

Can renewable energy turn Nigeria's lights on?

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Around 70 million Nigerians have no access to grid electricity. Reliable night-time lighting for households, for refrigeration, and affordable power for businesses would change many lives, and renewable energy has the potential to do this. But for solar power, hydropower and wind energy to be made available on a significant scale, government policy needs to change. Affordable loans to finance development and market growth for a range of installations, including solar thermal power, which shows major long-term potential for northern Nigeria, are essential. And government and non-government organisations must implement a strategy to increase understanding among individual consumers, business people and policymakers about the benefits of renewable energy.

Bridging the energy gap

There is a major energy gap in Nigeria. Present levels of conventional power generation of around 5000 MW go only a fraction of the way to meeting demand, which at the most conservative estimates, is around 20,000 MW (other estimates have been as high as 60,000 MW). Millions of people face the prospect of little or rationed access to energy for years to come. Power sector reforms need to support renewable solutions as complementary energy sources for more rapidly deployed renewable energy, particularly solar thermal, to increase grid capacity and to support the millions who will not have grid access for many years to come, through use of technologies like solar photovoltaic (PV).

Using a cost argument to resist policy change only goes so far before it falls down. Grid electricity is currently cheaper to use (see box), but the reality is that not

only are renewable costs coming down at an extraordinary rate with technological advances, but also erratic grid supplies actually mean that expensive 'standby' generators have become the main source of power for many basic rural services and households. Off-grid renewable energy also becomes more affordable if more attention is paid to the full cost of operating generators and the potential gains (through savings in transmission and grid costs) of positioning renewable energy generation much closer to end users than is possible with grid power.

Improving energy efficiency is also a good first step in reducing the supply-demand gap and much can be done here to reduce domestic and business consumption through more efficient appliances and better usage behaviour. Off-grid solar-PV systems become far more affordable if designed around energy-efficient products.

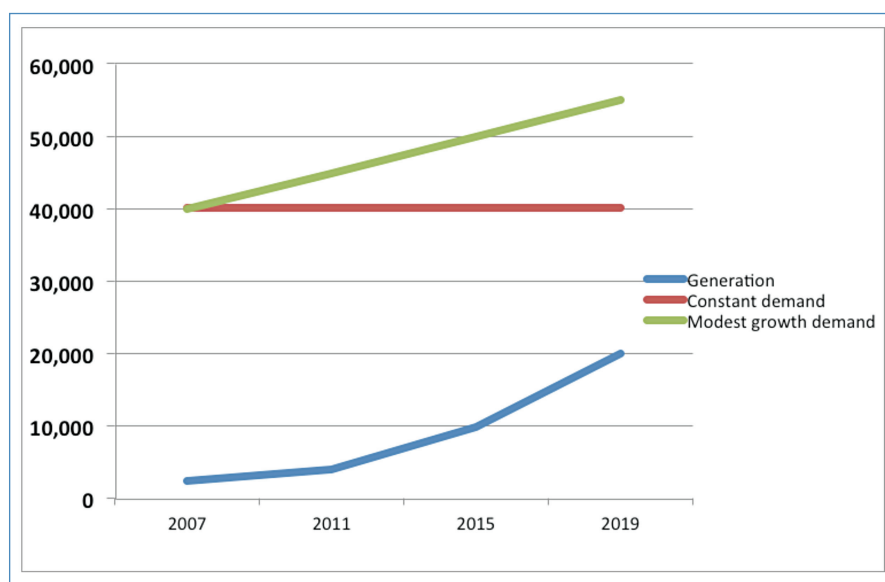
Cost per unit of power of renewable energy*	\$0.26-0.50/kWh
Cost per unit of grid electricity	\$0.10-0.15/kWh
Cost per unit of 'standby' electricity from generator or kerosene	> \$0.50/kWh
*Renewable energy costs continue to fall annually with some projects now credibly claiming 'grid parity' where renewable solar-PV power costs the same or less than conventional grid retail in Europe. For example, in a recent project in Spain, ¹ costs savings of solar-PV compared to today's grid energy costs are in the range of €0.05-€0.07/kWh (around \$0.10). Important to lowering the cost of renewables to a level similar to that enjoyed in Europe is fostering a wider renewables market in Nigeria and reducing the business costs of renewable energy companies – including removing import barriers and tariffs.	

