Green Power for Mobile

Supported by

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World Bank Group

Bi-annual Report July 2011

Contents

Welcome

From David Taverner, Programme Director – Green Power for Mobile and Community Power from Mobile

The GSMA Development Fund launched the Green Power for Mobile (GPM) Programme in September 2008 to *'extend mobile beyond the grid'* through the promotion of renewable energy technologies and energy efficient base stations. More recently the Development Fund launched Community Power from Mobile which supports mobile network operators (MNOs) and tower-sharing companies in developing countries to provide excess power generated by their base stations to local, off-grid communities. Both programmes are supported by the (International Finance Corporation World Bank Group).

This report is divided into 3 key sections.

Key Trends for Success Within Green Power for Mobile

The first highlights key successes in the Green Power for Mobile industry on a global level. Included is a case study from China Mobile, which is currently the front runner for having the largest number of green deployments of any MNO with 7,795 sites. Cinergy introduces an innovative direct current diesel/battery hybrid solution demonstrating impressive diesel savings of 60%. We overview the GSMA's Mobile Energy Efficiency (MEE) benchmarking service, which enables MNOs to identify opportunities for reducing energy costs and greenhouse gas emissions.

Innovation from the Indian Sub-Continent

The Indian sub-continent has become the epicentre of innovation in green mobile networks. For this reason, it seems important to bring to light the pioneering work of players in this region. Included is a case study on Banglalink (based on a Feasibility Study conducted by GPM), an overview of outsourcing procurement models for renewable energy which are rapidly gaining traction and finally, a look at how Indus Towers are deploying renewable energy solutions to 2500 sites.

Community Power from Mobile

The final section of this report will focus on Community Power from Mobile (CPM), which has grown from strength to strength in the last year. In this section we profile a wide range of live and emerging projects including Rockefeller Foundation's SPEED project in India, The Ecology Foundation, Energize the Chain, Barefoot Power and a press release from Viom Networks about their rollout of Rural Service Centres at their base stations.

As mentioned in November's report, our working group strategy moved from being global to regionally focused. We have subsequently had two of these Regional Working Groups; the first in India last November and more recently in Africa in March. Both of these Working Groups were exceptionally well attended and as a result, we will be continuing with this strategy, with the first Asia working group meeting in July this year in Indonesia.

The GPM team looks forward to continued collaboration with our Working Group members and the industry in general to ensure that our work is relevant to stakeholder requirements, actionable and aids advancing this emerging sector within the telecommunications industry. I trust you will find the fourth edition of our bi-annual report educational and informative and we look forward to seeing many of you over the next six months to work on the issues raised in this report, as well as to establish the work plan for us all over the next period.

David Taverner
GSMA Programme Director – Green Power for Mobile

Meet the team

Who's who in GPM & CPM

David Taverner
Programme Director
David is Programme Director for the Green Power for Mobile (GPM) Programme. He has developed GPM through its launch phase in September 2008, having defined the original implementation strategy and business plan. He is responsible for managing the full scope of the programme, leading the team of six international staff located in London, Africa, and Asia.

Abirami Thasarathakumar
Programme Coordinator
Abi is the Green Power for Mobile Programme Coordinator. She provides the team with ongoing project management support for all GPM work streams; Renewable Energy Networks, Off-Grid Handset Charging Initiative and Community Power from Mobile. Abi is particularly involved with organising the GPM Working Groups which are held quarterly around Asia and Africa.

Ferdous Mottakin
Field Implementation Consultant
Ferdous is the Field Implementation Consultant for the Green Power for Mobile Programme. Within GPM he is responsible for Green Power Feasibility Studies and the associated project management. Ferdous has completed successful projects in Burundi and Bangladesh. Ferdous is currently establishing and leading GSMA Community Power from Mobile pilot projects in East Africa.

Charlotte Ward
Programme Manager for Community Power from Mobile
Charlotte Ward is a financial consultant based in Nairobi working on the Community Power from Mobile Programme. She previously consulted government and corporates on carbon and energy projects in East Africa. She is a Masters in Applied Environmental Science from Sydney University. She has eight years investment banking experience with Deutsche Bank in Europe, Asia and Australia.

Areef Kassam
Programme Manager
Areef is the Green Power for Mobile Programme Manager. In this role he is responsible for developing and delivering the programme products and services that are tailored to support operators in the decision-making process around deploying renewable energy. Areef also works directly with our vendor partners to understand their products, services and provide visibility to the mobile operators.

Michael Nique
Strategy Analyst
Michael joined the GSMA as a Strategy Analyst for the Green Power for Mobile Programme. In this role, Michael leads the development and dissemination of content on new innovations and trends affecting the sector. A particular focus at present is analysis on the issues and solutions for off-grid handset charging.

Mina Zaki
Field Implementation Consultant
Mina Zaki is a Field Implementation Consultant for the Green Power for Mobile Programme. Mina has worked in Telecoms for many years in Africa, USA and the Middle East with both vendors and MNOs. Currently, he is conducting a multi-country Feasibility Study for a Central Asian Operator.

The Evolution of the Green Power for Mobile Working Group

By Abirami Thasarathakumar
GSMA

Last month, we revisited the birth place of GPM's Working Groups, and returned to Kenya for the first of the Africa focussed Regional Working Group. This was again hosted by Safaricom, at the Sarova Whitesands in Mombasa, and was attended, not only by operators and vendors, but tower companies, financiers, academics and consultants; a testament to how quickly the industry has grown.

We had some fantastic presentations and interesting discussions:

1. Safaricom presented its 83 renewable energy sites a number of which also support community power projects. It presented the positive impacts to the community these projects had as well as improved social cohesion. However, it also brought to light the challenges and barriers it faced.
2. Orange presented a community power project in Niger where excess base station power is used by a health clinic. This community power project is from one of their 900 solar-powered base stations in the AMEA region.
3. Following on from their article in the November 2010 edition of the Green Power for Mobile bi-annual report, Vodafone reiterated its carbon reduction goals, sustainability plans and future innovations. Vodafone announced plans to build one of Africa's greenest commercial buildings as a base to develop new ways of using renewable energy across the world. This Innovation Centre is expected to be built by the end of 2011.
4. Ericsson and Flexenclosure talked about empowering people through community power. Using the Millennium Village in Sudan as an example, they showed how they use excess power from base stations to power vaccination fridges.
5. Mobinil currently has 100 solar sites and presented the Feasibility Study conducted by the GPM programme showing that there was potential to convert a further 150 sites from diesel to renewable energy.
6. There were a number of vendors who presented their solutions, these included Winafrique, Tesuco and also a couple of our Associate Members Eltek Valere, General Electric and Alcatel Lucent.
7. New additions to our Working Group included The Ecology Foundation and Energize the Chain who spoke about their ideas and plans within community power. More information about both these organisations can be found later in the report.

Working Groups not only provide an opportunity for knowledge sharing and networking but are often used to plan new strategies, approaches and deliverables for the GPM programme. The GPM team look forward to continued collaborations with our Working Groups to ensure that our work remains innovative and relevant to stakeholder requirements.

Future Working Group Dates:

Indonesia:	19th and 20th July 2011 hosted by XL (Axiata)
India:	TBC
South Africa:	7th and 8th November 2011 hosted by Vodafone

If you would like further information about our Working Groups or as an operator, would like to attend, please contact us at greenpower@gsm.org

Green Power for Mobile: 'Green Deployments Tracker'

www.wirelessintelligence.com/green-power

By Abirami Thasarathakumar
GSMA

When the Green Power for Mobile (GPM) Programme launched in September 2008 with the aim of promoting the use of renewable energy sources by the telecoms industry, a target was set to power 118,000 new and/or existing off-grid base stations in developing countries by 2012.

To showcase the hard work and commitment of the industry to reach this target, GPM launched the Green Deployment Tracker; a database which uses Google Earth as a platform to track green deployments worldwide. The progress is shown country by country but is also broken down into the various operators, different technologies and highlights individual site case studies. The site also tracks planned deployments so that we can see where the industry is heading, but also establishes potential gaps in the market.

The Tracker is used by organisations the world over and has multiple uses. Mohammed Belfqih, Senior Manager Site Infrastructure & Energy at Vodafone Group is very positive about the value of the Tracker to an operator:

'The Green Deployment Tracker is a mirror to show great engagement from mobile operators in the green sector and allow positive and green competition between operators.

It is also a way to share best practice and experiences with other operators and to demonstrate that Green Solutions for network sites in rural areas are of strategic importance for our business.'

The tracker currently hosts over 20,000 live and planned sites and to date, the biggest contributor of renewable energy deployments of any operator has been China Mobile. Their deployment of green base stations has been phenomenal from 2,135 sites in 2008, to 6,372 in 2009 and now 7,795 in 2011.

For more detail on their Green Action Plan, please see Chapter 3:

Figure 1 – ChinaMobile's Green Base Stations hosted on the Green Deployment Tracker

Other major players in the industry include Orange, MobiTel, SMART, Mobinil and Vodafone.

If you are able to contribute to the Green Deployment Tracker, your information is invaluable to us, so please get in touch at: greenpower@gsm.org

18. The term "dealer" is used to describe the persons or businesses which distribute airtime for Tigo.

Key Trends for Success within Green Power for Mobile

We highlight some of the best practices, initiatives and developments in the ecosystem including a case study from China Mobile, who is currently leading the way with a staggering 7,795 live deployments. We also take a look at Cinergy who have introduced an innovative DC Diesel-battery hybrid system offering impressive 60% diesel savings. Lastly we put the spotlight on the GSMA's Mobile Energy Efficiency (MEE) benchmarking services which gives MNOs the tools they need to identify the opportunity to reduce their energy costs and greenhouse gas emissions.

China Mobile on its 'Green Action Plan'

By Abirami Thasarathakumar in collaboration with ChinaMobile

Environmental Management

China Mobile's uptake of renewable energy base stations has been phenomenal. GPM's charting of it's progress on the deployment tracker shows that from the original deployment of 2,135 renewable energy base stations in 2008 to a staggering 6,372 in 2009 and now 7,795.

China Mobile is currently the world's largest network operator and holds the largest customer base at 584 million. The current market share in Mainland China alone is 69.3% but it also has roaming services available in 237 countries. China Mobile possesses a number of accolades in the world of business and finance and has won the world over with its Corporate Social Responsibility (CSR) efforts.

Being the world's largest network operator, China Mobile has always placed a huge importance on global climate change and environmental protection. In 2007, China Mobile started to implement its 'Green Action Plan' and energy reduction was at the core of its goals. Even though telecommunications is a relatively low emissions industry, its energy consumption is quite significant, at 20 billion kWh. Air conditioning units for base stations are the most energy intensive and alone contribute 7 billion kWh.

To enforce these Green Action Plans, China Mobile has a comprehensive Energy Efficiency Evaluation Standard, which they use to monitor and evaluate energy consumption. Pilots have been conducted on 550 base stations to test these standards. Not only do China Mobile monitor their own energy consumption, but they also only work with their 'greenest' supply chain partners.

Green Action Plans

1. **Promotion:** Use the breadth and depth of our experiences to promote and enhance the application of energy-saving technologies.
2. **Efficiency:** Continue to increase system efficiency through energy efficiency standard controls for base stations and data centres.
3. **Management:** Enhance our management and establish long-term mechanisms to save energy.
4. **Innovation:** Promote customised energy-saving air-conditioning units, green packaging and other R&D innovations.
5. **Publicity:** Raise public awareness on climate change through benchmarking and sustained advocacy.

Energy Efficiency in Air Conditioning

In 2009, China Mobile, together with 8 different air conditioner manufacturers, developed an energy saving air conditioning system for base stations and have been the first in the industry to do so. This is currently 25% more energy efficient than traditional cooling methods/equipments.

Benefits of the new system include:

- Cost savings
- Energy consumption reduced
- Air conditioning compressors moved indoors, improving the working environment of the compressors and reducing noise pollution.

As of early 2010, 40% of base stations across the China Mobile network had adopted new energy-saving measures.

Renewable Energy

China Mobile has taken full advantage of alternative energies available to them including wind, solar, hydropower, geothermal technology and fuel cell technology to reduce the consumption of conventional energy sources. This includes converting old base stations using conventional energy to renewable energy as well as installing new renewable energy base stations.

Table 1: Breakdown of Renewable Energy Used by China Mobile at Base Station Sites

	2008	2009
Total	2,135	6,372
Solar Energy	1,615	5,581
Wind Energy	–	72
Solar and Wind Hybrid	515	689
Fuel Cell	5	30

These base stations, not only power telecommunications, but at some sites the excess power is also distributed to remote communities. In 2008, China Mobile started pilot projects, in the Southern part of China where rainfall is plentiful, of micro hydropower instalments. Lami, a village in the Leibo country is far from the local power grid, but is rich in its water resource due to the Dele River which runs through it. As a result, Lami was a highly suitable candidate for a pilot micro hydropower project. Following an investment of 16,000 Yuan, the village is now able to generate 270kWh of electricity per day. The micro hydropower project not only meets the power demand of a base station, but some of the excess power is also distributed to remote villages to meet the demands of the local people.

