



Redrawing the Grid

A case for sustainable, decentralised electricity for Southern Africa

Thala seswantsho gape

Lekga la tša maatla le le hlokomolwago e bile le lekodišwago ke ditsibi.

Imiqondo ngokokutsha

Ukukhankasela iindlela zokonga umbane ezilondolozekayo njalo ezisebenza ngoku nakwizizukuwan a zezizukuwana ezizayo emazweni asemazantsi e-Afrika.



Knowledge is Power

The energy we use influences many areas of our lives. Our ability to access energy affects our basic needs such as access to food, water and good health. Energy underpins our economy and the way in which we supply and use energy and the choices we make as a nation will impact on our livelihoods for many years to come.

The first steps to dealing with known and unknown benefits and impacts of different electricity systems are to acquire information, spread that information and collectively strategise.

We hope this resource book helps you along that journey.

The reason for this brochure:

Civil Society organisations working in the energy and climate change sector have prepared sound technical arguments for their motivation for renewable energy, energy efficiency and the importance of involving the broader affected citizenry in these debates.

This brochure is one of a series that looks at different aspects of an alternative energy vision for South Africa. This brochure summarises the findings of an in-depth report that examined how decentralised electricity system that was based on renewable energy might be beneficial, particularly to those millions of South Africans who are beyond the reach of the national electricity grid.

The report is available in English on-line at www.thegreenconnection.org.za, together with details of the eleven case studies on which the conclusions of the study are based.

The Green Connection is a non-governmental organisation working in the field of renewable energy and climate change.



The threat of climate change means modern society cannot continue producing energy, and associated greenhouse gases, as it has for the past 300 years. But developing communities need access to energy urgently if they are to be lifted out of poverty.

Where poorer communities in Southern Africa aren't plugged into the electrical grid, they lack access to power for cooking, lighting, doing laundry, heating or cooling homes, telecommunications and many activities that would otherwise drive local economic endeavours.

This report, written to inform the World Bank Group's energy strategy for the next decade, demonstrates how renewable energy can address these issues. Communities' health and wellbeing may be improved if they have access to affordable, clean energy while fostering economic productivity.

Six case studies are included here, demonstrating models for sustainable energy growth in poorer rural and urban communities in Southern Africa. These show how appropriate technology, diverse mini-grid systems, political will within local authorities, a "can-do" approach from the private sector, and appropriate policy can change the way emerging economies are powered.

For the full report and case studies in English, visit www.thegreenconnection.org.za

Energy Poverty and the Grid

In South Africa – a focal point of this study – up to 55% of the population lives in poverty. Even though 80% of homes are now electrified, there are still 2.5 million poor rural households without electricity. Poverty means that even people on the electricity grid may not be "energy secure" as the relatively high, and climbing, cost of electricity may be unaffordable for many. To compensate, poor households often burn alternative fuels such as wood and coal indoors, exposing themselves to dangerous smoke pollution.

Renewable and energy efficient solutions can overcome the challenges of fossil fuel-related emissions and help alleviate energy poverty. Although the initial rollout costs of these technologies may appear high, these case studies demonstrate that renewable solutions are becoming increasingly more affordable, meaning the provision of energy for the poor and marginalised will be financially sustainable. Renewable energy also buffers users against the fluctuating price of electricity since it is not subject to the variable but ever-increasing costs of fossil fuels. This is particularly true in relation to South Africa's electricity utility Eskom, whose tariffs are planned to double in the coming three years. These price hikes will obviously hit poorer communities hardest.

How to make it work

Establishing renewable and energy efficient measures within communities will require strong leadership, technological skills, appropriate financing mechanisms, and a policy framework that fosters these efforts. Valuable insights were gleaned from the case studies reviewed for this report.:

1 The champion

Strong, passionate cooperative leadership was critical in implementing many of these projects, whether within local government, an NGO or the community. This provides institutional knowledge to overcome bureaucratic hurdles and ensure community and gender inclusion.

2 Knowing the rules of the game

Rolling out these energy solutions is not dependent on having the necessary policy framework in place, but it helps to know the legal and institutional frameworks in which projects will operate. For instance, having a Renewable Energy Feed-In Tariff (REFIT) may encourage entrepreneurship from independent power providers, but *not* having a REFIT policy in place doesn't need to hamstring such developments. Private partnerships can succeed, for instance, through building a mini-grid within a community or via legal contracts with government.



3 Money talks

Local authorities wanting to invest in renewable or energy efficient technologies need appropriate funding. This may come from a municipality's own tax structures (such as tiered tariff structures and cross-subsidisation) or from external funding such as that related to climate change.

For ventures by energy entrepreneurs to be financially viable, private sector or cooperative initiatives need to be able to feed electricity onto the grid easily and get a fair price for their product. The size of a development needs to be appropriate to the need and location of a community.