1. PV-Tech (2012) Conergy's Spanish pilot project achieves grid parity [online]. Available at http://www.pv-tech.org/news/conergys_spanish_pilot_project_achieves_grid_parity [Accessed 05 December 2012]

POLICY POINTERS

- Government must commit to renewable energy by creating and supporting systematic policymaking, research and finance for the development of the sector.
- The case for renewable energy needs to be made through an education campaign aimed at policymakers, business people and ordinary citizens.
- State governments should consider reducing business costs for renewable energy companies in order to lower barriers to product expansion.
- Renewable energy developers and financiers need to work together to make the case for renewable energy in both homes and businesses with a clear path to affordable options for customers with very different needs.

Fig 1. Estimated electricity demand in Nigeria



Source: author²

While not all the refrigeration problems are down to solar power, failure of components because of dust or leaves on solar panels is totally avoidable, as is lack of knowledge about existing regional maintenance contracts.

But past experience also includes the lessons from projects where the desire to take on a valuable large-scale project outweighs the concern for monitoring results, contractors and technical basics. An attitude of 'let's see what we can get away with' has blighted many renewable projects and contributed to the sector's poor public reputation. From the favoured project agency to the installers and even product vendors, a lack of interest in

accountability has led to poor quality installations and products and a consequent high project failure rate.

Busting the myths about solar power

Renewables, and especially solar energy, have had a bad press in Nigeria. Many people know of solar power projects that have failed or believe that conventional electricity will always be cheaper. But there have been successful projects which have shown clearly the potential of this kind of energy; projects which through years of innovation and experimentation have achieved a reliable and affordable energy supply using fit-for-purpose products that are robust and require minimal maintenance.

The Niger Delta Wetlands Centre, for example, has developed a model for solar-powered water boreholes, despite being in an area of the country with a reputation for 'cloudiness'. It chose a direct current system that eliminated the need for batteries and inverters – two elements notorious for high cost and high failure rates. By assessing likely demand for water on a daily basis and adjusting tank storage and daytime pumping rates accordingly, the system pumps enough water to meet local needs.

Learning from past experience

The experience of the Wetlands Centre highlights the importance of continuous testing, learning from mistakes and refinement of product design. The refrigeration sector, where solar power is a major factor in the increase in supply of fridges to rural health centres as well as to households, also shows that where valuable lessons learnt have been forgotten over time, mistakes lead to significant failure of systems and persistent concerns around maintenance.

It need not be like this. The private and social enterprise sector has a key opportunity in Nigeria to tap into a huge potential market. With more market research and analysis and access to better quality products – many already available in other countries – the possibilities are huge. The present challenge, however, is in finding reliable and experienced renewable practitioners to join the supply chain and ensure a project or product's success.

Investment in development and market research as well as support for all stakeholders to collaborate and share knowledge and experience is a key responsibility of government, working with non-government organisations. Applying the learning across Nigeria could reduce the likelihood of unnecessary failure.

Financing renewable energy

Progress in product design and technology for renewable energy generation from household to grid level is well advanced, if not widely known in Nigeria. It could be further forward, however, if a major barrier were removed – that of access to affordable finance.

If a typical household has a choice of a solar lantern with no ongoing energy costs priced at N3,000 (\$19) and a kerosene lantern with constant fuel needs costing N300, the likely result, where money supply is not flexible, is to choose the lantern that is cheaper in the short term. Translated to a larger scale, an investment of N40,000 for a generator with weekly fuel costs of N3,000 will win over a

2. The demand figures for the graph are a rough illustration of one scenario for demand with an assumption that Nigeria would have a peak demand of at least 250 Watts per person, if the grid were able to supply it (some of that need currently being met by generators). As a comparison South Africa's 45,000 MW peak capacity is barely keeping pace with its 50 million people is equivalent to 900 watts capacity per person. Ghana where there are increasing blackouts with estimated electricity coverage for 43% of its population of 23 million with 2,000MW of generation could be said to have 200 watts capacity per person 'on the grid'. As mentioned elsewhere these figures only underscore the importance of energy efficiency and South Africa's energy companies are making this a central part of their strategy for meeting growing demand gaps.

small solar/inverter combination costing N250,000. Cheap startup capital or loans, together with education to improve awareness of the long-term benefits and increasing reliability of solar-powered products, could go a long way to making the alternative renewable choices a possibility.