Cinergy

DC Generator/Battery Hybrid Deployment in Fiji

The Challenge

To supply DC power directly to telecoms equipment from a fuel-efficient DC Generator/Battery hybrid solution.

Telecoms radio equipment typically requires either 24V or 48V DC power. This power requirement is normally delivered from an AC power source, either a local grid connection or an AC generator, via a bank of rectifiers.

The problem with this delivery method is that the rectifiers generate heat resulting in power loss and a higher cooling load. Further, rectifiers are typically far more sensitive to high ambient temperatures than the radio electronics whose power they supply and are often a key driver for site air-conditioning.

The Solution

Cinergy has a range of fuel-efficient hybrid generator/battery solutions based on DC architecture and DC generator technology which can supply DC power directly to telecoms equipment. These solutions can be used as primary power sources on off-grid sites and also as stand-by power sources on grid-tied sites where the grid is unreliable.

On off-grid sites, the Cinergy solution allows rectifiers to be discarded, reducing power loss and removing a significant heat source and point of failure. Since Cinergy solutions include a deep-cycle battery bank, with a low-power thermo-electric cooling option available, a separate UPS is also unnecessary.

So, apart from higher efficiency, the Cinergy solution can offer an opportunity to remove or significantly reduce levels of air-conditioning.

Case Study Site

In January 2011, Cinergy installed its Rapid Deployment Hybrid system on a typical Digicel PDH site in Fiji to prove the savings yielded through direct DC power supply. The system, contained in a single, secure skid unit, included:

- A 5.5kW DC generator powered by a diesel Perkins engine
- A single battery string of 24 2V 400Ah VRLA AGM cells
- Remote management, monitoring and battery charge control

The site UPS and usual AC power source were disconnected and the Cinergy system delivered 48V DC power directly to the radio equipment.

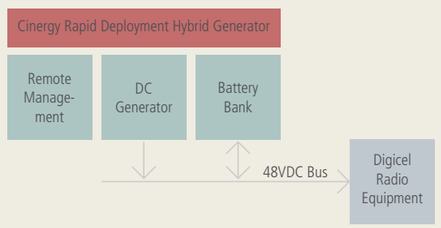
The radio equipment on site is housed in outdoor units with no air conditioning. The site power demand ranged from 0.95kW to 1.72kW with an average of 1.35kW.

DC Voltage Range & Quality

The DC voltage range supplied by the Cinergy solution on the Fiji site was 47.8V to 57.8V. The voltage ripple of the DC generator itself does not exceed 200mV on full load – in conjunction with the battery bank, power ripple is negligible. The radio equipment on site operated with no issues when supplied with the DC power directly from the Cinergy solution.

The DC voltage range supplied is governed by the selected battery charging strategy.

Figure 2. Cinergy Hybrid Generator



The high end of the voltage range occurs when the DC generator is running to charge the batteries and the charging process has neared completion and the supplied voltage is the rapid charge voltage for the batteries used – in this case 2.4V per cell or 57.6V for the 48V battery string. Where the battery technology used requires charge voltage temperature compensation, this voltage will reduce in warm climates. For instance, with a temperature compensation of -5mV/degree C and a battery reference temperature of 25 degrees C, for every 10 degrees above this temperature, the charge voltage would reduce by 50mV per cell, or 1.2V for a 48V battery string.

The depth to which the battery bank is discharged before charging begins determines the low end of the voltage range. The relatively small battery bank deployed at the site in Fiji required a battery discharge to 50%. A more typical installation would include twice the battery capacity and discharge the batteries to 75%, thus raising the low end of the voltage range by at least 1 volt.

Fuel & System Performance

The key benefit of a generator/battery hybrid solution is that the generator runs cyclically to charge the system batteries, dramatically reducing engine run hours and fuel consumption and delivering a corresponding reduction in fuel and maintenance costs. The performance of the Cinergy solution can be compared against an 11kVA AC generator/battery hybrid solution run by Digicel Fiji on similar sites and with an 11kVA AC generator running 24 hours per day.

Table 2: Fuel and System Performance

	Cinergy Solution	11kVA AC hybrid solution	Cinergy Saving %	11kVA Generator running 24 hours per day	Cinergy Saving %
Fuel Consumption (litres per day)	18.8	21	10.5%	50	60%
Engine Run Hours per day	10	14	29%	24	28%

The Cinergy system used on site is designed, sized and configured for rapid deployment. The new Cinergy Cubes solution on the same site, using a 10kW DC generator and 998Ah battery bank, would consume less than 17 litres of fuel per day and run for 7 hours per day, yielding even greater savings.

Conclusion

The fuel consumption and engine run hours of the Cinergy DC hybrid solution are impressive. The Fiji trial showed that it is practical to supply DC power directly to radio equipment from a DC-based generator/battery hybrid system and that the Cinergy solution:

- Allows rectifiers to be discarded
- Reduces or removes requirement for air conditioning
- Delivers significant additional CapEx and OpEx reductions over AC generator battery hybrid solutions

The GSMA's Mobile Energy Efficiency Benchmarking Service Now Has 26 MNO Participants, Accounting for over 170 Networks

By Mark Anderson and David Sanders
GSMA

Energy efficiency is a strategic priority for mobile network operators globally. As mobile use expands, so does the demand for energy, particularly by the network infrastructure. The GSMA's **Mobile Energy Efficiency (MEE) benchmarking service** enables operators to identify energy cost cutting and also greenhouse gas emission reduction opportunities in their mobile networks across the world.

MEE now includes 26 MNO participants, accounting for over 170 networks. A successful pilot was completed with Telenor, Telefonica and China Mobile. Participants are deriving high value from the results of the benchmarking service, which enable them to compare their networks internally as well as externally against their peers on four different energy Key Performance Indicators (KPIs). Energy cost and carbon emissions **savings of 20% to 25% of costs** are typical for underperforming networks.

Benefits to Operators

MEE enables operators to lower their network energy costs and emissions. The benefits to operators include:

- Detailed analysis of the relative performance of their networks benchmarked against a large dataset (anonymised to ensure confidentiality)
- Unique "normalisation" analysis that enables like-for-like comparison of networks
- Suggested high level insights to improve energy efficiency
- The ability to map improvements year by year and quantify the impact of cost reduction initiatives
- Demonstration of positive action on energy efficiency and greenhouse gas reduction to stakeholders

The **MEE** methodology enables the consistent evaluation and comparison of network energy efficiency across a range of variables. It "normalises" for variables outside the energy managers' control, for example country, market and technology factors and thus enables like-for-like comparison. Energy consumption can be converted into greenhouse gas emissions using country grid electricity and diesel conversion factors to help the mobile industry to lower its greenhouse gas emissions per connection in accordance with **Mobile's Green Manifesto**. The GSMA is collaborating with the European Commission and the International Telecommunication Union to ensure that the methodology is adopted as a global standard.

"...it's great to see the Mobile sector's Green Manifesto getting some real teeth today with 17 new recruits signing up to the GSM Association's (GSMA) Mobile Energy Efficiency Network Benchmarking Service..."

Vice-President of the European Commission Neelie Kroes, 22 March 2011

We are recruiting more MNOs to join this year's MEE service, which benchmarks the 2009 data set, and we will shortly start collecting the 2010 dataset. For more information or to become involved, please contact **mee@gsm.org**

Methodology

Our unique analytical approach allows operators with multiple networks to compare these on a like-for-like basis. Variables outside the operators' control, e.g. population distribution and climatic conditions, are normalised for, using multi-variable regression techniques. All external comparisons are made anonymously to preserve confidentiality.

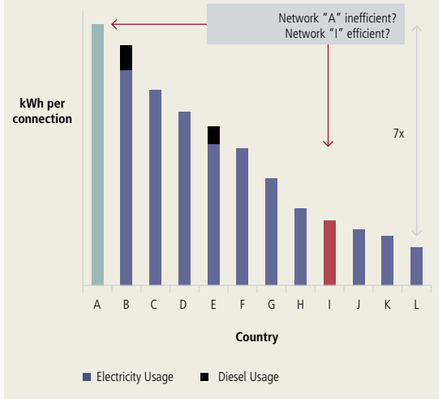
The methodology benchmarks mobile networks by country or region by comparing the four energy KPIs, which are:

1. Energy consumption per mobile connection
2. Energy consumption per unit mobile traffic
3. Energy consumption per cell site
4. Energy consumption per unit mobile revenue

Taking energy per mobile connection as an example, we have used regression analysis to explain variations in energy per connection for the following factors: % 2G connections; number of cell sites per connection; [% urban population]/[% population covered by MNO]; number of cooling degree days; and GDP per capita.

Figures 3-5 show how the normalisation works. Prior to any normalisation, the spread of energy per connection across countries can be quite high, see the example given in Figure 1.

Figure 3: Operator X: Mobile Network Operations Electricity and Diesel Usage per Connection, 2009

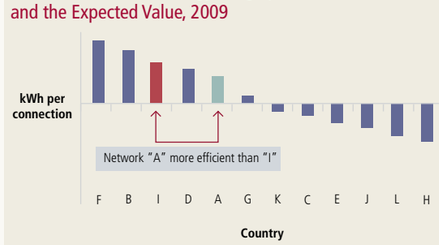


Source: GSMA

However, normalisation against five variables shows a truer picture, see Figure 2.

Source: GSMA

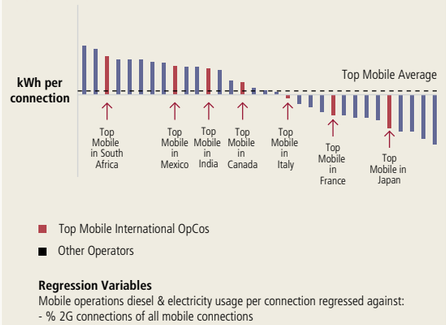
Figure 4: Difference Between Operator X's Actual Electrical and Diesel Energy Usage per Mobile Connection and the Expected Value, 2009



Regression Variables
Mobile operations diesel & electricity usage per connection regressed against:
- % 2G connections of all mobile connections
- Number of cell sites per connection
- % urban population/ % population covered by MNO
- Number of cooling degree days (population weighted)
- GDP per capita (adjusted)

An anonymous comparison against other operators allows greater insights for energy managers in operator 'Top Mobile', see Figure 3.

Figure 5: Difference Between Operator Actual Electrical and Diesel Energy Usage per Mobile Connection and the Expected Value, 2009



Regression Variables
Mobile operations diesel & electricity usage per connection regressed against:
- % 2G connections of all mobile connections
- Number of cell sites per connection.
- % urban population/ % population covered by MNO
- Number of cooling degree days (population weighted)
- GDP per capita (adjusted)

Source: GSMA

What is required from MNOs?

Much of the country and market information has been gathered independently by the GSMA. The information required from operators is the following, by country/region:

- Mobile network electrical energy usage, split by RAN and Core
- Mobile network diesel energy usage
- Number of physical cell sites and technologies
- Number of mobile connections
- Geographic and population coverage
- Minutes of mobile voice traffic and bytes of mobile data traffic
- Mobile revenues.

To participate in the Mobile Energy Efficiency benchmarking service email us at **mee@gsm.org**

www.gsmworld.com/mee

Innovation from the Indian Sub-Continent

Focussing on some of the most exciting models coming out of the Indian Sub-Continent's hotbed of innovation, we bring to light the pioneering work of players in this region. Included is a case study on Bangalink, an overview of outsourcing procurement models for renewable energy and finally we take a look at how Indus Towers is deploying renewable energy solutions to 2500 sites.

The Move to Outsourcing

By Areef Kassam
GSMA

Mobile network operators (MNO) in emerging markets are faced with the challenge of addressing the following realities:

- Growing subscriber base predominantly in rural areas
- The necessity to expand the number of off-grid base stations
- Capital constraints and the need to reduce operating costs (OPEX) with the uncertainty of diesel prices.

Since 2008 there has been a noticeable shift in the industry. Telecom operators in the past used to be more sceptical about being able to reliably run a site from renewable energy from a technical point of view, as well as about the potential saving that could be achieved. Through data from numerous trials, pilot sites and case studies that have been released across the industry, a level of confidence has been built in the technology and financial benefits. Continued price reductions and technological improvements have set the stage for a market poised for expansion; the only factor to consider at this point is when the willingness of operators to make large-scale capital outlays will catch up with the long term benefits of the technologies.

Until recently the options to get the capital for renewable energy rollouts have been limited to internal financing, external debt or equity financing, but new developments in the industry have changed that. MNOs have approached vendors to share the burden of the capital costs, which has now gone a step further to become the complete outsourcing of power.

In this scenario, the vendor, referred to as an ESCO (Energy Service Company), not only takes responsibility for financing the equipment, but also the full provision of power to the MNO or tower company. This ESCO outsourcing facility can operate under several different schemes, but there is no industry standard or accepted structure at this stage. Some of the ESCO business and energy service models that are being considered, developed and tested in the market place include: (i) power purchase agreement (PPA); (ii) energy services or energy savings agreement (ESA); (iii) operating lease with fixed fee combined with ESCO services.

