The Oil Drum: Europe
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Electricity in Uganda

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In Europe we take our electricity supply largely for granted, almost all Europeans have reliable grid electricity at affordable prices. This isn't the case everywhere in the world and may not always be the case in Europe. Electricity is a particular concern in the UK where a generation crisis is brewing with the decommission of the aging nuclear fleet, the closure of around a third of the coal fleet under the EU Large Combustion Plant Directive and the rapid depletion of North Sea gas.

To take a glimpse at what life might be like without today's reliable supply we take a trip to Africa, Uganda, courtesy of Nokia who have carried out an investigation looking at how people manage to keep their mobile phones charged and maintain some degree of electricity use at home in off-grid parts of the country.

Advertising for urban Kampala battery charging services, Uganda, Jan Chipchase, 2006

Special thanks to Jan Chipchase (blog) and Indri Tulusan of Nokia upon whose research this is based. The two Nokia presentations discussed below are available for download here.

1) Power Up: Street Charging Services in Kampala

Much of Uganda's population is not served by wire-line telecoms services (~100k telephones for a population of over 30 million) and likely never will be. Today's obvious choice for network deployment is wireless mobile networks. A single base station (which itself requires several kW) can provide coverage over 60km if the terrain allows. This results in mobile phone coverage in areas without grid electricity, possibly for many km, and leads to the question asked by the Nokia

researchers:

> How to stay charged without access to mains power?

The mobile phones are charged at stalls on the street. The example in the photo below was located at bus station. You deposit your phone with the stall holder in exchange for a receipt detailing the unique identification numbers of both the phone and the battery, the phone is locked in the cupboard and after several hours can be collected fully charged.

Street charging service provider, Kampala, Uganda, Jan Chipchase, 2006

The cost of this service is ~500 Ugandan Shillings or 23 euro cent, for comparison a one minute phone call costs between 200 and 500 Shillings. Considering a typical phone battery only stores a few watt-hours of energy (3.6V and ~1000mAh = 4Wh), then at almost 60 euros per kWh this must be some of the most expensive electricity in the world, several hundred times more expensive than European electricity. When considered next the price of the calls however it does not seem unreasonable.

This is a good example is improvisation. The stall vendor has taken components that were readily at hand (chargers and sockets) and developed the phone charging solution. The chargers are nothing fancy, just relativity inefficient AC to DC transformers producing a few hundred mA at around 5V, the charging circuitry is in the phone itself. A more efficient solution would involve a single high performance transformer however I expect absolute efficiency is a secondary consideration to simply cobbling together a solution that works.

I can't help thinking this whole approach is misguided though. When mobile phones only need such small amounts of energy, investment in a solar charger, shared between several people or even a mechanical hand charger must be a better idea in the long run. I wonder why they are not used.

Street charging service provider, Kampala, Uganda, Jan Chipchase, 2006

2) Rural Charging Services, Uganda

The second of the Nokia presentations shifts the focus away from phones on to home power with the question:

> How to stay powered up without access to mains power

The researchers discovered that in rural communities where grid electricity supplies are not available car batteries are the primary means of supply. A used car battery is said to cost between 30 and 40 US dollars and is enough to last a household using items such as radios, CD players, televisions and domestic lighting for a month. The challenge, as with the mobile phones, is how the charge the batteries.

The process identified takes 3 to 5+ days:

> Deliver the car-battery to a charging service, often tens of kilometres away the nearest town with mains electricity access. The battery is taken and returned by a trusted and friendly taxi driver or trader.
>
> I takes 3 days to charge a battery, longer if the town where the service is based itself experiences power cuts.
>
> The cost of charging a battery around 1,000 Ugandan shilling (0.46 Euro), not including delivery. As a comparison a mobile phone battery costs half as much to be recharged.

Rural car battery charging service provider, Uganda, Jan Chipchase, 2006

As with the solar or mechanical charging for mobile phones I mentioned above, I'm not convinced this is the best approach. Lead acid batteries are heavy and the charging process plus transport is expensive. Surely using off-grid electricity generation using photovoltaic or even a bicycle and dynamo would be better.

Question to the group – how long does it take to charge a car battery with a bicycle?

Summary

Whist no part of Europe is likely to face prolonged failure of grid electricity in the foreseeable future it is reasonable to suggest the reliability will decline in some areas over the next couple of decades. We should be asking ourselves (or possibly the off-grid Ugandans) how to minimise the socioeconomic impacts of unreliability.

When tackling this issue the Ugandans do not seem to have developed any specific, innovative solutions but rather make do with improvisations based on the technology at hand. They use banks of regular chargers for the phones not a single large DC power supply, they use car batteries (according to Nokia) not the more suitable deep discharge batteries.

I suspect the same will be the case in Europe unless we act with foresight, designing and deploying equipment today, that is tolerant of the intermittent grid supplied electricity we may be faced with in the future.

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