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# Powering Africa: Facing the Financing and Reform Challenges

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Anton Eberhard\*

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**Contact at AFD:**

Nicolas VINCENT (VINCENTn@afd.fr)

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\*Graduate School of Business, University of Cape Town, [eberhard@gsb.uct.ac.za](mailto:eberhard@gsb.uct.ac.za)

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## **Powering Africa: Facing the Financing and Reform Challenges**

By Anton Eberhard, Professor, Graduate School of Business, University of Cape Town

### **Summary**

Africa faces chronic power problems, including insufficient generation capacity, low connectivity, poor reliability and high costs, all of which constrain development. Power capacity additions in Sub-Saharan Africa (excl. SA) since the 1990's were minuscule. Historically, investments in the power sector in Africa have come mostly from governments or public utilities (with foreign aid support). In recent years these sources of funding have been flat. The fastest new sources of funding are from Independent Power Producers (IPPs) and from China. To understand the determinant of the new sources, the paper analyses the effect of several key factor and find non-expected results, such as there is no obvious correlation between unbundling, or the presence an independent regulator, and the level of private investment through IPPs; or that there is no correlation between Chinese investment in generation and resource rich countries (dispelling the myth that Chinese firms are only interested in Africa's resources). The paper delivers several recommendations that indicate that more attention needs to be given to issues related to planning, procurement and contracting as well as securing revenue flows.)

This paper has been prepared for the 11th AFD-PROPARCO/EUDN Conference, "Energy for Development", December 2014, Paris.

**Keywords:** Electricity, Africa, Independent Power Producers, China

**JEL Classification:** O13, O25, L94

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## **1. Africa underpowered**

Sub-Saharan Africa faces chronic power problems, including insufficient generation capacity, low connectivity, poor reliability and high costs, all of which constrain development.

The combined power generation capacity of the 48 countries of Sub-Saharan Africa is about 80 gigawatts (GW); a single country – South Korea – has more and, excluding South Africa, this total is less than 40GW. Nigeria, with more than three times South Africa's population, has only a tenth of its installed generation capacity.

Just 12 countries have power systems larger than 1GW and they account for 85% of power capacity in Sub-Saharan Africa (excluding South Africa). Thirty Sub-Saharan African countries have grid-connected power systems smaller than 500MW and 13 smaller than 100MW.

Installed capacity in Sub-Sahara Africa (excluding South Africa) is 44MW per million population, compared to 192MW in India, 590MW in Latin America and 815 MW per million in China (EIA, 2011 and IEA, 2011).

Only three in every ten people living in Sub-Saharan Africa have access to electricity, compared to more than half in South Asia and 90% in East Asia. Rural areas remain the most under-served in the world: in some countries, less than 5% of rural population have access to electricity. Inadequate electricity networks are certainly a reason, but many countries simply do not have enough electricity to distribute to potential consumers. At the heart of Africa's power crisis is insufficient investment in generating capacity.

Previous studies have documented the required investment to provide adequate generation capacity to power economic development and for widening access to electricity. Using 2005 as a baseline, the World Bank estimated that Sub-Saharan Africa needed to add close to 8 GW of new generation capacity each year through to 2015 to meet suppressed demand, keep pace with projected economic growth, and support the rollout of further electrification in line with poverty reduction targets, against the 1-2 GW added on average every year in the past decade (Eberhard et al., 2011:58).

The cost of addressing Sub-Saharan Africa's power sector needs has been estimated at US\$40.8 billion a year, equivalent to 6.35% of Africa's gross domestic product (GDP).

Approximately two-thirds of the total spending need is capital investment (US\$27.9 billion a year); the remainder is operations and maintenance. Of the capital expenditure about US\$14.4 billion is required for new power generation additions each year with the remainder for refurbishments and networks (Eberhard et al., 2011: 60). Existing funding is far below what is needed.