Power Purchase Agreement

A power purchase agreements (PPA) is where the ESCO installs the renewable energy power system and sells power to the operator at an agreed per kWh rate. The main benefits of a PPA to the operator are that the payments for energy are an operating expense, i.e. the operator is only paying for the power that they use and the financing of the power equipment is the responsibility of the ESCO. In this type of arrangement the MNO must typically commit to a minimum take or capacity payment otherwise they assume the risks of energy load levels. (See Figure 7.)

Energy Savings Agreement

An energy savings agreement (ESA) is where an ESCO installs the renewable energy system and the operators pay based on a portion of verified energy cost 'savings'. The key component to the ESA is the operator payment formula which will determine how much of the saving will be passed through to the operator and how much will go to the ESCO to recover the capital cost of the equipment. This formula to split the saving will sometimes change at an agreed time during the term of the contract. (See Figure 7.)

Fixed Fee Operating Lease

In an operating lease or fixed fee structure, the ESCO would own, install, operate and maintain the renewable energy equipment and provide power to the operator's site for a fixed monthly cost. In addition to capital expense being the responsibility of the ESCO, one of the other benefits is that it stabilises the MNO's OPEX associated with power so that it is no longer a variable part of the budget. (See Figure 7.)

A number of operators, tower companies and ESCOs have executed pilot and small rollouts using outsourcing models. The majority of these rollouts are in India, but the use of the model is starting to be apparent in other parts of Asia and Africa. In the Indian market, the tower sharing model is predominant and a number of tower companies and service providers have deployed third party energy solutions for their telecom towers. Several more are actively looking to deploy to a third party and this model is likely to see rapid expansion in the coming years.

Benefits for MNO's and Tower Companies

Any of the models mentioned have significant advantages to the MNO or Tower Company and the industry as a whole. It allows the MNO to achieve a portion of the potential saving of using renewable energy without the CAPEX. Simultaneously, while lowering operating costs the MNO is able to minimise the resources needed to manage power for the network and stabilise their operating expenses. These advantages come at the expense to the ESCO who would be responsible for the CAPEX of providing cheap reliable power to the network. In order for a MNO to get the benefits of outsourcing the provision of power to a third party, it needs to have sufficient confidence in the ESCO to entrust them with the BTS power systems, which requires the ESCO in many cases to have a proven track record in the renewable energy systems, site operations and maintenance.

Barriers to Outsourcing

The demand for these outsourcing solutions and the shift of the related responsibilities to the ESCO brings about new challenges and issues to the industry. In order for ESCOs to compete in this new market place of power outsourcing, it requires the ESCO to have internal capital or the ability to raise the external funds needed to implement outsourcing projects. This combined with the MNOs requirement for ESCOs to have significant prior experience and a proven track record in renewable energy power systems creates financing and marketing barriers to enter the market and often makes it challenging for small, less experienced ESCOs to compete.

The GPM programme is initiating a new programme in India, where these outsourcing models will be hugely significant and poised for large scale adoption. Through this initiative in India, GPM plans to further investigate the workings of the power outsourcing model and track its progress with the intention of disseminating this information, as well as other learnings, to the wider industry.

Figure 6. Evolution of Telecoms Infrastructure Business Models

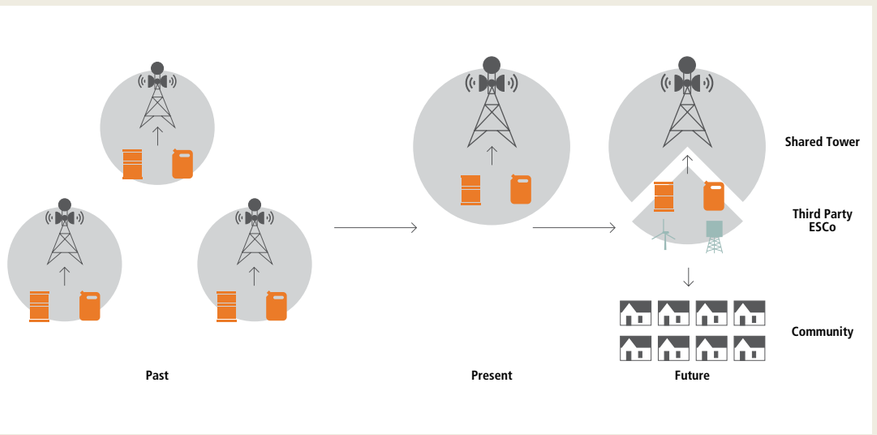
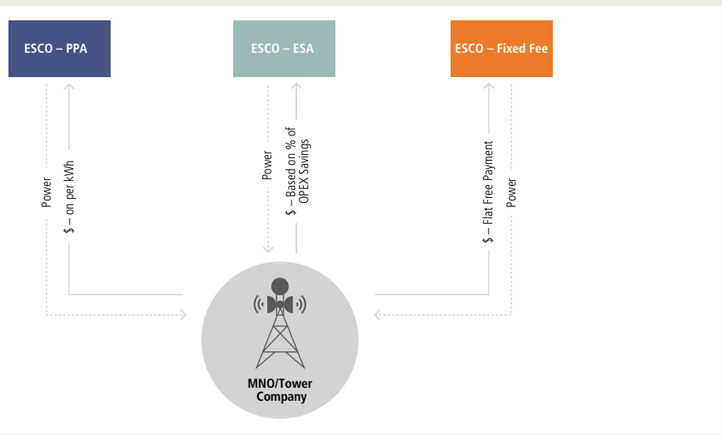


Figure 7. ESCO Models



Indus Towers

By Danesh Bansal, Indus Towers

As per the Telecom Regulatory Authority of India (TRAI) Consultation paper on Green Telecommunication published in March 2011, the telecommunications industry in India uses about 2 billion litres of diesel fuel worth US$1.15 billion per annum. The diesel generators are of 10-15 kVA capacity and consume 2 litres of diesel per hour and produce 2.63 kg of CO_2 per litre. The total emission is approximately 5 million tonnes of CO_2.

This consumption will only increase as more new operators roll out their services as well as existing operators expanding their network further and launching 3G/BWA services. Currently, 40% of the total telecom power requirements are met by grid electricity and 60% by diesel generators. In India, there are 330,000 telecom towers which is expected to reach 550,000 towers by 2015, with a focus on rural expansion. As future growth is more focused on the rural sector, this will in turn increase the consumption of diesel for powering telecom towers due to sub-optimal grid supply.

Indus Towers Ltd: Transcending the Horizon in Passive Infrastructure

"We transform lives by enabling communication" – these simple and yet powerful words drive Indus Towers Ltd. towards excellence in service delivery.

Founded in 2007, Indus Towers is a joint venture between the three leading telecom companies of India: Bharti Infratel Ltd, Vodafone Essar Ltd, and Aditya Birla Telecom Ltd. Indus Towers Limited is an independently managed company offering passive infrastructure services to all telecom operators and other wireless services providers. With a portfolio of more than 110,000 towers, Indus is the largest telecom tower company in the world. It has a presence in the 16 major telecom circles of India and headquartered in the National Capital Region, Delhi.

Indus Towers' objective is to provide shared telecom infrastructure to telecom operators on a non-discriminatory basis. The company's commitment towards continuous innovation enhances operational efficiencies and results in substantial cost savings for its customers.

Indus Towers recently achieved 200,000 tenancies which is a first in the telecom tower industry.

With its vision of transforming lives by enabling communication, the company has contributed significantly to enable wider access, offer affordable services, and propel wireless telecommunication sector towards achieving Government of India's National Teledensity Goals.

Brand Differentiators:

With a strong footprint across India and offering scale benefits to its customers, Indus has the following key differentiators with respect to its competitors

- Operational excellence
- Largest network
- Speed-to-market
- Lower energy costs coupled with its Green Commitment

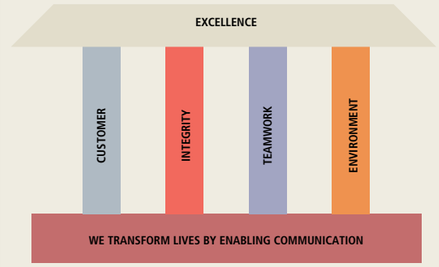
Indus Towers has earned the distinction of being a preferred choice for customers and is set to continue to enable the next generation communications.

Environment: Key element of Indus Values Edifice

Indus Towers has recently finalised its value system – ExCITE (Excellence, Customer, Integrity, Teamwork and Environment).

By design, the environment has become the DNA this organisation. Indus Management has clearly expressed its Green Commitment. Unlike many other organisations, Indus Towers is extremely committed to its values framework. Indus Towers believe that, as an industry leader, they owe it to the society to take the right actions today to ensure future generations a safe environment.

Figure 8. Indus Values Edifice



Excellence is the all encompassing umbrella value and in support of our vision

"Our corporate color-Green reflects our commitment to be socially responsible and deliver our services in an environmentally friendly manner."

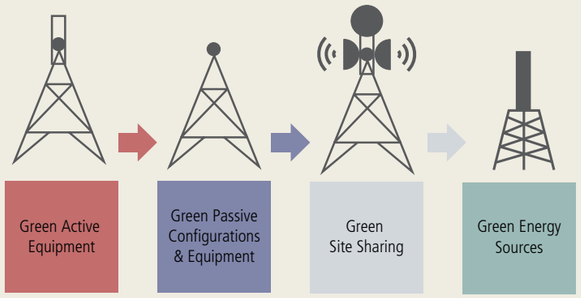
Green Telecom in Indus Towers

As of now, Indus Towers has one of the largest portfolios of green sites amongst all telecom/tower companies. Indus Towers' impetus to reduce GHG emission and usage of renewable energy source to power telecom towers eluded to **CAP (Carbon Abatement Program)** with a time frame of 3-4 years.

Indus Towers' Green Value Chain has many facets to drive the CAP. It can be classified broadly into 4 parts:

- Green telecom equipment
- Green design of passive telecom sites
- Enhanced site sharing
- Power generation through green sources

Figure 9. Indus Value Chain



Indus Value Chain

Generally, Green energy is synonymous with green energy sources, however, Indus Towers is working with a comprehensive approach by focusing equally on all the possible aspects. The fragments of the value chain are briefly described below:

- **Green Active Equipment:** There has been a significant reduction in power consumption of active equipment from about 2.5kW to below 1kW per BTS. Also the newer BTS's are capable of working at much higher temperatures than previous models. While this area is primarily driven by our esteemed customers, Indus Towers facilitates such initiatives for its customer
- **Green Passive Configurations & Equipment:** Indus Towers is investing to ensure that the passive infrastructure equipment's are state of the art with the highest possible energy efficiency. We are also working on maximising the build-up of outdoor cell sites which eliminates the need for air conditioners on sites; hence reducing the energy cost by 20-25%. We are also implementing retro fitment solutions like direct current diesel generators (DC-DG), free cooling unit, soft start inverter, and fuel catalyst to reduce energy cost.
- **Green Sharing:** The sharing of sites by multiple operators optimised the energy costs significantly. Broadly speaking 2-3 operators sharing, brings down the energy cost by 20-30% for the respective operator. Indus Towers believes that its portfolio with higher tenancies helps the environment significantly.
- **Green Energy Sources:** Indus is focused to bring renewable energy sources like solar, wind, fuel cells, natural gas, biomass and geothermal to power telecom towers. It has garnered a significant progress in implementing of Solar Hybrid solutions. A project for the deployment of 2500 sites has been initiated; of which more than 500 sites have already been deployed.

Indus has also initiated trials on PNG (Pipe Natural Gas) and LPG (Liquefied Petroleum Gas) based generators to substitute diesel as an energy source.

Indus being the industry leader is steadily progressing in promoting green power solutions. We believe that increase in scale shall result in reduction in prices and hence facilitate exponential growth.

Green Telecom: Challenges and the Way Forward

The major financial challenges being faced for powering telecom towers through green sources are the high initial investment and longer Return on Investment (ROI) periods. The technical and operational challenges include nascent technologies for lower load situation in telecom, non-predictable power situation and distributed telecom networks.

In order to sustain Green Telecom, the industry needs to take a holistic approach towards collaboration within industry players and government agencies. Incentives and tax benefits to OEMs and services providers can facilitate affordable green solutions.

Case Study: Banglalink

By Ferdous Mottakin, GSMA

Background

Bangladesh; a low-lying Ganges delta is located in the north-eastern part of South Asia. It borders predominantly with India, but also the Bay of Bengal and a small part of Myanmar. Straddling the Tropic of Cancer, the climate in Bangladesh is tropical with a very mild winter from December to March, a hot & humid summer from March to June and a warm and humid monsoon from June to November.

Power Infrastructure in Bangladesh:

Despite large investment within the power sector over the last two decades, the power infrastructure is yet to extend into many of the remote rural areas of Bangladesh. The current electricity penetration rate is 47%[4]. Lack of adequate power generation and increasing demand puts the power infrastructure under pressure. The Rural Electrification Board (REB) has connected 433 sub-districts out of 486[5], but it's still beyond the reach of a large number of villages. Moreover, the lack of adequate power generation creates long power outages throughout the year which has major impacts on the national economy.

