

Renewable energy auctions in sub-Saharan Africa

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Declaration

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Abstract

Africa is short of power. Over the past decade, renewable energy auctions have emerged as an effective mechanism to competitively procure utility-scale private power projects. This thesis sought to analyse successful renewable energy auctions in sub-Saharan Africa and identify the elements contributing to efficient price and effective project realisation outcomes through comparative case studies in South Africa, Zambia and Namibia. The analysis of empirical data was deepened with reference to existing literature and theory on those elements that contribute to success in Independent Power Projects (IPPs), combined with that on renewable energy auction design and implementation. Project success is defined, from the host country perspective, as competitive project prices and timely project realisation.

The literature on contributing elements to IPP success has focused mainly on country and project level factors and the literature on auction design and implementation on programme level factors. An integrated analytical framework that combines these bodies of literature has shown that the introduction of renewable energy auctions provides an essential programmatic element which connects existing country level factors (for example the investment climate, sector regulation, etc.) and project levels factors (for example, project finance and contracts) and is crucial in achieving superior project realisation and price outcomes.

Auction price outcomes were mainly determined by factors that act as auction signals, barriers and incentives primarily geared towards increasing competition in the procurement process and lowering projects' cost of capital. These factors include setting and dividing auction volumes prudently over multiple rounds; building and maintaining bidders' trust in the auctioning authority and auction process; limiting auction participation to credible bidders; and ensuring that the contract being bid for is acceptable to lenders and backed by a secure revenue stream.

The case studies showed that project realisation is determined by bidder quality, project preparation levels, investor commitment, constraints (revenue stream and political economy) and post-award support. These are influenced by factors from all three levels – country, project and programme – that act as auction signals, barriers, incentives and support measures.

Finally, the case studies highlighted the pervasive influence of political economy elements – not included in the analytical framework - as determinative for longer-term auction outcomes

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Chapter 1: Introduction

1.1 Background rationale

Sub-Saharan Africa is in desperate need of more power. The entire region, made up of 48 sovereign nation states with a population of more than a billion people, has about as much installed power generation capacity as France, a single European country with a population of less than 70 million. Almost half of the region's installed generating capacity is found in one country – South Africa. In 2017, 25 sub-Saharan African countries had power systems smaller than 500 MW; 11 of these were smaller than 100 MW (Eberhard, 2019).

More than two-thirds of sub-Saharan Africa's (SSA) population has no access to electricity, while the remaining third often has to rely on expensive and polluting diesel generators to augment the poor quality of electricity supply. In addition, the per-unit cost of electricity in SSA is among the most expensive in the world. The lack of generation capacity, the high cost of power and the unreliability or unavailability of supply constrains economic growth and social development in the region (ADFB 2017; Findt et al., 2014; IEA 2014; The World Bank, 2017b).

Addressing this shortage requires considerable investment, from both public and private sources. Electricity demand in the region is set to double by 2030 and treble by 2040. Meeting this demand will require investment of more than US\$490 billion (Castellano et al., 2015), which is more than ten times what was invested in the 1990–2013 period (Eberhard et al., 2017). Public investment levels in new power plants have remained largely unchanged over the past 30 years – representing about half of the investment total – but private and Chinese investments have been on the increase since 2000. While encouraging, these increased investment levels are nowhere near what is required to meet current and projected electricity demand. Success, from the perspective of African countries, would mean that more power projects are built soon and, as we shall note later, come online at competitive prices.

1.1.1 The need for Independent Power Projects in Africa

Independent Power Projects (IPPs) – utility-scale (> 5MW) power projects that are built, owned and operated by the private sector – are the main source of private investment in power in sub-Saharan Africa. More than 280 of these projects have reached financial close since 1990, representing 20+ GW of installed capacity in over 30 countries. Most of these projects (87%) built since 2008 have been

renewable-energy-based (including large hydro) (Alao & Kruger, 2020). Many more IPPs are needed to plug the generation gap.

Research into the factors influencing or determining both the investment size and realisation of IPPs in sub-Saharan Africa has identified contributing elements at two levels: project and country (Eberhard et al., 2016; Eberhard et al., 2017; Eberhard & Gratwick, 2011, 2013b; Gratwick & Eberhard, 2008b).

1.1.1.1 Project-level contributing elements to IPP success

At the project level, a secure revenue stream is essential for project success – that is, timely project realisation and competitive prices. Most IPPs in SSA are project financed, meaning that they are highly leveraged (using 70–90% debt) and that debtors only have recourse to the revenue stream – and not to the assets of the project sponsors (equity investors) – for servicing the debt (Eberhard et al. 2016). A secure revenue stream, captured in a contract – called a power purchase agreement (PPA) – between the offtaker of power (usually the state-owned utility company) and the power project is thus critical. The PPA stipulates the price per unit of energy (kWh) (or sometimes also for capacity, MW) to be paid over a fixed period (usually 15–25 years), and also allocates risks for a range of events and issues, including payment default, transmission delays, *force majeure*, and so on. For a PPA to be considered “bankable” – that is, meeting the requirements of debt providers – it needs to allocate risks to those best able to control and/or influence them (Gratwick & Eberhard, 2011).

Most sub-Saharan offtakers are not creditworthy, mainly owing to the utility’s poor financial and operational performance as well as to consumer electricity tariffs not being cost-reflective (Trimble et al., 2016). This means that additional risk mitigation is needed for PPAs in sub-Saharan Africa to be bankable. This risk mitigation most often takes the form of a guarantee from the state (sovereign guarantee) that it will fulfil the utility’s payment obligations if it defaults. IPPs can also be provided with liquidity support – for example, the offtaker deposits a payment buffer, normally for 6 months’ worth of payments, in a dedicated escrow account – and special political risk insurance to improve the risk profile of projects. A reasonable risk profile means that the cost of debt and equity (cost of capital) is also more likely to be reasonable and allows projects to charge more affordable tariffs (Eberhard et al., 2016).

It is, however, not merely the cost of capital, but also the providers thereof, that determines project success. The IPP literature shows that experienced, committed and development-oriented investors (both equity and debt providers) take a longer view and are more likely to help projects weather external and internal pressures, including through multi- and bi-lateral pressures on governments not

to renege on contracts, with potential consequences for other country support programmes. This is one of the reasons why development finance institutions (DFIs) – such as the International Finance Corporation (IFC), FMO, KfW, Proparco and others – are such prominent investors in and lenders to IPPs on the continent.

1.1.1.2 Country-level contributing elements to IPP success

At the country level, IPP success is influenced or determined by a handful of variables which include a stable investment environment encompassing factors such as political stability, economic growth prospects, sound macroeconomic policies, low levels of corruption and ease of doing business; clear (energy) policy that allows for private power investment accompanied by regulatory certainty on market access and electricity tariffs; and – importantly (because it is a factor that is often overlooked) – a dynamic, least-cost power expansion planning framework, based on realistic electricity demand scenario projections and up-to-date power generation costs translated into competitive procurement processes in a timely manner (Eberhard et al., 2016).

Where these country and project level elements are in place, one should see projects reaching financial close (FC) and commercial operation dates (COD) in relatively short time frames at competitive prices.

1.1.2 IPP procurement methods

Given the recent emphasis of the planning-procurement nexus in the IPP literature (Eberhard & Gratwick, 2008; Eberhard et al., 2016), it is worth exploring the topic of the design and implementation of procurement programmes in greater detail. There are three main ways in which private power projects can be procured.

1.1.2.1 Direct Negotiation

The first is direct negotiation (sometimes also called an unsolicited bid) between a project developer and the host government. This method suffers from limited transparency, long realisation timelines and generally results in comparatively high project prices (tariffs), increasing the risk of contract renegotiations. Direct negotiation has, historically, been the dominant method through which IPPs in sub-Saharan African have been procured, but this is changing rapidly.

1.1.2.2 Feed-in Tariffs

The second procurement method is the feed-in tariff (FIT), sometimes also called a renewable energy feed-in tariff (REFIT). This method emerged in Europe to support the rollout of renewable energy in a context where these technologies were initially not cost-competitive. A feed-in tariff's main feature is that the price at which projects will be selling electricity is set by a public administrative agency instead of by the market and where the process for concluding contracts is relatively simple, low cost and fast, provided these documents are bankable. Projects are thus not competing on price but are contracted on the basis of technical and financial qualifying criteria, usually on a first-come first-concluded basis.

While enormously successful in developing the renewable energy market in Europe, this procurement method has been less successful in sub-Saharan Africa, delivering projects (mostly solar PV, small hydro and biomass) in only three sub-Saharan African countries (Namibia, Uganda and Kenya), generally at prices higher than the market would have offered in competitive tenders (Alao & Kruger, 2020). All three countries have subsequently announced a halt to feed-in tariff-based contracting – with the exception of small hydro projects in Uganda - and are switching to competitive auction-based mechanisms. Still, the feed-in tariff has proven to be superior to direct negotiation in that it is a structured process that provides price certainty, more transparency and generally shorter project realisation timelines (if implemented correctly).

1.1.2.3 Auctions/Bidding

The third procurement method is an auction – also called competitive procurement, internationally competitive bidding (ICB) or tendering. It is a structured procurement programme (in contrast with direct negotiation) where contracts are awarded to projects with the lowest tariff¹. An auction is distinct from a feed-in tariff in that it is the market, and not an administrative agency, that sets project prices through a competitive process. The level of competition is determined by the number of bidders (more bidders mean more competition) and also by the kinds of bidders (technically and financially stronger bidders mean more competition).

More competition should translate into lower project prices through three mechanisms.

- i. The first is that bidders reveal more information about their real costs as they compete with each other, reducing information asymmetry between the private sector

¹ Projects can also be scored on factors besides price, including project quality or socio-economic contributions, but in almost all cases the general weighting is in favour of price.

(developers/bidders) and the public sector (procurers) (Hubbard & Paarsch, 2015). This makes it the most transparent of the three procurement methods.

