

RESEARCH PAPER BY RICHARD ATTIAS & ASSOCIATES

TASKFORCE 1      Scheduled for: August 29, 14:30-16:00, Libreville room

## RURAL ELECTRIFICATION

Powered by Africa Caucus, Harvard Kennedy School

### Session overview

Electrification will have a significant effect on employment levels in the short term (within five years), raising employment by enabling micro-enterprises. Yet less than 10% of sub-Saharan rural households have access to electricity with an overall access rate below 25%. Under existing scenarios, that number will increase to about 50% by 2030 – how can we increase access to electricity further and quicker?

- YOSTINA BOULES, Founder, Taqa Solutions (Egypt)
- MOHAMED H'MIDOUCHE, CEO, Inter-Africa Capital Group (Morocco)
- BUNKER ROY, Founder, Barefoot College (India)

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### Current situation

Africa has a large and growing energy deficit. According to the [World Bank](#), less than 10% of sub-Saharan (SSA) rural households have access to electricity, with an overall access rate below 25%. This low level of electrification is projected to worsen over coming decades due to the continent's rapid population growth rate, with some experts expecting no increase in the rate of coverage even if all ongoing electricity generation projects were to be completed. In fact, at the current pace of electrification, only 50% of SSA's population would have access to electricity by 2030. Without adequate electricity supply, Africa cannot achieve the goal of rapid industrialization and broad based prosperity. Africa's rural communities bear the brunt of the continent's energy poverty with the rural poor having the highest cost per joule of energy.

### Technical and policy challenges

Africa's energy landscape is currently as complex as it is inadequate. In Africa today, depending on the region, between 19 and 50% of total installed energy capacity is produced by households and businesses, representing a \$1.2 trillion fuel generator market in Africa and the Middle East ([Energy Policy 2015](#)). Major economies such as Nigeria have national grid capacities that are about a third of their

private generation capacity ([McKinsey Global Institute](#)). This data clearly shows that the continent's energy supply is already decentralized, with off-grid power sources such as generators and increasingly solar, micro-hydro and other renewable sources supplying the bulk of the energy consumed. Dalberg research shows that demand for products such as solar-powered lamps and chargers has been growing by 90% annually in Sub-Saharan Africa compared to 45% in India.

It is increasingly becoming clear that off-grid power will continue to play a significant role in providing energy for the African continent. It is also apparent that the decentralized nature of these off grid solutions provides unique advantages when tackling issues of energy grid resilience and technical loss over the vast distance that electricity needs to travel on traditional grid power systems. These are particular concerns for rural electrification where the target communities often live far from the path of major power lines and are dispersed into small settlements that are difficult to serve economically.

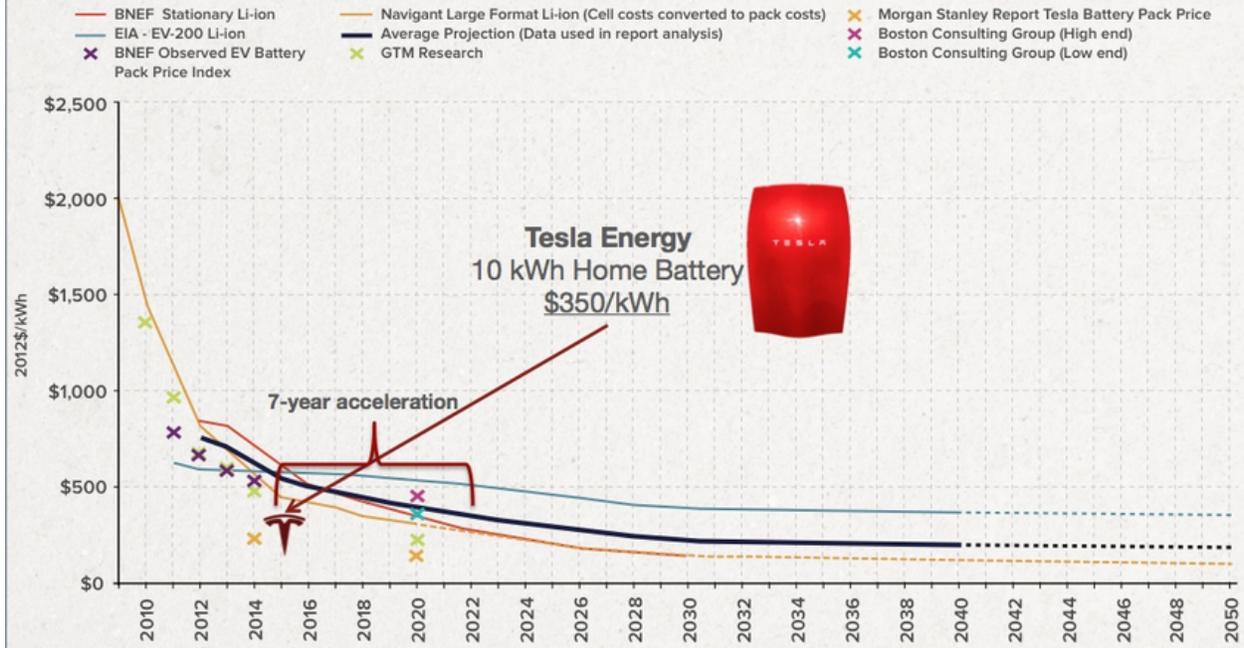
A number of innovative companies like Stima Co. in Kenya are experimenting with alternatives such as micro-grid solar energy installations with the help of development partners. The major hurdle that needs to be overcome by such experiments is developing economic models that would enable the communities to pay for the upkeep of the expensive energy storage. Stima Co. is experimenting with charging enough for their service to cover this upkeep cost. Fortunately battery cost has been dropping faster than industry consensus predictions and are projected to continue to do so with major new producers such as the Tesla Gigafactory set to come online over the next two years ([GreenBiz 2015](#)).

