



Green Power for Mobile



Green Power Feasibility Study – Econet Zimbabwe





This document has been written to provide information to mobile operators who are considering or planning to deploy 'green' renewable power resources for base station and transmission sites. It details the experiences gained during the GSMA Feasibility Study.

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Executive Summary

The GSMA Green Power for Mobile (GPM) programme was commissioned by Econet Zimbabwe during Q2 2010 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 GSMA's GPM methodology.

Key Facts – Zimbabwe

- Population: 12.5 million
- GDP per Capita: US\$340
- Mobile Penetration: 40%
- Internet penetration - 17 %

The main findings of the study are as follows:

- GSMA analysed a total of 202 sites, 183 existing sites with suitable power consumption and 19 new off-grid sites.
- GSMA recommends an investigation into cooling options as currently Econet Zimbabwe use indoor sites with large air conditioning units with high power consumption.
- The implementation of green power technology in BTS sites represented a technically feasible and financially attractive solution with a payback period of less than 3 years at all 202 sites. This is provided the cooling can be modified to fan cooling or low power air conditioning.
- Energy analysis should be undertaken at network planning stage (i.e. during the land acquisition process).
- Low power, diesel generator only sites show the best financial indicators. However, due to the unreliability of the commercial power network, grid connected sites still provided a good ROI for the solar solution.



Background & Power Infrastructure in Zimbabwe

Econet Wireless (Private) Limited is the cellular network operator and main subsidiary of Zimbabwe's Stock Exchange (ZSE) listed Econet Wireless Holdings Limited (EWH); a company with interests in telecommunications and other sectors of the Zimbabwean economy. Econet is the largest telecommunications company in Zimbabwe, with an overall market share of over 61% of the total mobile sector and a cellular subscriber base of 1.2 million as of February 2009 (the latest published figures available). Econet is currently upgrading its network capacity towards 2.5 million and has already secured funding for a further upgrade to 5 million. The company's network was launched on 10th July 1998 and the holding company listed on 17th September 1998, making it now one of the largest listed companies on the ZSE in terms of market capitalisation.

Zimbabwe Electricity Supply Authority (ZESA) has the sole responsibility for power generation and distribution. The search for national energy self-sufficiency in the early 1980s led to an emphasis on coal and other thermoelectric projects (78% of supply) as well as the hydroelectric power from the Kariba dam (22%). Although the second stage of the Hwange thermal power station, commissioned in 1987, raised the total capacity to 2,071 megawatts (MW), supply has failed to keep up with demand leading to imports from Mozambique and South Africa. Zimbabwe suffers from long power outages due to 'power sharing', a result of the lack of capacity in the distribution network. This is especially critical in rural areas where outages of 14 hours are not uncommon.



Suggested Solution:

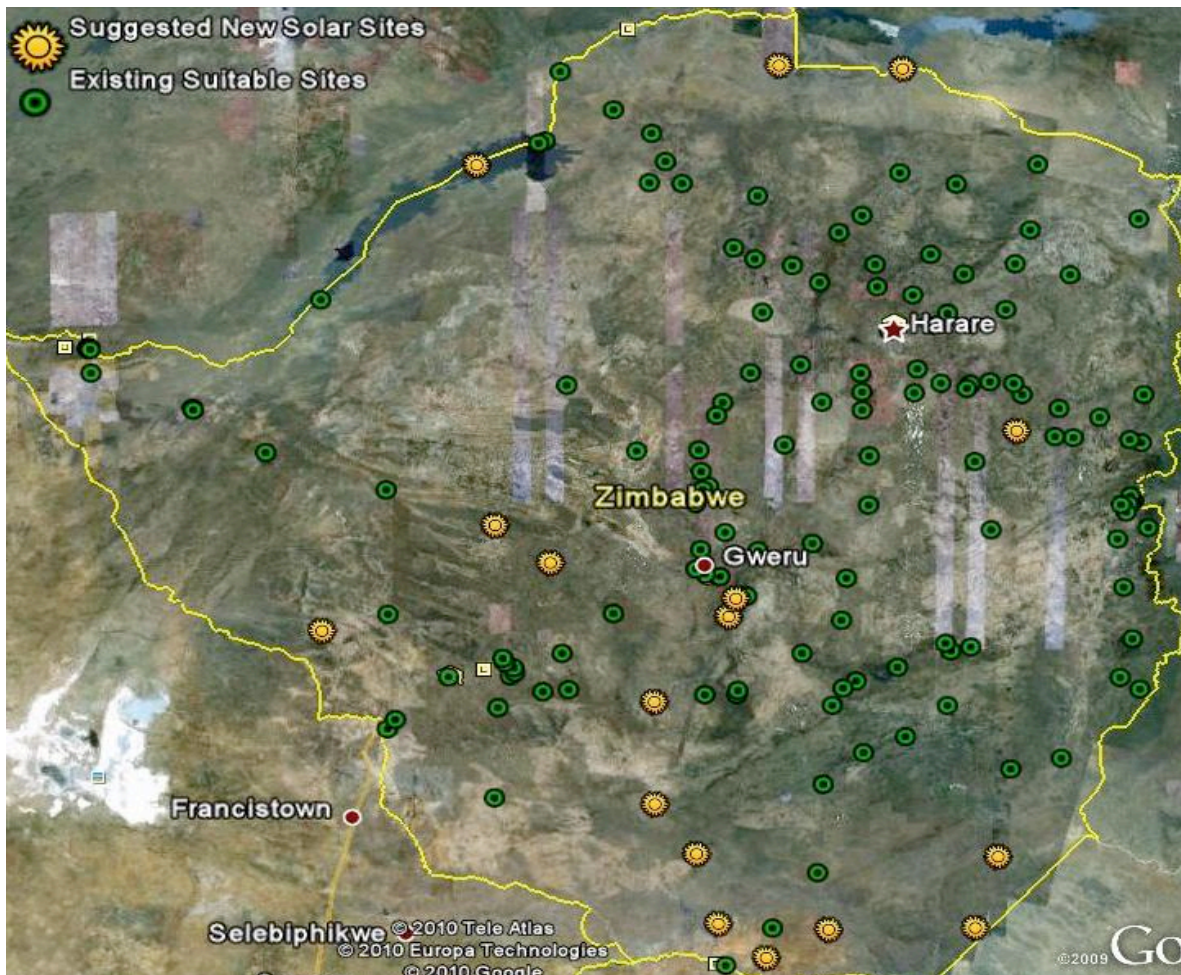
Funded by Econet Lesotho, the GSMA's GPM programme conducted a Feasibility Study to investigate the opportunity for deploying solar, wind or hybrid power generation equipment onsite to replace the existing diesel generator sets.

GSMA performed a feasibility study for all the ZTE Sites; these sites were deemed suitable for a 'Green' solution as they have low power consuming equipment and are situated in more rural areas away from Harare. From the current sites, 183 sites have been identified as suitable for green energy as they have a single RBS on site and therefore lower power consumption.

Having said this, Econet will need to consider alternative cooling systems to enable provision of solar solutions at these sites. The current 452 sites, 183 of which are ZTE low RBS power sites, and a further 319 are planned, 260 of which are low power sites. There are a further 17 proposed sites that have already been identified as suitable for a solar solution due to lack of commercial power.

The key financial indicators used to determine whether or not 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 if an alternative cooling system is adopted then all the low power sites (443 potential) there would be a payback period of less than three years and ROI greater than 30%.

Figure 1: Map of Base Stations Analysed with Recommended Solution



The green power solutions that were designed were solar integrated with deep cycling batteries, as well as reusing 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. 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. Wind energy was not considered in Zimbabwe as the indications there are insufficient wind sources in all areas of the country

The graph below shows an example of the OPEX cost savings using the solar solution over the twenty year project, compared with the OPEX cost for a simple diesel solution.

Other key findings from the analysis are:

1. The financial results showed a payback period ranging from 1.3 years to 5.4 years
2. It was possible to find renewable energy solutions that had a payback period of less than 3 years in all regions of Zimbabwe. This is provided a suitable low power cooling system is installed and delivered to site diesel price is US\$1.
3. The CAPEX range for the green power solutions is US\$51,000 to US\$138,000 per site depending on the cooling system installed
4. The GSMA Development Fund recommended that Econet Lesotho implement a 10 site trial before full scale deployment of 200+ sites, to test multiple vendor solutions