- ii. Secondly, competition not only reveals costs but also forces bidders to lower costs by squeezing margins or inducing innovation in an attempt at improving their odds of winning through offering the lowest price (Eberhard & Naude, 2017; Haufe & Gephart, 2018).
- iii. Thirdly, even if a procurer might have full transparency on a developer's costs in a direct negotiation (an unlikely but not impossible scenario), the procurer does not know if there might be someone better able to develop the project at a lower cost. A competitive procurement process provides the procurer with more certainty that they are getting the best price that the market – and not only a single entity – has to offer (Del Rio, 2017f).

Auctions have become the dominant global method for procuring renewable energy, with 96 out of 195 countries having launched a renewable energy auction by early 2020. The same trend is evident in sub-Saharan Africa, with 29 countries, since 2015, having either run or announced that they will run an auction for renewable energy. This growth in competitive procurement has largely been driven by continued record-breaking renewable energy prices announced in markets as diverse as Brazil, the UAE, Zambia, Mexico, Morocco, Chile, Peru, the USA, Saudi Arabia and Germany.

In sub-Saharan Africa, at least 135 IPPs have been procured in this way, mostly since 2012. This includes projects in South Africa, Uganda, Zambia, Namibia, Senegal, Malawi, Mali and Mauritius. In general, these projects have been procured at prices lower than feed-in tariffs or directly negotiated projects – in many cases at surprisingly low tariffs (e.g. South Africa, Zambia, Namibia, Senegal, Ethiopia) - and with shorter realisation times (Alao & Kruger, 2020; IRENA 2019).

The existing literature on IPPs in sub-Saharan Africa is not able to adequately incorporate the growing importance of auctions for private power investment, despite the emphasis on the importance of competitive procurement as a country-level contributing element to project success. The literature specifically does not analyse nor identify how a competitive procurement programme's design and implementation contributes to a project's price and realisation outcomes (success), nor does it offer insights into how country- and project-level elements interact with the programme level.

This study aims to fill this empirical and theoretical knowledge gap by combining different bodies of literature to develop a comprehensive analytical framework that integrates procurement design and implementation programme-level factors in the analysis. In combination with the country- and project-specific factors identified in the IPP literature, this framework will deepen our understanding of IPP outcomes in sub-Saharan Africa, and, more generally, in other challenging investment climates.

1.2 Key terms and concepts

Before going further, it is important to clearly define some of the key concepts and terms used throughout this thesis:

- *Success* is defined from the perspective of the host country government, and includes two issues of importance for them: a low, contracted price of electricity delivered by the independent power project, and the contracted project being built and reaching commercial operation in a timely manner (project realisation) (Del Rio, 2017f; Eberhard & Naude, 2017). Throughout this study, the term “success” will refer to both these aspects – unless it is expressly specified that we are only looking at one of these elements (for further detail on each, please see below).
- *Price outcomes* refers to the contracted price of the electricity that will be delivered by the IPP as captured in the power purchase agreement, expressed in USD/kWh. This price is often also referred to as the *bid price* (Eberhard & Naude, 2016; Ferroukhi et al., 2015) or – in the case of more than one project – the *auction’s (static) efficiency* (Del Rio, 2017f). A “competitive price” is an average price for an auction round that is close to or below the global levelised cost of electricity (LCOE) for that technology (as measured and reported by the International Energy Agency, IRENA) (IRENA, 2020).
- *Investment outcomes* – again defined from the perspective of the host country government – refers to awarded IPPs being realised - in other words, reaching financial close and commercial operation (Eberhard & Naude, 2016). *Project realisation* is also the measure of what Del Rio (2017f) terms *auction effectiveness*. These terms – *investment outcomes*, *project realisation*, *auction effectiveness* – are used interchangeably throughout the text to refer to the same phenomenon – namely projects reaching financial close and commercial operation in a timely manner.
- *Independent Power Project (IPP)* refers to a greenfield, utility-scale (5MW+) power generation project where majority ownership (51+%) resides with the private sector, and where the offtaker of power is most often a state-owned utility (Eberhard et al., 2016).
- *Implementation* refers to the actions of the host country government – primarily represented by the auctioning authority (auctioneer) – to execute or administer the auction programme. In the context of this study, it refers to: the characteristics of the auction implementing authority (Eberhard et al., 2014); the way that the auction process is rolled out and

administered (Chiu et al, 2010; Zitron, 2006); and the support provided by the auctioning authority to awarded projects to help them reach financial close and commercial operation (Eberhard et al., 2014).

- *Contributing elements to success* is a term used throughout the literature on IPPs in Africa (Eberhard & Gratwick, 2011; Eberhard et al., 2017) to refer to enabling factors (also called determinants or conditions) at both country and project levels that both influence or determine the volume of IPP investments and the ongoing operation of IPPs. In the context of this study, the concept of “contributing elements” is used in the same way, but the emphasis in the definition of success has shifted slightly (see above) to capture both price and realisation outcomes (also discussed further in chapter 2).
- *Necessary conditions* refers to a “...cause (that) allows an outcome to exist. Without the necessary cause, the outcome will not exist... necessary causes are not automatically sufficient” (Dul, 2016: 11). These are thus also referred to “necessary but not sufficient” conditions. Other terms used include “...constraint, a barrier, an obstacle, a bottleneck that must be managed to allow a desired outcome to exist.” (Dul, 2016: 11). The focus is on individual factors, and not their interaction: “each single necessary cause must be in place, as there is no additive causality that can compensate for the absence of the necessary cause.” (Dul: 2016: 11).

Other relevant terminology is defined in Chapter 2.

1.3 Research Questions

The above background rationale for this thesis leads to the following research questions:

Main questions:

RQ1: How have factors at the country, programme and project levels contributed to the price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2: How have factors at the country, programme and project levels contributed to the project realisation outcomes of renewable energy auctions in sub-Saharan Africa?

Secondary questions:

RQ1A: What are the price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2A: What are the project realisation outcomes of renewable energy auctions in sub-Saharan Africa

RQ1B+2B: Can our understanding of the price and project realisation outcomes in renewable energy auctions in sub-Saharan Africa be deepened through the application of an analytical framework that combines three bodies of literature, covering:

- i. elements contributing to the success of IPPs in Africa;
- ii. renewable energy auction design; and
- iii. renewable energy auction implementation?

RQ1C: What are the *necessary, but not sufficient*, conditions at country, programme and project levels for competitive price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2C: What are the *necessary, but not sufficient*, conditions at country, programme and project levels for investment outcomes of renewable energy auctions in sub-Saharan Africa?

1.4 Brief overview of the literature review and analytical framework

To better understand and explain renewable energy auction price and project realisation outcomes in sub-Saharan Africa, we need a theoretical and analytical framework, informed by relevant literature, which enables deeper insights into competitive IPP procurement experiences in the region. Accordingly, the thesis first reviews the literature on the contributing elements of success for IPP investments, where the focus has been on the relevant country- and project-level factors. This initial literature review highlights and reveals a missing level of analysis within this body of literature – viz. the design and implementation of IPP procurement mechanisms and programmes – emphasized all the more by recent private power procurement trends, especially renewable energy auctions in sub-Saharan Africa (Eberhard et al., 2017).

To address this gap in the literature on contributing elements to IPP success requires identifying and adding literature that addresses a key question (implied by RQ 1B+2B): how does the design and implementation of the procurement programme impact project price and realisation outcomes?

The first part of this question (auction design) concerns primarily three issues:

- Auction volume: The amount of power that should be procured and how it should be divided between technologies, projects and bidders over time.
- Winner selection: the criteria or rules used for bid-scoring, bid-ranking and awards; and
- Measures to ensure project realisation: auction design decisions that are meant to directly impact project realisation timelines and rates, such as qualification criteria and penalties.

The literature on renewable energy auctions has much to say on each of these three topics, drawing on economic theory (including game theory) and empirical evidence, and thus forming the first body of literature to be analysed in detail (Del Río, 2017a, 2017f; Del Río & Linares, 2014; Estache & Iimi, 2012; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; IRENA 2019; Kitzing et al., 2019; Kitzing & Weber, 2015; Kreiss et al., 2016; Kylili & Fokaides, 2015; Lucas et al., 2013; Lucas et al., 2017; Mastropietro et al., 2014; Moreno et al., 2010; Welisch, 2018).

The second part of the question – concerning the impact of procurement programme implementation – is mainly concerned with two issues:

- The impact of trust in the procuring authority and procurement process on bidders' decision on whether to submit a bid or not (Chiu et al., 2010; Zitron, 2006); and
- Auctioning authorities' coordination of public sector responsibilities and processes to ensure project realisation (post-award support) (Boulle et al., 2015; Eberhard et al., 2014; Montmasson-Clair & Ryan, 2014a).

While the renewable energy auction literature discusses some of the factors underlying the bidding decision, the researcher argues that the issue of trust is central to answering this question – trust in the bidding authority (auctioneer) and trust in the bidding process. The literature on trust and “bidding justice” is surveyed to help frame this decision (Chiu et al., 2010; Lewicki et al., 2006; Liu et al., 2016; Mayer et al., 1995; Zaheer et al., 1998; Zitron, 2006).

