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ADVANCED REVIEW

Renewable energy auctions in sub-Saharan Africa: Comparing the South African, Ugandan, and Zambian Programs

Wikus Kruger | Anton Eberhard

Graduate School of Business, University of Cape Town, Cape Town, South Africa

Correspondence
Wikus Kruger, Graduate School of Business, University of Cape Town, Cape Town 7700, South Africa.
Email: wikus.kruger@uct.ac.za

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Sub-Saharan Africa desperately needs more electricity. Recent years have seen private investment in renewable energy projects breaking through in the region, primarily driven by well-designed and implemented auction programs. We review three renewable energy auction programs in the region to improve our understanding of the auction design and implementation elements that have enabled this important transition: the South African Renewable Energy Independent Power Producers Procurement Program (REIPPPP); the GET FiT solar facility in Uganda; and the first round of the Scaling Solar program in Zambia. Our analysis shows that a well-designed and implemented program that adequately deals with risks for both the procuring authorities and investors is able to deliver good investment and price outcomes in sub-Saharan Africa.

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1 | INTRODUCTION

Recent years have seen renewable energy (RE) overtake “traditional” forms of power provision globally, both in terms of investment volumes and price levels. This shift has coincided with a geographic shift in investment, with most RE installations now taking place in developing countries (including Africa) (Bloomberg New Energy Finance, 2015; REN21, 2016). These global trends in RE investment are in large part driven by the rise of auctions, interchangeably referred to as competitive tenders or bids, for long-term contracts between Independent Power Projects (IPPs) and off-takers, typically the national or local utility. Globally, more than 62 countries—most of them developing—are using these competitive procurement mechanisms to contract renewable power (REN21, 2016). While RE feed-in tariffs have largely failed to result in significant RE investments in Africa, auctions have brought thousands of megawatts onto the grid in less than 5 years, and at lower prices (Eberhard, Gratwick, Morella, & Antmann, 2016). Given that two out of every three people in sub-Saharan Africa do not have access to electricity, and that the entire region's installed generation capacity is less than that of Spain, this is a very significant development.

There are two primary measures of success for RE auctions: price cost-effectiveness—the ability of the auction to deliver comparatively low tariff outcomes; and investment outcomes—the ability of the auction to ensure that projects successfully reach financial close, construction, and commercial operation (Gephart, Klessmann, & Wigand, 2017). In a sense, a trade-off exists between these two measures: for example, increased competition can result in overly aggressive bidding, resulting in prices that are so low that these projects cannot be feasibly built. Good auction design therefore seeks to achieve a balance between both these measures.

This paper investigates the design of RE auction programs in sub-Saharan Africa, focusing on three ground-breaking countries in their pursuit of new renewable power (especially solar PV): South Africa, Uganda, and Zambia. Our aim is to understand how these programs have sought to ensure balanced (cost-) effective outcomes, and what this might mean for future auction programs in the region.

2 | LITERATURE REVIEW

The research on RE auctions in Africa sits at the meeting point of two relatively distinct streams of literature:

On the one hand, there has been considerable research into the "success factors" for IPP investments on the continent (Eberhard et al., 2016; Eberhard & Gratwick, 2011, 2013; Eberhard, Gratwick, Morello, & Antmann, 2017; Woodhouse, 2005), broadly understood as those factors contributing to IPP projects being procured, financed, built, and operated sustainably. The challenge of power infrastructure investment in Africa is such that realizing private investments requires the confluence of a considerable number of contributing factors. More than 40 such success factors have been identified in an emergent, bottom-up manner through the use of comparative case studies. While these IPP success factors have been empirically derived, they correspond with the risks, barriers, and bankability requirements identified in the project finance, PPP, and infrastructure finance literature (Annamalai & Jain, 2013; Babbar & Schuster, 1998; Bonetti, Caselli, & Gatti, 2010; Collier & Cust, 2015; Collier & Mayer, 2013; Estache, Serebrisky, & Wren-Lewis, 2015; Farrell, 2003; Grimsey & Lewis, 2002; Jamali, 2004; Pollio, 1998; Siemiatycki & Farooqi, 2012; Thobani, 1999). Prominent country-level IPP success factors include:

- The national investment climate and/or country risk.
- The existence of policy allowing for private participation in the power sector and competitive procurement.

At the project level, the following factors have been shown to be important determinants of success:

- The existence of a secure project revenue stream, contracted through a well-structured Power Purchase Agreement (PPA), and backstopped by appropriate credit enhancement and guarantee mechanisms.
- The involvement of favorable debt (mainly from Development Finance Institutions) and equity (from developers with successful African track records) partners.

Further recent analyses of IPP investments by Eberhard et al. (2016) and Eberhard, Gratwick, Morella, and Antmann (2017) have in particular emphasized the importance of two country-level factors as critical for accelerating investment: *dynamic, least-cost power planning,* linked to the timely initiation of *competitive procurement* for power generation. This emphasis is supported by theoretical assertions and empirical evidence from literature on procurement theory and infrastructure investment (Bajari, McMillan, & Tadelis, 2009; Chong, Staropoli, & Yvrande-Billon, 2014; Estache, 2016; Estache & Iimi, 2008) and points to the need to further develop procurement design and implementation as part of the literature on IPP investments in sub-Saharan Africa. Contrary to popular belief, the research shows that auction programs can deliver power quicker than directly negotiated or unsolicited deals (which remain the primary form of IPP procurement in sub-Saharan Africa), and that the superior price outcomes more than outweigh the added expense of a structured procurement program.