Lack of availability and inconsistency of grid power has become the key concern to mobile phone operators in recent years. As there is fierce competition among the mobile phone operators, to increase subscriber base and mobile phone penetration rate. Operators are extending their network in off-grid areas by using diesel generators (DG). Currently there are more than 2000 base-stations in Bangladesh that are located in an off-grid location and run by DG[6]

Challenges of Banglalink Network

Since Banglalink launched it has been expanding rapidly and is continuing to maintain a fast rate of expansion. It is a challenge for operators to keep the energy OPEX in line while keeping countrywide operations running smoothly. Around 16.5% of Banglalink's base stations are off-grid and 70% of the on-grid base stations have frequent power outages. Each day there are about 19,000-24,000hrs of power unavailable in Banglalink's on-grid network which forces Banglalink to run DG. The average DG running cost is US $27,000/day which creates a pressure on Banglalink. Power consumption for air conditioners is another key challenge for Banglalink. Air conditioners for the entire network consume 170,000kWh power daily, which is almost 50% of the entire network energy cost.

Feasibility study Approach

Data Analysis:

Data analysis is the most important part for a green power Feasibility Study. GPM analysed year-wise network data for Banglalink from 2005 to 2010. While analysing the data, GPM considered all factors that could assist with dimensioning the right solution for the network operator. A sample of data analysis is shown below:

Table 3. Yearly Data Analysis Example

Year	Basic Analysis	Deep Analysis		Observation	Key note
		Off-Grid*	On-Grid*		
2xxx	Total 91 sites	113 Sites have average load of 2kWh	98 sites have average load of 2kWh	DG runs for **3800 hrs** everyday	Daily POEX to run DG is $6,700
	186 off-grid & rest are on-grid	Rest Sites have load of ≥ 2kWh	193 sites have average load of 3kWh	Each Air-conditioner consumes 2.25kWh power	Daily CO2 emission is 24.1 Tonnes
	Almost equal number of rooftop and greenfield	Each site has one 20kVA DG	Rest all sites have ≥3kWh load		
	Sites		Average daily power outage 2-12 hrs		
			121 sites have DG as back-up power		

*Site load is calculated without air conditioners load

3. Wireless Intelligence www.wirelessintelligence.com/Logged/MarketTracking.aspx?draw=false
4. Power Division, Government of Bangladesh. www.powerdivision.gov.bd/index.php?page_id=262

Design Models:

Design models were created based on the data analysis. After analysing Banglalink's network data, GPM found 362 sites had potential for green power implementations. 13 design models were created to cover all 362 sites. These designs were based on Solar-DG hybrid solutions. Out of 13 design models, two were designed for rooftop sites; two for outdoor greenfield sites and the remaining nine models were for indoor greenfield sites. All the design models were carefully prepared to get the best possible technical and financial output.

Business Cases for Design Models:

GPM created business cases for each design model considering a 10 year business plan. The business cases were prepared based on actual market data and rates as well as providing a full overview of the CAPEX, OPEX and investment metrics such as NPV and ROI.

Table 4. Proposed Solution Dimensioning

Proposed Solution dimensioning					
Model	PV	Battery OPzS (Ah)	Auxiliary DG (kVA)	Controller (Amp)	Converter (kW)
1	11.2	2000	20	240	14
2	11.6	2000	20	250	12
3	12	3000	20	250	16

Priority Group:

GPM identified priority sites based on technical, financial and environmental indicators. These priority sites were essential for Banglalink to make a more efficient investment plan. The 362 potential green power sites were divided into six priority groups each of which had an associated investment plan and analysis of financial indicators.

Renewable Energy Results and Recommendations

Site Design Example

13 design models were created for off-grid sites. Each of the designs was carefully created to maximize the utilisation of the energy generated. While dimensioning the equipment for the design models, a specific load requirement was calculated and a solution was recommended based on the precise load calculation. Solar-hybrid solutions were proposed for all the designs. The technical dimensioning proposed for Banglalink contained detail site and model wise data.

Site Selection for Prioritisation

Priority groups were set based on site importance, site load, CAPEX, ROI and OPEX savings for each individual site. After preparing technical solutions and business cases for all 362 sites, GPM analysed and came-up with six priority groups.

Table 5. Priority Sites

Priority Sites						
	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Priority 6
Number of sites	6	23	141	32	139	21

The six sites in Priority 1 are technically more important and financially more attractive than any other group. Setting site priority enabled Banglalink to make their investment plan more flexible and accurate.

Business Case and Financial Analysis for Priority Sites

GPM created an analysis table for each priority group based on the business case of each design model. This detailed analysis brought an easy understanding for the network operator to identify the credibility of their investment. The analysis consisted of solution details, performance indicators, financial indicators as well as environmental indicators for each solution.

Priority Results Summary Table

Financial analysis was undertaken considering CAPEX and OPEX savings for each priority group. A summary table of financial results of all priority groups is as follow:

Table 6. Summary Table

Priority	Number of sites	Total CAPEX (US$)	Yearly OPEX (US$)	OPEX Saving/Yr (US$)	Payback Period (Yr)	ROI	NPV	CO_2 Emission Reduction (tonnes)
1	6	410,880	410,880	113,338	3.6	28%	501,902	207
2	23	1,571,880	410,880	412,669	3.8	26.3%	1,906,088	790
3	141	9,623,760	410,880	2,567,884	3.7	27%	11,492,399	4912
4	32	2,304,480	410,880	532,017	4.3	23.25%	2,981,944	1026
5	139	10,032,120	410,880	2,304,312	4.35	23%	13,009,243	4451
6	21	1,459,080	410,880	378,258	3.85	26%	1,873,764	681

Energy Efficiency Recommendation

For overall energy optimisation, GPM came-up with a list of recommendations which could help Banglalink reduce their energy requirement at every site. Examples of these include:

- Not use AC air conditioner for off-grid sites
- Use free cooling units (FCU)/DC aircon for shelter/BTS-room environment control
- Not to use aircon solely for on-grid sites. Use FCU + aircon if low power outage tendency
- For high power outage on-grid site, use only FCU for shelter/BTS-room environment control
- Not to keep anything other than telecom equipment in BTS-room
- Deploy outdoor BTS for upcoming rollout
- Use a battery cooler for all both on-grid and off-grid sites. It will increase battery life by 50%.
- Use VDT/intelligent controller to manage battery and DG operation
- Use energy saving light for all Green field sites

There are a number of off-grid sites which were not recommended to have a renewable energy solution due to the site characteristics and poor business case. GPM provided some specific recommendations for those sites to help Banglalink reduce its energy OPEX. Examples of these include:

- Dismantle all existing aircon and use FCU instead
- Use battery coolers
- Turn off unused/less used TRX
- Energy savings lighting

GPM also found a large number of on-grid sites have inconsistent power availability which forces network operator to use DGs during these power gaps. To get rid of this, GPM came-up with some specific recommendations:

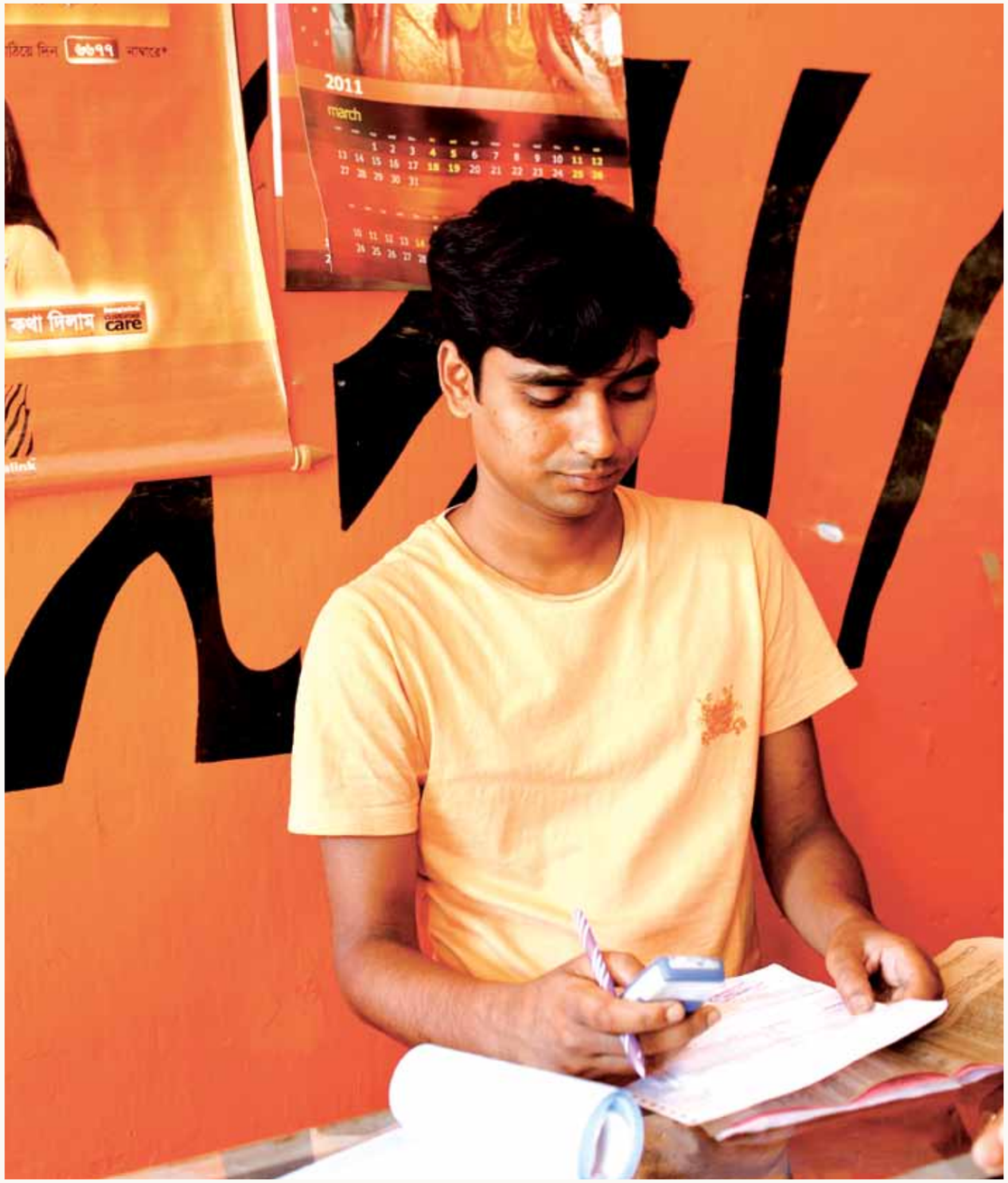
- If any sites have more than 6 hours of power outage tendencies:
  - Dismantle all aircon and use FCU instead.
  - Upgrade existing battery bank to 2000Ah
  - Install battery cooler for each battery bank

Banglalink could save 21,600 litres of diesel every day.

Summary Results for Full Feasibility Study

After an eight week Green Power Feasibility Study, GPM concluded that:

Suggesting green power solution implementation at	362 off grid sites
Not suggesting green power solution implementation at	468 off grid sites
Deep battery cycling at	On-grid sites having more than 6 hrs power outage tendency
A list of generic recommendations saving up to 40% of energy OPEX	
GSMA also provided the operator with financial figures for an entire green power rollout	
Total CAPEX requirement for green solution implementation	**US$25.4 million**
Current total energy OPEX for off-grid sites	US$7.6 million/yr
Total energy OPEX for off-grid sites after implementing green solution	US$1.3 million/yr
Total energy OPEX can be saved at off-grid sites by implementing green solution	US$6.3 million/yr
Pay back period less than 4 yrs	188 sites
Average NPV	US$87,750
Average ROI	25%



Community Power from Mobile

A profile of some of the most important live and emerging projects in this arena, including Rockefeller Foundations SPEED Project in India, The Ecology Foundation, Energize the Chain, Barefoot Power and a press release from Viom Networks announcing their rollout of rural service centres.

Rural Connections and Off-Grid Handset Charging

By Michael Nique, GSMA

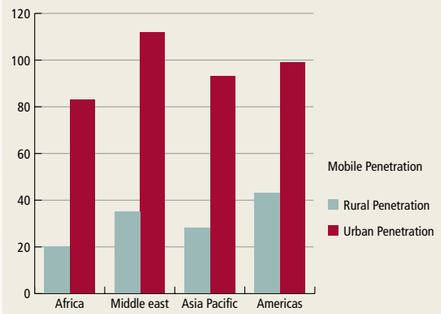
Low Access to Energy is a Barrier to Mobile Ownership in Rural Regions

By the end of 2011, six billion mobile connections worldwide will be reached[1]. Four billion of these connections will come from developing economies and as a result, emerging markets are among the current drivers of the mobile industry. However this growth in the developing world is not uniform across market segments, as rural regions lag significantly behind urban regions. Recent research from the GSMA estimates 95% market penetration in urban regions but only 28% penetration in rural regions today[2]. This rural gap, totalling 1.39 billion unconnected people, represents a major untapped market segment for mobile operators.