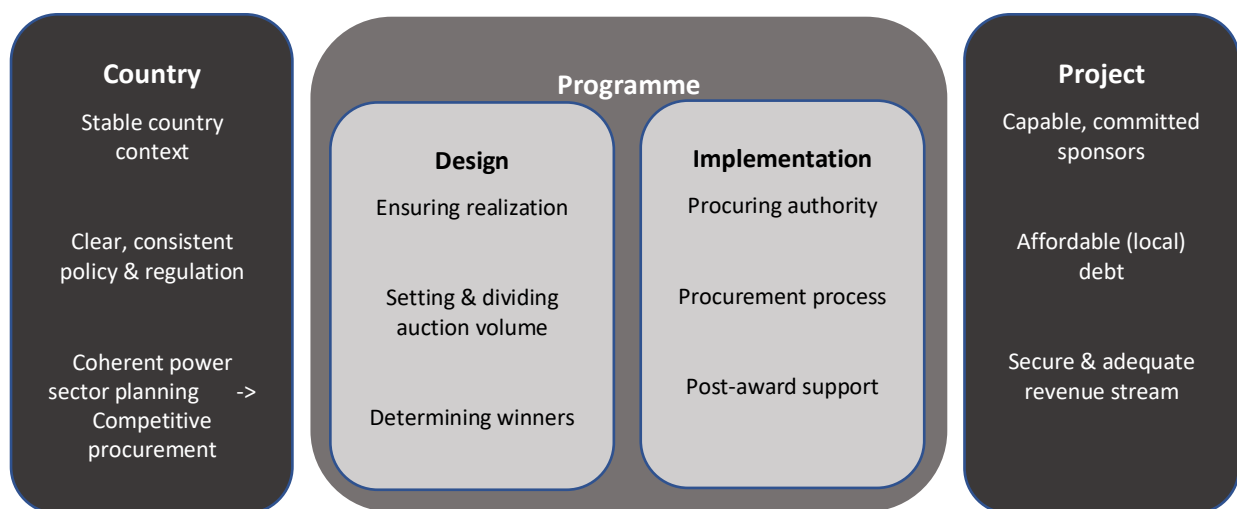


Figure 1.1: Country, programme and project level factors

Together, these auction design and implementation elements constitute the programme level of analysis. In combination with the country- and project-level factors identified in the IPP literature, this expanded framework (Figure 1.1), developed for the first time in this thesis, will hopefully deepen our understanding of private power investment outcomes in Africa.

1.5 Research approach, design and methodology

1.5.1 Pragmatist philosophical orientation

This thesis is guided by a pragmatist philosophical orientation (Kelemen & Rumens, 2008) that emphasizes a problem-solving, action-oriented disposition to research. It acknowledges that the research is inherently driven by the researcher's values and desire to effect successful actions to solve a particular set of problems (Elkjaer & Simpson, 2011)). In this particular case, the objective is to ensure the design and implementation of successful renewable energy auctions in sub-Saharan Africa to help address the region's power generation problems. Though my research questions do not incorporate or explicitly probe for practical implications, they are underpinned by the desire to effectively inform policy and auction design decisions to accelerate investment in affordable, clean power generation on the continent.

The pragmatist approach seeks to ensure that the research strategy and design is informed by the need to find practical solutions to the research problem (Creswell & Poth, 2018; Saunders et al., 2016). "It strives to reconcile both objectivism and subjectivism, facts and values, accurate and rigorous

knowledge and different contextualised experiences. It does this by considering theories, concepts, ideas, hypotheses and research findings not in an abstract form, but in terms of the roles they play as instruments of thought and action, and in terms of their practical consequences in specific contexts. Reality matters to pragmatists as practical effects of ideas, and knowledge is valued for enabling actions to be carried out successfully.” (Saunders et al., 2019: 151). Pragmatism is not wedded to a particular research methodology; rather, pragmatists “...use the method or methods that enable credible, well-founded, reliable and relevant data to be collected that advance their research (Kelemen & Rumens, 2008)” (Saunders et al., 2016: 151).

I have selected a qualitative, exploratory comparative case study-based research design that uses an abductive approach to theory development (discussed further below in sections 1.5.2. and 1.5.3). This design is aimed at informing practice (in particular auction design and policy development) by identifying elements and causal mechanisms that contribute to successful renewable energy auction outcomes in sub-Saharan Africa through rigorous academic research. Measures to ensure the quality and rigour of the research are guided by the qualitative research design orientation, discussed in more detail in section 1.5.5.

1.5.2 Research design: exploratory comparative case studies

The research was conducted using a primarily exploratory comparative case study design², in line with the exploratory nature of the main research questions, making use of both within-case analysis (chapters 3–5), as well as cross-case comparison (chapter 6). Case studies – both single and multiple – are the dominant research design used throughout most of the literature on IPPs and renewable energy auctions (see chapter 2).

A case study is especially useful where phenomena, such as a government procurement programme, are not well understood and need to be studied within their context – and where the boundaries between the context and the phenomena are not clear (Babbie & Mouton, 2001; Kumar, 2011; Yin, 2003). In other words, a case study is essentially well suited when we are unsure as to what the extent and nature of the relationship is between a phenomenon (for example, a renewable energy

² There are also elements of an explanatory approach in the design, based on the research questions. There are furthermore aspects of a comparative evaluative approach incorporated in the study, specifically with regards to understanding the extent to which the modified conceptual framework allows for deeper and more comprehensive understanding of the elements leading to the auction outcomes (RQ1B+2B).

procurement programme) and its context such as country and institutional environment (Yin, 2003, 2018).

There are some (like Stake, 1995) that view case studies as “...a choice of what is to be studied” (Creswell & Poth, 2018: 96), while others (Denzin & Lincoln, 2005; Merriam & Tisdell, 2015; Yin, 2014) view case studies as “...a strategy of inquiry, a methodology, or a comprehensive research strategy (Creswell & Poth, 2018). I employ the case study definition developed by Creswell & Poth (2018: 96), emphasising that it is a “...type of design in qualitative research that may be an object of study as well as a product of the inquiry...(that) explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information...”. While discussed in more detail under section 1.6 (research focus), it is helpful to already state that the primary unit of analysis in this thesis are national renewable energy auction programmes.

A case study is good at revealing the complete picture as well as identifying and highlighting potential causal paths or mechanisms as a result of the comprehensive, detailed analysis characteristic of the method (Eisenhardt, 1989). “A case study has the capacity to generate insights from intensive and in-depth research into the study of a phenomenon in its real-life context, leading to rich, empirical descriptions and the development of theory” (Saunders et al., 2016: 197). The rich description that results from case study research is not only useful for tracing causal paths and mechanisms, but also supports the transference of findings to other settings by allowing readers “... to make decisions regarding transferability...” to other settings that have shared characteristics³ (Creswell & Poth, 2018: 263).

Multiple cases were selected based on the potential to “...draw otherwise inaccessible conclusions” (Creswell & Poth, 2018: 99). In other words, the use of multiple cases allows for the comparative evaluation of patterns, findings and theories that ultimately widens and/or strengthens the study’s conclusions. Case selection was based on a “deviant case selection” logic (Seawnght & Gerring, 2008: 302): cases were selected because, with “... reference to some general cross-case relationship, (they) demonstrate a surprising value; they are poorly explained.”

At the time that this research was being designed, there were only a handful of successful renewable energy auction cases in sub-Saharan Africa. The three cases (South Africa, Zambia and Namibia) selected had all revealed surprisingly low prices for awarded projects – prices that were not thought

³ Note that transferability is not meant to denote or be taken to be equivalent to generalization. Statistical generalization is generally not an objective of qualitative research (Creswell & Poth, 2018).

to be reflective of the general investment conditions in sub-Saharan Africa or these specific countries or their sectors.

The purpose of deviant case analysis is “...to probe for new – but as yet unspecified – explanations” (Seawright & Gerring, 2008: 302). It is thus an exploratory form of research where the researcher “...hopes that causal processes within the deviant case(s) will illustrate some causal factor that is applicable to other (deviant) cases” (Seawright & Gerring, 2008: 303). The initial focus on the price outcomes of these auctions was supplemented by a focus on the project realisation outcomes, both as a “test” of the viability of these prices⁴ and an important outcome in its own right, given the study’s foundational impetus to accelerate power generation investment in the region.

As such, this thesis uses an exploratory approach in its search for and development of an expanded, combined theoretical framework towards improving our understanding of the factors and causal mechanisms driving price and project realisation outcomes in the context of sub-Saharan African renewable energy auction programmes.

1.5.3 An abductive approach to theory development

This orientation lends itself to an abductive theory-building approach: partly deductive, based on relevant literature and a resultant analytical framework, and partly inductive, based on the empirical data from the case studies, informing and enriching theory (Yin, 2018). An abductive approach is normally associated with qualitative and case study-based research, and is especially well suited to the modification of theory, especially through the incorporation of additional theoretical lenses (Saunders et al., 2016). Saunders et al. (2016: 156) furthermore assert that “... a well-developed abductive approach is most likely to be underpinned by pragmatism”. Dubois & Gadde (2002: 554) explain the abductive approach in case study research to be a “...continuous movement between an empirical world and a model world. During this process, the research issues and the analytical framework are successfully reoriented when they are confronted with the empirical world”. They argue that the main objective of any research is to confront theory with the empirical world, and that within the abductive approach “this confrontation is more or less continuous” (Dubois & Gadde, 2002: 554).

⁴ The assumption being that if these prices were too low – unrealistic – these projects would not be able to be finance and built.

This conception of the abductive approach is consistent with what is often the reality, usefulness and advantages of the research process in case studies: “a standardized conceptualization of the research process as consisting of a number of planned, subsequent “phases” does not reflect the potential uses and advantages of case research. Instead, we have found that the researcher, by going ‘back and forth’ from one type of research activity to another, and between empirical observation and theory, is able to expand his understanding of both theory and empirical phenomena...this stems from the fact that theory cannot be understood without empirical observation and vice versa” (Dubois & Gadde, 2002: 554).

A case study researcher, using the abductive approach, is able to expand his understanding of both theory and the empirical phenomenon by moving back and forth between research activities, and between empirical observation and theory. It requires that the research starts with a preliminary analytical framework that is developed over time “...according to what is discovered through the empirical fieldwork, as well as through analysis and interpretation” (Dubois & Gadde, 2002: 555).

In many abductive studies, the analytical framework is the main result of the research: “the analytical framework is of great importance...the successive refinement of concepts implies that they constitute input, as well as output of an abductive study.” (Dubois & Gadde, 2002: 558). They go on to explain that “one major difference, as compared with both deductive and inductive studies, is the role of the framework. In studies relying on abduction, the original framework is successively modified, partly as a result of unanticipated empirical findings, but also of theoretical insights gained during the process. This approach creates fruitful cross-fertilisation where new combinations are developed through a mixture of established theoretical models and new concepts derived from the confrontation with reality.” (Dubois & Gadde, 2002: 559).