On the other hand, the global North has been debating auctions as an appropriate support mechanism for RE for years (Del Río & Mir-Artigues, 2014; Kylili & Fokaides, 2015; Toke, 2015). The use of auctions in electricity markets is of course not a new development (David & Wen, 2000; de Souza & Legey, 2010; Mastropietro, Batlle, Barroso, & Rodilla, 2014; Moreno, Barroso, Rudnick, Mocarquer, & Bezerra, 2010; Rego, 2013), but its application in the RE support space, which has until recently been dominated by feed-in tariffs, is. The fact that auctions have been able to deliver low cost power seems to have largely settled this debate for developing countries (Atalay, Kalfagianni, & Pattberg, 2017; Eberhard & Kåberger, 2016). The research focus now appears to be shifting to practical auction design aspects. Given the pragmatic relevance and novelty of RE auctions at the policy level, the majority of literature on auction design and implementation has so far been coming from so-called "gray" literature by institutions such as the International Renewable Energy Agency (IRENA), GIZ, and the World Bank (IRENA, 2012; IRENA & CEM, 2015; Lucas, Ferroukhi, & Hawila, 2013; Tietjen, Blanco, & Pfefferle, 2015). The past few months have however seen recent scholarly publications on specific auction design aspects for energy projects, such as risk mitigation (Shrimali, Konda, & Farooquee, 2016), volume control, qualification requirements, and penalties (Gephart et al., 2017; Kreiss, Ehrhart, & Haufe, 2016). Whereas the IPP success factor literature was primarily focused at the country and project level, much of the literature on auctions is focused on the level in between: the program (design) level.

The impetus for much of this convergent work has been a particularly successful RE auction program: the South African RE IPP procurement program (REIPPPP). Whereas most scholarly attention has been focused on the political economy (Baker, 2015; Baker, Newell, & Phillips, 2014; Baker & Sovacool, 2017), socioeconomic, and geographic impact (McEwan, 2017; McEwan, Mawdsley, Banks, & Scheyvens, 2017; Wlokas, Westoby, & Soal, 2017) aspects of the program, other authors have identified specific lessons, in the form of IPP success factors and RE auction design elements, that could be applied to other countries in the sub-Saharan region (Eberhard & Naude, 2016; Montmasson-Clair & Ryan, 2014). This paper takes this research a step further by comparing the South African REIPPPP with two other prominent RE auction programs on the continent, with the aim of adding to and strengthening our understanding of the success factors (including auction design elements) for RE IPP investments in Africa.

3 | RESEARCH METHODOLOGY AND ANALYTICAL DESIGN

This cross-case comparative analysis was primarily desktop-based, relying on previous reviews (where available), as well as various primary documentary sources. This includes tendering documents and contracts used during the auctions, databases on auction outcomes, press releases by official stakeholders, and supplementary interviews—where required.

Guiding the analysis is a framework adapted from the International Renewable Energy Agency (IRENA) and the Clean Energy Ministerial (CEM) that allows us to structure our investigation according to six broad auction design categories (IRENA & CEM, 2015):

- *Auction capacity and frequency*: the choice of the volume auctioned (including whether bids are for energy or capacity), the way it is shared between different technologies and project sizes, and the frequency at which auction rounds are held.
- *Site selection and preparation*: do bidders find their own sites with best resources and close enough to transmission lines or does the procurement agency select sites and prepare them with grid-connections, environmental permissions, and so forth. If the former, bidders need to demonstrate that they have secure access to land, can evacuate the power and have secured the necessary environmental permissions.
- *Contract currency and financing*: an important issue for investors is whether the currency of the off-take contract is in a local or hard currency, such as US dollars or Euros, and how the projects will be financed. The majority of auctions now encourage bidders to secure their own commercial financing, but in some auctions, stapled concessionary financing is available which can lower the cost of capital and result in lower prices.
- *Qualification requirements*: determining which suppliers are eligible to participate in the auction, conditions with which they must comply and the documentation that they must provide prior to the bidding/evaluation stage. This focuses primarily on whether the bidder will be able to finance the project and whether they have the experience to complete construction and operate the plant effectively. Qualification criteria typically includes information on the legal standing of the bidders, prior project experience, adherence to technical standards, secured financing, and the ability to meet any socioeconomic criteria that may be part of the auction requirements.
- *Winner selection process*: involves the bidding and clearing rules as well as the process of awarding contracts to the winners. This includes: bidding procedure (auction type); requirements of minimal competition; winner selection criteria; clearing mechanism and marginal bids; and payment to the auction winner.
- *Sellers' and buyers' liabilities and obligations*: This includes: bid bonds, commitment to contract signing; contract schedule; remuneration profile and financial risks; nature of the quantity liabilities; settlement rules and underperformance penalties; delay and underbuilding penalties; assigned liabilities for transmission delays; deemed energy payments, and risk mitigation and credit enhancement.

