Green Power for Mobile

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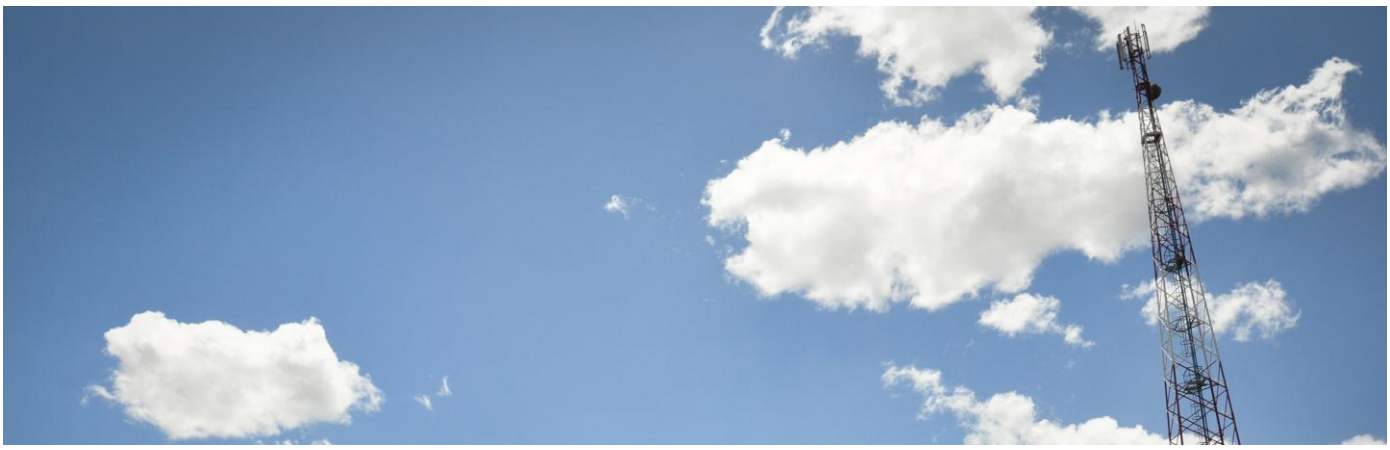

Telecel – Central African Republic – Feasibility Study

African Republic (CAR) is landlocked. It is mainly savannah in the north and equatorial forest in the south. Chad borders the north of the country, with Sudan to the east; Democratic Republic of Congo and Republic of Congo are on the southern border. Cameroon lies to the west. The Oubangui River, which forms the southern border and flows through the capital Bangui and then south to the Congo basin, is an important transport route.

Background

Area: 622,984 sq km (242,000 sq miles)
Population: 4.3 million (2007 est.)
Capital City: Bangui (population: 690,000)

CAR is desperately poor. 62% of the population lives on less than $1.25 a day, and life expectancy at birth is 43 years, putting the country near the bottom of the UNDP Human Development Index (178 out of 179 countries measured). The country is highly dependent on funds from donors. France has always been the biggest bilateral donor. Relations with all donors were very poor in the later years of the Patasse regime and there was a significant buildup of unpaid arrears on donor loans. Relations have improved more recently, and in early 2006 the country signed its second IMF Emergency Post Conflict Assistance Loan. This was transformed into a Poverty Reduction and Growth Facility loan in December 2006. The government's Poverty Reduction and Growth Strategy was presented to donors at a round table meeting in Brussels at the end of October 2007. This round table was successful, with donors pledging $600m. CAR reached completion point of the Highly Indebted Poor Countries Initiative at the end of June 2009.

Despite this relatively optimistic macro-economic outlook, the instability in the north has had disastrous consequences for the local populations. According to UN agencies, 212,000

have become displaced within the country, and a further 80,000 have fled to neighbouring countries, some of which are themselves unstable.[1]

Power Infrastructure in CAR:

The country has abundant hydroelectric resources that provide reliable and inexpensive power to the capital city. About 80 percent of the CAR's electricity is provided by hydroelectricity, most of which is generated north of Bangui, with fossil fuels providing the rest. Besides these hydroelectric generators, Bangui has oil-powered generators to supplement power during peak periods and to use as backup.

The state-owned enterprise, Enerca, supplies the electricity. The potential exists to harness more water resources and export energy to neighboring countries. [2] However power outages are common especially in rural areas, and many of the more rural areas have no commercial power connection.

[1] www.fco.gov.uk
[2] www.nationsencyclopedia.com

Challenges of Telecel CAR network

Telecel CAR has a small network consisting of only 90 BTS sites covering the most inhabited areas, and the roads that transverse the country. CAR has some security problems especially in the north of the country, where transport of fuel and sites visits can be difficult. The hot tropical climate creates problems with cooling of both equipment and batteries. Telecel are now rolling out a plan to convert all sites to outdoor units, to negate the need for external cooling systems for the equipment. They are also rolling out across the network, a battery cycling solution to help reduce the consumption of the generators.

