



Green Power for Mobile



Green Power Feasibility Study – Econet Lesotho





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 Lesotho during Q1 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 operator's entire network and ranked the most suitable green sites according to specific criteria defined in the GSMA GPM methodology.

The main findings of the study are as follows:

- Energy analysis should be undertaken at the network planning stage (i.e. during the 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.
- GSMA analysed a total of 40 new off grid sites.
- The implementation of green power technology in BTS sites represented a technically feasible and financially attractive solution with payback period of less than 3 years at 17 sites.
- GSMA recommended an implementation of 40 solar or a combination of solar and hybrid (solar/wind) sites.
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- For the 40 sites analysed the projected CAPEX spend would be USD\$3.1 million and the OPEX saving would USD\$1.09 million per year. The project would reduce carbon emissions by 4171 tonnes per year.

Key Facts – Lesotho

- Population – 2 Million
- GDP Per Capita - US\$1080
- Mobile penetration – 30 %
- Internet penetration - 3.4 %

Background

Econet

Telecom Lesotho was privatised in February 2001 from the former state-owned Lesotho Telecommunications Corporation (LTC). In 2002, Telecom Lesotho launched its wholly owned subsidiary, Econet Ezi~Cel Lesotho (EEL) which renders mobile telecommunications services. Mountain Kingdom Communications owns 70% of Telecom Lesotho's shares whilst the Government of Lesotho owns 30%. Following the exit of Eskom Enterprises from Mountain Kingdom Communications, Econet Wireless Global now owns 100% of their shares so is now the ultimate holding company for Telecom Lesotho. 3.5% of the Mountain Kingdom Communications' shares should be set aside for staff in terms of the sale agreement.



Power Infrastructure in Lesotho

Lesotho is now able to provide 100% of its electricity requirements due to the completion of the Lesotho Highland Water Project which provides power and water to neighboring South Africa. Although electricity is available in most towns, many of the required sites are very isolated and are not cost effective to connect to the commercial power network. To solve this problem, 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 operators to justify expanding their service to rural areas with the 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 Lesotho and to replace existing generators on 'off grid' sites.