4 | RENEWABLE ENERGY AUCTIONS IN SUB-SAHARAN AFRICA

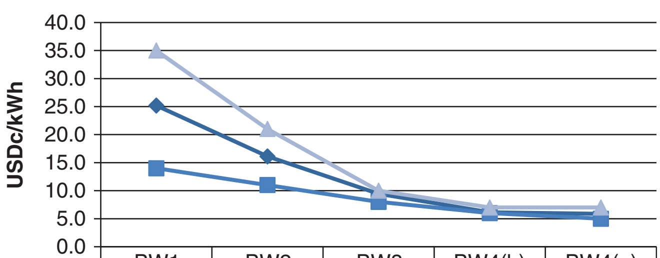
In total, sub-Saharan Africa has less installed generating capacity than Spain; half of this capacity sits in a single country: South Africa (Eberhard et al., 2016). With a population reaching one billion people, the region is hopelessly underpowered. The precipitous drop in RE prices, coupled with the region's massive growth in energy demand, presents a formidable investment opportunity. Indeed, recent analyses show that private investments are one of the fastest growing sources of power investment on the continent. While the majority of IPPs are still thermal-based (gas or diesel), RE IPPs are breaking through—largely driven by RE auction programs (Eberhard, Gratwick, Morello, & Antmann, 2017). Our analysis of the three RE auction programs is ordered according to the year in which the program was initiated: South Africa (2011); Uganda (2014); and Zambia (2015). Table 1 provides a breakdown of some of the main characteristics of the RE auction programs in these countries.

TABLE 1 Main characteristics of the three sub-Saharan African renewable energy auction programs

	South Africa - REIPPPP	Uganda—GET FiT solar facility	Zambia—Scaling solar round 1
Total national installed generating capacity (MW; 2012)	44,559	779	1,888
Market structure and level of unbundling in power sector	Vertically integrated national public utility with horizontal unbundling in distribution, and IPPs	Vertically unbundled; private concessions in generation and distribution, and IPPs	National public utility. Private transmission and supply to copper belt, and IPPs
GDP (US$ million; 2015)	314,572	27,529	21,154
Capacity auctioned	Solar PV: 2292 MW (75 MW project max) 6,327 MW in total, over 4 rounds; multiple technologies	4 × 5 MW solar PV plants	2 × 50 MW solar PV plants
Qualification requirements	1-stage RfQ/RfP combined	2-stage RfQ and RfP	2-stage RfQ and RfP
	Stringent economic development criteria, incl. Local content, local ownership, job creation, community investment	No local content requirements	No local content requirements
Site selection & preparation	Location agnostic	Projects to be located within 3 km from grid and in priority zones	Preselected site(s); ESIA led by IDC and transmission line provided.
Winner selection	70:30 price: Economic development evaluation	70:30 price: Technical evaluation	100% price evaluation
	Pay-as-bid	Pay-as-bid	Pay-as-bid
Contract currency & financing	Local currency (ZAR). Bidders had to demonstrate firm commitment from both equity and debt providers	USD (FiT portion) and euro (GET FiT premium payment). Letters of support from debt and equity providers	USD. Stapled concessional financing provided by IFC for portion of debt
Sellers' & Buyers' Liabilities & Obligations	20 year PPA, fully indexed	20 year PPA; only O&M portion indexed to US inflation rate	25 year PPA, nonindexed
	Bid bonds, which double once a bidder becomes a preferred bidder (until FC)	Bid, construction and performance (COD) bonds	Bid, performance (COD) and decommissioning bonds
		Letters of credit, backstopped by World Bank PRG (optional)	Letter of credit, backstopped by World Bank PRG (optional)World Bank loan guarantee (optional)
	Implementation agreement (sovereign guarantee)	Implementation agreement (sovereign guarantee)	Government support agreement
	Direct agreement (lender step-in rights)	Direct agreement (lender step-in rights)	Direct agreement (lender step-in rights)

4.1 | South Africa

South Africa stands out as the continent's leading RE investment destination, with 102 projects totaling 6,327 MW procured in 4 years through the country's Renewable Energy Independent Power Producers Procurement Program (REIPPPP). The program has been widely hailed as an international success, with prices for RE projects falling to levels below the utility's average cost of supply (Figure 1) and nearly all plants in the earlier rounds reaching COD in record times. This success is all the more striking considering the fact that, until 2011, the country had virtually no private participation in a power sector dominated by a vertically integrated state-owned utility primarily generating power using coal. The early success of the program has unfortunately been shaded by delays in later rounds with PPA signing by the national utility.



	BW1	BW2	BW3	BW4(b)	BW4(a)
Blended Weighted Average (All Technologies)	25.2	16.1	9.5	6.1	5.9
Wind Average Tariff	14	11	8	6	5
Solar PV Average Tariff	35	21	10	7	7

FIGURE 1 Weighted average bid tariff (across all selected projects) per bid window for South Africa's REIPPPP *Source.* Authors' calculations from DOE IPP office data and Eberhard, Kolker, and Leigland (2014).*Note.* BW 3.5 excluded from this illustration as only Concentrated Solar Power was auctioned. Bids were in local currency (ZAR) and USD conversions are at time of bid.*Weighting by share of Contracted Capacity for that Round

TABLE 2 Price caps per technology and bid window (BW) for the REIPPPP

	BW 1 (ZARc)		BW 2 (ZARc)		BW 3 (ZARc)		BW 4(b) (ZARc)		BW 4(a) (ZARc)	
Technology	Price cap	Bid tariff	Price cap	Bid tariff	Price cap	Bid tariff	Price cap	Bid tariff	Price cap	Bid tariff
Onshore wind	115	114	115	90	100	74	76	72	Removed	62
Solar PV	285	276	285	165	140	99	87	85	Removed	79
CSP	285	269	285	251	165	164	137[a]	–	165	–
Biomass	107	–	107	–	140	140	147	–	140	145
Biogas	80	–	80	–	90	–	147	–	–[b]	–
Landfill gas	84	–	84	–	94	94	99	–	94	–
Small hydro	103	–	103	85	85	–	111	–	106	112

[a] Base price

[b] No biogas capacity was made available for tender under BW 4.
Source: Authors' calculations from DOE Project data. All tariffs are as reported at time of bid.