In addition to the technical challenges, there also exist policy challenges to the effective implementation of off-grid energy solutions, from the implementation of tax incentives, to the provision of support for the development of the technical skills necessary to install and maintain these new technologies. Programs such as the World Bank's Africa Electrification Initiative are working on supporting African countries as they craft their electrification policies so as to take into account the latest thinking and innovation in the rural electrification space.

Furthermore, partnerships with technology companies such as IBM, that are developing smart-grid solutions to increase the efficiency of existing power grids and interconnect micro-generators, could boost the effectiveness of electricity supply in remote parts of Africa. These types of technologies are likely to become increasingly important as countries accelerate their attempts to connect rural communities. In Tanzania for instance, one of every nine new connections is rural ([McKinsey Global Institute 2015](#)). Keeping the cost of rural connections low through the use of alternative smart technologies can therefore represent significant savings for national governments.

# DECLINING LITHIUM-ION BATTERY COSTS AND FORECASTS

## LITHIUM-ION BATTERY PACK PRICES: HISTORICAL AND FORECASTED



Source: Rocky Mountain Institute

Grid electricity is still central to Africa's power needs especially when one considers the needs of the industrial consumers that are essential to the continent's development ambitions. A number of countries across the continent have therefore begun to invest heavily in building out their national grids. Countries in the East African Community have also begun to interconnect their national grids so as to enable them to share their power generation capacities and trade power amongst each other, reducing the need to build out national grids that can independently handle each nation's peak load. Strengthening such regional power networks in other regions of the continent will make a significant contribution to the reduction of electricity cost across the continent further increasing access to electricity for the rural poor.

### Main issues to be solved

- Creating sustainable business models for off-grid solutions in rural areas
- Deploying more efficient grid based power solutions
- Putting in place policies that encourage innovation and reduce capital cost for power generators and distributors

### Recommendations from the World Bank, Dalberg and the Brookings Institution:

- Reducing overall cost of power through the creation of regionally interconnected power grids such as the East Africa Power Pool (EAPP)
- Supportive regulatory environments and external financing for last mile distributors of power, especially those that are willing to innovate and experiment with new power production and storage technologies (*Dalberg, 2015*)
- Advocacy for knowledge and technology transfer programs with a focus on renewable technologies (*Brookings, 2013*)
- Policy support of micro generation off-grid power through reductions in tariff on green energy technologies including offsetting high upfront capital costs through subsidies and establishing Rural Energy Funds (REFs) (*World Bank, 2012*)

### Issues for debate

It is highly likely that off-grid power will continue to play a significant role in powering rural communities given that the cost of supplying rural communities with grid electricity is estimated at three times the cost of serving urban communities (*Brighter Africa report, McKinsey Global Institute 2015*). These off grid solutions are often expensive, requiring government subsidies such as feed in tariffs in order to be competitive with grid options. Given the limited resources at the disposal of a number of African countries, what level of resource expenditure should African countries allocate to fostering the rural electrification through off-grid solutions?

*Summary prepared by Jaques-Jonathan Nyemb, Masters in Public Administration, Harvard Kennedy School, and John Kidenda, Masters in Public Administration in International Development, Harvard Kennedy School.*