The thesis started with the observation of “surprising facts” – very low renewable energy project prices in sub-Saharan Africa, achieved in quite different contexts. It seeks to develop plausible theoretical explanations by an iterative back-and-forth movement between data and theory. Data collection and data analysis was, thus, an iterative processes, allowing for the possibility of exploring the applicability of a priori constructs and constant dialogue between the evidence and the enfolding literature (Eisenhardt, 1989; Ragin, 1999). This two-way process has, for example, been at the heart of the dialogue between the cases and the literature, leading to the identification of additional bodies of theory and literature – not originally considered – that help explain the project outcomes.

To practically illustrate this process: it was found that the literature on contributing elements to IPP success was insufficient to explain what was happening in the case study countries’ auction

programmes – specifically with regards to the price and project realisation outcomes within and between the cases. An additional body of literature – covering renewable energy auction design - was identified to help fill this gap. Going back to the cases, it was found that while this literature advanced our understanding, it still failed to address certain key aspects that seemed particularly important for explaining outcomes in the case study countries, namely how and by who the auction was implemented (as opposed to how it was designed), and how projects were assisted post-award. This led to the identification of additional bodies of literature covering trust, bidding justice and policy implementation – collectively termed the auction implementation literature. This framework was further modified and refined through the empirical findings from the case studies. It is through this back and forth movement between the data and the theory that the analytical framework – a key contribution of this thesis – was developed and applied.

1.5.4 Data collection and analysis

1.5.4.1 Interviews and documents

Data was gathered in two primary ways: collecting and analysing documentation from the relevant case studies (including requests for qualification and proposals documents, contracts, project agreements, financing and credit enhancement offers, media reports, press statements, relevant policies and regulations, meeting minutes and scholarly publications) and unstructured interviews (guided conversations) with officials from government agencies and departments (including procuring entities, utility representatives, energy ministries and regulators), the private sector (including successful and unsuccessful bidders and project developers, debt and equity providers, EPC⁵ and O&M⁶ contractors) and advisors (legal, financial, technical, environmental, social) intimately involved in the design and implementation of the RE auction programmes in the case study countries. The interviews were carried out in the 2018 –2021 period (see Appendix C).

A purposive sampling strategy (Yin, 2018; Saunders et al, 2019) was used to select interview participants, based on their involvement with and familiarity with the auction programmes. In each case study country, I interviewed the key decision-makers from the relevant state agencies involved in designing and implementing the auction; international partner agencies (and their consultants or advisors) that were intimately involved in auction design and implementation (where relevant);

⁵ Engineering, Procurement and Construction

⁶ Operations & Maintenance

responsive (shortlisted) bidders; lenders and investors. No further interviews were conducted once it was confirmed that additional interviews were not providing new concepts, indicating data saturation (Saunders et al., 2016)⁷.

Most of the interviews were in-depth conversations taking anywhere between one and three hours, in line with the fluid “intensive interview” method typically employed as part of the case study approach (Rubin & Rubin, 2012; Weiss, 1994). A total of 45 interviewees’ responses were analysed (see appendix C). An additional four interviews with representatives from development finance institutions, commercial lenders, local government and a RE project development company were not analysed due to the interviewees withdrawing their consent for the interview data to be used over concerns about the sensitivity of disclosed data.

In some instances, where respondents were considered key informants, multiple interviews were conducted over time, often to confirm information gained from other sources or to understand specific aspects in more detail. Most of the interviews were conducted in person, but several had to be conducted telephonically. Follow-up emails or telephone calls were used for clarification purposes, where necessary. Interview notes were coded manually, mainly using theoretical concepts from the literature (see Chapter 2), but also allowing for the data to highlight important new themes. Case study chapters were shared with key informants for validation, mainly to verify the accuracy of information used and to gain their view on the interpretation of the data (please refer to section 1.5.5. for more on measures to ensure research quality).

The author also participated in several events – including conferences, workshops, courses and a financial bid-opening process (as an official independent observer) throughout this period. Notes from these events were also used as data sources and analysed. Appendices A and B provide a full list of bidding documentation and events used as evidence in this study. Appendix D further attempts to capture and explain how research projects, events (incl. conferences, courses) and other related processes influenced my conceptualisation of the study, the theoretical framework and some of my interpretations.

The example of research conducted in Namibia, detailed here, is representative of the approach in all three countries in which case studies were carried out. 18 interviews were conducted from August to November 2018, and again in March and October 2020, both in person in Windhoek and Cape Town,

⁷ In several cases, respondents had already been interviewed as part of other research projects on power sector investment in Africa; it was consequently easier to judge, during these 2018 – 2020 interviews, when data saturation points were reached based on these previous interactions as well.

as well as telephonically with stakeholders in Johannesburg, Windhoek and Madrid. Interviews were followed up by emails and calls for clarification of discussion points.

Stakeholders interviewed in Namibia include high-level representatives from the national utility NamPower (current and former employees); successful bidders and investors Alten Energy and Inspired Evolution; the Electricity Control Board of Namibia; the Ministry of Mines and Energy, the Development Bank of Namibia; five unsuccessful bidders, the Government Institutions Pension Fund and EMCON engineering (an independent Namibian energy sector consultancy). I was additionally provided with access to the bidding documents (including draft contracts) for two procurement programmes, all relevant policies and regulations, unofficial and official bidding results and relevant sector- and project-level data.

1.5.5 Ensuring the quality of the research

Flyvbjerg (2011) notes that case studies have generally been criticised due to misunderstandings about their ability to produce generalisable, reliable and theoretical contributions to knowledge, which he (and others, such as Buchanan, 2012; Bansal & Corley, 2011; Denzin & Lincoln, 2018) put down to largely debunked positivist criticisms of qualitative research. Creswell & Poth (2018) emphasise that, in their view, there is no distinct research quality strategy for any specific philosophical approach to qualitative research, and that multiple accepted (at least two) strategies should be used to improve the accuracy of the findings and the trustworthiness of the research. Qualitative research is also praised for its ability to produce findings with high levels of validity due to “.. the extensive time spent in the field, the detailed, thick description, and the closeness of the researcher to participants in the study...” (Creswell & Poth, 2018: 259).

I have employed three accepted validation strategies in this research:

- i. *Corroborating evidence through triangulation of multiple data sources*: the case study method is particularly useful in this regard, allowing researchers to collect multiple sources of data through multiple methods. This allows for “...triangulating information and providing validity to their findings” (Creswell & Poth, 2018: 260). Each case study included the collection of documentary data as well as interviews. The use of multiple interviews from various organisations allowed for the testing and verification of reported findings. I also used additional secondary data sources, such as credit rating reports, World Bank indices and databases and media reports to strengthen and support the analysis. The use of these various data sources is referenced throughout the text (incl. direct quotes from interviews), and is

also built into the evidence tables (Appendices E-G) that support the concluding analysis sections of each of the case study chapters.

- ii. *Member checking or seeking participant feedback*: this validation strategy requires that the researcher “...solicits participants’ views of the credibility of the findings and interpretations” (Creswell & Poth, 2018: 261). It is viewed by Lincoln & Guba (1985: 314) as the “most critical technique for establishing credibility” and practically involves the examination of rough drafts of the researcher’s work by key informants (Stake, 1995). Drafts of the case study reports were sent to key informants to check the accuracy of the data and provide feedback on the credibility of the analysis. Feedback was provided in writing (incl. track changed documents) as well as through telephonic conferences. Summarised analyses were also presented at various teaching and other events to audiences familiar with the cases (see Appendix D), which allowed for further validation of the interpretation and results.
- iii. *Peer review or debriefing of the data and research process*: this strategy involves an external check by someone that is familiar with the research or the phenomena explored. It is “...an individual who keeps the researcher honest, asks hard questions about methods, meanings and interpretations...” (Creswell & Poth, 2018: 263). In this case, the experienced study supervisor fulfilled this role, acting as critical sounding board and reviewing the data, analysis and findings throughout the research process – thereby enhancing the validity of the findings.

This research furthermore included a considerable run-up in the period prior to 2018 (when the study officially began) where work was already being done on and engagements taking place around the competitive procurement of utility-scale renewables in sub-Saharan Africa. This included commissioned research reports⁸, workshops, capacity building events etc. These and similar engagements extended into the actual research period as well. I have sought to chronologically list these events and activities in Appendix D, seeking to explain the substance of these events and activities and reflecting on how they influenced the research. While I have attempted to provide some sense of how this impacted the research, I also need to acknowledge that it is impossible to fully account for all the ways in which my views of the cases and the analysis was shaped by these events and activities. To try and guard against possible bias and error, I have sought to limit my analysis within

⁸ During the course of my PhD research, I also contributed to two research projects: the “Renewable Energy Auctions in sub-Saharan Africa” research project funded by the UK government under the auspices of the Energy & Economic Growth Programme (EEG); and the Tendering Sustainable Energy Transitions (TENTRANS) project funded by the Danish Fellowship Centre.

and across the cases to the data collected during the 2018 – 2021 period, and referenced publications (some peer-reviewed) emanating from these “contextual” events as justification where they seemed to have a bearing on my analysis and conclusions.

Finally, each of the case study chapters contain rich, thick descriptions as well as summary tables (annexes E-G) that includes evidence for the claims made, including direct quotations from interviews to enhance the trustworthiness the research (Cloutier & Ravasi, 2021; Creswell & Poth, 2018).

1.5.6 Research ethics

The research was carried out in compliance with the University of Cape Town’s faculty of commerce research ethics policy and with full research ethics committee approval. Written permission was secured from each of the interviewed participants, and interviews treated in an anonymised and confidential manner. Owing to the sensitivity of some of the data, the names and organization affiliations of interviewees have been omitted. Notes and/or write-ups of the interviews were shared with the interviewees for verification of accuracy and comments.

1.6 Research focus

The empirical work is focused on sub-Saharan Africa, given the desperate need to increase sustainable power investment in the region. At the time that this study was conceived (2016/17), there were only six sub-Saharan countries that had launched renewable energy auctions. Three cases were selected from these six, primarily based on the low prices achieved.