Network Summary:

Total Base stations	**90**
Off grid Base stations	37
On grid Base stations	53
Daily OPEX to run DG	$3,148
Daily CO_2 Emission	5.2 Tonnes

Source: Telecel

Challenges of Feasibility Study

CAR is a very poor country with poor infrastructure and some security issues, which made travel within the country very difficult. Due to the current rollout of a battery cycling system for all sites, and the CAPEX, that had already been allocated for this, it was deemed that any further CAPEX for these sites to implement a total Solar solution, would not make financial sense. But the GSMA did study their existing design for the battery cycling, and confirmed that this would save Telecel CAR up to 60% of their diesel consumption. The main focus therefore, for the complete solar solution, was for the new planned sites consisting of 15 sites, six new BTS sites and nine SDH Repeater sites.

Approach of Feasibility Study

Analysing Data:

Data analysing is the most important part for a green power feasibility study. GSMA analysed the entire Telecel CAR network, and also looked at the proposals for battery cycling and a trial for a solar hybrid solution. However the main focus for the study was the planned sites, including nine low power repeater sites, which were very suitable for a solar solution. A wind power solution was not found to be suitable due to the lack of sustained wind, in this land locked country.

Design Models:

Green power design models are created based on the data analysis. Due to the battery cycling rollout, only fifteen Sites were considered for a complete Solar power solution. These consisted of six BTS sites, with a power consumption of 1.53KW and the nine repeater sites with a power consumption of 700W. Designs were created for all fifteen sites, on an individual basis, taking into consideration geographical and metrological conditions. Homer Solar design models were created to cover all fifteen sites. All design models were carefully prepared to get the best possible technical and financial output.

Business Cases for Design Models:

GSMA created business cases for each design models considering 10 year business plan. The business cases were prepared based on actual market data and rates. Each of the business case provided a full idea of CAPEX, OPEX, Cash Flow and all relevant financial terms.

Renewable Energy Results and Recommendations

Fifteen Homer Solar design models were created for off-grid sites. Each of the design is created carefully to maximize the best utilization of generated energy. While dimensioning the equipment, a specific load requirement was calculated and solution was recommended based on the precise load calculation.

Business Case and Financial Analysis

GSMA created an analysis table for each site based on prepared business case of each design model. As Telecel CAR was suggested to invest based on GSMA recommendations, the detailed analysis brought an easy understanding for the network operator to identify the credibility of their investment. The analysis consisted of solution details, performance indicator of solution, financial indicator and Environmental indicators. An analysis table for the fifteen Solar sites are given below:

Solar Solution Financial Analysis

SITE NAME	Solar (KW)	SITE LOAD (W)	PV (KW)	Battery (Ahr)	Approx Build Cost ($)	Approx Total Cost Saving 10Yr ($)	Payback (Yrs)	10 Yr NPV ($)
BTS SITE 1	5.7	1530	13KW	4000 Ahr	$126,156.72	$264,000.00	2.98	52,195
BTS SITE 2	4.91	1530	15 KW	4000 Ahr	$132,310.72	$264,000.00	3.15	46,071
BTS SITE 3	5.38	1530	14 KW	4000 Ahr	$129,233.72	$264,000.00	3.07	49,130
BTS SITE 4	4.87	1530	15 KW	4000 Ahr	$132,310.72	$264,000.00	3.15	46,071
BTS SITE 5	5.15	1530	14 KW	4000 Ahr	$129,233.72	$264,000.00	3.07	49,130
BTS SITE 6	4.84	1530	14 KW	4000 Ahr	$129,233.72	$264,000.00	3.07	49,130
				Total	$778,479.34	$1,584,000.00		

SITE NAME	Solar (KW)	SITE LOAD (W)	PV (KW)	Battery (Ahr)	Approx Build Cost ($)	Total Cost Saving 10Yr ($)	Payback (Yrs)	10 Yr NPV ($)
SITE BACKBONE 1	5.06	700	6.43KW	1500 Ahr	$64,708	$346,000	1.41	111,583
SITE BACKBONE 2	5.06	700	6.43KW	1500 Ahr	$64,708	$346,000	1.41	111,583
SITE BACKBONE 3	5.13	700	6.43KW	1500 Ahr	$64,708	$346,000	1.41	111,583
SITE BACKBONE 4	5.15	700	6.63 KW	1500 Ahr	$65,308	$346,000	1.42	110,985
SITE BACKBONE 5	5.33	700	6.045 KW	1500 Ahr	$63,508	$346,000	1.38	112,777
SITE BACKBONE 6	5.33	700	6.045 KW	1500 Ahr	$63,508	$346,000	1.38	112,777
SITE BACKBONE 7	5.16	700	6.63 KW	1500 Ahr	$65,308	$346,000	1.42	110,985
SITE BACKBONE PK35	5	700	6.63 KW	1500 Ahr	$65,308	$346,000	1.42	110,985
SITE BACKBONE BOY-R	5.03	700	6.43KW	1500 Ahr	$64,708	$346,000	1.41	111,583
				Total	$581,772	$3,114,000		

