Uganda, suggest that users spend US$1 to US$3 per month on charging their phone – this represents between 5–30 % of a subscriber monthly mobile expenditure. This is in addition to the cost of travelling to the nearest charging shop. As an example, people living in the South West of Uganda, in the Kisoro Valley, sometimes have to travel up to 20 km to the nearest village to get access to an electricity point. This essentially is a day trip for them, away from homes and businesses, just to charge their phone. Solutions emerge to make this process more convenient – subscribers sometimes give their phones to a truck/car driver going to the city to get it charged, retrieving it again a few hours later. When off-grid users were asked how they would spend their money if they could save these charging expenditures, most of the people interviewed would spend more money on airtime.

Off-grid Charging Solutions

In order to help off grid users charge their phones, several solutions coexists.

Since 2009, several solar phones have been introduced in developing countries such as India, Kenya and Uganda. The Digicel Group are distributing solar phones in markets such as Papua New Guinea, Tonga and Vanuatu after forecasting a market of over 700,000 customers[13] across Central America, the Caribbean and the South Pacific in 2009.

Innovation is also being driven to address the charging issue for users who do not have easy access to electricity both for their mobile phones as well as other low power devices. External chargers have proven to be really useful to remote communities. Today, most external chargers are either solar or kinetic; the latter using mechanical forces to generate low power. In June 2010, Nokia unveiled a bicycle charger kit in Kenya. It uses a small dynamo or electrical generator, powered by the rotation of the bicycle wheel, to charge a phone. Smaller companies such as Nuru Energy or American startup Fenix International are both providing kinetic chargers for low power devices.

[13] Source: Digicel

Figure 4: Kinetic Charger Developed by Nuru Energy

Source: Nuru Energy

Technology Comparison

Solar

Solar is currently the most widely researched and developed technology; they have a high degree of flexibility and highest efficiency when compared to any other green charger. Solar battery chargers currently occupy majority share (over 90%) of the European green battery charger market. Success and availability of solar phones remain limited but the recent introduction of newer models with better efficiency in major off grid markets such as India should create more momentum around this technology.

Figure 5: Solar Powered Phone

Key Points

1. Well designed and efficient for countries with high solar radiation (sub-Saharan region)
2. Price range still expensive for base of the pyramid (BoP) people living below the poverty line, though this is expected to get cheaper
3. Improved availability, with extensive distribution networks in developing countries
4. Large investments coming to this solution for start ups and technological innovation around solar charging
5. Highest degree of flexibility and efficiency in comparison to any other green charger.
6. Reliable with minimal maintenance requirements

Mechanical (Kinetic)

The mechanical (kinetic) charger has been applied to charge low power mobile devices for a few years. It is based on the motion of a set of magnets spinning around a coiled wire. It could be a hand crank mechanism or a dynamo attached to a bike wheel. Though environmentally friendly, the kinetic charging process could be seen as cumbersome as it involves of lot of work for the limited amount of energy generated. However, its simplicity gives it some potential to reach in increased penetration rate in developing countries.

Figure 6: Bike Charger Developed by Nokia (June 2010)

Key Points

1. A simple yet sturdy solution for remote rural areas – resistant to dust and shocks
2. Small, compact, light and easy to use solution to charge low power devices
3. Availability remains limited in developing countries with no real distribution networks
4. Needs more suppliers and partnerships with players of the mobile value chain to be widespread
5. Remains cumbersome and takes a lot of work for a small amount of energy