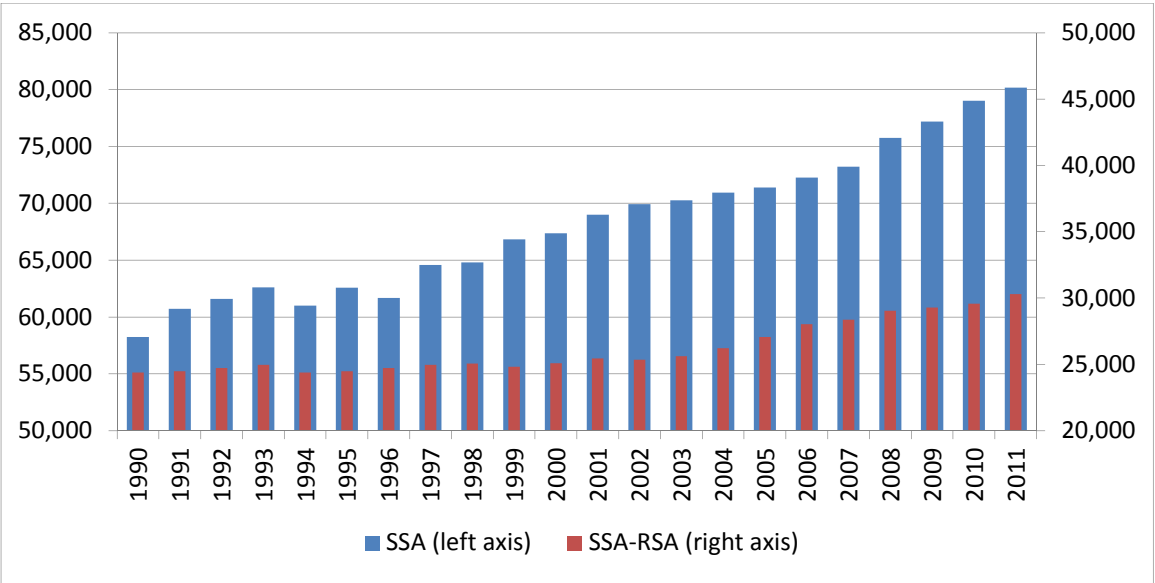
The large funding gap for new power projects cannot be met by the public finances of African countries alone. Fortunately, as shall be seen below, private investment in power in Africa is growing. The financial landscape has also changed considerably in recent years with non-traditional donors and financiers, such as China, taking a leading role. A better understanding of these emerging trends can help African countries make more informed choices and effectively leverage investments and financial assistance by a wider and more diverse range of partners.

## 2. Investment trends in power capacity in Sub-Saharan Africa

Excluding South Africa, power capacity additions in Sub-Saharan Africa in the decade from 1990 were minuscule, only 1.8GW (Figure 1). In this period, a number of countries actually saw their systems contract, which may be attributed in part to civil war and lack of system maintenance, most notably in the Democratic Republic of Congo and Cote d’Ivoire, but also countries such as Angola, Central African Republic, Ghana, Liberia, Nigeria, Sierra Leone, Somalia and Zimbabwe.

Since 2000, investments have picked up and 9.65 GW has been added in the region, excluding South Africa. A dozen countries account for around 90 per cent of these capacity additions.

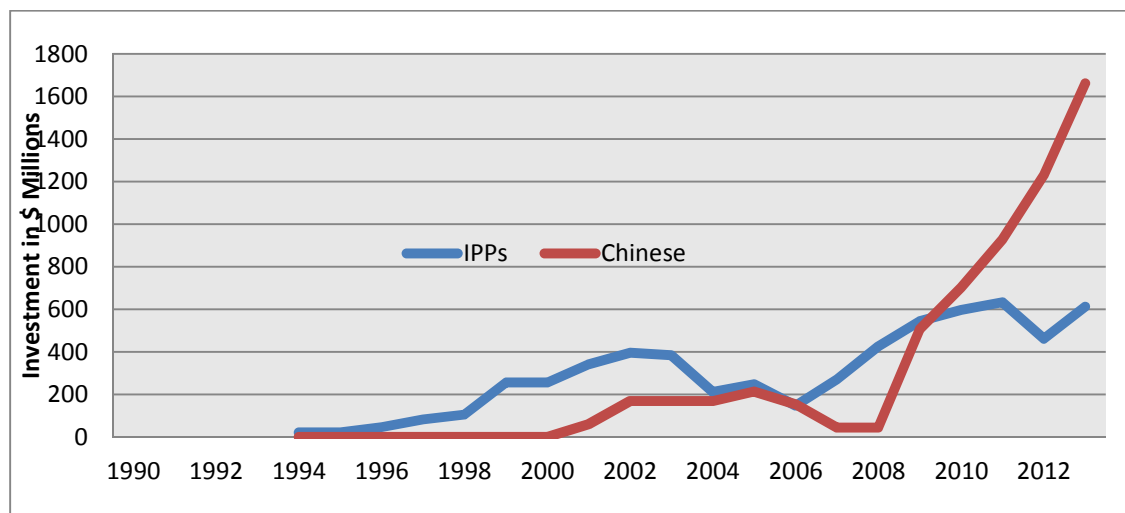
**Figure 1: Grid-connected generation capacity in Sub-Saharan Africa (MW)**