Much of the program's success can be attributed to the way in which it has been designed, managed and implemented by a specialized DoE IPP project unit—which is led by a management team seconded from the Public-Private Partnership unit of the National Treasury. The largely ad hoc institutional status of the DoE's IPP unit allowed an approach that emphasized problem solving, rather than an enforcement of bureaucratic rules and norms. The unit’s management team and team leader had extensive experience, expertise and credibility with both public and private sector stakeholders (Eberhard et al., 2014). Substantial input was also obtained from local and international technical, legal, and financial transaction advisors.

4.1.1 | Auction capacity and frequency

The REIPPPP is firmly embedded in South Africa's energy planning regime and shows how important it is to learn from and adjust the program design based on implementation experience. The auctions incorporated a diversity of RE technologies which were published in ministerial determinations based on a national power generation expansion plan—the Integrated Resource Plan (IRP)—which established the capacity volumes and timing for each technology. From the beginning the program envisaged a series of auctions, with the aim of increasing competition over time and establishing a local RE industry. In the first auction, market readiness was overestimated and too much capacity was offered with too few bids, resulting in bid prices close to the auction price caps. As the IPP office lowered auction volumes in future rounds and the market was better prepared to respond, competition increased and prices fell dramatically for most technologies (Table 2).

Addressing project realization and performance risks required stringent technology requirements and ensuring project diversity. Bidders needed to, for example, provide independently verified long-term resource assessments and international certification for all proposed equipment. Project size constraints were set out for each technology category (e.g., 100 MW for onshore wind; 75 MW for solar PV) in an effort to ensure not only diversity of technologies, but of projects within each technological band.

The national utility (Eskom) is the official off-taker charged with signing the 20-year power purchase agreements (PPAs). An intergovernmental framework agreement obliges the regulator (NERSA) to pass on the REIPPPP costs to consumers through the Eskom tariff—effectively mitigating the risk for National Treasury, which offered sovereign guarantees on Eskom's payments through an Implementation Agreement.

4.1.2 | Site selection and preparation

Project site selection and land acquisition were entirely up to the bidder, with onerous permitting and documentation implications. In some cases, upward of 20 permissions have been required, taking more than a year to process. Bidders were only responsible for “shallow” connection works to the grid, resulting in Eskom having to invest significantly in strengthening the transmission backbone in areas with high concentrations of RE plants. The government has consequently established eight Renewable Energy Development Zones and five Power Corridors to speed up the development process and ensure better coordination (McEwan, 2017).

4.1.3 | Contract currency and financing

Bids needed to be denominated in the local South African currency (ZAR). The impact of this has been that the vast majority of debt in the program has been sourced from South African commercial banks. A defining feature of the REIPPPP has been the requirement that finance providers submit letters of support, which in practice “outsourced” much of the due diligence of projects to banks. Bidding documents and contracts were nonnegotiable and finance providers had to indicate that they accepted the risk allocation in these documents.

TABLE 3 Economic development thresholds and targets for the REIPPPP

Element (weighting)	Description	REIPPPP Threshold	REIPPPP Target
Job creation (25%)	RSA based employees who are citizens	50%	80%
	RSA based employees who are black people	30%	50%
	Skilled employees who are black people	18%	30%
	RSA based employees who are citizens and from local communities	12%	20%
	RSA based citizens employees per MW of contracted capacity	N/A	N/A
Local content (25%)	Value of local content spending	40%–45%[a]	65%
Ownership (15%)	Shareholding by black people in the seller	12%	30%
	Shareholding by local communities in the seller	2.5%	5%
	Shareholding by black people in the construction contractor	8%	20%
	Shareholding by black people in the operations contractor	8%	20%
Management control (5%)	Black people in top management	–	40%
Preferential procurement (10%)	BBBEE procurement[b]	–	60%
	QSE & SME procurement[b]	–	10%
	Women owned vendor procurement[b]	–	5%
Enterprise development (5%)	Enterprise development contributions[c]	–	0.6%
	Adjusted Enterprise development contributions[c]	–	0.6%
	Enterprise development contributions on SMEs	N/A	N/A
Socio economic development (15%)	Socioeconomic development contributions[c]	1%	1.5%
	Adjusted socioeconomic development contributions[c]	1%	1.5%
SME participation	Key components &/or Equipment & Balance-of-Plant spend on SMEs	N/A	N/A

[a] Depending on technology; 45% for solar PV, 40% for all other technologies.

[b] As percentage of total procurement spend.

[c] As a percentage of Revenue.
Source: DOE (2014).

4.1.4 | Qualification requirements

Standardization, transparency, and speed have characterized much of the program. The REIPPPP had no prequalification round, opting instead for a rapid procurement process and using stringent qualification criteria for bids. The program required a great deal of financial and contractual transparency from bidders, including term sheets, financial models, and all key subcontracts.

