



Independent Power Projects in Sub-Saharan Africa: Investment trends and policy lessons



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ABSTRACT

Sub-Saharan Africa is in urgent need of more power. Private sector investment is key to achieving this. Along with Chinese-funded projects, Independent Power Projects (IPP) represent the fastest growing sources of power investment in Sub-Saharan Africa. IPP investment flows show little concern for electricity market structures, but are more likely to gravitate to countries with strong planning, procurement and contracting capacity, as well as good regulatory quality. Data from the continent also shows a variety of ownership and financing structures for IPPs, but generally development financing institutions (DFIs) play an important part in mitigating risk and bringing in private financiers. We also see renewable energy breaking through on the continent - both in scale and price. This breakthrough is in part being facilitated by competitive procurement or auctions, which deliver lower prices and increased transparency when compared with renewable energy feed-in tariffs or directly negotiated contracts. These developments have important policy implications, highlighting the need for: dynamic, least-cost planning, linked to the timely initiation of the competitive procurement of new generation capacity; the building of effective regulatory capacity; and appropriate risk mitigation mechanisms. Such efforts promise to promote sustainable economic and social development across the continent.

1. The need for Independent Power Projects in Africa

Sub-Saharan Africa (SSA) has a severe shortage of power. In 2014 the 49 Sub-Saharan African countries, with a combined population of more than 800 million, had less generating capacity (92 GW) installed than Spain (106 GW), a country with a population of 45 million (Findt et al., 2014; U.S. EIA, 2014). What further sharpens this contrast is the fact that more than half of the region's installed capacity is based in a single country: South Africa. The remaining 46 GW is therefore shared among the remaining 48 countries in the region, with only 14 countries having power systems larger than 1 GW. Put another way: installed capacity in Sub-Saharan Africa is 44 MW per million people, compared with 192 MW per million people in India, 590 MW in Latin America, and 815 MW in China (U.S. EIA, 2014). Electricity demand is set to double by 2030, and triple by 2040 (International Energy Agency, 2015). A recent report by McKinsey estimates that more than \$490 billion will need to be invested in additional power generation capacity by 2040 to meet projected demand (Castellano et al., 2015). Approximately \$45.6 billion was invested in electric power generation in Sub-Saharan Africa between 1990 and 2013; excluding South Africa,

this total drops to \$31.3 billion (Eberhard et al., 2016). Existing investment levels are therefore far below what is required, calling for increased private sector involvement (Eberhard and Shkaratan, 2012). Independent Power Projects, or IPPs, are the main source of private investment in the African power sector (Eberhard and Gratwick, 2013). While these entities are having a significant impact on the African power sector landscape, relatively little is known about their related outcomes and the factors driving and underpinning these infrastructure investments.

The research questions that we aim to address, are:

- What are the main power sector & IPP investment trends in Sub-Saharan Africa?
- Why are some countries more successful in attracting private power investments than others?
- What are the different IPP types (ownership structures, technology choices, procurement methods) in Sub-Saharan Africa, and what are the related outcomes?
- What are the key lessons for scaling up investment in power generation in Africa?

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2. Methods

We define IPPs as power projects that are, in the main, privately developed, constructed, operated and owned; have a significant proportion of private finance; and have long-term power purchase agreements with a utility or another off-taker. IPPs included in this study are all greenfield, grid-connected installations of 5 MW (MW) or greater that have reached financial close, are under construction, or are in operation. A significant amount of data on power projects has been collected and analyzed for this study. Sources include a series of World Bank databases, including the Private Participation in Infrastructure (PPI) database; data from the Energy Information Administration (EIA); and databases prepared by Aid Data and the OECD, among others. In addition, the authors have conducted primary and secondary source research, particularly on individual Independent Power Projects.

Apart from the above-noted data sources, the analysis of IPP types and outcomes, as well as the identification of lessons learned, is based primarily on original, in-depth case studies carried out in five countries, namely Kenya, Nigeria, South Africa, Tanzania, and Uganda. The five case study countries were selected because they present the largest and most diversified experience with IPPs over the longest time period, accounting for around 80% of IPP investment in Sub-Saharan Africa. Each country has developed four or more IPPs, a fact that facilitates an assessment of enabling policies and regulatory frameworks, planning and procurement practices, and lessons learned. All five countries have been host to IPPs with different technology bases, which allows for a relatively in-depth evaluation of cost and reliability. Finally, each country has a mix of directly negotiated and competitively bid projects, which has the potential to shed light on which procurement methods are more effective.

