



Green Power for Mobile

ZANTEL



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Supported by



Case Study

Green Power Feasibility Study – Zantel, Tanzania



Key Facts

Tanzania

Population: 41 million¹

GDP Per Capita: US\$442²

Mobile Penetration: 23%³

Internet Penetration: 1.3%⁴

Grid Penetration: 11%⁵

Executive Summary:

The GSMA Green Power for Mobile (GPM) programme was commissioned by Zantel, Tanzania during Q3 2009 to complete a Feasibility Study to analyse the operator's network and propose an implementation plan for a green power network. The study analysed the entire operator's network and ranked the most suitable green sites according to specific criteria defined in the Green Power for Mobile methodology.

The main findings of the study are as follows:

- GSMA analysed a total of 231 sites (147 diesel powered, 84 grid powered)
- GSMA recommended an implementation of 50 solar, 17 wind, 48 hybrid, 84 diesel/battery
- With a first phase implementation of 10 sites to test different vendor solutions before full scale implementation

- The implementation of green power technology in BTS sites represented a technically feasible and financially attractive solution with payback period of less than three years at 115 sites
- Energy analysis should be undertaken at network planning stage (i.e. during land acquisition process)
- Low power, diesel generator only sites show the best financial indicators
- Mobile operators venturing into green power solutions for their networks must be supported by resources experienced in the specific application of green power and telecoms. The GSMA offers technical assistance services through its GPM programme to provide operators with the skills and understanding to implement green power solutions.

1 US Department of State (<http://www.state.gov/r/pa/ei/bgn/2843.htm>)

2 US Department of State (<http://www.state.gov/r/pa/ei/bgn/2843.htm>)

3 Wireless Intelligence (<http://www.wirelessintelligence.com>)

4 InternetWorld Stats (<http://www.internetworldstats.com/africa.htm>)

5 United Nations Development Programme (<http://www.undp.org>)

Zantel:

Zanzibar Telecom (Zantel) was launched in July 1999 and is a joint venture between the Government of Zanzibar, Etisalat (Emirates Telecommunications Corporation), Kinbary Investment and Meeeco International. Zantel has been a pioneer in the Tanzania telecommunications market, by being the first operator to introduce wireless internet and per second billing and is one of the fastest growing operators in the region.

Power Infrastructure in Tanzania:

Tanzania is a vast country, with a diverse landscape covering areas like the Serengeti Plain, Lake Victoria and Mount Kilimanjaro. The country has a growing population of more than 40 million people and is one of the fastest developing countries in Africa today, with an GDP growth of 7.1 percent⁶ in 2008. In spite of this impressive growth rate Tanzania, like many other developing countries has very underdeveloped power infrastructure. This lack of existing power infrastructure has not prevented the mobile operators of Tanzania from rolling out telecoms infrastructure aggressively. In Tanzania’s emerging market, the mobile network operators have already achieved mobile penetration of 23%.

The lack of power infrastructure in rural areas and high demand for mobile communications has created a challenge for operators on how to rollout power telecoms infrastructure to these rural areas that lack power. To solve this problem telecom operators have relied heavily on diesel generators to provide power to the telecoms equipment and this has created an environment of high operating costs, increased

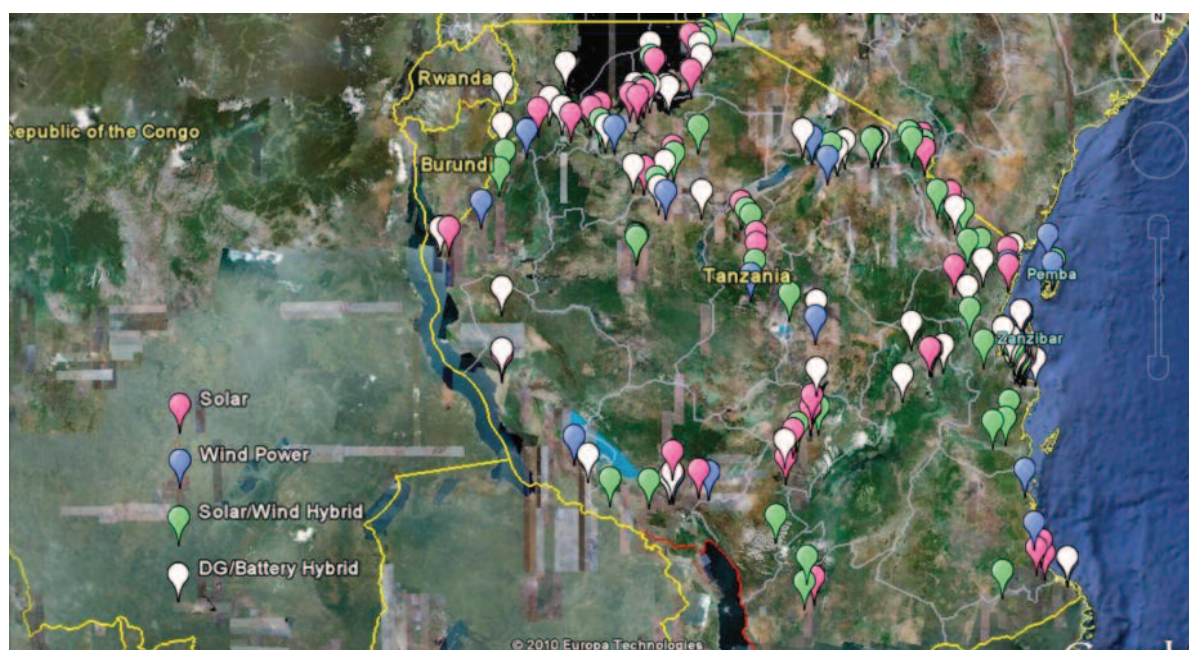
environmental pollution and logistical challenges of diesel delivery. Considering these factors it makes it tougher for telecom operators to justify expanding their service to rural areas with existing power infrastructure. The challenge is to come up with an easier, more cost effective and environmentally friendly way to expand network coverage in rural Tanzania.

