

## **Energy Storage Applications for Telecomms Infrastructure in Sub-Saharan Africa**

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What is the next big thing in energy? In a recent paper Chandni Raj, researcher at Frost & Sullivan answered: “If your answer is renewables, you are wrong. Renewables are already a big thing. The future of the energy industry now lies in energy storage and especially finding alternative energy storage solutions.” This is also the belief of Likusasa, a systems integrator operating in the Telecoms market in sub-Saharan Africa. In our experience energy storage is the key to off-grid power efficiency and is an enabler for renewables.

### **The role of energy storage systems in Telecoms in Africa**

By far the bulk of telecoms sites in Africa operate off-grid mainly due to the absence of infrastructure. Where grid is available the costs of connection can be prohibitive or the reliability and quality extremely poor. Telcos have traditionally relied of diesel generators running 24/7 to meet their power requirements. For fast rollouts the generator is a quick and easy means of providing power and little consideration has been given to efficiencies, operating costs or even environmental concerns. The squeeze of competition, market saturation and the increased cost of fossil fuels have heightened awareness of the inefficiencies of the current power regime and has opened the door to the implementation of generator/battery hybrid power systems.

Many telcos have looked at and implemented various battery schemes with varying levels of success with some failing predominantly due to poor management. A spate of new rollouts were triggered by the spike in the oil price in 2008, but only time will tell if they have been correctly implemented. Given 1 to 2 years of continuous operation the poor quality systems will start to show!

### **Off-grid power system design considerations**

In order to develop solutions that meet the telco’s requirements one needs to consider the following factors:

- Reduction of generator runtimes (by at least 50%)
- Improving of generator efficiency through right-sizing and elimination of dummy loads
- Reduced maintenance intervals
- Difficulty of and frequency of refueling
- Optimization of secondary loads (lighting, air conditioning etc)
- Reducing cooling / air conditioning requirements through use of outdoor type equipment

It is important to understand that many sites are very difficult to access for both maintenance and refueling and thus the reduction of physical visits can realize considerable savings!

### **The Africa factor**

The planning and implementation of hybrid conversions may be a simple task on paper, but in reality one needs to understand the conditions on the ground. In a recent project Likusasa converted 44 sites to generator/battery hybrid systems, a task theoretically expected to take about 2 months. In reality this project took close to 4 months to complete. Some of the problems encountered and dealt with were:

- Site access – poor roads, lack of roads, rivers and mountains caused delays and stoppages. Damage to vehicles and tires were always realities to consider
- Lack of facilities – staff had to “rough-it”, fending for themselves in the bush, camping out and carrying days of supplies, water and food
- Grueling working hours – cut-over of the power system was only permitted after midnight
- Logistical problems caused work stoppages due to unavailability of all or part of the equipment

A clear understanding of the countries being worked in and the ability and experience of staff are all essential to being able to successfully implement projects in Africa.

## What types of systems are suited for African telecoms applications?

Traditionally the lead acid battery has been the stalwart of the telcos, initially providing simple UPS power to keep sites running during short outages and switch-over of power sources. More recently deep cycle batteries have provided an easy solution for generator/battery hybrids, but these are subject to short battery lifetimes and thus higher maintenance and replacement costs. Studies based on total cost of ownership have shown that other storage systems can provide much better lifetime costs for the telcos. The graph below compares some of the solutions available:

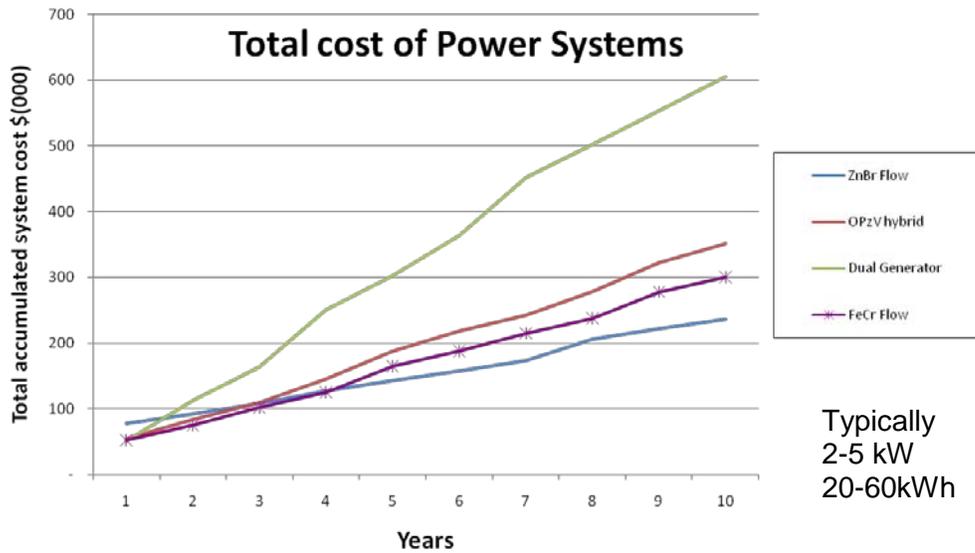


Figure 1: Comparison of different energy storage systems

What can also be clearly shown in such studies is that the more remote the sites are or the more difficult they are to access the greater the effectiveness and efficiency of alternate systems become.

