

## Transitioning from diesel to alternative energy

A certain operator in Africa (Operator X) now serves nearly four million users and has increased its market share from 30 to 45 percent from 2009 to early 2011, while its network scale and services continue to grow. With its adoption of varied energy solutions at various times, X serves as a microcosm for global energy development.

By Hu Bo

### Energy challenges: Old and new

In the local telecom market, the competition between X and its rivals has been extremely aggressive, with promotional campaigns launched one after the other. Declining ARPUs and high station construction costs have also been bearing down, leaving X trapped in a vicious cycle of increasing volume and stagnant profit. Moreover, the government is set to issue

new licenses, which will trigger a new round of user acquisition battles and a subsequent price war.

X has sought to increase revenue through market expansion and cost reduction, but this is easier said than done; the local market is nearly saturated, and new customers are typically low-end subscribers who do little to increase ARPU. Bargain prices win over these customers, but these small victories do little to advance the war. Operational refinements stand a better chance of increasing margins, with many areas

warranting improvement. Onsite construction costs, particularly energy costs, have been especially burdensome.

The national power grid is class-4, with power failures totaling eight hours a day. Despite a multitude of rivers running through X's home country, their shallowness makes them unsuitable for hydroelectricity. Diesel generators, a mainstay of the developing world, were used exclusively by X during its early years, due to a lack of alternatives and the profitability of the nascent telecom market.

However, despite their reliability,



the maximum base station load rate a traditional diesel generator can support is 20 percent, while a typical site consumes fifteen to twenty thousand liters of diesel annually. If the onsite fuel tank is one thousand liters, refueling must be carried out every two to three weeks, which can be a tricky proposition in a region with poor roads and restive residents. Oil is also not particularly plentiful in this country, meaning that diesel costs are high and getting higher.

Meanwhile, the nonstop running of generators leads to frequent breakdown and maintenance, while the carbon emissions involved warrant reduction, whether out of self-preservation or social consideration.

## Solar energy brings new choices

X's home terrain is arid, ranging from savanna to desert. It has three seasons – hot, rainy, and cool. Maximum temperatures can reach 50°C, with a daily sunshine index averaging nearly six hours (both are near the top of global rankings). While these conditions may sound harsh, they are near ideal for alternative energy deployment.

Since the 1980s, photovoltaic cells have been among the tech industry's rising stars. Current sentiments are certainly pushing them to the forefront of public awareness, as they are more pleasing to the eye than wind farms. The public and private sectors are both pouring resources into this fast-growing field, which is driving down the prices for essential components. As of November 2011, the price of silicon solar modules has gone down to USD0.85 per watt; moreover, thin-film solar modules have reached USD0.70 per watt.

## Tentative first steps find solid ground

X did not make any moves into solar energy until early 2009. Even after

they did, there were lingering doubts within the company, which led them, in coordination with Huawei (its solar energy solution supplier), to start out on a pilot scale.

Pilot sites were largely stable, with the exception of a few outliers which failed during a particularly long rainy season; this was overcome through increased battery capacity, or supplementation with a solar-diesel hybrid solution. Overall, solar deployment not only improved performance but actually reduced O&M costs.

Economies of scale in purchasing, operation, and management proved crucial to minimizing the costs for X during deployment. Fortunately, upfront solar cell deployment costs were slightly higher than those for diesel, while long-term costs prove infinitesimal. Compared to a traditional diesel solution, solar energy saves costs for fueling, daily maintenance, and mid-term maintenance, totaling about USD20,000 per station annually.

Based on the test results and input-output estimations, X implemented a four-stage reconstruction plan. Phase 1 was finished at the end of 2009, and included the reconstruction of over one-hundred stations. Phase 2 was finished in early 2010 and covered another hundred. In late 2010, phase 3 was finished, covering another two-hundred stations. By mid-2011, ninety percent of its stations had been converted to solar. Furthermore, the technology has also been used in auxiliary roles for transmission equipment and other wireless devices.

X's solar conversion has resulted in greatly reduced fuel and maintenance costs, which have been sufficient to enable annual profit increases of five percent, despite the project's costs. It has also enabled X to consolidate its market position and polish its brand image with its contemporaries, investors, users, and government. 

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