The inherent social and economic benefits of the access to mobile services in rural regions are keys to a remote community's empowerment. As an example, E-services such as messages and internet through mobile phones have brought farmers and buyers together by enabling access to crop prices and quantities in a timely and affordable way[3]. These services bring reductions in prices across markets, e.g. in Niger, where these is a 20% reduction due to the availability of cost comparisons. This means that farmers are able to search across markets and respond to surpluses and shortages. In 2005, regions in Niger with mobile phone coverage had far lower consumer grain prices than regions without mobile coverage.

In terms of geography, mobile penetration remains the lowest in African and Asia Pacific. Indeed the urban-rural disparities are high in these two regions where a large proportion of the population still live in rural areas and are considered to be living below the poverty line. Due to economic factors, mobile phones are generally shared by a household and/or a community.

Figure 10: Urban/Rural Penetration by Region



Although the rural segment represents a major underserved market for mobile operators in the developing world, challenges remain to access this market. A study published in 2009 by Accenture[4] looked into the obstacles to mobile adoption in rural environments. Added to total cost of ownership and the lack of mobile infrastructure, **the inability to access electricity when required to charge handsets was viewed by the end consumers as a one of the main barriers to mobile take up.** Electricity access in the sub-Saharan Africa and South Asian regions are still well below the world average[5] (~65%), with less than 10% of the population having direct access to the electricity grid in many countries in Africa. The situation is not going to change in the short to mid-term due to the high investments required from governments and private players to extend the electricity grid to the isolated areas. Therefore there is a need for local off-grid solutions to give communities the opportunity to have access to lighting or power for mobile devices without having to travel for miles to the nearest grid connected village.

Table 7. Population and Number of Mobile Subscribers without Access to Electricity

	Population without Access to Electricity[5] (in million)	Mobile Subscribers without Access to Electricity[6] (in million)
Sub-Saharan Africa	585	161
Middle East and North Africa	24	12
East Asia and Pacific	186	88
South Asia	612	260
Latin America	31	27

Source: IEA & GSMA

How Users Charge their Phone in Off-Grid Regions

To understand the current challenges of the off-grid population accessing electricity, the GPM Programme conducted several field studies to collect and analyse data charging services, expenditures and end user behaviours. Overall, the most common solutions are charging shops (especially in Africa), where a micro-entrepreneur will charge the community's handsets, or use household batteries to charge phone batteries and several other devices. At present, the penetration of solar handsets or external chargers remains low, due to several reasons: affordability, availability and poor user experience.

Overall, the off-grid population has a high expenditure on charging mobile devices off-grid; sometimes up to 50% of their monthly mobile expenditures[8]. The charging process is also time consuming, as a round trip often involves a full day's travel to the nearest urban area to access electricity. In rural Africa for example, people living in remote areas sometimes have to travel up to 20km to charge their phones. It is estimated that in most cases, phones are not in use for at least one day per week due to battery depletion. Most people interviewed in Uganda[9] also mentioned they would spend more money on airtime if they could save money on charging services.

Figure 11. A Charging Shop in Kenya

Figure 12. Charging Shop Sign in Kenya

Source: GSMA

In Asia, the handset charging shop model is not as dominant as it is in Africa and subscribers tend to spend a lower fraction of their monthly mobile expenditure on charging their handsets. For example, the primary issue of rural electrification in India is grid reliability rather than grid availability. Batteries are more widely available and allow users to power home devices such as televisions, lights and mobile phones. In Cambodia, nearly every household has a car battery for their home; the cost of charging a battery is between US$0.37-0.50 for a 40-50 Ampere lead acid car battery.

1. Wireless Intelligence
2. GSMA–Based on the calculation of mobile penetration in urban and rural areas from 112 developing countries mid-year 2009.
3. Does Digital Divide or Provide? The impact of Cell Phones on Grain Markets in Niger, Jenny Aker, 2008
4. New business model for profitable rural expansion – Accenture-2009
5. IEA, World Energy Outlook-2009
6. GSMA 2010 – Based on the electrification level and market penetration per regions in 2010
7. Field studies performed in Uganda, Kenya, Burundi, India, Bangladesh, Cambodia
8. For mobile expenditure below US$8
9. Around 80% of the people interviewed in Uganda would rather spend money on airtime than charging service (based on a sample of 45 persons)

Develop the Access to Local Charging Solutions

Several solutions to help remote off grid communities charge their mobile phones are already in use. However, most of the time, these solutions don't reach these remote customers, mainly because of the lack of local distributors and the affordability barrier for low income group.

Table 8: Current Handset Charging Solutions in Emerging Markets

	Devices	Current Status	Providers	Cost US$
 Source: Vodafone	Solar Handset	More reliable versions of solar handsets have been released, with improved efficiency, shortening charging time. More mobile operators are now distributing these. However affordability (prices ~ US$35), form factor and charging experience in environment where theft rate is high may be barriers to its adoption.	ZTE, Samsung, Sharp, Intivation, Umeox	30-45
 Source: Renew It	External Solar Charger	External solar chargers have been plagued by poor and unreliable products in the past. With a focus on design, user experience and reliability, new products are now emerging aimed at the low income rural population. With models starting at $US10, external solar chargers are a fast and affordable solution.	RenewIt, Suntrica, Toughstuff, Solarc, Starfire, Solio, Fenix International, Xpal	10-60
 Source: Dlight	Lamp with charging feature	The integration of light and handset charging features represent a very interesting value proposition to end users, relying on costly and dirty kerosene fuel for their household. Cost efficient solutions are now available and could constitute a new product to distribute by mobile operators.	DLight, Barefoot Power	10-35
 Source: Eton	Kinetic/ Hand Crank	Kinetic based charging solutions are easy to use and cheap to access in rural environment. With limited efficiency and long charging time (and strenuous effort sometimes), these charging solutions are interesting for fast deployments and disaster relief situations.	Nokia, Eton	5-25
 Source: GSMA	Community Power from mobile	Mobile operators have already begun to develop community power solutions based on the excess power from base stations to recharge mobile handsets. In Kenya, Safaricom, has already deployed more than 20 community power sites where users can charge their handset at a booth next to the BTS.l	Safaricom Grameenphone	

Barriers to the Access of Charging Solutions

Cost: The cost of ownership of solar handsets and external charging is one of the main barriers to mass adoption. As for mobile handsets, the average price for newer solar handset models such as the ZTE VF 247 provided by Vodafone India and Vodacom (RSA) at the end of 2010, ranged between US$32 and US$42. As a comparison, Ultra Low Cost (ULC) handset models retail today for US$15.

Reliability: The lack of traction of such devices can be partly explained by the poor quality of the products available on the mass market to date. Retailing for low prices, these charging devices achieved low efficiency and are unreliable a few months after purchase.

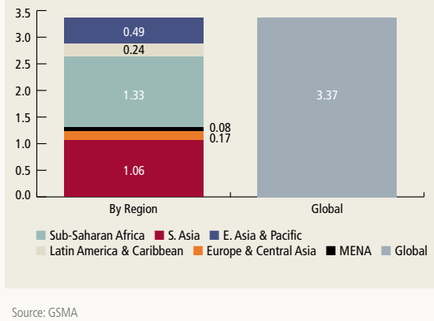
Distribution: The availability of charging solutions is another critical barrier to adoption. Solutions are already available but the difficulty in reaching consumers in remote off-grid regions prevent vendors from achieving the economies of scale and mass distribution required. Partnerships with mobile operators would give vendors access to their extensive distribution network and have a wider impact on communities.

Security: Users are eager to get access to charging solutions, but they also want a reliable, cheaper and easy to use solutions compared to what is currently available. Charging should be a seamless experience, where the impact on daily life is negligible. The use of solar and other charging solutions may be stressful in some environments where theft rate is high. In these locations, people will be unwilling to leave their devices to charge outside without any attendance. Security of devices being charged is a high priority, and as a result, community charging remains a good solution to this problem.

Revenue Benefits from Mobile Phone Charging

The GSMA estimates 548 million mobile subscribers live in off-grid areas today; these subscribers live mostly in two regions, South Asia and sub-Saharan Africa, where the percentage of rural populations remains high. The total market opportunity for mobile operators is estimated to be US$3.37 billion globally, the sub-Saharan Africa and South Asian regions having the highest potential to supply charging solutions.

Figure 13: Additional Yearly Revenues for Mobile Operators from Charging Solutions Availability (in million US$)

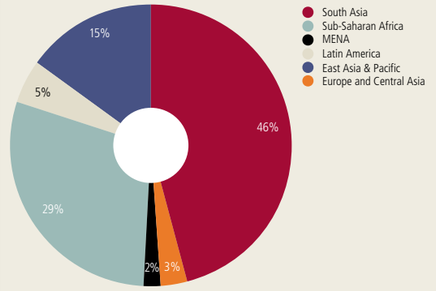


Source: GSMA

This calculation is based on an estimate from the mobile operator Digicel. Trials in Haiti and Madagascar in 2009 suggested that when off-grid subscribers acquire mobile charging solutions, usage and ARPU increases by 10% to 14%[11]. This ARPU increase can be explained by the transfer of expenses from travel and charging to spending on airtime. Increased battery life also contributes to the increase in ARPU. Without an instant solution for phone charging, phones are often left unused for days after the battery life has depleted. This consequently leads to reduced usage, whereas an instant charging solution would allow the user to use their phone as and when required.

Incremental revenue opportunities range from US$83 million per year in the MENA region, to US$1.33 billion per year in sub-Saharan Africa; on a country level, India accounts for the majority of this with an estimated US$866 million.

Figure 14: Revenue Opportunity Segmentation by Regions



Source: GSMA

There are additional benefits to operators and the community:

Suggestions to Operators

Several options can be considered to create a 'healthy charging ecosystem':

Using an operator's distribution channels: by providing charging devices at local airtime shops, operators ensure remote off-grid populations have access to appropriate solutions. Extra revenue could include a margin on the devices sold (from a price range of ~US$10 to US$150)

Table 9: Benefits to Mobile Operators and Community

Benefits to	
Operators	Local ARPU increase due to availability of charging solutions New mobile users within community Increased community support for the company brand (churn reduction)
Community	Time savings (reduced travel to charging shops) Cost savings (reduced charging expenditures) Ability to charge multiple devices (external chargers) Local Empowerment

Bundling option: for external chargers, solutions could be bundled with airtime or handsets, so that users within a community have access to a full package of mobile communication

Leasing model: solutions could be leased to end users to reduce the primary cost of ownership and upfront capital

10. GSMA–2010–Based on the average ARPU per country and a conservative estimate of 10% ARPU increase from charging solutions
11. Source Digicel

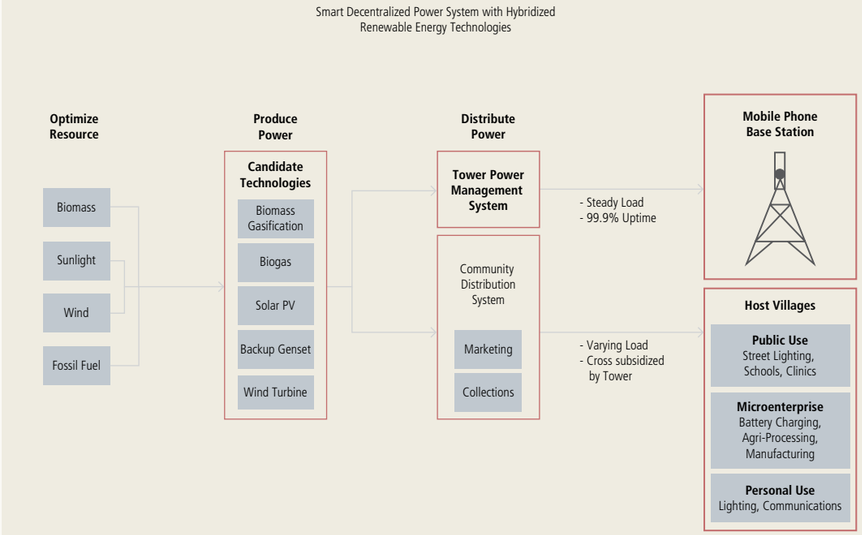
The Rockefeller Foundation's SPEED Project in India

By Zia Khan, Rockefeller

Smart Power for Environmentally and Economically Sound Development (SPEED) is an initiative of the Rockefeller Foundation that was initiated in 2008-09 through a consortium of partners: Decentralised Energy Systems India Private Ltd (DESI Power - an India based rural electrification organization), Cleanstar Energy (an organisation involved in sustainable bio-fuels production and distribution) and the Confederation of Indian Industry's Green Business Centre (CII-GBC).