*Source: Constructed by the author from US Energy Information Agency (2014) data*

Historically, investments in the power sector in Africa have come mostly from governments or public utilities, and in some countries through ODA and DFIs. In recent years these sources of funding have been flat. The fastest new sources of funding are from IPPs and from China.

**Figure 2: IPP and China investments in power in Sub-Saharan Africa (excluding South Africa), 5 year rolling average**

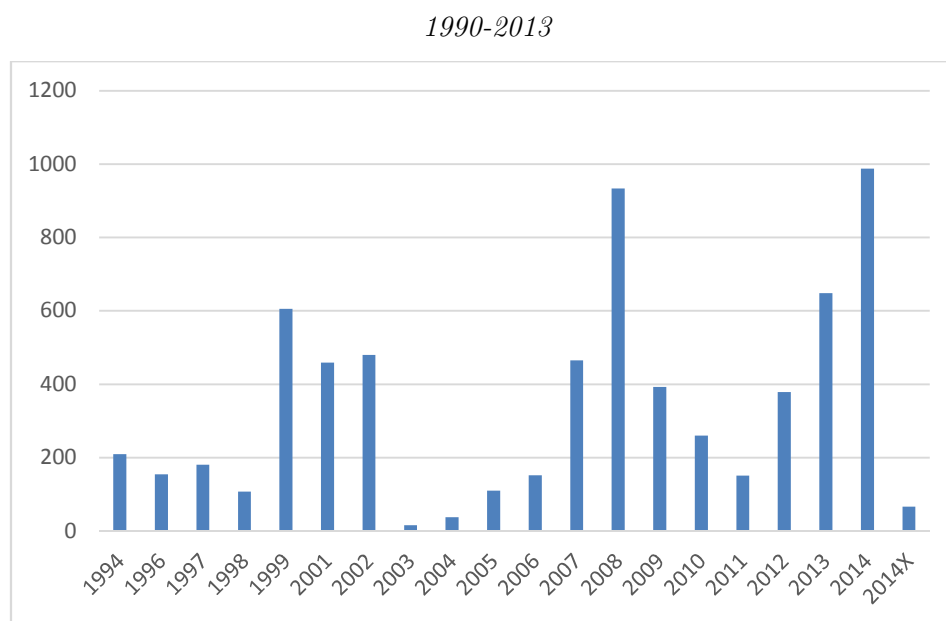


*Source: Eberhard & Gratwick (forthcoming). New models to scale up power generation investments in Africa. World Bank, Washington DC. Constructed from the PPI database plus authors' own database.*

## 2.1 IPP projects

Of the 11.5GW generation capacity added in Sub-Saharan Africa (excluding South Africa), between 1990 and 2011, around 4.1GW may be accredited to IPPs that have reached COD (out of 4.8GW that reached financial close). Recent years have seen a considerable increase in IPP projects and an additional 977MW reached financial close in 2012 and 2013 bringing the total IPP deal capacity in Sub-Sahara Africa to 5.8 GW. Furthermore an additional 1.1 GW has reached financial close in 2014. These numbers exclude South Africa, which has reached financial close on 3.9 GW of renewable energy IPP since 2012. Figure 3 shows the IPP capacity added each year since 1990 (recorded at the date of financial close).

