

Transition to Solar Home Systems in Nigeria

BY MARYAM BELLO

Abstract

In Nigeria, the imbalance between power generation, transmission and consumption has resulted in unreliable supply and frequent blackouts. These necessitate Households to resort to self-generation using backup electricity generators. However, there is a recent gradual transition of replacing these fossil fuel backup generators with solar home systems.

1. Background

Reliable, affordable and sustainable energy is regarded as the key to economic development and the basis for enhanced economic growth. Access to electricity is above all critical to human development as electricity is, in practice, necessary for certain basic activities, such as lighting, refrigeration and the running of household appliances, and cannot easily be replaced by other forms of energy. Individuals' access to electricity is one of the most clear and un-distorted indications of a country's energy poverty status. Yet, an estimated 1.1 billion people-14% of the global population do not have access to electricity. Many more suffer from supply that is of poor quality. Around 84% of those without electricity access reside in rural areas and more than 95% of those living without electricity are in countries in sub-Saharan Africa and developing Asia (IEA, 2017).

Nigeria is a Sub-Saharan African Country with the largest economy and the richest oil resource centre of the African Continent. The country also remains the largest gas consumer and producer of West Africa. Yet, the country has the highest number of people without electricity in the region. It is estimated that about 40% of Nigeria's population do not have access to electricity (IEA, 2019). In Nigeria, the imbalance between power generation, transmission, and consumption is a major challenge for the population of around 200 million. While over 13 GW of grid power generation capacity is installed, only approximately 3.4 GW reaches consumers on average (PPI, 2019). The implication of this puts a large number of Nigerians without access to electricity at all, and those who have access battle with unreliable supply and frequent blackouts. Given this high level of unreliability, households in Nigeria have adopted different strategies to cope with this poor public provision. Some of these response adjustments include the use of kerosene lamps, kerosene stoves, rechargeable lamps, gas lamps, inverters, touch lights, mobile phones with touch lights, and self-generation through backup generators. Although all these responses are observable among Nigerian households, the most common and closest substitute to the electricity from the public grid is self-generation. Many households operate small size generators with capacity ranges between 0.4kW and 8kW for their own generation (Oseni, 2014).

These small generators produce considerably high levels of noise and emit carbon monoxide (CO) which is inimical to human health. Sadly, many Nigerians who are unaware of the dangers associated with generators fumes have fallen victim of their own prized possessions.

The continued heavy reliance on fossil fuel powered generators in Nigeria by government, institutions, and households for electricity supply constitutes a major threat to the nation's climate change plan and eventually pose a health risk.

However, with the growing concerns over the environmental consequences of emissions from the continuous use of fossil fuels, and the geopolitical climate surrounding fossil fuel production, renewable energy sources have emerged as an important component in the energy consumption mix. According to many studies, renewable energy has one of the most significant cost-effective potentials for reducing energy-related greenhouse gas emissions. Increasing the supply of renewable energy would allow for the replacement of carbon-intensive energy sources and significantly reduce pollutant emissions.

2. How Transition to Solar Home System is taking Place in Nigeria

Unreliable power supply through the electricity grid is a major challenge in Nigeria, and therefore alternative energy sources are often used to meet basic electricity needs. The household sector, which accounts for most of the energy consumption, resorts often to self-generation through backup generators. However, there is recently a gradual transition of replacing these fossil fuel backup electricity generators with solar power systems. This has led to the emergence of several off-grid solar companies providing access to cleaner and more reliable electricity to homes and small businesses. These companies usually install rooftop solar panels and an indoor battery unit that supplies electricity to homes whenever there is a power outage from the national grid.

One of the most popular initiatives is an MTN franchise called "LUMOS", which provides customers with a mini solar kit to power critical loads in the home such as LED bulbs, computers, mobile phones, television sets, radios, fans and other small appliances. Importantly, the kits are provided on a pay-as-you-go basis to remove the upfront cost of acquiring a solar home system. Other companies and NGO's have implemented similar schemes, usually providing solar home systems comprising of solar panels, an inverter and batteries for energy storage. Their pitch has also been multidimensional: offering households clean and reliable electricity to boost productivity.

Maryam Bello is with the Department of Economics at Gombe State University in Nigeria. She may be reached at maryambello2014@gmail.com

3. Limiting factors

Nigeria is endowed with abundant renewable energy resources which if well placed will meet the electricity demands of its growing population with clean, reliable electricity. These resources range from biomass, hydropower, solar, wind and potentials for hydrogen utilization as the most abundant. However, there are some identified structural barriers to a successful transition to renewable energy in the household sector. These include: i) lack of skilled personnel to meet a code of standard procedure, to install and maintain solar PV. ii) lack of adequate knowledge about how to use the solar home systems, for example improper identification of the ideal system capacity. iii) The initial setup cost is high and very few households can afford to buy and install the technology. iv) Most of these solar solutions can only power few appliances and are basically suited for use in rural areas. v) Another factor is cultural and behavioural changes required for full utilization of a solar home system.

4. Conclusion

Ensuring a smooth transition to renewable energy systems such as solar requires the enabling technologies, grid modernisation and expansion of appropriate business models, market design and system operation. Overall, this transition is expected to reduce long-term power system cost, lower pollution and improve energy security as a result of reducing the reliance on fossil fuels.

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