The SPEED project aims to address the needs of approximately one-third of the world's population that do not have access to electricity. SPEED will identify business models and support scalable demonstration pilots of off-grid renewable energy generation and distribution systems that harness the power demand of mobile phone infrastructure and other local enterprises to provide electricity services and spur economic growth in rural communities. The mobile phone towers will provide anchor demand for power generated by rural power plants, thus increasing their commercial viability so that they can generate and distribute affordable power to rural communities. SPEED will initially focus on India where 400 million people remain without electricity, with the goal to expand to other geographic regions, particularly in sub-Saharan Africa.

Figure 15: SPEED Model Description



Source: SPEED

The SPEED project's strategic action agenda is to:
Build an enabling environment that encompasses a broad range of stakeholders, including mobile phone industry, government ministries, private investors, local entrepreneurs, bilateral and multilateral institutions, technology enterprises, local business schools, research institutes and civil society organisations.

Mobilise financing for the ESCOs so that there is a significant flow of commercial, government, and donor funding for these projects.

Case Study in Baharbari - Bharti Infratel and DESI Power

In 2001, DESI Power identified the rural Bihar region and the powerless Baharbari village in Bahabari district as a potential site for a 50 kW power station, based on gasification of rice husk briquettes. The 50 kW plant was later upgraded to 61 kW. The raw material was available in abundance in neighbouring villages.

Figure 16: DESI Power Gasifier

By 2004, villagers could access electricity in their household for a fixed monthly rental fee. According to DESI Power's concept of "EmPower Partnerships for rural development", the access to power also benefited micro-enterprises and led to local value addition, agro-processing industries, and increased agricultural productivity. These micro-industries and the power plant generated regular jobs and additional farm income which in turn increased purchasing power for electricity, energy services, drinking water, health services and education. Following the success of its first power plant in Bahabari, DESI setup a second similar gasifier based power plant of capacity 61 kW in Vebhra village in Araria district, followed by two more gasifier power plants of capacity 75 kWe in Gayari village and Zero Mile area of Araria district in 2008.

Despite the success of DESI Power in creating a thriving local economy in the Araria district by setting up multiple power plants that use locally available feedstock, achieving commercial returns from the operation of these power plants was still a challenge. Hence, DESI Power became a part of the Rockefeller Foundation-led SPEED project to increase the financial viability of its power plants by powering local telecom towers, adding a strong anchor load customer to the power plants. The SPEED project team conducted a market research and developed business models for this purpose, following it up with their first set of pilots which involved connecting the existing 4 DESI power plants in Araria to telecom towers. The process of connecting DESI's power plants to these telecom towers began in June 2010 and the current status (as of March 2011) is as shown in the table below:

Table10: Current Status of Telecom Tower Connections for the SPEED project

SI No.	Place	Tower Name Owner	Tenant	Infrastructure Provider	Load from Telecom Tower (kW)	Remarks
1	Jokihat	Bharti Infratel	Tata Indicom	Bharti Infratel	10	Due to single phase issue, it is decided jointly not to connect this tower. Bharti has identified a new tower
2	Jokihat	Vodafone	IDEA	Vodafone	6	Connected
3	Jokihat	Tata Docomo		Tower Vision	5	Cable laid but not connected. DESI is waiting for the confirmation from Tower Vision, Technically OK.
4	Gaiyari 1	Tata Indicom		VIOM Networks	6	Cable laid, DESI is waiting for the confirmation from Tower Vision. Technically OK
5	Gaiyari 1	Vodafone		Vodafone	6	Cable laid, Vodafone has agreed but some local issues need to be sorted out
6	Zero Mile, Araria	Vodafone	IDEA+Tata Docomo	Vodafone	6	Connected
7	Zero Mile, Araria	Bharti Infratel		Bharti Infratel	4	Connected

Source: DESI

Figure 17: Local Entrepreneurs in Gaiyari

DESI Power's 75 kWh biomass gasifier based power plant in Gaiyari is currently supplying power to a Bharti Infratel tower and a Vodafone-owned tower which is shared by Vodafone, Idea Cellular and Tata Docomo equipment. However, the difference in load provided by telecom towers and other consumers is due to the fact that telecom towers provide a continuous load to the DESI power plant for 6-7 hours everyday (when the power plant runs) whereas power is supplied to other consumer based on their need as all the consumers may not be using power all the time.

Being connected directly to the DESI Power gasifier plant, allows the mobile operators to reduce their overall operational expenses. In the case of the Bharti Infratel owned tower in Gaiyari, this operational expense saving has been quantified in terms of reduction of diesel generator (DG) run-time per day. This saving in number of DG running hours translates into 1.8 litres per every hour of DG run-time at the Bharti Infratel site[12].

Table 11: Reduction in Diesel Generator Use from the Use of DESI Power Plant

Diesel Generator Run Time per day BEFORE connecting to DESI Power's gasifier plant)	Diesel Generator Run Time per day AFTER connecting to DESI Power's gasifier plant)
22.8 hours per day	17.8 hours per day

Source: Bharti Infratel

12. The Bharti Infratel tower is a Ground-based Tower (GBT) which is shared by two base station equipmenr (including one from Bharti Airtel) and both the equipment are outdoor base station type (hence they don't require air-conditioning, which reduces their overall power requirement).

Regulatory Environment

For all its four existing gasifier power plants, DESI Power has not faced any regulatory issues around power distribution licensing since it operates the plant as a captive power plant which is part-owned by the local community which buys power from the plant. Ministry of New and Renewable Energy (MNRE), Government of India and the Bihar State Government have both confirmed that in rural and off-grid areas, supplying power to any consumers within a 3 km radius doesn't require any distribution licensing.

Social, Environmental and Climate Change Benefits

The business enterprises yield considerable social and environmental benefits through reducing air pollution from diesel engines, creating rural jobs by adding value to local, renewable resources, and increasing the GDP of the village by keeping most electricity revenues within the local economy. Other benefits include health, access to information and communication technology (ICT) and financial services, and enhanced water and food security. Furthermore, the increased prosperity of rural populations enhances their social, economic and political participation in the democratic process. The entire array of social and economic benefits of typical business enterprises in villages encompasses those that are easily quantifiable-such as total employment, number of jobs for women, increases in income and local GDP- those where new measurement metrics are required, and those that resist quantification.

Next Steps

Since the launch of the SPEED project at the end of 2009, more stakeholders have expressed interest in joining this initiative. The SPEED project's strategic action agenda is to establish 7-8 clusters of up to 50 village-level decentralised renewable energy units that test a diversity of commercially scalable models across different renewable energy technologies and geographical conditions by the end of 2013.

The goal is to demonstrate the sustainability of the model and create verifiable conditions for its scaling up. SPEED will also continue to promote favourable policies and regulation, engage critical industry players, create financial models and promote increased channels for affordable technology dissemination.

Telecom tower companies such as Bharti Infratel are interested in continuing to work with DESI Power on similar projects since it can reduce their operational expenses as well as assist them in enabling the local community to access DESI's power at lower costs than before.

Community Power from Mobile: The Ecology Foundation

By Declan Murphy

Affordable electric power is the underlying currency of all global society. Delivering electric power to off-grid rural communities is a challenge well under way in developing countries.

Many approaches are being tried, but the most pragmatic is to use existing infrastructures to facilitate power generation in communities. The goal is to roll out low cost energy systems to empower the lives of millions of people within the next decade. In this context, the mobile communications industry has already proven the ability to reach off-grid populations rapidly and affordably. Now, many rural areas have an infrastructure poised for further positive social impact, the delivery of micro power to communities!

The Ecology Foundation has been developing concepts and models for sustainable and affordable micro power since 2008 and has collaborated with GSMA to pilot systems in 2011. The approach is simple and effective; to extract about 10% of the excess power generated at existing operator base stations and deliver this directly to off-grid communities. The communities' initial usage for power would be for cell phone charging followed by domestic lighting and eventually micro businesses. This in turn supports the usage of local base station traffic; a win-win relationship.

There are a few important factors to consider in order to deliver this concept successfully:

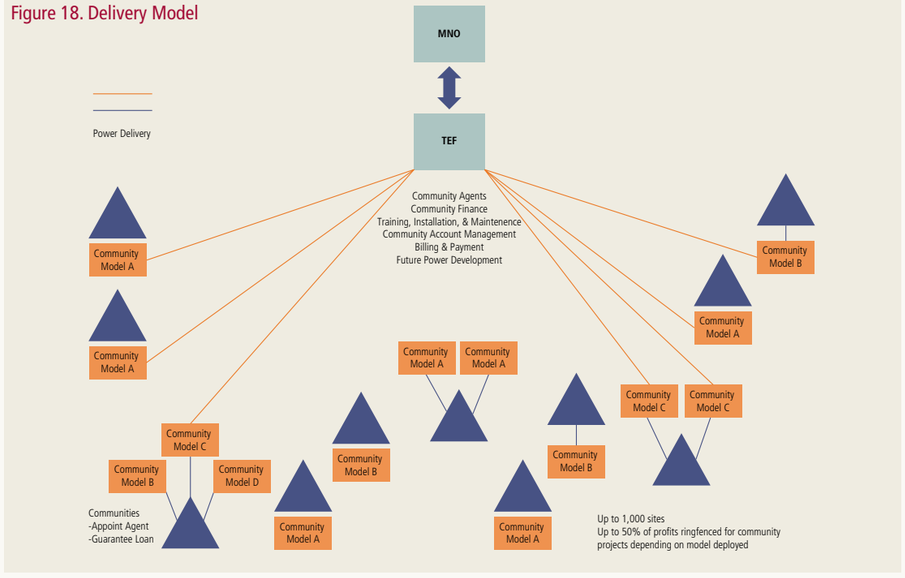
- Proper charging solutions
- Trained human resource
- A strong supply chain
- Partnerships with key organisations

There can be many different models for this concept. The easiest and most efficient model is:

- The Ecology Foundation (TEF) and Mobile Operator select suitable base station sites
- TEF appoints a local 'Energy Agent'. The energy agent is provided wih sufficient training for maintaining daily activities as well as being the first level of local social networking
- TEF sets up an energy kiosk.
- TEF delivers energy services to community as follows:
  - Individual/multiple phones charging.
  - Airtime sales (free charging if bundled with airtime)
  - Household electric lanterns & battery exchange service
  - A micro-finance institution can assist local community with purchasing household lighting devices.

As the sites will be located at remote areas, creating a strong supply chain will be a challenge for TEF. TEF can partner with existing organisations to overcome the supply chain constraints. An overall delivery model as follows:

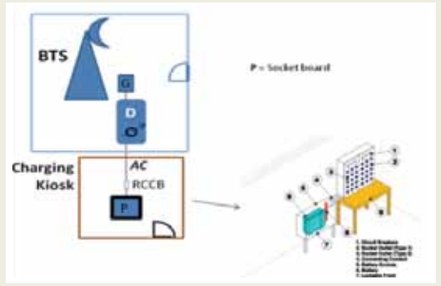
Figure 18. Delivery Model



In different locations, the community scenario is different. The charging model should be compatible with community needs as well as being within reach. Sometimes the base station is located inside the community centre, but on occasion located a bit further away from the community centre. Considering both scenarios, there are two potential charging models:

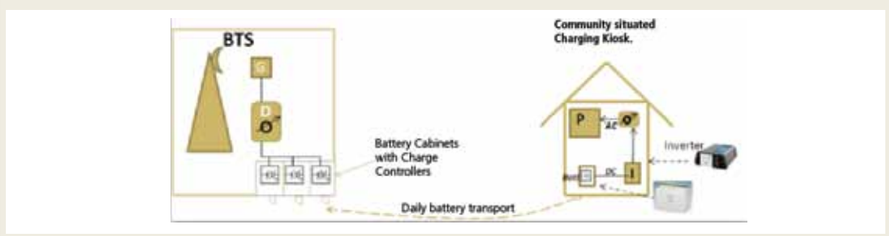
- Charging at Base station
- Charging at Community

Figure 19: Charging at BTS:



- TEF sets up energy kiosk outside the BTS
- Power is direct from a standard metered charge controller of the kiosk
- Kiosk consists of plug board with approximately 34 standard sockets
- Agents charge handsets, lights and other small domestic devices for end-users
- Community agent pays TEF directly through mobile money

Figure 20. Charging at Community:



- TEF sets up kiosk inside the community (which may be 1-2 km away from BTS)
- A large deep cycle battery is charged by the agent at the BTS
- Power is brought by battery several times a day to the energy kiosk
- Kiosk consists of plug board with approximate 34 standard sockets
- Agent charge handsets, lights and other small domestic devices for end-users
- Community agent pays TEF directly through mobile money.

The concept targets to extract only 2-4kWh power per day from the base station diesel generator. This requirement may increase due to the community demand. Independent solar panels can be integrated to cope with extra power requirements, if any. The charging service for mobile phones can be delivered with a minimum fee, or no fee when bundles with airtime, to the local community. Having a charging facility inside the community will eventually increase the APRU for mobile operators by 10-20%.

It will also assist with creating a new subscriber base for the operator. An estimated US$9000/year will be returned to the mobile operator from this initiative, per base station. Primarily the initiative will be invested by TEF, therefore mobile operator will be free from any CAPEX requirements.