**Figure 3: IPPs that reached financial closure in SSA - excluding South Africa**



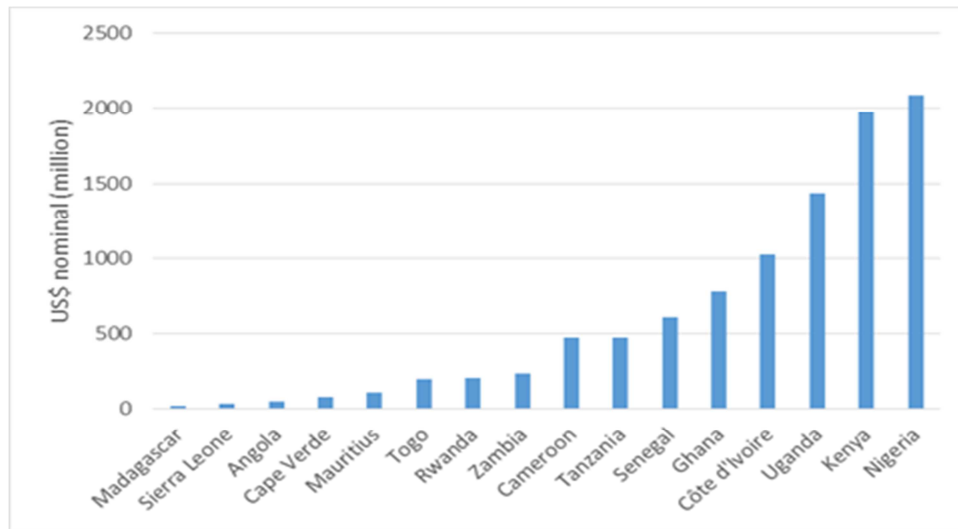
*Source: PPI database augmented by Gratwick & Eberhard data records*

The total number of IPPs in Sub-Saharan Africa is about 130. Excluding South Africa, this number drops to 67. Uganda, the next frontrunner, will also soon contribute a total of 19 projects to this sum, if the projects approved in its GETFiT programme reach financial close. It is noteworthy that 74 of the projects in these two countries have occurred only within the last two years. Thus, almost 55% of the total IPP project pool, in terms of number of projects, is concentrated in two countries and relatively new. The balance has developed slowly over two decades with the first large-scale IPP reaching financial close in 1994 in Cote d'Ivoire.

Variations in private investments are particularly noticeable, in part because there have been a relatively small number of investments, and individual projects cause spikes in the data, but also because private investment declined in the period after the Enron collapse in the early 2000s, as many US IPP developers withdrew from Africa, and also after the 2008 financial crisis. However, private investment has started to recover in recent years.

A break-down of IPP investment by country is provided in Figure 4, with the greatest investments going into Nigeria, Kenya and Uganda, for more than a decade and in the case of Kenya, for nearly two.

Figure 4: Investment in IPPs, by country, excluding RSA, 1990-2011



Source: PPI database augmented by Gratwick & Eberhard data records

Previously, South Africa lagged other Sub-Saharan countries in IPP investments, but in the last three years it has closed \$14 billion in renewable energy IPPs, more than double the total in the rest of Sub-Saharan African over the past two decades.

Table 1: Renewable energy investments in South Africa

	Wind	PV	CSP	Hydro	Biomass	Landfill	Total
Capacity MW	1984	1484	400	14	16	18	3915
Projects awarded	32	23	5	2	1	1	64
Investment US\$m	4683	5085	3806	79	108	29	14011