The prominence of economic development qualification thresholds and evaluation criteria has been one of the defining features of the REIPPPP. The program had two primary Economic Development thresholds that had to be passed in order for a bid to be considered compliant. Firstly, there had to be a minimum of 40% "South African entity participation" in the project company. Secondly, the bidder had to have a Broad Based Black Economic Empowerment (BBBEE) Contributor Status Level of at least 5,[1] determined according to the relevant BBBEE legislation and codes.[2] Bidders were moreover required to meet or exceed any minimum thresholds indicated in the Economic Development scorecard of the RFP (Table 3).

4.1.5 | Winner selection process

The bid evaluation criteria were designed to ensure low price outcomes, while also meeting economic development objectives. Initially, ceiling price mechanisms were in place for all technologies, although these were abandoned in later rounds for solar PV and wind energy. The scoring of compliant bid submissions was split between price (70%) and Economic Development criteria (30%). The emphasis on economic development outcomes has been essential in securing and maintaining political support for the program (Eberhard et al., 2014).

Despite the transparency and stringency in the evaluation process (Eberhard et al., 2014), the program still allowed for some flexibility to maximize value. The DoE reserved the right to reallocate the total MWs available among the various technologies at any stage, and could also increase or decrease the total MW available per technology and/or for the bid round in total. Due to the low prices received in the fourth round of bidding, for example, the provision was used to increase the total MWs available and a second batch of preferred bidders was announced, effectively doubling the procured capacity.

4.1.6 | Sellers' and buyers' liabilities and obligations

The program made use of several risk mitigation measures to ensure timely project realization and performance, as well as ensure long-term sustainability of the off-taking agreement. Bidders needed to submit sizable bid bonds to ensure bidder commitment and quality; the bond doubled in value once bidders became a "preferred bidder." To limit delays, the PPA stated that for every day that the Commercial Operations Date (COD) was delayed, the operating period of the PPA would be reduced by an additional day; in other words, one day's delay results in loss of revenue of two days. Significantly, the PPA could be terminated due to a project failing to comply with its economic development obligations. Bid prices were indexed to South African inflation, and denominated in South African rand (ZAR). This limited foreign exchange market exposure risks for the off-taker, but still offered attractive returns for investors as well as lenders (most of which were South African commercial banks).

Eskom, the off-taker, has been the major risk for the program's future. Winning bidders signed an Implementation Agreement with the Department of Energy, which functioned as a sovereign guarantee in the case that Eskom could or would not honor its obligations under the PPA. This specific issue has recently lead to a great deal of speculation about the sustainability of the program, with Eskom reportedly refusing to sign winning bidders' PPAs and even suggesting that Treasury might pay for the REIPPPP through triggering its liabilities (Van Rensburg, 2016). This obstruction of government policy is fuelling calls for Eskom to be restructured, with various parties arguing that the utility's conflict of interests due to its vertically integrated model threatens the survival of the IPP program in South Africa (De Vos, 2016; Eberhard, 2016; Steyn, 2016).

4.1.7 | Conclusion

The South African REIPPPP has been important for several reasons. Above all it has shown that RE can be procured at competitive prices, and at sufficient scale, through a well-designed and implemented program. The program also clearly illustrates the value of having multiple procurement rounds, transparency, and standardization in the bidding process, and using risk mitigation and credit enhancement to foster competition. In addition, the program has proven the potential of RE investments in contributing to socioeconomic development objectives, especially when fostered through a procurement system. However, recent developments underline the reality of off-taker risk in systems where a vertically integrated, state-owned utility holds significant "gate-keeping" power in procurement—specifically in the signing of PPAs.

4.2 | Uganda

Despite having a much smaller power sector than South Africa (840 MW installed capacity, mostly hydro), Uganda occupies a unique space in the history of power sector reform and investment in Africa. It was the first country to unbundle generation, transmission, and distribution into separate utilities and to offer separate, private concessions for power generation and distribution (Kapika & Eberhard, 2013). Consequently, about half of the country's electricity production comes from IPPs, 120 MW of which is generated using bagasse and small hydropower. Uganda has the second most IPPs in sub-Saharan Africa, after South Africa (Eberhard et al., 2016).

The Global Energy Transfer Feed-in Tariffs program (GET FiT) has been responsible for stimulating investment in small RE technologies. Launched in 2013, the initiative was spearheaded and implemented by Uganda's Electricity Regulatory Authority (ERA), the Government of Uganda, and the German Development Bank, KfW, with funding contributions from the governments of Norway, Germany, the UK, and the EU. While the GET FiT program has been marked by an impressive institutional setup, both in terms of governance (Investment Committee and Steering Committee) and management (Secretariat), a dedicated procurement unit akin to South Africa's IPP office has not been established. This has unfortunately contributed to the lack of certainty regarding further auction programs beyond GET FiT.

The program sought to fast-track the development of a portfolio of 20–25 small-scale RE generation projects (1–20 MW). A primary feature of GET FiT was that successful RE projects were eligible to receive premium payments under the GET FiT Premium Payment mechanism in order to "top up" the relevant RE feed-in tariffs.

While GET FiT initially only supported small hydro, biomass, and bagasse (13 projects, totaling 108 MW), a solar facility was launched in January 2014 for four 5 MW solar projects. Each bidder could bid two projects and in the end the winning bidders each had two adjacent 5 MW plants to lower costs. The solar tender differed from the previous tenders in that the project bids were evaluated not just in terms of their quality, but also on price. The average levelized bid prices in the solar auction were US$c 16.37/kWh, lower than the average retail tariff of US$c 16.6/kWh in 2013 (GET FIT Uganda, 2015, 2016; Meyer, Tenenbaum, & Hosier, 2015).