Power, like food, shelter and clean water, is an essential component for social development. Social development is in the interest of all stakeholders as it builds the current market as well as fulfilling a personal and corporate desire to have a positive impact.

The Ecology Foundation, with support from GSMA and Mobile Network Operators expects to make a globally significant impact on community power delivery.

If you would like some further information about these models, please contact:
Declan Murphy
Founder, The Ecology Foundation,
Email: declan.murphy@theecologyfoundation.org

The Barefoot Power Model on Community Power from Mobile

By Stewart Craine

Barefoot Power is a global, social and profitable enterprise that manufactures and distributes solar phone charging devices, lighting products and business development services to people at the base of the global economic pyramid. Barefoot Power has impacted the lives of 1 million people in over 20 countries. Over 1.5 billion people lack access to electricity and Barefoot Power's goal is to bring affordable renewable energy and efficient lighting to 5 million people by 2012 and subsequently 10 million people by 2015 in order to help eradicate energy poverty.

Barefoot Power has partnered with the GSMA and mobile operators/tower companies in India to pilot off-grid community charging service models to reach 1 million individuals in the next three years.

Barefoot Power's charging service model involves utilizing telecom tower power systems that have unused capacity, and sharing general tower real estate, to help improve access to electricity for surrounding communities. There are two different service models that will meet the needs of communities:

- **Barefoot Power Charging Stations - Nearby Villages** – Villagers within 1-2 km of the tower can visit stations for battery and phone charging. The tower would also be a retailer and last-mile **supply point** of Barefoot Power's lighting products. These stations will also provide a direct **after sales services**.
- **Barefoot Power Field Charging - Outlying Villages** – Villages 2-20km from the tower will be serviced by daily trips conducted by staff based at the tower. The tower will act as an energy hub; a district supply point and service centre:
  - As a **supply point**, it will act as a shop and a local distributor to retailers, supplying primarily pico solar lighting and phone charging systems of 1-15 watt per household.
  - As a **service centre**, it will provide last-mile logistical and installation services for larger systems of 10 - 200 watts. These are predominantly Solar School charging stations, which serve as centralized power access points. The Solar Schools may play a role as a service centre and would be the first point of contact point after-sales service for nearby village households. For outlying villages, the Solar School would be more of a second level of service.

Benefits from Community Power from Mobile

Telecom Tower Infrastructure Companies

The cost to tower companies is minimal. There would only be a marginal increase in operational expenditure for the tower due to the increased power consumption by Barefoot Power's for charging devices. In return, tower companies will have the following benefits:

- Enhanced tower security
- Increased revenues from direct sales of power and space rental at tower
- Increased community support
- Increased customer support (customers in this case are mobile operators who are tenants of the tower) and loyalty due to the tower company helping to increase phone usage in the area - hence an increase in ARPU
- Long term additional revenue and profit streams from a new line of business; selling electricity

Mobile Operators

Mobile operators who rent space on the tower managed by the tower company will have a direct benefit from the implementation of Barefoot Power's model. They will see a 5-15% increase in ARPU when households have reliable power supplies which lead to the subsequent increase in handset usage.

Barefoot Power

By bringing electricity to people that currently use kerosene lighting and travel far and wide for phone and battery charging, Barefoot Power will extend its rural distribution and reach 1 million households in India with clean lighting within the next 3 years. This in turn would support Barefoot Power's global goals.

Schedule

The Barefoot Power Charging Stations will be setup in 2011, with multiple tower companies in India. This will be followed by a phase of monitoring, evaluation, accumulating and applying learning from the pilots to finely tune technical designs and business models. Post pilot phase, Barefoot Power plans a large scale roll out of 100-200 new energy hubs being set up within 3-4 years.

Energize the Chain Initiative

By Dr. Harvey Rubin and Judah Levine

People living in the rural regions of developing countries are often deprived of local healthcare facility access. With more than 2 million persons[13] dying each year from the unavailability of vaccines, local solutions to ensure vaccines are available and efficient in rural and off-grid regions have to be developed. **Energize the Chain (EtC)**, a recently formed, not-for-profit organization, aspires to eradicate vaccine-preventable deaths worldwide by preserving the vaccination cold chain to ensure delivery of active vaccines. At the simplest level, EtC proposes to use power installations at cell towers as the energy source to power vaccine refrigeration units in remote locations that currently lack the energy infrastructure needed to preserve the cold chain. The project is currently seeking new partnerships with mobile operators and international foundations.

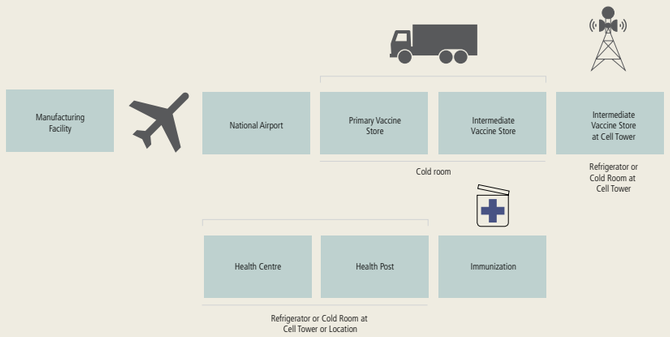
Preserving the Cold Chain for Vaccine Effectiveness

Many vaccines must be kept at a prescribed temperature to maintain their potency. Typical distribution models have relied for now on delivering vaccines to remote destinations in insulated cold-boxes. Disruption of the "cold chain" that ensures temperature-sensitive vaccines remain effective cripples these prevention efforts, and in the absence of thermo-stable vaccines, preserving the vaccination cold chain requires immediate focus. This approach requires that vaccines be administered almost immediately upon arrival, as the cold-boxes are limited in their ability to maintain the necessary temperature conditions (between 2°C and 8°C). Due to these limitations, vaccines often either freeze or exceed their upper temperature range and are rendered virtually useless.

The Vaccine Cold Chain Utilizing Cell Tower Power Facilities

Approximately 75% of the world is covered by a mobile cellular signal, and that percentage is expected to reach nearly 100% by 2015[14]. This expansion of mobile coverage transports the presence of energy by necessity to remote locations, many of which are otherwise without access to centrally provisioned power. In off-grid regions, cell towers offer a constant supply of energy, sourced from any combination of diesel generators, battery backup, gas turbine, renewable energy, and other options.

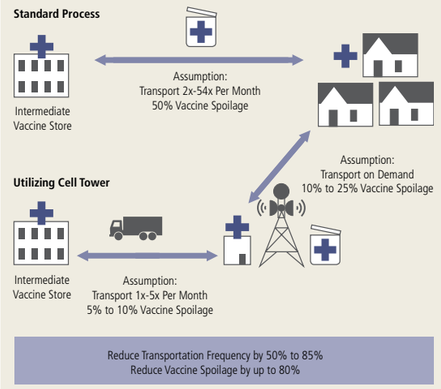
Figure 21. Energize the Chain Concept to use Cell Tower power for Vaccine Fridge



Source: EtC, HipConsult

Access to refrigeration at these remote destination points would enable vaccines to be stored for longer periods of time. This would allow for a critical mass of vaccines to be delivered at one time, warranting the use of a transportation vehicle (e.g. a refrigerated truck). This vehicle would provide more stable temperature conditions than a cold-box, thus preserving the integrity of the vaccines and eliminating the pressure to immediately administer them. All of this would not only improve the integrity of the vaccines but also reduce costs.

Figure 22. Illustrative View of Efficiency Opportunities in Vaccine Cold Chain Using Cell Tower Power Facilities



Source: EtC, HipConsult

A typical vaccine-storage refrigeration unit requires at least eight hours of daily power supply[15]. Harnessing the energy potential of cell tower facilities provides the means to power these refrigeration units. Research shows that base stations often have a surplus of power capacity of about 5kW for a diesel generator powered BTS and under 5kW for a BTS powered by alternative energy sources[16]. Considering that a refrigerator unit consumes between 0.5 – 1.9kW[17], there is ample power at most cell tower sites today to supply refrigeration units. Many tower sites also have some spare land available to support an additional shelter for these units.

The Potential Socioeconomic Impact

The numbers of lives impacted by increasing the delivery and access to effective vaccines may extend well beyond the two million lives lost to vaccine-preventable illnesses each year. It is estimated that under the current coverage of vaccine delivery and utilisation, there are almost 400 million life years saved and 97 million disability-adjusted life years saved annually by vaccines. The same study showed that there are almost six million deaths prevented annually by vaccination[18].

The Potential Business Impact

While the opportunity to extend and sustain the vaccination cold chain is clearly compelling from social and macroeconomic standpoints, the attendant challenge is to identify a suitable business model which will allow for a scalable implementation and sustainable operation of this concept. Due to the lack of proven business models, initial funding will need to come from governmental agencies, foundations and other public and private not-for-profit sources. Pilot programs will likely be funded by one time grants, with the goal of working the projects into a more sustainable government or NGO budget. Once the economics of a business model are solidified, then private enterprises may be compelled to enter this space, creating a more competitive and dynamic market which focuses on the cold chain application or uses it as an anchor tenant to support other services.

Energize the Chain is hoping to demonstrate a proof of concept that using cell site refrigeration will help to improve vaccine integrity and reduce costs in the cold chain. In order to do this, it will need to take on the capital and operating expense required to support the refrigeration site. Economic benefits from this are only realised if EtC participates in the portions of the cold chain where costs are reduced; primarily vaccine spoilage and transport efficiencies. While EtC's concept is in its nascent stage, many stakeholders have expressed enthusiastic interest in the program. Currently, EtC is pursuing multiple options for early sites, including locations in India and Africa, and is developing the initial pilot to take place in Andhra Pradesh, India. In many of the potential early locations, EtC is working with representatives from the government agencies that currently administer most of the vaccines.

13. WHO
14. World Telecommunication/ICT Development Report 2010. "Monitoring The WSIS Targets: A mid-term review." International Telecommunication Union.
15. UNICEF. "Handbook for Vaccine & Cold Chain Handlers 2010. "Department of Health and Family Welfare. Ministry of Health and Family Welfare, Government of India.
16. "Community Power. Using Mobile to Extend the Grid. "The GSM Association Green Power for Mobile. January 2010.
17. Harvey Rubin, Alice Conant: Energy for health: Cell phone expansion and disease prevention.
18. Table 4 in Ehreth, J., The Global Value of Vaccination. Vaccine (2003) vol. 21, 595-600.

Base Healthcare Model

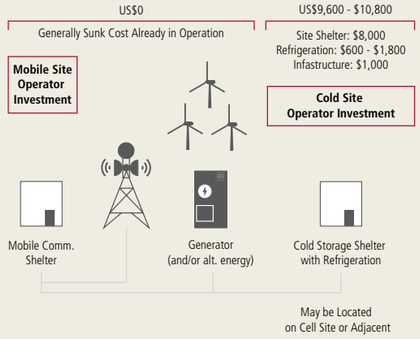
Cold Storage Provider

- Leases land and power from site operator
- Builds and maintains cold storage

Funding Sources

- Government funds via direct involvement, grants or sponsorship
- Private investment in non profit
- Hybrid government and private investment and/or use of government subsidies or incentives

Figure 23. Base Healthcare Model for Cold Storage at Cell Site



Source: EtC, HipConsult

Early initiatives will be primarily public sector funded, with private operations potentially developing once a business model is proven.

A mobile operator or tower company, which already operates the power generation at its sites, would be the logical support provider for co-located refrigeration shelters. In terms of pure business merit, supporting the power and shelter requirements for vaccination could represent a high margin business, but requires scale and contains risk (i.e. a simple reality whenever dealing with peoples' lives). However, there are other indirect benefits that may be attractive to operators, such as social responsibility and community goodwill.

The revenue opportunities in supporting this application are multi-fold. Initially there is the straight forward opportunity of selling power as well as leasing land and offering site management services. In the base healthcare model, the cold storage provider leases the land and power from the site operator. This may generate an additional US$400 to US$1,200 per month per site using excess power[19]. The margin on these services is high as the investment is sunk and the site is already in operation. Investment in additional power capacity to supply larger refrigeration units could double or quadruple revenue at somewhat lower margins provided demand exists. Beyond the direct revenue potential, there is an opportunity for the operator to offer value added data services related to the refrigeration units and the shelter, such as remote monitoring and alarming on temperature ranges and unit operation, inventory control and tracking, and security monitoring.

If you are interested in additional information about Energize the Chain, please contact:

Dr. Harvey Rubin at **rubinh@upenn.edu**

19. Estimates based on market land lease and power circuit rates

The below article is a Press Release issued by Viom Networks on the 28th March 2011 whilst this report was in production. Therefore this is a verbatim reproduction of Viom's Press release and has not been manipulated in any way. GPM sees this information as vital in relation to CPM and essential for it to be included in this report to draw attention to the work that is being done in India.