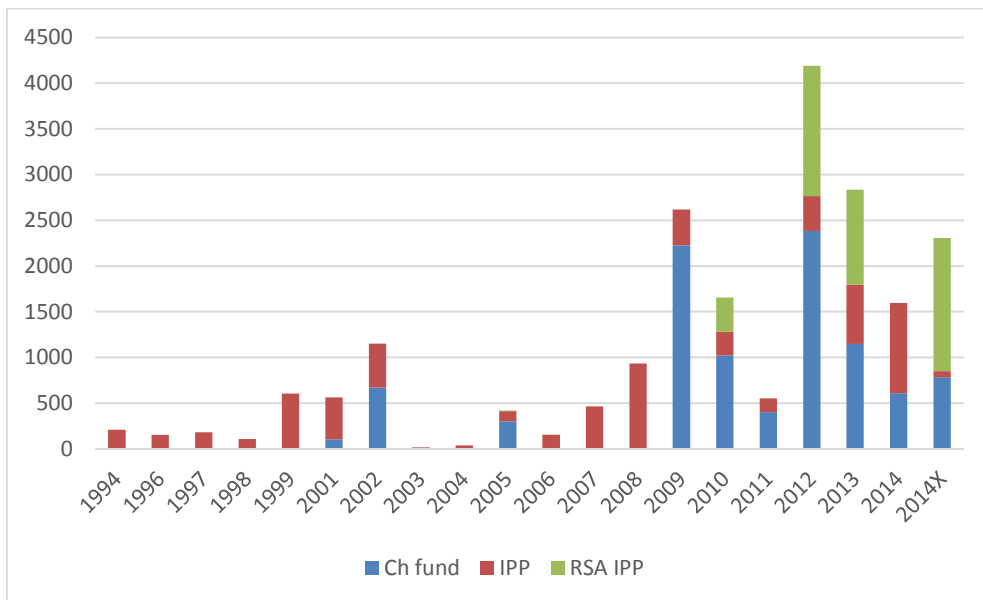
Source: Eberhard, Kolker and Leigland (2014)



## 2.2 Chinese projects

The fastest growing source of funding for power projects Africa is from China, with 5 GW coming online between 1990-2011 and another 4.7 GW noted for the 2012-2014 period, including those which have reached financial close and/or are under construction, for a total of 30 projects. These projects do not follow an expected pattern, that is, there appears to be no correlation between Chinese investment in generation and resource rich countries (dispelling the myth that Chinese firms are only interested in Africa's resources). Furthermore, Chinese-funded projects appear to be in the following 16 countries: Cameroon, Republic of the Congo, Cote d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Ethiopia, Ghana, Guinea, Liberia, Mali, Nigeria, Sudan, Togo, Uganda, Zambia, and Zimbabwe. Eight of these sixteen have IPPs, again signalling no apparent pattern in which countries may be targets for Chinese investment. Excluding other macro-economic considerations, which may help determine investment, the one notable observation is in the technology, namely the preponderance of large hydro projects (7.6 GW or approximately 77% of projects), for which Chinese EPCs have become renowned worldwide. Figure 5 depicts Chinese funded power projects, in contrast to IPPs.

**Figure 5: Chinese-funded projects and IPPs, having reached financial close or under construction, generation capacity (MW)**



*Source: PPI database augmented by Gratwick & Eberhard data records*

The majority of these projects have received funding from the Chinese ExIm Bank, responsible for soft loans and export credit, on the part of the Chinese government. Additional finance has been provided to projects by Industrial and Commerce Bank of China and China Development Bank, with the latter providing primarily commercial loans. Apart from these three, both China Construction Bank and Bank of China are also involved in investments in the energy sector. Of these five, both ExIm and China Development Bank remain state-owned, whereas the balance are 2/3 owned by government and 1/3 publicly traded. The China Africa Fund is an additional, more recent, source of concessionary finance.

The typical project structure involves an EPC plus financing contract, which means EPCs will have a preliminary support letter or letter of interest from the above noted 'cooperation banks'. After what has been described as 'fierce competition' among Chinese EPCs, and upon selection, the EPC will start the work generally with its own funds prior to the disbursement of the bank loan, provided that the bank passes its evaluation of the project loan. The majority of loans (80%) are entered into between SSA governments and said cooperation banks. The balance 20% of loans are given directly to Chinese SPVs or EPCs for the project.

In summary, while public utility funding historically has been the major source of funding for new power generation capacity, that trend is changing. Most African governments are unable to fund their power needs and most utilities do not have investment grade ratings and are unable to raise sufficient debt at affordable rates. ODA and DFIs have only partially filled the funding gap. The fastest growing sources of finance are private sources and Chinese funding.

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