The three cases were selected mainly based on the fact that they had similar outcomes (competitive project prices). It also became clear, throughout the case study periods, that the RE auction programmes in these countries had seen most of their initial procured projects reach financial close and commercial operation in a timely manner. While the case selection was not undertaken with this outcome in mind, it was still deemed to be an important measure of the procurement programmes’ actual (vs. perceived) success – especially in a context where timely project realisation is rarely the case – and as such it forms a key part of the analysis.

The three cases selected for this study are thus the first-mover countries in the region that have seen projects reach financial close and commercial operation at comparable competitive price levels. These project realisation milestones are critical to understand the project realisation process, while the highly competitive prices are a key outcome that this research tries to understand.

Case selection was also influenced by existing relationships with the relevant stakeholders in the countries, which helped facilitate privileged access to relevant data. These cases were furthermore chosen both for their similarities in setting (sub-Saharan African location) and outcomes (for example, competitive prices) but also for their differences at country, programme and project levels that help to illuminate – through verification and falsification – the factors that might help explain these outcomes (Stewart, 2012; Yin, 2018).

1.6.1 South Africa

As a regional and global trailblazer, and the sub-Saharan African country with the most experience of the auction procurement framework, South Africa forms the first case study. In 2011, South Africa was the first country in sub-Saharan Africa to launch a dedicated renewable energy auction programme called the Renewable Energy Independent Power Producers Procurement Programme (REI4P). The programme procured 112 projects, representing 6327 MW across multiple renewable energy technologies. The country has also witnessed the dramatic fall in project prices over four procurement rounds (2011–2015), representing a 50% price reduction in the case of onshore wind and close to 80% in the case of solar PV. REI4P, furthermore, features a high project realisation rate, with 95% of procured projects in the first three rounds reaching commercial operation on time. South Africa's auction programme is renowned for the way that it incorporates a range of detailed socio-economic and economic development criteria and requirements in the auction process. It is regarded as an influential auction programme, not only in the region, but also internationally. The last round of procurement was in 2015, but new procurement rounds were initiated in 2021.

1.6.2 Zambia

Zambia was the second⁹ country to run an auction in sub-Saharan Africa, through the International Finance Corporation's (IFC) Scaling Solar programme in 2015/16. This was the first instance of this World Bank group-packaged approach being used and included a range of risk mitigation and credit enhancement measures. The programme also made concessionary finance packages available to bidders and emphasized speed, quality and price. The resulting bid prices were globally competitive at the time of announcement and quite controversial in the sub-Saharan region, with some

⁹ While it could be argued that Uganda's GETFIT solar facility was the second auction in the region, it is strictly considered a hybrid programme because it combines a feed-in tariff approach with a competitively set top-up premium payment. While interesting and potentially illuminating, the case was not included in the final analysis.

complaining that the market was being distorted through subsidized financing. Despite delays in reaching financial close, projects were still built in good time and began commercial operation in early 2019. A second round of Scaling Solar procurement was cancelled in 2018/19 owing to the declining fortunes of ZESCO – the Zambian electricity utility company – and the Zambian economy in general. Nevertheless, a parallel procurement programme – the Zambian version of the GETFiT solar facility – was launched in 2018 and resulted in even lower prices. These two different procurement programmes, driven by two different donor groups, allows for the comparative analysis of the evolution and innovations in the design and implementation between the programmes, over time and in different contexts.

1.6.3 Namibia

Namibia was the third country to launch an auction programme, following closely on the heels of Scaling Solar in Zambia. It featured important differences from the other programmes in the region. While Namibia managed to secure a project at prices similar to those in Zambia's Scaling Solar programme and South Africa's REI4P, it did so without offering any risk mitigation or credit enhancement measures, and no concessionary finance. The auction was implemented by NamPower, which was also the offtaker of power and eventual minor shareholder in the project. The programme furthermore featured no donor involvement or assistance. It also featured a unique and innovative debt arrangement between a commercial bank and a development finance institution. A second round of procurement was launched in 2019, and announced prices were again highly cost competitive. The Namibian case is a strong reminder of the importance of a strong offtaker and procurer for the success of a programme.

These three cases form an important empirical basis for the study of renewable energy auctions in the region. Applying the expanded analytical framework to these case study countries deepens our understanding of the elements contributing to the project outcomes in each country, as well as across countries. The cases' empirical contribution also allows for the testing and modification of the framework where necessary. Finally, studying the first-mover countries offers the opportunity to gain important insights and lessons for private power investment programmes in the rest of sub-Saharan Africa.

1.7 Organisation of thesis

The rest of the thesis is organised as follows: Chapter 2 will review the relevant bodies of literature to develop an analytical framework that combines the literature on IPP investments, renewable energy auction design and auction implementation. This framework will be applied in the three case study chapters (as discussed above) – South Africa (Chapter 3), Zambia (Chapter 4) and Namibia (Chapter 5). The analysis will cover the auction programme outcomes, as well as all three levels of analysis: country, project and programme elements of success – with a special emphasis on the latter in a narrative, phased format (Flyvbjerg, 2006).

The case study chapters will be followed by a synthesis and conclusions chapter (Chapter 6) that will combine and provide a comparative analysis of the case studies' findings according to the main outcomes, and the underlying country, project, auction design and implementation factors. The chapter will draw out the main areas of convergence and divergence between cases, identifying the contributions of each and making clear where cumulative evidence strengthens or weakens certain arguments. The final chapter will also collate and interrogate the identified causal paths between programme elements and analytical levels, explicitly probing the contextual similarities and differences between cases. The chapter will furthermore identify necessary conditions for price and project realisation outcomes at the country, project and programme levels. The chapter will summarise the answers to the research questions and show how the findings relate to theory and the literature. It will furthermore emphasise the study's contribution to new knowledge and clearly spell out the significance of the findings for private power investment and renewable energy auctions in sub-Saharan Africa and beyond. This conclusion chapter will end by reflecting on the study's limitations and making recommendations for further research.

Chapter 2: Towards a framework for explaining renewable energy auction outcomes in sub-Saharan Africa

2.1 Introduction

This first part of this chapter seeks to survey relevant literature which identifies and explains the factors that influence or determine successful outcomes (meaning competitive project prices and timely project realisation) of private power projects in sub-Saharan Africa, specifically, and more generally in emerging economies. A gap is identified in the literature: while country and project level enabling factors (contributing elements of success) are comprehensively discussed, insufficient attention is paid to factors at the programme-level – i.e. the crucially important issue of governments or utilities running competitive procurement programmes or auctions to secure new power investments at competitive prices. We thus also explore the literature on auction design and implementation, including relevant literature on public policy implementation, trust, institutions and organizational effectiveness which impact auction effectiveness. This new emphasis on programme-level factors or elements enables us to better link country-level with project-specific factors, thus offering the prospect of developing an expanded and integrated analytical framework that will help us to probe our research questions more deeply.

Recent analyses of power sector investment in sub-Saharan Africa (Eberhard et al., 2016; Eberhard et al., 2017) have highlighted two notable trends. The first is a steady increase in power generation investment activity from the private sector in the form of independent power projects (IPPs¹⁰). In the 2009–2018 period, 226 utility-scale (5 MW+) IPPs representing 15,316 MW of new capacity reached financial close across sub-Saharan Africa, compared to 46 projects (3,444 MW) during the 1999–2008 period. The second trend is that most new IPPs are renewable energy-based, secured through structured procurement programmes – most notably, renewable energy auctions. Of the 114 projects that reached financial close during the 2015–2018 period, 101 were renewable energy-based¹¹. Of these 114 projects, 38% were procured through internationally competitive bidding (auctions), 27% through feed-in tariff schemes and 35% through direct negotiation. Close to 30 countries in the region have also announced or already implemented a renewable energy auction programme over the last three years (Alao & Kruger, 2020).

¹⁰ These projects are privately developed, constructed, owned and operated, with significant private finance and long-term power-purchase agreements with a utility offtaker (Eberhard et al, 2017).

¹¹ 62 solar PV, 17 hydro, 16 wind, 6 biomass and 2 geothermal.

The existing literature on IPPs in sub-Saharan Africa does not fully explain these two trends, neither does the renewable energy auction literature, which mostly ignores country context. The IPP literature notes the importance of competitive procurement practices for achieving sustainable investment outcomes in the region but fails to tackle questions about the design and implementation of these procurement programmes in a systematic, theoretically informed manner. The literature on renewable energy auction design is mostly framed within micro-economic analysis and ignores the impact of the broader investment environment and institutional context, as well as the related literature on private investment in IPPs.

The aim of this chapter, thus, is to review the relevant literature and to begin to frame a more integrated analytical framework that helps us better understand the role of renewable energy auctions within the broader challenges of accelerating investment in IPPs in Africa (and other developing regions) as well as a deeper understanding of country-, project- and programme-specific factors that can contribute to successful investment and implementation.

The chapter will firstly locate renewable energy auctions within the broader literature on IPP investments in sub-Saharan Africa, focusing on country- and project-level contributing elements of success, elaborated on below. This initial conceptual foundation having been established, the chapter will then open a third, unexplored level of analysis, namely the importance of programmes, covering auction design and implementation, in supplementing country- and project-specific contributing elements of success. Auction design will be discussed primarily within broader auction theory, but will also draw on the more empirically informed literature.

The empirical auction literature, in particular, notes the impact of factors concerning auction implementation not readily addressed by auction theory, such as the institutional setting, the auctioneer (implementing agency) and the auction process. The chapter will also explore renewable energy auctions as embedded institutional innovations vulnerable to trust deficits and dependent on existing institutional resources. Finally, the chapter will draw together these bodies of literature into a complementary analytical framework that will be tested, contextualised and refined by the case studies in the subsequent chapters.