Kapil Sibal inaugurates Viom Networks' Rural Service Centre

- Rural Service Centre a culmination of the Hon'ble Minister's vision to usher in Telecom Revolution 2.0 in rural India
- Innovative concept of 'Power of Tower' by Viom, to partner with Government in nation building exercise
- Rural Service Centres to drive the Government's vision of universal Education, Financial inclusion, Telecom services, Healthcare and e-Governance related services for rural India
- Huge employment and entrepreneurship potential for rural population

The Hon'ble Minister of Communications & Information Technology, Mr. Kapil Sibal, today inaugurated the model Rural Service Centre (RSC) of Viom Networks, India's leading independent telecom infrastructure company. Based on the vision of the Hon'ble Minister, the Rural Service Centre, set up at village Badshahpur in Gurgaon, is an innovative concept of .Power of Tower, developed by Viom Networks for leveraging its existing infrastructure through the Public Private Partnership (PPP) model to achieve the Government's vision of providing universal Education, Financial inclusion, Telecom services, Healthcare, e-Governance facilities and other related services to the rural population, thus ushering in the second round of telecom revolution 'Telecom Revolution 2.0' in the country.

Inaugurating the Rural Service Centre, The Hon'ble Minister of Communications & IT, Mr. Kapil Sibal said "I strongly believe that the telecom infrastructure sector offers a tremendous untapped potential that can be leveraged to enhance various Govt. programmes and initiatives in rural India. Telecom infrastructure, especially towers that are located at remote locations in the country can be used to promote various social and economic development initiatives. The industry can, in actual terms, become true partner of the Govt. and play a critical role in promoting growth in rural India. Our host Viom Networks has demonstrated this impressively at their Proof-Of-Concept site at Badshahpur, Gurgaon. I urge the entire telecom infrastructure industry to come together and work towards making this concept a nationwide reality and help the people in rural India enjoy the benefits of connectivity and convergence and be Government's partner in progress."

During the launch of Rural Service Centre Mr. Arun Kapur, CEO, Viom Networks said "Having pioneered the shared telecom infrastructure services industry, it has always been our endeavour to offer various innovative products and solutions to our operator partners. Our telecom infrastructure solutions have significantly reduced investments and costs for telecom operators, resulting in affordable telecom services for the common man thus facilitating the first leg of telecom revolution in the country. The Rural Service Centre concept, envisioned by the Hon'ble Minister and developed by us, is yet another innovation aimed at leveraging our existing telecom infrastructure across the country to usher in the second round of revolution in rural India Telecom Revolution 2.0."

"Through these Centres we aim to partner with the Government to achieve their vision of bridging the digital divide through a range of telecom services, enhancing literacy in rural India, driving the agenda of financial inclusion, providing healthcare facilities & consultation using telecom infrastructure, plugging inefficiencies in the rural system by driving e-Governance and offering various other services aimed at bringing rural India into the mainstream, thus contributing to the Government's vision of Bharat Nirman. This concept can be adopted by the entire telecom infrastructure industry, providing the Government a large canvas to implement its various initiatives effectively that are aimed at the social-economic growth of the rural population", added Mr. Kapur.

The brainchild of the Hon'ble Minister and developed by Viom, the idea behind the Rural Service Centre is to utilize existing telecom infrastructure to partner with the Government through a PPP business model and provide various services and facilities to the rural population. The Centres will also help create huge employment as well as entrepreneurial opportunity at the local level. The company has plans to extend this facility at a pan-India level to its rural sites spread across 879 districts, thereby bringing the real Bharat into the mainstream. Viom's strong grass-root level presence will also aid effective implementation of Government outreach programmes such as Polio Vaccination drives, while the company's time-tested entrepreneurial culture and corporate ethics will ensure accountability and increased productivity in this innovative initiative.

The Rural Service Centre is aimed at offering a range of services:

1. Education for all - e-Education, primary and vocational classrooms
2. Universal Healthcare - vaccine storage, telemedicine leveraging telecom services
3. Financial inclusion through ATM services - biometric ATMs
4. e-Governance: access to PDS rates, Commodity prices, employment exchanges, payment of taxes, birth, death, land record registration
5. Water: provision of bore well water
6. Information Display Board - updated real-time information in local language, weather monitoring, mandi rates, immunization drive etc.

The available site premises will be used for offering a range of additional services such as mobile charging and recharging points, rural cyber cafes as an entrepreneurial opportunity to local youth, as well as other value added services such as utility payments (power, water, telecom bills), travel bookings, mobile top-up facility, weather monitoring, function as Business Correspondent (BC) to raise deposits, disburse tiny loans, recover bad loans, sell micro insurance, mutual funds, pension products and other third-party products, and receive and deliver small value remittances. The real estate and other assets (for e.g. 24x7 power availability) can be extended to other Government & private initiatives based on opportunities.

About Viom Networks Limited: Viom Networks Limited, a joint venture between Tata Teleservices and Quippo, a Srei Group enterprise, is the pioneer in Shared Telecom Infrastructure industry in India. In 2009, the parent company - Quippo Telecom Infrastructure Limited (QTIL) announced its partnership with Tata Teleservices Ltd. (TTSL) with the merger of their passive infrastructure businesses, resulting in the formation of a unified entity - Viom. The company further strengthened its leadership position with the acquisition of the tower arm of Tata Teleservices (Maharashtra) Limited in early 2010. Viom is an independent entity with over 38,000 towers and with over 89,000 tenants. The company plans to roll-out nearly 20-25,000 additional towers in the next two years and take the tenancy ratio to 2.5x from a current of over 2.25x. Viom is the strongest player in neutral host Shared In-Building Communication Solutions (IBS) with installations already completed at most of the major airports.

Services to be offered at the Rural Service Centre

1. **Education for all:** Aimed towards Right to Education (RTE), primary as well as vocational (professional) education will be provided by building an additional shelter in the tower site premises for uninterrupted learning sessions. This will further help build an educated workforce by providing opportunities for entrepreneurship and enhancing employability of the rural population.
2. **Universal Healthcare:** With an objective to make rural areas healthy, safe and equipped with medical facilities, provision of storing Life savings drugs is made in the freezer units installed within the shelters at the sites. The site premises could be used to carry out vaccination programs also.
3. **Financial inclusion through ATM services:** ATMs at the site will help promote financial inclusion in rural India. These machines can be used for disbursal of wages under Mahatma Gandhi National Rural Employment Generation Scheme (MGNREGS), thus minimizing the role of the middle-man. These facilities can also be extended for selling other financial products such as infrastructure bonds, mutual funds, loan disbursals/collections etc.
4. **e-Governance:** Internet enabled computers will allow citizens to access various Government sites for information on PDS rates, Commodity Prices in various markets, employment exchanges, MGNREGA Sites etc. In addition services like payment of taxes, registration and access to birth, death and land records etc. can be used. Sahaj, a group concern of SREI, would aid in this endeavor.
5. **Rural Cyber Cafe:** Computers installed could be leased out to local entrepreneurs to be used as cyber cafe for providing not only Internet access but also value added services such as utility payments (power, water, telecom), undertake travel bookings, mobile top-up facility etc.
6. **Water:** Viom also aims to setup provision of bore-well water at all its Rural Service Centre sites in order to meet the acute storage requirement of local areas.
7. **Information Display Board:** A LED display board, installed on the boundary wall of the site, will provide access to updated real-time information in local language on various rural programs benefiting the local community: weather monitoring, mandi rates, immunization drive etc. The display board will run on remote low-power consumption and will be updated from a central control-room.
8. **Charging Facilities:** Electrical charging facility has been provided for mobile phones and rechargeable electrical lanterns.
9. **Security Cameras:** These will help the security guard in monitoring access-to-site, ATM and Education centre. These cameras can also enable remote monitoring of implementation of Education Programs and ATMs. These could be upgraded and mounted on towers for local area monitoring of sensitive areas.

Glossary

2G/3G
Second-generation and third-generation mobile telephone technology

AC/Alternating Current
An electrical current or voltage with a changeable direction (polarity) with respect to a fixed reference

Ah/Ampere-hour
Unit of electric charge, the electric charge transferred by a steady current of one ampere for one hour

ARPU
Average Revenue per User

BoP
Base of Pyramid

BTS/Base Transceiver Station
The name for the antenna and radio equipment necessary to provide mobile service in an area

CAPEX
Capital Expenditure

CO2e/Carbon dioxide equivalency
A quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO_2 that would have the same global warming potential when measured over a specified timescale.

COAI
Cellular Operators Association of India

CPM
Community Power from Mobile, GPM project

DC/Direct Current
An electrical current or voltage with a constant direction (polarity) with respect to a fixed reference

ESCO
Energy Service Company

GDP
Gross Domestic Product

GHG
Green House Gases

GPM
GSMA Green Power for Mobile Programme

GPRS
General Packet Radio Service

GSM
Global System for Mobile communications

GSMA
GSM Association

IFC
International Finance Corporation - a member of the World Bank Group

IRR
Internal Rate of Return

kg/kilogram
A kilogram is a unit of mass

km/kilometre
A kilometre is a measure of distance

KPI
Key Performance Indicator

kVA/Kilovolt-Ampere
The unit of apparent power. KVA is used for measuring the power consumption of non-resistive equipments such as generators

kW/kilowatt
A kilowatt is a unit of power (see watt)

MEE
Mobile Energy Efficiency, GSMA Initiative

MHz/megahertz
The hertz is a unit of frequency. It is defined as the number of complete cycles per second.

MSC/Mobile Switching Centre
Interface between the base station system, ie the BTS and the switching subsystem of the mobile phone network

OPERATOR
Mobile Network Operator

NGO
Non Governmental Organisation

NVP
Net Present Value

OPEX
Operating Expenditure

PV/Photovoltaic
In this instance refers to PV cells which convert visible light into direct current

ROI
Return on Investment

V/volt
The value of the voltage equal to one ampere at one watt of power

W/watt
A unit of electrical power equal to one ampere under a pressure of one volt

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Resources

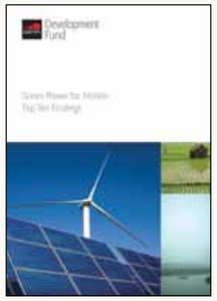
http://gsmworld.com/our-work/mobile_planet/green_power_for_mobile/resources.htm

Green power for Mobile Bi-Annual Report (November 2010)

http://www.gsmworld.com/documents/GPM_Bi-Annual_Report_Nov10.pdf

Green power for Mobile Bi-Annual Report (June 2010)

http://www.gsmworld.com/documents/GPM_Bi-Annual_Report_June_10.pdf



Green Power for Mobile: Top Ten Findings

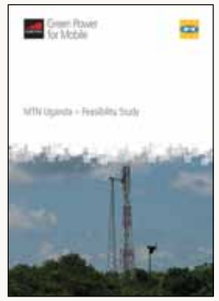
http://www.gsmworld.com/documents/green_power_top10.pdf

An overview of the top ten research findings for green power solutions for mobile networks.

Community Power – Using Mobile to Extend the Grid

http://www.gsmworld.com/documents/gpfm_community_power11_white_paper_lores.pdf

This study discusses how the mobile industry can help provide environmentally sustainable energy to people in the developing world who live beyond the electricity grid.



Green Power Feasibility Study – MTN Uganda

http://www.gsmworld.com/documents/gpfm_mtn_feasibilitystudy_pages.pdf

Comissioned by Digicel Haiti, this study analyses the operator's network and proposes an implementation plan for a green power network.

Green Power Feasibility Study – Digicel, Haiti

http://www.gsmworld.com/documents/digicel_haiti_04_10_med_res.pdf

Comissioned by Digicel Haiti, this study analyses the operator's network and proposes an implementation plan for a green power network.

Community Power Feasibility Study – Zantel, Tanzania

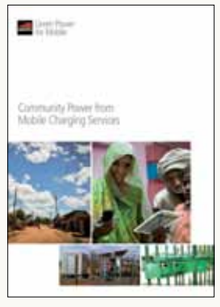
http://www.gsmworld.com/documents/zantel_tanzania_page_layout(1).pdf

A Feasibility Study to analyse the operator's network and propose an implementation plan for a green power network..

Green Power for Mobile: Charging Choices (2010

http://www.gsmworld.com/documents/charging_choices.pdf

This study discusses charging solutions for handsets in off-grid areas and identifies a US$2.3 billion market potential for those solutions.



Green Power for Mobile: Charging Services (2011)

http://www.gsmworld.com/documents/charging_services_2011.pdf

Green Power for Mobile: Charging Choices (2011)

http://www.gsmworld.com/documents/charging_choices_2011.pdf

Green Power for Mobile Replication Guide

http://www.gsmworld.com/documents/replication_guide.pdf

An interactive toolkit to help mobile network operators choose the right energy solution for phone masts of tomorrow.

HOMER Software – Training Guide for Renewable Energy Base Station Design

http://www.gsmworld.com/documents/homer_training_guide_210X297.pdf

A free software application used to design and evaluate technically and financially the options for off-grid and on-grid power systems for remote, stand alone and distributed generation applications.

Green power for Mobile Vendor Directory

http://www.gsmworld.com/documents/vendor_directory.pdf

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