4 Getting the “tech” right

There's no one-size-fits-all approach: one community's solution may be a mini-grid combining fossil fuel technology with wind and solar; another situation may require retrofitting homes with solar water heating systems. This means tailor-making solutions to each situation.

When addressing energy poverty, solutions need to address health, education and other socio-economic concerns. This requires technically adept people, careful planning and strong links within communities. Job creation opportunities are considerable, as people within communities can be trained to install, manage, maintain or repair equipment, for instance.

Final word on policy

Policymakers must match appropriate energy solutions with demand, prioritize the role of local government, find appropriate funding mechanisms (such as micro-finance or public-private partnerships to ensure long term sustainability), see where renewable energy can create jobs, include women in the energy conversation and take a decentralised approach to energy planning.

Case Studies

These cases show that the most successful and affordable energy service is a mini-grid based on biomass, linked to an industrial activity such as farming or tanning. The integration of industrial and residential energy systems appears to provide the most affordable electricity to poor households. Based on an average mini-grid tariff of R1.50 per kWh, the decentralised renewable energy model is calculated to be cheaper than the average Eskom prepaid electricity unit by 2015.

[1] Waste not, want not

A chicken farm in KZN has the potential to produce three times more power than it uses, simply by harvesting the methane from the birds' manure, and could feed the surplus power onto the national grid. Custom-made tarpaulin bio-digesters are the basis for a biogas plant built on the farm: manure is fed into the massive sausage-shaped tarpaulin containers which are solar-heated to facilitate digestion; the methane captured in the system is diverted for use in cooking stoves and running an electricity generator on the farm.



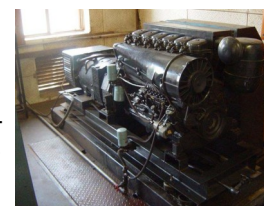
Given the quantity of manure produced on the farm, its biogas plant could generate 11 000kWh of electricity monthly.

[2] Mixing it up in the Namib

An experimental mini-grid at the Gobabeb Training and Research Centre in the Namib Desert is so successful, it's being replicated into a larger off-grid system for the Tsumkwe settlement in Namibia. When the Tsumkwe energy system is completed in 2011, it will be one of the largest hybrid systems in Africa.



Gobabeb moved from a diesel-operated mini-grid to a mix of renewable and diesel energy. Parallel to this was a series of efforts towards energy efficiency, good energy management, raising awareness around energy use, and revenue collection using metered consumption.



Adding solar and wind power to the formerly diesel-only local grid, Gobabeb has switched from 18 hours of power per day, to 24 hours while cutting back on diesel use by 83%.

[3] Retrofitting for the poor



The challenge of getting power into the homes of poor South Africans may be met if the pilot retrofitting project in the Cape Town community of Kuyasa, in Khayelitsha, can be duplicated in other developing communities.

Government-constructed low cost houses had solar water heaters (including showers and hot taps), insulated ceilings and energy-efficient lights installed in a cooperative partnership between city authorities, the local community and the non-governmental organisation SouthSouthNorth.

Some 2300 homes were fitted, saving each household about R625 in energy expenses annually. By powering these homes renewably and efficiently, the Kuyasa project saved 2.85 tonnes of potential CO₂ emissions per household per year and increased quality of living (including health).



[4] A “Robin Hood” approach to energy management

The Ekurhuleni Metropolitan Municipality in Gauteng, South Africa, is using some of the electricity revenues earned from higher using households in wealthier areas to subsidise the installation of solar water heaters and other energy efficiency measures in poorer communities. The tiered tariff system allows for higher rates on energy consumption above 2 500kWh per month. Five civic centres and 20 depots within the municipality have been retrofitted with energy efficient lighting, kettles and geysers, amongst others, saving the local administration over 320 000kWh annually (equivalent to 308 tonnes of CO₂ per year). This is just one example of how political will can bring about significant change at local government level.



[5] East African entrepreneurialism

Two Tanzanian biomass projects serve as excellent models for how organic matter can be used as a sustainable source of energy. The Tanganyika Wattle Company LTD (TANWAT) uses wood chips from wattle, pine and eucalyptus trees to fuel a steam-driven turbine which feeds electricity into the local grid while the exhaust steam from the system is directed back into the plant to increase efficiency. In 2002, the TANWAT power plant supplied half of the electricity used by nearly half a million people in the Njombe district. Meanwhile a sisal farming and processing company, Katani LTD, uses a 300kW biogas digester to drive the plant's operations: sisal waste is deposited into the digester, methane harvested, and used to fuel a generator.



[6] “Modern energy for all”

This is the payoff line of NuRa, an “energy services company” operating up the east coast of South Africa. Functioning as a trust which allows all employees a degree of ownership, NuRa offers off-grid energy to more than 10 000 users. They provide photovoltaic and LPG gas technologies to mostly poor, rural households. Their small scale PV setup replaces candles, car batteries and dry-cell batteries which are often used in off-grid homes, and provides a reliable supply of electricity for powering lights, radios, small television sets and charging cell phones.

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