4.2.1 | Auction capacity and frequency

The solar facility was conceived as an additional, stand-alone auction. Developers could be awarded a maximum of two projects. The relatively small size of the auction was the result of several factors, including concerns about grid stability and funding constraints for the premium payments (Meyer et al., 2015). Winning bidders signed two sets of price/payment contracts: a 20-year PPA with the Uganda Electricity Transmission Company Limited (UETCL) for the feed-in tariff of US$c

11/kWh; and a Developer Financing Agreement with KfW for the premium payments. Thus far, there has been only one round of bidding, with no clear indications on possible future rounds.

4.2.2 | Site selection and frequency

The GET FiT solar facility constrained bidder freedom in terms of project site selection. Bidders were able to choose their project sites, but the prequalification stage included the provision that projects could not be located more than 3 km away from the grid. An additional requirement, which was only included in the RFP documentation, was the inclusion of priority zones close to load centers and sufficient grid capacity. Projects located in these zones received additional points during bid evaluation. As a result, solar projects are not facing the same grid availability risks that some of the GET FiT hydro projects are currently experiencing (GET FIT Uganda, 2016).

A major cost driver during the development stage was the requirement for bidders to conduct their own feasibility and grid stability studies, which was hampered by the lack of available information from UETCL.

4.2.3 | Contract currency and financing

To ensure positive investment outcomes and in line with the financing bidding requirements under South Africa's REIPPPP, equity and finance providers in the GET FiT solar facility needed to provide letters of support covering risk allocation, due diligence and credit committee approval. The payment profile offered by the GET FiT solar facility reflects a more distinct departure from the South African program. The PPA payments were denominated in US dollars, and only the Operations and Maintenance component of the tariff was indexed (to the US inflation rate). Meanwhile, the premium payment was denominated in Euros and front-loaded: 50% of the premium amount is to be paid on COD, while the remaining 50% is spread over the first 5 years. The payment profile has reduced some of the risks associated with the critical early debt repayment phase for the developers (Meyer et al., 2015).

4.2.4 | Qualification requirements

The solar auction was run as a two-stage bidding program, with an initial prequalification stage receiving 23 expressions of interest. Prequalification was based primarily on the developers' experience and capacity, and nine firms passed this stage. Seven opted to submit proposals.

In terms of qualification requirements, the GET FiT program seemed to take its lead from the REIPPPP, with many of the same, fairly onerous, provisions. In some areas, the program had imposed even more onerous requirements than the REIPPPP, such as the strict and detailed level of equipment specifications, down to the level of the cabling used in the plant. One would perhaps have expected the program to relax some of these provisions given the relatively small size of the projects being procured.

A notable divergence from the REIPPPP approach is the absence of any local content and local community development investment requirements. All bids were, however, still required to comply with the IFC's Performance Standards on Environmental and Social Sustainability (International Finance Corporation, 2012)—considered the de facto “gold standard” on social and economic impact assessments and mitigation schemes for infrastructure projects. Compliance was scored for both qualification and evaluation purposes.

4.2.5 | Winner selection process

The solar auction used a sealed, single-offer process, with pay-as-bid for winning bidders. No ceiling price was announced, although the Feed-In Tariff level was publicly known. Bids were evaluated and scored 70% for price and 30% for a basket of environmental, social, technical, performance and economic criteria (Table 4). The technical evaluation was done first and bids needed to achieve a threshold score of 70% to advance to the financial evaluation stage. An additional hurdle was that any bids that scored less than 50% of the points in any of the technical evaluation categories would automatically be disqualified.

4.2.6 | Sellers' and buyers' liabilities and obligations

The Ugandan GET FiT solar auction required a bid bond of US$ 10000/MW (higher than the South African bid bond), a performance bond of US$ 20,000/MW to start construction and a US$ 10,000/MW bond to achieve the scheduled COD. Timelines were however more lenient than in the REIPPPP. Bidders had 7 months to prepare their final bids (if one adds up the EOI and RFP submission stages)—as opposed to South Africa's 3 month RFP response time. While Financial Close (FC) requirements appear to be more or less similar (9 months after bid selection), the deadline for COD is shorter in Uganda: 13–16 months after bid selection (vs 24–30 months after FC in South Africa). In practice, timelines turned out to

TABLE 4 Summary of technical bid evaluation matrix

	Category	Possible Total points	
1.	**Environmental & Social (IFC compliance)**		**30**
A.	Assessment & management of environmental risks	15	
B.	Assessment & management of social risks	15	
2.	**Technical & Organizational Performance**		**50**
A.	Technical quality of proposed project & compliance with technical specifications	40	
B.	Technical advanced stage of development of project (studies, land, grid concept)	10	
3.	**Economic criteria**		**20**
A.	Timeline from award to COD	10	
B.	Project based in priority green zone	5	
C.	Project close to substation/demand center	5	
	TOTAL		**100**

Source: GETFiT RFP (2014).

be longer. The Soroti plant was commissioned in 2016, while the Tororo plant was expected to be commissioned in the third quarter of 2017 (GET FIT Uganda, 2016).