Suggested Solution:

Through a Feasibility Study funded by the GSMA & International Finance Corporation, the Green Power for Mobile programme and Zantel investigated the opportunity to deploy solar or wind power generation equipment onsite to replace the existing diesel generator sets.

The combined GSMA and Zantel team studied 231 existing base station sites, analysed the power requirements for the sites and designed optimal solar power, wind power, hybrid or battery solutions. Given the favourable weather conditions in several of the rural areas of Tanzania a number of technical solutions were feasible. Using detailed costing data for the operations and maintenance of each site and the CAPEX pricing of the solar and/or wind power equipment, the business case for installing renewable energy equipment was determined. The key financial indicators used to determine if the new solution would be a positive investment were ROI (Return on Investment), IRR (Internal Rate of Return), NPV (Net Present Value), Payback Period and initial CAPEX pricing. Using this analysis methodology it was found that almost 78% (115 sites) of diesel powered sites were found to have a payback period less than three years and ROI greater than 30%.

Figure 1: Map of Base Stations Analysed with Recommended Solution



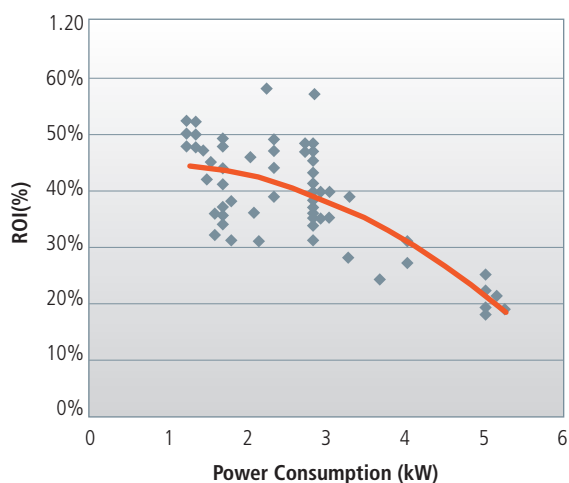
6 US Department of State (<http://www.state.gov/r/pa/ei/bgn/2843.htm>)

As the grid commercial power is cheaper and also there is no 'sell back to grid power' programme in the country, there is no good business case for renewable solutions for on grid sites. Therefore, the 84 grid connected sites will be equipped with high-capacity battery banks and hybrid controllers to accommodate the longer autonomy requirement and to cut down the diesel generator usage.

The green power solutions that were designed were a mix between solar, wind and hybrid (solar and wind power) integrated with deep cycling batteries, and reusing one of the existing diesel generator as a backup power solution. The preferred renewable energy component being used for a particular site was determined through analysis of the local weather and the space available on the site. Some other essential indicators in the decision making process included the power contribution coming from the renewable energy component to the overall system requirement and the battery backup time available for the system.

A key finding from the study, consistent with previous research and trials by Green Power for Mobile is that as the power load on a site increases the ROI decreases. Figure 2 shows this modelled over an analysis of 90 sites.

Figure 2: Return on Investment vs. Site Power Load



Other key findings from the analysis are:

1. The financial results showed a payback period ranging from 1.75 years to 5.6 years
2. 115 of the sites analysed were able to achieve a payback period of less than three years based on a delivered to site diesel price of US\$1.20
3. It was possible to find renewable energy solutions that had a payback period of less than three years in all regions of Tanzania
4. The CAPEX range for the green power solutions is US\$40,048 to US\$100,983 per site, with an average US\$75,832

5. The GSMA Development Fund recommended that Zantel implement a ten site trial before full scale deployment of 115 sites, to test multiple vendor solutions.