	Overall Financial analysis for the Fifteen New Sites				
	CAPEX (US $)	OPEX Saving/yr (US $)	Payback Period (yr)	NPV (US $)	CO2 Emission reduction (Tonne/Yr)
Total	1,360,251	469,800	2.08	1,296,566	525
Average	90,683	31,320		86,437	35

Energy Efficiency Recommendation

For an overall energy optimization, GSMA came-up with a list of generic recommendations which could help Telecel CAR reducing their energy requirement at every site.

Many of which Telecel have already started to implement, with their replacement of indoor sites, with outdoor.

- Not to use any Aircon for off-grid sites
- Use **FCU/DC Aircon** for Shelter/BTS-room environment control.
- No to use ONLY Aircon 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
- Purchase **outdoor BTS** for upcoming deployment.
- Use **Battery cooler** for all both on gird 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 GF/GFRT sites

Summary Results for Full Feasibility Study

Telecel CAR have expressed a great deal of enthusiasm to start a roll out for energy saving initiatives, including outdoor BTS, and battery cycling. They are also keen to trial the totally solar powered sites.

After an 4 weeks green power feasibility study, GSMA concluded with the following findings:

Suggesting green power solution implementation at	15 off grid Sites
Not suggesting green power solution implementation for Off grid Sites at	37 off grid sites
Deep battery cycling at	Currently being implemented at all sites throughout the network. Saving up to 60% of Diesel consumption.
A list of generic recommendations can save up to 40% of energy OPEX.	

For the initial implementation of the 15 solar sites, the following figures have been calculated

Total CAPEX requirement for Green solution implementation	$1.36 million
Current projected total energy OPEX for the fifteen sites	$619,740/yr
Total energy OPEX for Off grid sites after implementing Green solution	$127,000/yr
Total energy OPEX can be saved at off grid sites by implementing Green Solution	$492,740/yr
Payback period less than 4 yrs	15 sites

GSMA Green Power for Mobile Programme

Promoting Green Power to Extend Mobile beyond the Grid

An estimated 1.6 billion people live without electricity. An additional 1 billion people live in areas with unreliable access to power. In order to expand into areas without regular electricity, mobile networks have primarily used diesel generators for power. However, as diesel prices rise and mobile network infrastructure is built in increasingly inaccessible regions, mobile operators need a viable alternative to diesel, such as solar and wind power. Recent technological improvements and cost reductions in green power solutions have made this alternative more commercially attractive. Coupled with the environmental benefits of reduced diesel use and subsequent emissions, green power solutions provide a promising opportunity for operators.

The GSMA Green Power for Mobile programme has set the goal of helping the mobile industry use renewable energy sources, such as solar, wind, or sustainable biofuels, to power 118,000 new and existing off-grid base stations in developing countries by 2012. Achieving that target would save up to 2.5 billion litres of diesel per annum and cut annual carbon emissions by up to 6.8 million tonnes.

The Green Power for Networks work stream within the Green Power for Mobile programme focuses on aiding the mobile industry to deploy solar, wind, or sustainable biofuels technologies to new and existing off-grid base stations in developing countries. The Green Power for Networks work stream supports the mobile industry in this initiative by providing:
- Network Feasibility Studies: Complete network assessments on technical and financial viability of renewable energy for BTS sites.

Aiding network operators to deploy renewable energy, GPM will be promoting the expansion of mobile networks into regions currently lacking coverage (to bring coverage to the unconnected) and the systematic reduction of reliance on diesel consumption by operators.

Project Locations and Operator Partners:

Community Power:

Community Power aims to utilize the excess power created by base stations, by distributing it into the local community. At a minimum, operators can provide excess power to the community for small needs such as charging up mobile handsets, large household batteries and rechargeable lanterns. At a maximum, the consistent power requirement of a mobile base station provides a stable demand for a bigger investment by a third party company in a village energy system, powering the base station as well as local homes and businesses. This is currently being investigated by the GPM team in India and East Africa with the hope of extending further into the developing world upon success.

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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http://www.gsma.com/Green-Power-for-Mobile/

About the GSM Association

The GSMA represents the interests of mobile operators worldwide. Spanning 220 countries, the GSMA unites nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, Internet companies, and media and entertainment organisations. The GSMA also produces industry-leading events such as the Mobile World Congress and Mobile Asia Congress.

About the Development Fund Serving the underserved through mobile

The GSMA Development Fund brings together our mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. We identify opportunities for social, economic impact and stimulate the development of scalable, life-enhancing mobile services.

For more information on the GSMA's Green Power for Mobile, please email greenpower@gsm.org

GSMA Development Fund