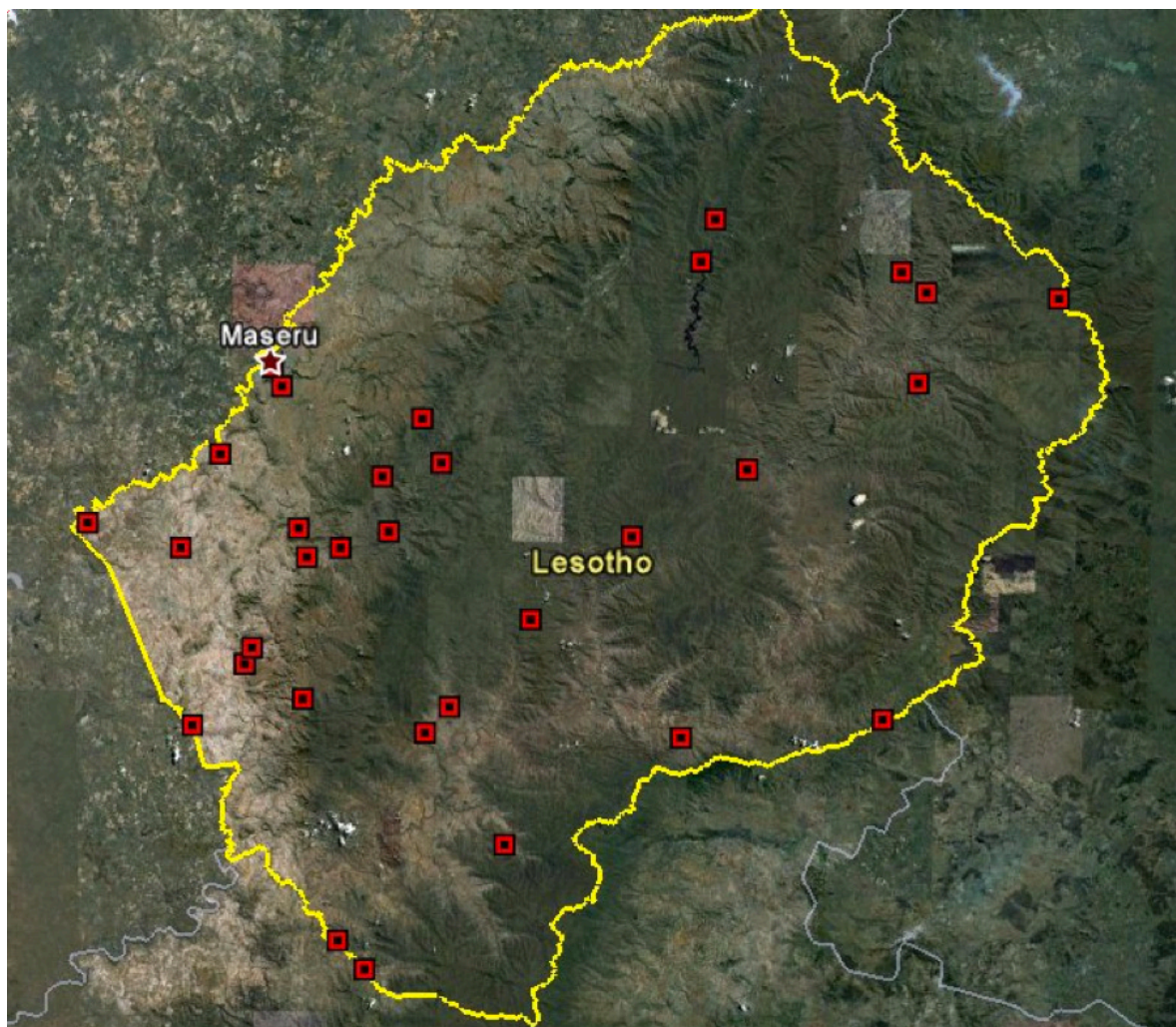
Suggested Solution:

Funded by Econet Lesotho, the GSMA Green Power for Mobile programme conducted a Feasibility Study, investigating the opportunity to deploy solar, wind or hybrid power generation equipment onsite to replace the existing diesel generator sets.

The combined GSMA and Econet Lesotho team studied 40 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 Lesotho, 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 43% (17 sites) of all sites were to have a payback period less than three years and ROI greater than 30%.

Figure 1: Map of Base Stations Analysed in Feasibility Study



The green power solutions that were designed were a mix between solar and hybrid (solar and wind power) 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 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 together with the battery backup time available for the system.

The graph below shows an example of the comparison between OPEX cost savings using the solar solution and the OPEX cost for a simple diesel solution for the duration of the 20 year project.

Other key findings from the analysis are:

1. The financial results showed a payback period ranging from 1.9 years to 3.8 years.
2. 17 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\$ 1.3
3. It was possible to find renewable energy solutions that had a payback period of less than three years in all regions of Lesotho.
4. The CAPEX range for the green power solutions is US\$ 57,000 to US\$ 101,000 per site.
5. The GSMA Development Fund recommended that Econet Lesotho implement a 10 site trial before full scale deployment of 40+ sites in order to test multiple vendor solutions.