Table 1 – Example of Key Financial and Technical Indicators for Five Sites

Site	Total Power (Watts)	ROI	Payback (Years)	NPV (US\$)	CAPEX (US\$)	Renewable Vs. DG Contribution	Battery Backup (Hours)
Site xxx	1550	36%	2.74	67,433	85,838	81%/19%	24
Site xxx	1650	34%	2.95	62,076	93,148	87%/13%	29
Site xxx	1650	36%	2.82	60,063	85,017	83%/17%	24
Site xxx	2800	31%	3.25	50,122	97,227	52%/48%	22
Site xxx	2800	36%	2.97	57,705	92,140	56%/44%	22

Projected Results:

Following the Green Power for Mobile recommendation and implementing 115 sites would amount to an additional CAPEX spend of approximately US\$8.74 million, but would result in a substantial savings in fuel expenditure, O&M costs and carbon emissions. The projected results for these 115 sites would be a savings of approximately:

- 2.4 mln litres / year
- US\$3.1 million/year in total O&M costs (including fuel) and
- Reduction in carbon emissions of 14,720tonnes/year.

The GSMA Development Fund:

The GSMA Development Fund exists to accelerate economic, social and environmental development through the use of mobile technology. We believe that providing tangible, accessible mobile services to people in developing countries is invaluable to society and can help improve people’s lives.

The Development Fund leverages the industry expertise of the GSMA and its members, as well as the development expertise of international agencies and non-profit organisations to accelerate mobile services in three areas: Connectivity, Energy and mServices.

GSMA Green Power for Mobile:

In September 2008, the GSMA Development Fund launched its Green Power for Mobile (GPM) to ‘extend mobile beyond the grid’ with two primary objectives:

1. To systematically reduce diesel consumption by mobile operators through the promotion of renewable energy technologies and energy efficient base stations
2. To remove the barriers to handset charging in off-grid regions.

Through its work the GPM programme aims to advance the use of renewable energy sources by the mobile industry to power 118,000 new and existing off-grid base stations in developing countries by 2012.

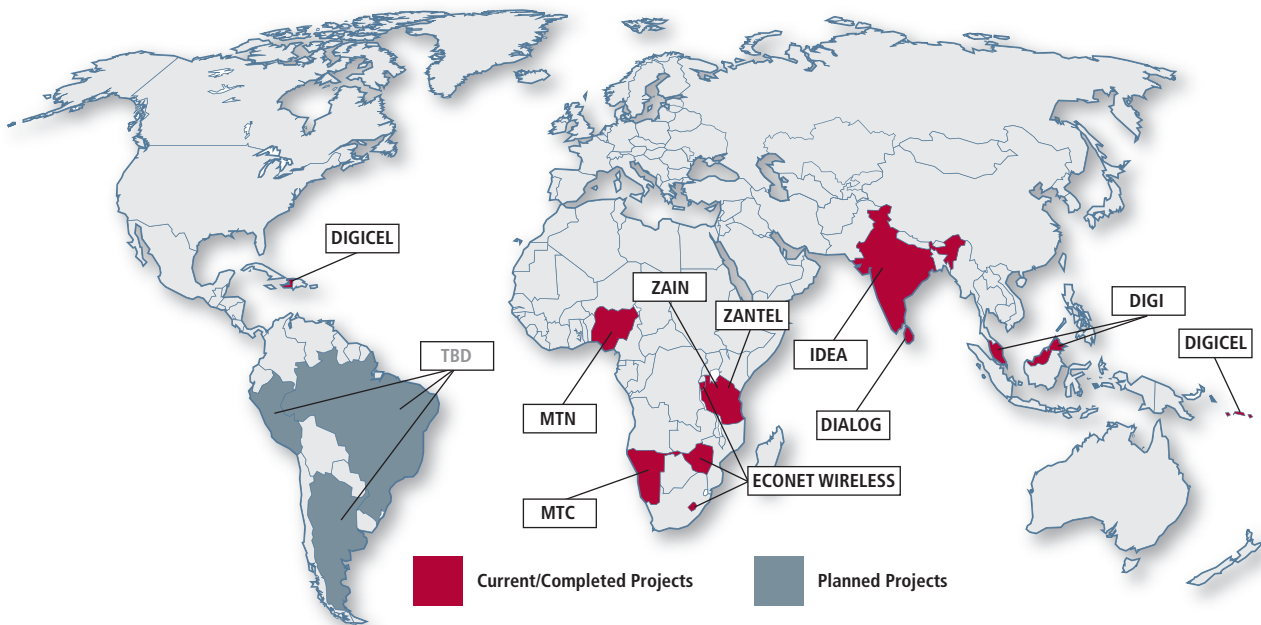
Achieving this target will save up to 2.5 billion litres of diesel consumption, cut annual carbon emissions by up to 6.8 million metric tonnes – which equates to Tanzania’s annual emissions – and connect 118 million people in developing countries to mobile networks using green power.

The programme has partnered with the International Finance Corporation. The IFC are providing both

financial support for the programme’s activities and seeking to assist operators with financing for green base station rollouts

Green Power for Mobile is now offering a Feasibility Study service for operators. This service analyses an operator’s entire country network of base stations, identifies those that are most suitable for green power solutions, dimensions the equipment required and forecasts CAPEX and ROI. Our primary goal is to maximise the ROI for operators and providing training on the Green Power for Mobile Methodology. The service also assists operators with RFP design and interpretation of responses from vendors specific to the use of alternative energy.

Figure 3: Project Locations and Operator Partners



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