ENHANCING ACCESS TO ELECTRICITY IN NIGERIA THROUGH LOW-CARBON SOLUTIONS

(NOTE: The views expressed in the paper should not be attributed to the World Bank or the Government of Nigeria)

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Overview

By 2035 Nigeria is projected to require some 600 Terawatt hour/ year (TWh/y) of power (on- and off-grid) to achieve and sustain the pace of economic growth envisaged in the government's development strategy. This paper analyzes and compares two stylized paradigms that could be followed to achieve such goal: a "reference" and an alternative, "low –carbon" scenarios.

Methods

Building on the shorter-term power sector priorities contained in the Government's Roadmap for Power Sector Reform, and projecting over the longer-term (up to 2035) the economic growth targets envisaged by Vision 20:2020, this paper first identifies a "reference scenario" where long term growth objectives are achieved through a power sector development model largely based on "conventional" generation technologies (thermal generation and to a less extent hydro-power), and delivery of electricity primarily through expansion of the national grid. The reference scenario is then compared to an alternative, more innovative approach (the "low-carbon" scenario), consisting of a mix of generation sources more diversified across technologies and across space, and a more pronounced use of distributed and off-grid generation. The technology mix of the alternative scenario is built on a spatially-explicit review of the technical potential in Nigeria of renewable energy and other low carbon sources, combined with an analysis of the corresponding levelized cost of generation, under a range of scenarios of relative prices' evolution.

Results

We find that the proposed alternative model would enable Nigeria to achieve the same long term sector development objectives of the reference scenario, at lower overall cost (10% less in NPV terms), and with significant reduction of Greenhouse Gases (GHGs) emissions, estimated to be in the range of 2 to 2.5 billion tons of CO2/e over the whole simulation period (2010 to 2035). Slower increases in the price of fossil fuels or flatter learning curves in renewable are found to delay the expansion of cleaner technologies in the energy mix, but the low carbon scenario remains by and large attractive in NPV terms.

Table 1: Two scenarios for the long term development (2035) of Nigeria's power sector

Scenarios	**Annual generation in 2035**	**Net present value of generation costs (US$ billion)**			**Cumulative emissions**	**Diversity of generation**
.	TWh	Capital and O/M	Fuel	Total	Mt CO2e	Reciprocal of Gini index
Reference	620	$86	$283	$369	6,669	18%
Low Carbon	525	$115	$222	$337	4,143	34%

Conclusions

The alternative "low carbon" paradigm presents a number of implementation challenges, in terms of information needs, technologies, institutions and regulations, and financial barriers. But it deserves consideration by policy

makers, since -under a range of plausible scenario on future power generation costs- it can save Nigeria a significant amount of resources in the long run (although with higher upfront capital expenditure); and it has the potential of placing Nigeria as a regional leader in the energy technologies of the future. Growth prospects for grid-based solar power (the bulk of which will be CSP) are significant: according to the EIA (International Energy outlook 2011) solar power generation will grow 10% a year world-wide in the next 20 years, but 24% a year in Africa. By investing early enough in renewable energy, Nigeria has the opportunity to become a regional leader in a quickly expanding market, and perhaps establishing itself as a regional hub for technology development and deployment in the rest of Africa.

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