2.2 Independent power projects: Determining the contributing elements of success

Independent power projects¹² were introduced as part of the wave of power sector reforms that swept across the developing world¹³, beginning in the early 1990s, and which aimed mainly at improving sector performance and increasing power generation investment. The introduction of IPPs was seen as an important step in what became known as the “standard power sector reform” model – unbundling, competition, private sector participation, independent regulation – advocated most notably by the World Bank¹⁴. Research around IPPs from this period (Bond & Carter, 1995; Dunkerley, 1995; Gupta & Sravat, 1998) was principally interested in understanding the range of investment risks faced by these projects and concluded that further reform efforts would be required to create the enabling environment to mobilise more investment.

By the mid- to late 2000s, a notable amount of experience with IPP investments in developing countries had been established, representing an array of outcomes – from relative success to outright failures. This prompted renewed academic interest, with two large research programmes leading the way. The first was the Stanford Programme on Energy for Sustainable Development (PESD), a multi-year study covering 13 countries and 34 projects (Woodhouse, 2005a). The study sought to explain the variation in investment outcomes across projects by testing the explanatory power of five hypotheses:

- i. the propensity for original deals to unravel and become subject to creeping expropriation by the host government once investment had been made (the obsolescing bargain hypothesis (Vernon, 1971));
- ii. the extent to which the state of the host country’s economic, legal and financial systems (including experience with FDI) explained outcomes (the investment climate hypothesis);
- iii. the impact of a country’s IPP policy, regulatory and procurement framework (or lack thereof), electricity demand, independent sector regulation and tariff payment systems (electricity market hypothesis);

¹² IPPs are power generation plants built, financed and operated by the private sector, selling electricity to a publicly-owned or –backed utility offtaker through a long-term contract (Eberhard et al., 2016).

¹³ The first IPP in Africa was built in Cote D’Ivoire in 1994, followed by Kenya in 1996 and Mauritius in 1997. They have since spread to more than 20 countries across the continent, representing more than 200 projects.

¹⁴ In many cases – most notably in sub-Saharan Africa – the reform process rarely progressed beyond the introduction of IPPs, resulting in hybrid power markets with IPPs producing power on the margins, most often alongside the publicly owned, vertically integrated utility (Gratwick & Eberhard, 2011a).

- iv. the negotiation and management – both operationally and financially – of the deals (the project management hypothesis);
- v. and the impact of external shocks and events (the exogenous events and contagion hypothesis).

The study found that while all of the hypotheses held some explanatory power, it was ultimately the project management hypothesis – later renamed strategic management and contrasted with a static risk engineering approach – that seemed to most fully explain the variety of outcomes, especially in the face of stresses (Woodhouse, 2005a).

The Stanford PESD study also linked several country-level factors (macroeconomic context, political and social context, legal and regulatory framework, electricity market and fuel framework) and project level factors (investor composition, financial arrangements, fuel and technology choice, O&M) to each of the hypotheses. It showed that most successful projects shared the following characteristics: a cost-reducing, transparent project selection method (primarily internationally competitive bidding – ICB); local partnerships that helped to mitigate dispatch risks and manage renegotiations; and a project governance setup that allowed project counterparties (private and public) to make concessions within tight project finance confines (Woodhouse, 2005a).

The study was also quite critical of the use of project finance in the IPP sector, especially in developing countries, where high project debt levels resulted in extensive risk engineering through increasingly detailed contracts, risk cover products and ironclad PPAs. This resulted in limited flexibility for project counterparties when changes did inevitably arise, limiting their ability to respond to these changes and ultimately undermining the project's sustainability.

Gratwick's (2007) Africa-focused analysis of IPPs both built on and critiqued the PESD study. Her work explored the complementary aims and tensions of the main parties involved in the IPP transaction: investors were mainly looking for a reasonable return on their investment, more investment opportunities and the assurance that project survival would not be threatened by contracts unravelling (investment outcomes). Government was mainly interested in securing reliable electricity supply at a competitive (low) price (development outcomes). Both parties wanted to see projects reach financial close, get built and operate sustainably. The tension between these parties was mainly around agreeing on the tariff at which electricity would be sold by the IPP.

The obsolescing bargain (Vernon, 1971) is pertinent to understanding this dynamic and posits that when a foreign investor invests in a developing country, the initial bargaining power is in the favour of the investor because the host country, generally short of capital, offers generous concession

agreements to entice the firm. The investor also has more information on its own performance and costs than the public principal (host country government). This is a problem since the private agent's remuneration is based on its performance, which the principal cannot verify.

In the context of tariff negotiations for IPPs, the developer is in a stronger negotiation position relative to the government as a result of information asymmetry and concessional agreements. It is quite likely (and data supports this) that prices will be skewed in the private agent's favour (Eberhard et al., 2016; Eberhard & Gratwick, 2011). The result is that investor and development outcomes are often (perceived to be) out of balance – tilted in favour of the investor during the initial stages of the project. However, once the investment is secured and operating, the bargaining power shifts to the government of the host country, which in many cases views the levels of return on the investment as too high. If the public sector perception is that they are paying too much, the likelihood of renegotiation or expropriation for an IPP is much higher¹⁵.

Gratwick's research found that the theory of obsolescing bargains is helpful in the understanding of most IPP investments across the continent, and that the balancing of development and investment outcomes would ultimately lead to more sustainable projects – contradicting Woodhouse's (2005a) findings against the obsolescing bargain hypothesis and for the project management hypothesis. She also used country- and project-level analyses to empirically uncover the range of elements that contributed to success.

Gratwick and Eberhard's (2008) classification of contributing elements to success at the country and project level has since been tested, refined and strengthened across a number of cases (Eberhard & Gratwick, 2013a, 2013b; Meyer et al., 2018) – most recently as part of a World Bank study on IPPs in sub-Saharan Africa foregrounding the importance of the planning-procurement nexus at the country level in attracting and sustaining IPP investments (Eberhard et al., 2016; Eberhard et al., 2017).

2.2.1 Foundation of the analytical framework: contributing elements to IPP success

Gratwick and Eberhard's contributing elements framework (Table 2.1) remains one of the most comprehensive and useful analytical frameworks developed to explain IPP outcomes in the region, and, as such, forms the initial conceptual foundation for this study that will be built on and improved.

¹⁵ The same effect is present in the transport sector in Latin America (Estache & Iimi, 2012).

Table 2.1: Country and project level contributing elements of success for IPPs in Africa (adapted from Eberhard et al, 2016)

Factors	Details
Country level	
Stability of economic and legal context	Stability of macroeconomic policies Extent to which the legal system allows contracts to be enforced, laws to be upheld, and arbitration to be fair Repayment record and investment rating Previous experience with private investment
Energy policy framework	Framework enshrined in legislation Framework clearly specifies market structure and roles and terms for private and public sector investments (generally for a single-buyer model, since wholesale competition is not yet seen in the African context) Reform-minded 'champions' to lead and implement framework with a long-term view
Regulatory transparency, consistency and fairness	Transparent and predictable licensing and tariff framework Cost-reflective tariffs Consumers protected
Coherent sectoral planning	Power-planning roles and functions clear and allocated Planners skilled, resourced, and empowered Fair allocation of new-build opportunities between utilities and IPPs Built-in contingencies to avoid emergency power plants and blackouts
Competitive bidding practices	Planning linked to timely initiation of competitive tenders/auctions Competitive procurement processes are adequately resourced, fair and transparent
Project level	
Favourable equity partners	Local capital/partner contributions are encouraged Partners have experience with and an appetite for project risk A DFI partner (and/or host country government) is involved Firms are development-minded and returns on investment are fair and reasonable
Favourable debt arrangements	Competitive financing Local capital/markets mitigate foreign exchange risk Risk premium demanded by financiers or capped by offtaker matches country/project risk Some flexibility in terms and conditions (possible refinancing)
Creditworthy offtaker ¹⁶	Adequate managerial capacity Efficient operational practices Low technical losses Commercially sound metering, billing, and collection Sound customer service

¹⁶ While it could be argued that the credit-worthiness of the off-taker is a country level factor since in most African contexts this is a state-owned utility, the inclusion of this factor at the project level of analysis emphasizes its importance for the security of the project's revenue stream. It also allows for analysis of power investments where the off-taker is not a state-owned enterprise – a situation that is developing rapidly in Africa and beyond.

Secure and adequate revenue stream	Robust PPA (stipulates capacity and payment as well as dispatch, fuel metering, interconnection, insurance, <i>force majeure</i> , transfer, termination, change-of-law provisions, refinancing arrangements, dispute resolution, and so on) Security arrangements are in place where necessary (including escrow accounts, letters of credit, standby debt facilities, hedging and other derivative instruments, committed public budget and/or taxes/levies, targeted subsidies and output-based aid, hard currency contracts, indexation in contracts)
Credit enhancements and other risk management and mitigation measures	Sovereign guarantees Political risk insurance Partial risk guarantees International arbitration
Positive technical performance	Efficient technical performance high (including availability) Sponsors anticipate potential conflicts (especially related to O&M and budgeting) and mitigate them
Strategic management and relationship building	Sponsors work to create a good image in the country through political relationships, development funds, effective communications, and strategic management of contracts, particularly in the face of exogenous shocks and other stresses

Gratwick and Eberhard (2008b) mainly seek to analyse successful outcomes from the perspective of the investor. These include investment returns and ongoing opportunity; contracts not unravelling; and new investment opportunities. The host country wants competitively priced, reliable electricity – which is the main focus of this thesis (price and project realisation outcomes). One of the ways in which investor and local country interests can be balanced is by mitigating investor risks, ultimately leading to a lower cost of capital which, in turn, can result in lower costs and prices and ultimately also serving a welcome development outcome. These issues are explored in more detail below within the framework of Gratwick and Eberhard's (2008b) analysis of country- and project-level contributing elements to success.