Apart from the attractive payment profile, the program made use of several guarantee and credit enhancement mechanisms to de-risk the program, including: an Implementation Agreement with the Government of Uganda (sovereign guarantee) and a Direct Agreement that provides lenders with step-in rights. World Bank Partial Risk Guarantees (PRGs) were also available to successful projects–designed to backstop government support for letters of credit issued by commercial banks against defaults by the utility in order to address off-taker and termination risks. The letters of credit could be drawn by developers in the event of an interruption in PPA payments by UETCL, while the PRG guarantees the issuing of bank debt, thus offering certainty around liquidity to lenders and project developers. However, none of the winning solar facility bidders have opted to use the PRGs—possibly due to the high up-front initiation fee (US$ 100,000) and/or the fact that DFIs providing finance to developers are confident that they have enough leverage to ensure payment without this guarantee (Meyer et al., 2015).

The GET FiT facility furthermore illustrates the importance of clear and complete information being communicated during the bidding process. Certain key issues—especially those relating to VAT, tax and import duty treatment—were not clearly communicated by the GoU or reflected in the RFP, leading to subsequent negotiations with winning bidders.

4.2.7 | Conclusion

South Africa proved that it was possible to achieve good price and investment outcomes from RE auctions in the sub-Saharan region; although prices were higher, Uganda confirmed this in a context very different to that of South Africa, but akin to many other jurisdictions in the region. While the project sizes in Uganda were relatively small, the 10 MW Soroti solar PV project was the biggest facility of its kind in East Africa when it was commissioned in 2016. The GET FiT solar facility used many of the same auction design and implementation principles as REIPPPP, but also employed unique features; principal among these were the added de-risking and credit enhancement mechanisms.

4.3 | Zambia

Despite having more than 2,400 MW of installed capacity, Zambia has been facing a severe electricity supply crisis, caused primarily by periods of drought affecting the largely hydro-based power system. Part of the government's response has been to target the procurement of 600 MW of solar PV capacity through the World Bank's Scaling Solar program.

Scaling Solar is an approach that aims to rapidly (within 24 months) develop privately owned solar PV projects (50 MW +) in sub-Saharan Africa, using a range of World Bank resources in a "one stop shop" package. This includes advisory services, standardized contracts and documentation, and stapled offers of financing, guarantees, and insurance. The program sought to address issues of scale, capacity, and risk to unlock the African solar PV market (Fergusson, Croft, & Charafi, 2015).

Zambia is the first country in which the Scaling Solar program was implemented, with the Industrial Development Corporation (IDC), a Zambian State Owned Enterprise (SOE) officially engaging the IFC as lead transaction advisor. Unlike South Africa's dedicated IPP office, the IDC is engaged in a number of activities beyond the power sector, including tourism, agriculture, and manufacturing. A prequalification round was launched in October 2015 for two 50 MW plants, attracting submissions from 48 interested bidders. The RFP was provided to 11 prequalified bidders, seven of which decided to submit a bid. The two winning bidders were announced in June 2016: Neoen/First Solar, with 52 MW[3] (US$c 6.02/kWh) and ENEL Green Power with 34 MW[4] (US$c 7.84/kWh) (International Finance Corporation, 2016).

4.3.1 | Auction capacity and frequency

Scaling Solar was conceived as a rapid way to implement solar projects at scale in sub-Saharan Africa. With the first tenders already awarded, the request for qualification for the second round, which will see between 150 and 200 MW awarded, has been launched (Industrial Development Corporation, 2017). Compared to Uganda, the program is more ambitious in its scale, both in terms of project sizes as well as overall volumes and rounds.

Scaling Solar is primarily driven by the need to deliver low cost solar power in Africa. As a result, the program went to great lengths to reduce costs and risks for bidders. For example, in an interesting departure from standard practice on the continent to date, IDC—together with the winning bidders—will be setting up Special Purpose Vehicles (SPVs) post-award and retain 20% of the company shares.

4.3.2 | Site selection and preparation

The Scaling Solar program did not require any technical details of the projects at the prequalification stage. This was only submitted in the response to the RFP and was facilitated by the fact that the project sites would be provided by the IDC—a further effort to reduce bidding and development costs. The Lusaka South Multi-Facility Economic Zone was chosen by the Zambian government, which leases the land for the two solar plants.

In addition to providing the project site, the IDC also played a lead role in many of the permitting and site inspection processes. For example, the IDC led the Environment and Social Impact Assessment permitting process (bids were to comply with the IFC's E&S performance standards); all other permits needed to be sourced by the project developers. IDC furthermore provided site climatic studies, grid interconnection information, grid stability and integration studies, site surveys, environmental and social scoping reports, legal due diligence reports, tax and accounting due diligence reports, as well as nonnegotiable project agreements, term sheets (for IFC financing), political risk insurance, and partial risk guarantees (World Bank).

4.3.3 | Contract currency and financing

Bidders will be paid in US dollars for the power delivered under the 25-year, nonindexed PPAs. As part of the qualification criteria, bidders needed to indicate whether they would be making use of the IFC's term sheets for finance[5] or, alternatively, submit initialed term sheets from other lenders. While this acted as an indication that finance had been sought and provisionally secured, it did not play the same due-diligence-outsourcing role as was the case in the South African and Ugandan programs.

4.3.4 | Qualification requirements

The Scaling Solar program's approach to ensuring good price and investment outcomes in the qualification requirements stage was based on two principles: ensuring that only the best firms qualify, but also making sure that the costs of developing bids and projects are relatively low once this qualification hurdle has been overcome. Qualification requirements for the program were therefore particularly stringent, as evidenced by the limited number of companies that passed this stage. A great deal of attention was paid to the financial strength of bidders. However, in order to encourage local participation, a special multiplier of 1.5 was applied to the net worth of bidders based in Zambia to enable them to pass the test.