Figure 2: Accumulated Cost of Ownership over Twenty Years

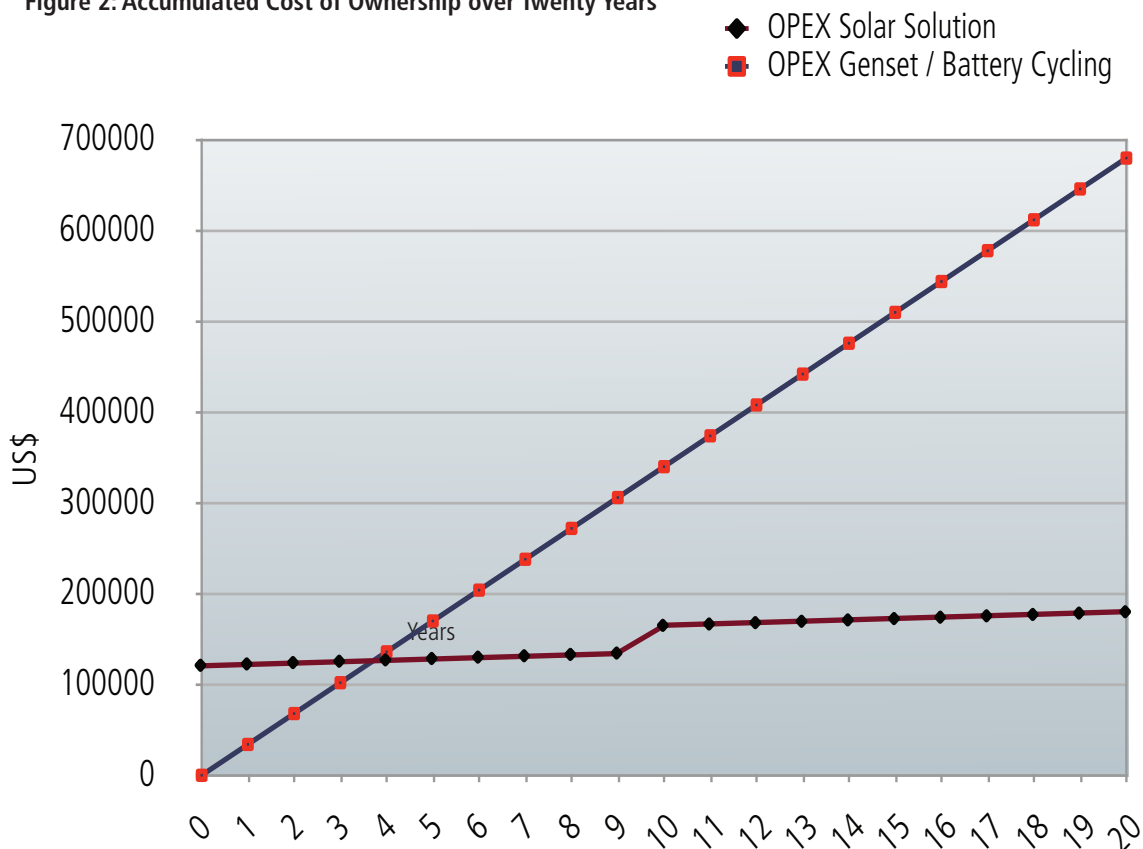


Table 1: Example of Key Financial and Technical Indicators for 183 Suitable Existing Sites

Design	Site Power (kW)	CAPEX (US\$)	OPEX / Year (\$US)	OPEX Saving/ Year (\$US)	Payback Period (Years)	ROI	NPV (\$US)	No. of Sites
1A	3.8	133,436	7229	21,659	5.14	19%	-2590	102
1B	1.8	72,968	6440	22,448	2.27	44%	51,836	102
1C	1	51,968	6370	22,518	1.33	75%	70,026	102
2A	1.9	76,468	6450	22,438	2.43	41%	48,812	81
2B	1.1	55,468	6380	22,508	1.49	67%	67002	81

The five designs in the table above reflect the various cooling solutions and the different RBS power consumptions within the network; these are for the existing sites with connection to unreliable commercial power. The existing cooling solution was considered in design 1 however, with such a large power consumption, any solution is likely to be expensive and the ROI very low; hence the NPV is a negative value indicating a poor investment. However with the use of direct current fan cooling as in design 3 and design 5 the solution becomes very cost affective and the ROI is very high with a good NPV. A compromise solution is provided with design 2 and design 4, where a 1kW cooling system is used.

Projected Results:

- 183 Initial Sites existing sites plus 17 new non-grid sites
- CAPEX US\$9.8 million
- OPEX savings of US\$4.1 million
- Diesel savings of 3 million litres/year
- Carbon emission saving of 9090 tonnes/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:

To systematically reduce diesel consumption by mobile operators through the promotion of renewable energy technologies and energy efficient base stations

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 Return on Investment 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:





For operators interested in finding out more about this service or the GPM programme please contact:

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