2.2.2 Country level contributing elements

2.2.2.1 Stable economic and legal system

A favourable investment climate – most often defined in terms of macroeconomic and political stability, and strong legal institutional development – has been shown to determine both the volume of foreign direct investment and the associated cost of capital. Cantor and Packer (1996) and Vaaler (2008), Vaaler et al. (2006), and Vaaler and McNamara (2004) show that improved sovereign risk ratings – a reliable measure of the cost of lending – depend on a relatively standard suite of macroeconomic fundamentals: a low, stable inflation rate; moderate levels of national debt; the size of the economy, and national wealth (as measured in GDP/capita terms) (Banerjee et al., 2006). This is consistent with findings from the FDI literature (Anyanwu, 2012; Asiedu, 2002; Groh & Wich, 2012;

Ramamurti & Doh, 2004; Tembe & Xu, 2012; Wint & Williams, 2002), and finance and investment theory (Modigliani & Miller, 1958), broadly supporting the assertion that a fast-growing, large economy with low inflation and low levels of debt is likely to attract more and better-priced foreign direct investment.

Gratwick (2007) adds a further dimension – the depth and level of development of local capital markets (Banerjee et al., 2006), and banking system efficiency, as determinants of the broader investment climate for IPPs.

Estache (2016) and Vaaler et al., (2008) also provide evidence of the importance of institutional factors – specifically as it relates to a country’s legal system – as a determinant of risk in project-financed deals. They point out that countries with common-law systems (La Porta et al., 1998; Ribstein, 2005), stronger rule of law (Banerjee et al., 2006; Pistor et al., 2000), ease of contract enforcement (Djankov et al., 2003) and support from informal institutions for the legal system (Libecap, 1989; North, 1991) represent lower investment risks as measured by projects’ financial gearing ratios. This supports Gratwick’s highlighting of a country’s history with upholding contracts and the ease of recourse to arbitration as important contributing elements to IPP sustainability¹⁷. Of secondary importance is, seemingly, the absence of corruption¹⁸ (Habib & Zurawicki, 2002; Mauro, 1995), a relatively well-educated and productive labour force (Ghura & Goodwin, 2000; Globerman & Shapiro, 2002; Noorbakhsh et al., 2001), tax incentives, political stability¹⁹ and a growing economy²⁰ (Banerjee et al., 2006; Estache, 2016; Ghura & Goodwin, 2000).

2.2.2.2 Energy policy framework and regulation

The context for private power investment is further strengthened by the existence of a clear energy policy statement, backed by legislation, that creates the space for private participation in the power sector, while also clarifying the governance of incumbent state-owned utilities and the regulation of

¹⁷ An important question that this study will seek to address is to what extent, from an investor perspective, country-level macroeconomic and institutional risks can be mitigated by international or bilateral development finance institutions playing a prominent role in the development and implementation of procurement programmes.

¹⁸ The perceived level of corruption has also been found to coincide with higher levels of private infrastructure provision in emerging markets (Banerjee et al., 2006).

¹⁹ Within institutional literature and using transaction cost theory, political stability plays an important role in reducing the costs associated with infrastructure investments (Estache, 2016).

²⁰ To be clear, the studies do not dismiss the importance of economic growth, but point out that in the context of project finance, legal institutional issues appear to have a more pronounced effect on project gearing ratios.

revenues which support private investment. There should be policy and legislative clarity on the power market and the respective roles of the public and private sectors (Eberhard & Gratwick, 2011). The passing of legislation that allows IPPs to participate in the electricity sector is a simple yet often-overlooked reform element that has been shown to be an important initial catalyst for investment (Urpelainen & Yang, 2017).

Nonetheless, the experience with energy policy-making in sub-Saharan African appears to be more experimental than coherent, frequently resulting in hybrid power sector reform models where an often poorly performing state-owned incumbent utility remains in a dominant position and where space is created on the margins for private sector investments in IPPs (Gratwick & Eberhard, 2008a). Part of this story is the all-too-familiar gulf between government's stated intent for the sector, as articulated in its policies, and actual implementation of those policies – an issue receiving considerable renewed attention in research on the political economy of power sector reform (Godinho & Eberhard, 2019; Ogunleye, 2016; Trollip & Boule, 2017; Urpelainen & Yang, 2019).

In sub-Saharan Africa, the establishment of a regulatory agency has been one of the most widely adopted reform steps (Eberhard et al., 2019). The establishment of an independent regulator with well-defined roles, functions and funding sources can play an important role in providing the necessary transparency and predictability in market entry and prices that the private sector needs, even (or especially) in the absence of fully unbundled power markets.

Regulators are most often responsible for two areas with major implications for private investors: tariff setting and approval, and licensing (Kapika & Eberhard, 2013). In the first instance, regulators are required to set electricity tariffs for captive consumers. Failure to set these tariffs at cost-reflective levels undermines the financial sustainability of the entire sector, yet the reality in almost all sub-Saharan African countries is that electricity tariffs are mostly not cost-reflective, very often not even covering the operating costs of utilities (Trimble et al., 2016). While this undermines the ability of utilities to raise debt and fund their own capital expansion programmes, it also depresses private investment by undermining the financial sustainability of what is often the only legally mandated offtaker of power – the government-owned utility.

Regulators are also responsible for approving generation tariffs contained in PPAs, which creates potential further uncertainty if an investor's agreement with the offtaker or procurer is open to possible arbitrary regulatory decision-making (Kapika & Eberhard, 2013). This has, for example, happened in Spain where renewable energy feed-in tariffs were retroactively adjusted by the regulator, leading to the collapse of their renewable energy market (Del Río et al., 2015). Finally,

regulators are responsible for providing licences for generation as well as for transmission/distribution activities. The licensing procedures can be opaque and costly, and outcomes might not be guaranteed (Eberhard et al., 2017).

The mere existence of a regulatory agency is, in itself, insufficient: rather, it is the quality of regulation – measured by the transparency, consistency and fairness of regulatory decisions – that supports IPP investments (Bradshaw, 2016; Eberhard et al., 2017; Kapika & Eberhard, 2013; Montmasson-Clair et al., 2014). Regulatory performance is determined by a host of political economy factors (Godinho et al., 2018; Godinho & Eberhard, 2019; Saussier et al., 2009), most notably by the institution's independence, defined in law and supported by its funding model (whether it is dependent on government for its finances, or is, for example, funded directly from electricity levies) and government's ability to influence staffing decisions (Kapika & Eberhard, 2013).

2.2.2.3 The planning-procurement nexus

While economic stability and institutional quality are important for attracting private power investments, recent research has highlighted the centrality of dynamic, least-cost planning frameworks linked to the timely initiation of competitive procurement processes (Eberhard et al., 2017; Montmasson-Clair & Ryan, 2014c). Effective electricity-sector planning models need to be designed to meet energy security and reliability standards, should be based on detailed supply and demand forecasts, updated costs of supply options, and should have as outputs a least-cost plan with various alternative scenarios. In hybrid power markets, governments should clarify how new generation production will be split between the private and public sector (Gratwick & Eberhard, 2008b).

Merely developing a plan is, however, not enough. The plan needs to be translated into timeous procurement windows to effectively increase the flow of investments into the power sector (Eberhard et al., 2017). Power market entry is not that obvious in this highly regulated sector. While unsolicited proposals are normally permitted, they are not desirable. Ensuring that the procurement process adheres to the plan's least-cost principles inevitably requires the use of competitive bidding for any new projects, rather than entertaining unsolicited offers (Eberhard et al., 2016).

There is a great deal of empirical evidence that competitive bidding delivers lower-priced investments and more sustainable projects (Eberhard et al., 2017; Del Rio, 2017f; Haufe & Gephart, 2018; Kreiss et al., 2017) – although some have argued that auction-based price reductions have merely coincided with (instead of resulting in) price reductions due to dramatic reductions in renewable energy

equipment costs (Toke, 2015). Others argue that auctions have actually resulted in unnecessary price increases – at least in cases where auction design choices led to low competition levels (Grashof et al., 2020).

There is nevertheless compelling theoretical arguments (Hubbard & Paarsch, 2016), as well as growing empirical evidence (Del Rio, 2017f; Haufe & Ehrhart, 2018) – especially from developing countries (International Renewable Energy Agency, 2017b & 2019) - that competitive procurement results in competitively priced projects. Competition between bidders in the procurement process is effective in reducing the level of information asymmetry between the procurer and bidders (Laffont & Martimort, 2002). The competition between agents forces them to reveal more information about prices which are reflective of costs and also compels agents to change the way that they structure projects, source inputs and generally do business in the hope of securing a cost-based competitive edge (Bulow & Klemperer, 1994; Milgrom & Weber, 1982; Toke, 2015'; Haufe & Ehrhart, 2018).

Competitive procurement is thus a potentially powerful tool for changing the bargaining power dynamic during the initial stages of the investment process, leading to more balanced development and investor outcomes and reducing the likelihood of the obsolescing bargain (Gratwick, 2007).

Realisation of the potential of competitive procurement to balance investment and development outcomes (i.e. result in competitive prices) is not a given. It requires appropriate choices in the design and implementation of the procurement programme, underpinned by an understanding of theoretical foundations for making these decisions (Del Rio, 2017f; Haufe & Gephart, 2018). This study aims to fill this knowledge gap. The specific procurement design and implementation choices, and their potential impacts on investment and development outcomes, will therefore receive the bulk of attention in both this literature review and the subsequent chapters covering empirical findings. These auction design and implementation choices will be analysed in greater detail after an unpacking of the project-level factors that contribute to IPP success.

2.2.3 Project level contributing elements

Utility-scale renewable energy IPPs in Africa are most often structured as project-financed deals, not only because of the contamination problem²¹ potentially posed by projects in these risky markets, but

²¹ The contamination problem refers to the situation in which a project is financed through corporate finance, which exposes the firm to bankruptcy risk if the project performs poorly – especially if the project is large compared to the firm's size. Limiting this risk is a textbook reason for using project finance (Gatti, 2008; Steffen, 2018).

also because of the debt overhang²² facing many developers active in the region (Steffen, 2018). The cost of capital, securing of revenues (including through effective risk allocation and mitigation) and project management consequently become key elements for ensuring the success of projects²³.