Providing incentives

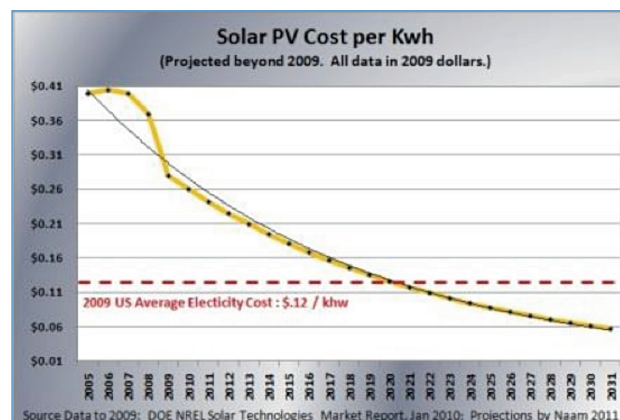
Few people doubt that in the next ten years solar power will become more competitive in price than existing fuels in Nigeria (as illustrated in Figure 2). Solar panel prices are falling and combined with more energy-efficient products, this kind of power represents better value for money in many situations. But despite this, installation costs are a make-or-break factor in determining whether a household consumer or a business makes the switch. Major incentives, such as low-cost loans and feed-in tariffs, could change this.

Feed-in tariffs are not without risks: at the household level it may be impractical to consider, given the unreliable state of the national grid. But larger businesses could support greater renewable generation and an assured tariff of around N40(\$0.25) per kWh might prove to be enough of an incentive, particularly if businesses who face much higher costs are able to meet part of the difference from grid power which is only theoretically available in many areas. A broadened set of pilots with clear business rationale in northern Nigeria could serve not only to raise the profile of feed-in tariffs but also to build a more positive reputation for renewables, and particularly solar thermal power.

Access to capital

Nigeria has typical borrowing rates of more than 20 per cent, which serves as a huge disincentive both to individuals and businesses to invest in either a basic household product or the infrastructure required to switch to renewable generation. With payback periods starting from between one and three years, the cost of borrowing becomes paramount in calculating the costs of installation.

Fig 2. Projected costs of solar PV versus conventional electricity, 2005–2031



Source: Nigeria Low Carbon Plan: Power Sector – Interim Presentation, October 2011

The need for affordable loans is crucial for development of the renewables sector. The Bank of Industry in Nigeria has committed to providing loans at 7 per cent or less per year for solar power generation, but more impetus is needed from government and the banking sector to make sure that theoretically available capital is converted into real projects.

In turn, to support this initiative, much more knowledge about the market for consumer products and the ability and willingness of consumers to pay bills is needed, to inform potential investors' decisions. Renewable energy developers and financiers need to work together to make the case for renewable energy in both homes and businesses with a clear path to affordable options for customers with very different needs. Loans will only become the norm when improved access to capital is combined with credible information and choices are fully understood by domestic and business consumers.

The potential of solar power to improve access to IT

Nigerians living in rural areas have poor access to information and to new technology. A stable power supply provided by solar energy and the availability of innovative products could change that. This would be a huge improvement over conventional power, prone to high cost generators, expensive maintenance requirements and damaging power spikes.

The Stakeholder Democracy Network runs an IT centre in the Niger Delta using solar power and newly developed low-energy computers designed especially for rural conditions by Aleutia PC Systems. This has brought the cost of the whole centre down by 75 per cent compared with estimates for a similar project in 2006, and has made it fully feasible. IT products are constantly developing and in a short time costs will be even lower and reliability greater. Schools as well as rural IT centres could be major beneficiaries.