All of these studies are very subjective and analysis and planning should be done on a case by case basis to achieve optimal results.

### The balancing act: Capital vs. Operational costs

Most operators are very keen to reduce operational expenditure and to improve EBIT, but they are also loath to spend a lot of money. Many operators have different parts of the business focused on capital and operations and thus very often there is no one really concerned with the total cost of ownership! As a result many solutions offered and implemented are a compromise between these two requirements and may not be the best in the long term. Financed and managed solutions can be offered, but once again the business models and cultures may not support these!

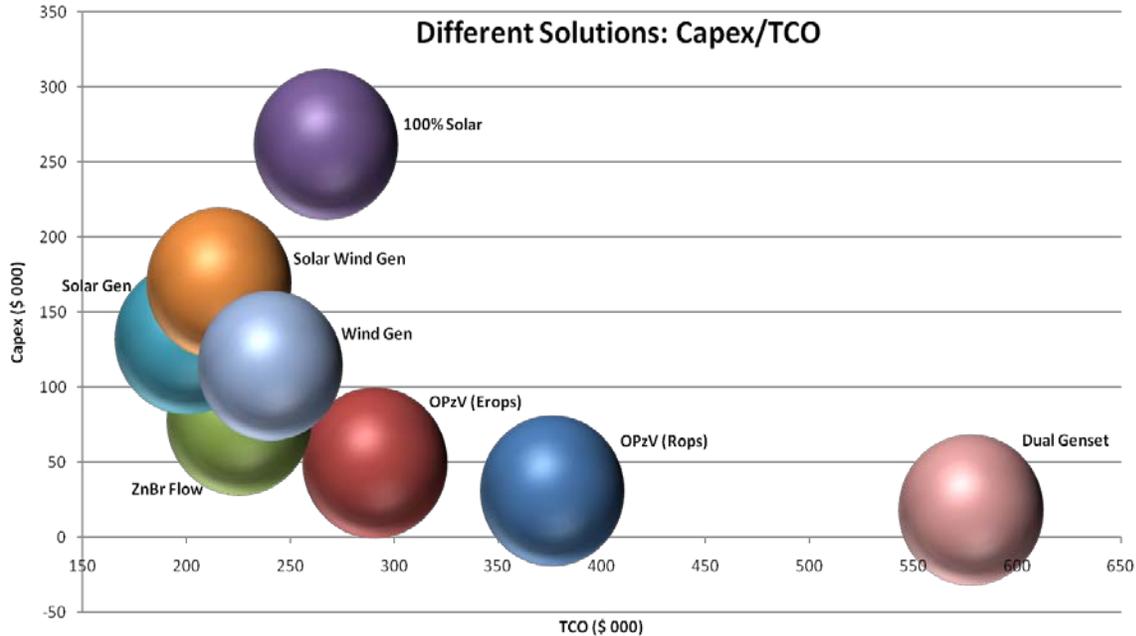


Figure 2: Comparison of Capex vs. TCO (indicative only)

The above chart is intended to give an indication of the relationship between various hybrid solutions and generator only off-grid power system. From this chart it is immediately evident that there are many more cost effective ways of providing off-grid power than the 24/7 generator. Pure renewable energy solutions can be very cost effective but are high on the initial capital outlay. Meeting the needs of a particular telco can be an involved process but there are many options available!

### The role of the power systems integrator

Likusasa as a systems integrator builds 100's of remote telecoms sites annually in sub-Saharan Africa. We provide civil, power and telecoms integration services to telcos, equipment vendors and governments. This requires an intimate knowledge of working under the harsh African conditions and the vastly varying business environments experienced from country to country. With the ability to choose freely from a myriad of different technologies and systems we are able to focus on quality, durability and efficiency of the power solutions in relation to the specific needs of the operator. A well designed and implemented system is also very cost effectively migrated to a renewable energy system, requiring only the addition of the renewable power elements!

### Is there sufficient motivation and drive to move to ESS and renewables?

There are factors both supporting and detracting from the drive to hybrid systems. For example on the positive side we have:

- reduced opex and EBIT wants of the operators
- simple hybrid systems can pay back in as short a period as 1 year (out of opex savings)

Whereas on the negative side:

- there is little or no governmental or regulatory drive to reduce carbon emissions or to go green!
- the redemption of carbon credits is very difficult to realize based on the small size of telecoms sites (in this regard the GSMA is investigating the possibility of bringing in all telco's sites throughout the region, but this will take time....)

### In conclusion

Off-grid supply for telcos is the norm in Africa and thus there are abundant opportunities for energy storage systems, however exploiting them calls for ingenuity and an understanding of the dynamics at play in order to produce sustainable business for the future! In our opinion the future of telecoms power in Africa lies firmly in the Energy Storage sector!