Figure 2: Accumulated Cost of Ownership over Twenty Years

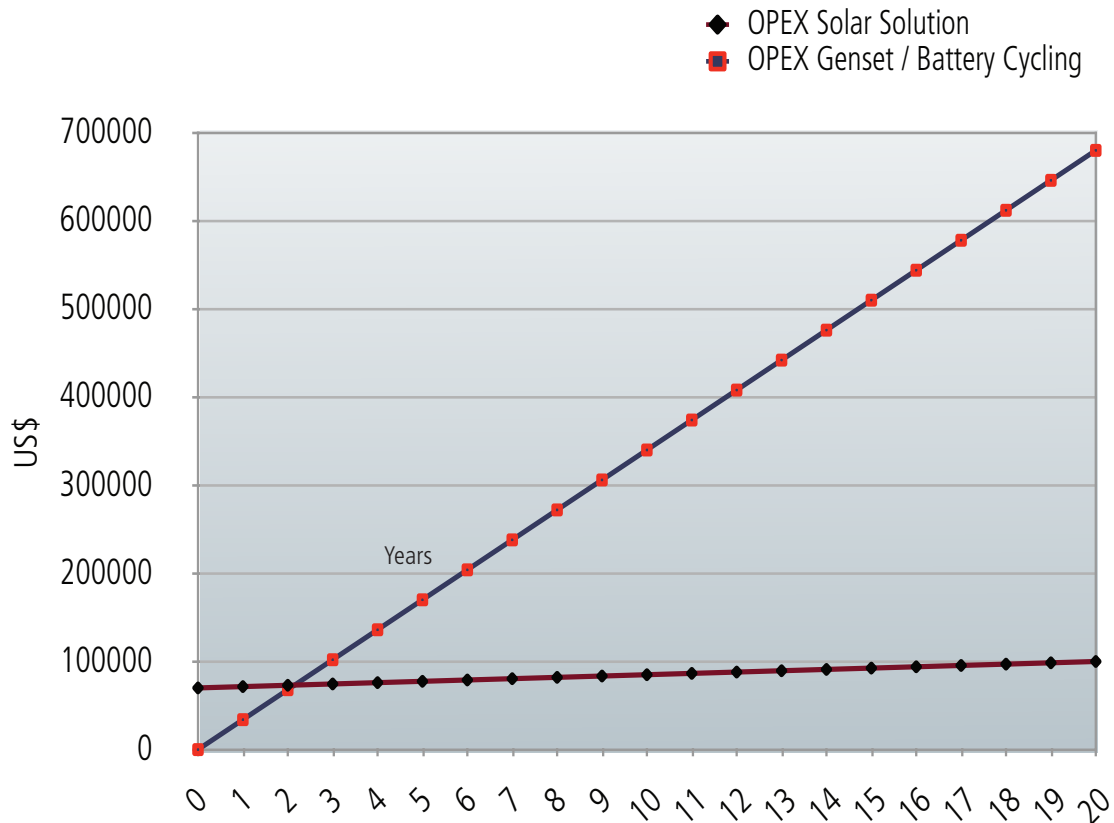


Table 1 – Example of Key Financial and Technical Indicators for 40 Sites

	Solar Photovoltaic (kW)	CAPEX Required (US\$)	Average OPEX / Year (US\$)	NPV (US\$)	Payback (yrs)	Number of potential sites
Design 1	3	57,240	3416	91,597	1.92	1
Design 3	4	65,920	3824	83,937	2.24	10
Design 3	4.5	69,420	4194	80,497	2.39	6
Design 4	6	84,480	6832	63,734	3.20	8
Design 5	7	91,960	7628	57,387	3.59	1
Design 6	7.5	95,460	7998	52,947	3.78	12
Design 7	8	101,840	8700	48,537	3.98	2

Within the 40 sites that were studied, there was a variation on equipment and therefore site power load. The seven designs are able to cover power requirements for all 40 sites, negating the need to provide 40 separate designs; as several sites have very similar power requirements.

Projected Results:

- 40 initial sites.
- CAPEX spend approx US\$ 3.17 Million.
- OPEX saving of US\$ 1.18 Million.
- Diesel savings of approx 680,00 litres/year.
- Reduction of carbon emissions 4171 tonnes/year.
- The financial results showed a Return On Investment ranging from 52% to 25%.

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.

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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 GPM programme has partnered with the International Finance Corporation (IFC). 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 maximize 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:



GSMA Contacts

If operators are interested in finding out more about this service or the GPM programme please enquire at the contact information given below:

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