4.3.5 | Winner selection process

In contrast to REIPPPP and GET FiT, the evaluation of bids under Scaling Solar was based purely on price. Though bidders had to pass technical and commercial evaluation stages, this had no bearing on the ranking of bids. Bidders were allowed to bid on both sites (and all did) but could only be awarded one of the projects to reduce the nonrealization risk for the bidding authorities. Winners could also size their plants within the 33–55 MW range, as long as it served to minimize costs. While no official ceiling price was communicated, the IFC's term sheets listed a price of US$c 16/kWh as the maximum it would consider as lender.

4.3.6 | Sellers' and buyers' liabilities and obligations

The financial obligations placed on bidders in the Zambian program were much more onerous than in REIPPPP or GET FiT. Scaling Solar made use of a number of expensive bond instruments to ensure compliance and commitment from bidders: a bid bond of US$ 1.3 million per project, a performance bond of US$ 15 million (expiring on COD), and a decommissioning bond of US$ 100,000/MW were all required. Projects would also be required to pay liquidated damages to ZESCO—the off-taker—in case the annual PV plant performance ratio was below 75% of the estimated PV plant performance.

The Zambian auction offered a suite of de-risking and credit enhancement mechanisms to the market. The program had fairly standard liquidity support mechanisms, including letters of credit, as well as World Bank payment and (if required by lenders) loan guarantees. The market opted for the payment guarantees but not the loan guarantees. The auction program furthermore dealt with the issue of off-taker risk by using a Government Support Agreement whereby the government would not step into the shoes of the off-taker and assume responsibility for all PPA payments in the event of buyer default, as the case would be in a standard sovereign guarantee. Instead, if this situation would arise, the government would buy the asset or shares in the project company at a predetermined price.

4.3.7 | Conclusion

While Uganda proved that it was possible to procure solar power competitively outside of South Africa, Zambia proved that it was possible to do this at scale and very cost-effectively. Scaling Solar offers sub-Saharan African countries the possibility to rapidly bring solar power online, at scale and at low prices, through a well-designed and effectively supported program.

5 | CONCLUDING REMARKS

This comparative analysis has shown that well-designed and effectively implemented RE auctions are able to achieve competitive price and investment outcomes across a diverse set of sub-Saharan African countries. While most countries in the region do not have the large power system, mature capital market or expansive grid infrastructure of South Africa, there are still many ways in which the country's RE success can be emulated. Both the Ugandan and Zambian cases have shown that sufficiently derisked projects, implemented and supported by well-capacitated and resourced authorities, with high quality, standardized documentation, can deliver cost effective outcomes. The Zambian case, in particular, has shown how authorities can secure very low prices for RE projects by addressing specific cost drivers for developers. It also illustrates the importance of project scale as a cost driver and supports the evidence from South Africa that indicates that multiple auctions can support market development and therefore increases competition.

To ensure effective investment outcomes, the analysis has also shown that limiting participation in RE auctions through stringent qualification criteria and ensuring commitment through bond instruments does not necessarily limit competition. These measures have, so far, ensured high rates of project realization, with favorable price outcomes pointing to adequate levels of competition. In addition, the fact that most developers in Uganda and Zambia opted not to make use of many of the World Bank guarantee products seems to indicate that there is increasing comfort within this market. While there is still much room for improvement, the implementing authorities appear to have struck a good balance in their auction design choices.

As such this research builds on and supports the literature on IPP success factors on the continent, in particular by showing how a well-designed program is able to address or mitigate many of the country- and project-level success factors previously identified. In addition, it also shows how RE auction design can be adapted to high-risk investment environments that have failed to deliver projects through alternative procurement methods (e.g., FiTs), to deliver low prices and positive investment outcomes.

It is apparent that RE is breaking through not only globally, but also starting to do so in the sub-Saharan region. Whereas in 2011 it was necessary, in the South African context, to sweeten the REIPPPP with potential developmental benefits such as local industry development and community investments, this same logic is not apparent in either Uganda or Zambia. Instead, projects are dealing with environmental and social factors as project risks (like most other infrastructure projects would), not as standalone initiatives that somehow legitimize the project and program. This has been made possible by the fact that RE—and solar PV in particular—has now become so cost-competitive that it is no longer considered a fringe technology that has to support a range of "additional" benefits. While this is most definitely not an argument against more socially aware and responsible investing in the sector, it does show that RE is becoming mainstream and offers the opportunity for rapidly deployable, scalable, and cheaper power generation on the continent though energy auctions.

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CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

NOTES

[1]Level 5 means that a company scores between 55 and 64.99 on the BBBEE Scorecard. The elements that make up this score are: preferential procurement (20%); ownership (20%); enterprise development (15%); skills development (15%); employment equity (15%); management (10%); and socio-economic development (5%).

[2]As per the Government Gazette No. 36928 General Notice 1,019 to the Broad-Based Black Economic Empowerment Act (53/2003) on the issue of Codes of Good Practice. The fundamental objective of the Act is to advance economic transformation and enhance the economic participation of black people in the South African economy.

[3]This is a DC number. The actual AC number is 47 MW.

[4]This is a DC number. The actual AC number is 28.2 MW.

[5]IFC was offering one tranche of debt financing on what it considers commercial terms, and another tranche on concessional terms based on available grant funding. A third tranche of financing needed to be sourced by bidders from other financiers, whether commercial banks, export credit agencies, and so forth.

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