Progress will only be made, however, if the public sector commits itself to using this technology and to taking the next steps in the process – steps that apply to all solar power applications, as much as to IT centres. These include:

- Supporting research and development of simple high-quality products with robust and well-protected components
- Improving solar efficiency and supporting new technology to make products more affordable and reliable
- Promoting market development through education of government and non-government budget holders
- Improving access to the many applied technologies available in other countries, but not yet available in Nigeria.

Investment in education

Improving understanding of the long term-benefits of renewable energy, the new products available and the likely installation costs is critical to the success of the sector. It will not be straightforward to counter misconceptions, acknowledge the reasons for past failures and reassure business, individual consumers and policymakers that future projects will learn from experience, but it is essential to dispel prejudice and restore the renewables sector's reputation.

The process can start with the government putting in place a highly visible range of well-run pilot projects and setting up a strategic education programme nationwide with target audiences including school children as well as adults. The secondary school education scheme started by the Lagos State Government with an online component and focus on energy efficiency is a simple but effective example. Adults could be reached through partnerships with organisations such as churches and mosques.

Towards energy independence for all

If federal and state government, the private and social enterprise sectors and not-for-profit organisations work collaboratively to support the holistic development of the renewable energy sector, they will make a difference.

Develop integrated renewable energy planning and investment

The federal government needs to reinforce its existing initiatives by developing both an integrated renewable energy plan that incorporates the lessons of the past ten years and a systematic major increase in investment

in research, market development and regulation of renewable energy.

Provide incentives for renewable energy uptake

Government should also consider incentives, probably through a feed-in tariff, and test their feasibility in at least one major pilot of solar thermal power generation in northern Nigeria.

Ensure sufficient and affordable capital financing

Low-interest capital financing for renewable energy needs to be systematically expanded, with increases in available capital matching growth in the industry.

Improve public understanding of renewable energy

Renewable industry actors and government need to make a significant investment in public education that will improve consumer and policy choices and overcome existing prejudices against the industry.

Cultivate collaboration between renewable energy developers and policymakers

Policymakers and renewable-energy developers need to work closely together to develop best practice options for services in rural areas — particularly for education, health centres and water provision.

Educate on energy use and efficiency

Energy use, particularly energy efficiency and renewable energy, needs to be a core part of the education system as swiftly as possible, with a view to changing public behaviour and expanding participation in a growing renewable energy sector.

Further resources

Suppliers of off-grid and solar products: www.lightingafrica.org and www.greenlightplanet.com and www.barefootpower.com
Suppliers of refrigeration products and solar powered water pumps: www.trueenergy.com
Stakeholder Democracy Network: www.stakeholderdemocracy.org
Suppliers of low energy IT products: www.aeutia.com
For gains made in the efficiency of computer products, see:
<http://www.extremetech.com/computing/95913-koomeys-law-replacing-moores-focus-on-power-with-efficiency>
World Bank worldwide energy assessment 2010 estimates that 50 per cent of the Nigerian population have no access to grid electricity: <http://data.worldbank/country/nigeria>
Roadmap for the Power Sector 2010 outlines Nigeria's energy policy: www.nigeriapowerreform.org/index.php/downloads

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This briefing paper is based on a research paper entitled *Renewable energy potential in Nigeria: Low-carbon approaches to energy delivery through renewables* by Chris Newsom and published by IIED, London for the Sungas project. The full paper can be downloaded free at <http://www.sungas-nigeria.org/resources-and-links>.

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The SUNGAS project aims to catalyse development of Nigeria's natural gas and renewable energy markets through innovation, demonstration, policy dialogue and advocacy. Small demonstration projects for both renewables and gas-to-power aim to show that community-based energy facilities are technically viable, financially sustainable, and can ensure better access to modern energy services for rural communities.

For further information on the Sungas project visit: <http://www.sungas-nigeria.org/> or contact Emma Wilson (emma.wilson@iied.org) or Ben Garside (ben.garside@iied.org) at the International Institute for Environment and Development (IIED).