2.1. Data limitations

Although an unprecedented body of data and case histories have been collected and analyzed, data limitations remain. Information concerning the composition of investments by funding source; the terms of IPP contracts (which remain mostly confidential); and the size, composition, and types of investment from emerging financiers (notably China) was gathered from various sources and triangulated. For Chinese data specifically, the authors used Aid Data as a starting point. Additional secondary source research was conducted, and then actual projects were verified with stakeholders in each of the study countries. However, because nearly every Chinese-funded generation project is directly negotiated with the government of a given African country, limited public data is available.

Due to a lack of available data, government and utility megawatts and investments have largely been derived by (i) subtracting the megawatt totals of IPPs, Chinese, official development assistance (ODA), and multilateral finance institutions, and development finance institutions, and then (ii) using the Energy Information Administration's corresponding data on "megawatts installed by technology" per country to determine residual megawatts per technology (U.S. EIA, 2014), and finally (iii) ascribing an investment value, based on average costs per technology in Sub-Saharan Africa. Wherever possible, efforts have been made to verify the megawatts and the technology with known projects undertaken by the government.

The focus of this paper is on power generation, as opposed to the transmission and distribution (T&D) of electricity. While inadequate T&D is clearly a constraint on any effort to widen service access, countries must have sufficient generation capacity to be able to serve new customers, improve welfare, and accelerate economic development. Also, a detailed discussion of the environmental externalities attached to specific IPP technologies—which pose growing concerns outside the purview of this paper.

Finally, South Africa's size and prominence in the generation of

Sub-Saharan Africa's electric power is noteworthy and hence efforts have been made to present Sub-Saharan African tallies with and without South Africa.

3. Trends in power generation investment in Sub-Saharan Africa

3.1. Investment trends

Power investments in Sub-Saharan Africa between 1990 and 2013 were far below requirements: only 15.63 GW net was added across the region, excluding South Africa (U.S. EIA, 2014). The 1990s saw a mere 1.84 GW of new capacity installed. Investment picked up since 2000, with an additional 13.8 GW installed in the region. Around 94% of this capacity has been added in only 15 countries, with the rest adding hardly any capacity at all, and some even losing capacity as a result of civil wars or poor maintenance (U.S. EIA, 2014).

While historically public utilities have been the major sources of new investment, this trend is changing. Most African governments are unable to fully fund their power needs, and most utilities do not have investment-grade ratings and so cannot raise sufficient debt at affordable rates (Eberhard and Gratwick, 2013). Official Development Assistance (ODA) and development finance institutions (DFIs) have only partially filled the funding gap. The fastest growing sources of finance for Africa's power sector are now private investments in IPPs and Chinese funding (Eberhard et al., 2016). Nevertheless, around 50% of investment in the African power sector is still coming from the public sector, but it has remained stagnant over the period analyzed. In addition, concessional DFI funding, ODA and Arab funding represent a small portion of the overall funding picture, with no real growth. The continent therefore seems set to increase its dependence on private and foreign (Chinese) investments to fund its power generation needs in the near and medium term (Fig. 1).

3.2. Chinese funding

While not the explicit focus of this paper, the growing size and prominence of China's involvement in the African power sector warrants some discussion. Chinese funded generation assets represent an important area of significant capacity additions in Sub-Saharan Africa, totalling 34 projects in 19 countries between 1990 and 2014 (Fig. 2). Taken together, these represent a total of 7.5 GW in installed capacity, with most capacity added in the years 2009–2014 (Eberhard et al., 2016). According to the International Energy Agency, Chinese capacity additions account for more than 30% of new capacity

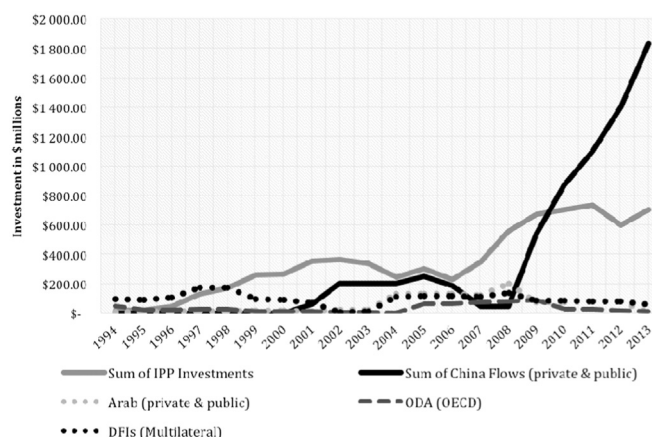


Fig. 1. Investments in Power Generation, Five-Year Moving Average: Sub-Saharan Africa (Excluding South Africa), 1994–2013. Note: DFI = Development Finance Institutions; IPP = Independent Power Project; ODA = Official Development Assistance; OECD = Organization for Economic Co-operation and Development.

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