2.2.3.1 Beyond WACC: The right equity and debt providers

Within the renewable energy literature, equity and debt contributions have mainly been analysed in terms of how they influence technologies' levelised costs of electricity (LCOE)²⁴ based on projects' weighted average cost of capital (WACC) (Angelopoulos et al., 2017; Egli et al., 2018; Ondraczek et al., 2015; Plowe et al., 2014; Polzin et al., 2019; Waissbein et al., 2013; Wuester et al., 2016). Studies have sought to understand the factors underlying projects' gearing ratios²⁵, loan tenors and risk-adjusted premiums as drivers of prices.

The IPP literature also looks beyond the equity and debt providers' relative pricing of capital to the identity and nature of these finance sources. African IPPs will face various political and economic pressures during their periods of development, construction and operation. Being able to navigate and withstand these pressures is essential for getting these projects built and operating sustainably (Eberhard & Gratwick, 2011). From a project sponsor's perspective, it has been argued that local shareholding is a possible means to reduce risks – especially around renegotiation and creeping expropriation (Hoskote, 1995; Woodhouse, 2005a). It had also been proposed that a firm's origins could play a role in increasing project resilience, based on the assumption that firms from developing countries would be better able to anticipate and navigate many of the pressures inherent in the African power sector (Woodhouse, 2005a).

However, Gratwick (2007) found that neither of these hypotheses held much explanatory power in the African context. Rather, it was shown that a firm's experience (track record) – preferably in-country, but also within the continent and irrespective of the firm's origins – alongside a strong

²² Debt overhang refers to the problem where the ability to finance new projects is limited by an already high debt ratio, impacting a developer's balance sheet. In such settings, project finance can be very effective in helping them conduct profitable projects since it decouples the project completely from the developer's balance sheet (Etsy, 2003).

²³ Recent analyses by Alova et al., (2021) using machine-learning models to predict the likelihood of African power projects being realised, found that while country-level factors (mainly corruption levels, income inequality, corruption levels) primarily impacted the development of the project pipeline, it is project level factors (project size, public vs. private ownership, grid-connection status, DFI involvement and, to a lesser degree, cost) that determines the likely rate of success of this pipeline.

²⁴ The LCOE is defined as "the break-even cost of producing energy from a given source over its useful lifetime" (Sager, 2014:21). Simply put, the LCOE is the tariff at which revenues would equal costs.

²⁵ The more debt a project has, the more highly geared it is.

developmental mandate, played a determining role in helping it face African risk. It is argued that these firms' projects would usually be more balanced, in terms of investment and development outcomes, thereby enabling them to better withstand public pressure.

DFI shareholding has also been shown to contribute to project realisation rates (Alova et al., 2021) and project resilience because their presence comes with a “halo” effect (Marcelo & Schuyler, 2016; Woodhouse, 2005a) that discourages creeping expropriation and payment defaults (Gratwick & Eberhard, 2008b).

On the debt side, Gratwick (2007) likewise emphasizes the experience and mandate of the lenders as an important element in the sustainability of IPP investment. As with most infrastructure projects, the majority of IPPs in sub-Saharan Africa have been structured with high levels of debt. High project gearing at low cost enables project sponsors to make reasonable equity returns while still selling electricity at a competitive tariff. In this context DFIs have come to play an important role in the development of the African IPP market, not only because of their ability to provide low-cost, long-tenored debt (at times without political cover) but also because of the already mentioned “halo” effect that protects the investment (Alova et al., 2021). DFIs have been shown to “crowd in” other sources of debt through their considerable experience in the region, appreciation of the risks involved and access to risk mitigation instruments (Eberhard et al., 2017).

It is nevertheless important that more commercial debt providers – in particular, institutional investors – start investing more actively in this market if the region is to stand any chance of addressing its generation infrastructure backlog (Eberhard et al., 2017; Waissbein et al., 2013). This is, however, not merely about the volume of debt needed but also about the source of debt. A significant source of pressure on many IPPs in the region is their exposure to foreign exchange movements: most debt to IPPs is provided in hard currency (US\$ or EUR) since debt is mostly derived from international lenders, while revenue from customers is in local currency.

Project developers and funders mostly require hard-currency-denominated pricing agreements. This exposes offtakers, host governments and, ultimately, electricity consumers or tax payers to significant price increases in the cost of electricity, which, in turn, exerts pressure on the project itself as well as on the system as a whole (Duve & Witte, 2016). Being able to provide locally denominated debt will remove this currency mismatch, but it requires functioning host-country capital markets of sufficient depth – a situation present, unfortunately, in only a handful of sub-Saharan African countries (Eberhard et al., 2017).

2.2.3.2 Ensuring a secure project revenue stream: Offtakers, contracts and risk mitigation

A secure, long-term revenue stream is essentially what makes it possible for these kinds of projects to be developed, financed and built, and is especially critical for project-financed investments dependent on non-recourse funding. The power purchase agreement (PPA) with the offtaker is the most important contract for the project and needs to be legally, technically and commercially robust for the project to be considered “bankable”²⁶ (Eberhard & Gratwick, 2011).

The PPA is also the main point of discussion when investment and development outcomes are considered out of balance (Gratwick & Eberhard, 2008b). It is effectively a long-term agreement (normally 15–25 years) that establishes the obligation of the offtaker to buy a certain amount of power from the project at a set price²⁷ for the duration of the contract. Owing to the non-dispatchable nature of many renewable energy technologies, this obligation is usually treated in a “take-or-pay” manner, meaning that the offtaker will pay for all electricity produced by the project, irrespective of whether it needs it.

A PPA will need to cover a range of technical, commercial and legal areas, including dispatch arrangements, interconnection agreements, insurance, *force majeure*, project transfer, termination, change of law, refinancing, dispute resolution (including the seat or arbitration), deemed energy payments, and so on (Alonge & Ewelukwa, 2013; Brasher & Krashe, 2003; IFC 2015; OPIC et al., 2019; Viljoen, 2017).

For most IPPs in the sub-Saharan region, the PPA will be signed with a single, state-owned utility as the offtaker (Eberhard et al., 2016). Many of the sub-Saharan utilities are practically insolvent owing to electricity consumer tariffs set at levels that are not cost-reflective, poor billing collection rates, high transmission and distribution losses and inefficient operations (Trimble et al., 2016). Out of the 48 sub-Saharan African countries, only NamPower in Namibia had an investment grade credit rating²⁸. For the rest of the region, investors and lenders are faced with a single buyer for their power that is often in financial distress and reliant on government subsidies (Eberhard et al., 2016; Trimble et al., 2016). It is therefore not surprising that offtaker risk has been shown to have a direct impact on a project’s cost of capital (specifically debt) (Bonetti et al., 2010).

²⁶ Bankability refers to a project’s ability to secure debt finance. A bankable project is one that debt providers (i.e. lenders) are willing to provide funding to based on their analysis of its likely profitability and the reasonability of risk allocation.

²⁷ The price is, in turn, determined by a competitive procurement process (competition for the market), a feed-in tariff established by government or bilateral negotiations

²⁸ A recent (2020) downgrade of the Namibian sovereign has also impacted NamPower’s credit rating.

As a result, lenders to most IPPs in the region require some form of sovereign guarantee, or other security arrangement, covering payment default as well as contract termination, and an international seat of arbitration for when contracts unravel²⁹. Bankable PPAs in the region are usually also backed by further security arrangements to provide liquidity support, including escrow accounts, letters of credit, stand-by debt facilities, committed public budget and/or taxes/levies and/or targeted subsidies³⁰.

Projects are further able to make use of a range of risk mitigation products (PRGs, PRIs, MIGA cover) from DFIs as well as, increasingly, the private sector (Eberhard et al., 2016). While useful in providing comfort to project lenders, these products come with their own costs and political and bureaucratic processes – potentially impacting a project’s timelines and tariff levels. In the context of competitive procurement, where price and often, in addition, realisation (financial close and construction) periods play an important role in the awarding decision, bidders might be reluctant to take part in an auction unless these products are provided as a standard package as part of the bidding programme (Fergusson et al., 2015).

2.2.3.3 Maintaining project support: Strategic management, relationship building

Estache et al. (2009), Laffont (2005) and Engel et al. (2009) argue that the long-term, fixed asset nature of IPPs leads to a tension between ensuring credible long-term commitments from both private and public parties – most often through long-term, inflexible contractual arrangements – and contractual and institutional flexibility to ensure project sustainability in the face of inevitable changes. This is supported empirically by both the PESD results (Woodhouse, 2005a) and Gratwick’s (2007) IPP research, although the prominence of the strategic management function in ensuring IPP sustainability is called into question by the latter’s findings. Nevertheless, there is agreement that limits of legal and financial engineering for large-scale, long-term investments means that relationship building and strategic management – especially via local partners – is important for ensuring fair risk allocation and sharing, and, ultimately, a project’s long-term sustainability³¹ (Eberhard et al., 2016).

²⁹ Some countries have been able to move away from the need to provide sovereign guarantees or even liquidity support (for example, Kenya) owing to good track records with regards to payment, contract enforcement and abiding by international arbitration decisions.

³⁰ For reasons already discussed, a hard-currency-denominated PPA is usually a further requirement in the region. Tariff indexation can also be used to protect project revenue against inflation.

³¹ A technically well-performing project – especially when compared to a utility-run plant – further strengthens the case for sustained project support in the face of mounting pressure (Eberhard et al., 2016)

In the renewable energy literature, local community resistance has become a key area of research – in particular, considering the extensive geographic and mostly rural footprint of these technologies (Burningham et al., 2014; Devine-Wright, 2011; Devine-Wright & Howes, 2010; Hammami et al., 2016; van der Horst, 2007; Zulkifli & Aslam, 2015). Project sponsors’ ability to secure and sustain a project’s social licence to operate is essential in ensuring both its immediate and long-term success (Sovacool et al., 2017; Wlokas et al., 2017; Wlokas et al., 2012). Possible examples of strategic relationship management are community development projects for the benefit of those most affected by projects. These (and many other) socio-economic development commitments (incl. local labour, local content, local ownership) can be incorporated in auctions’ qualification and bid scoring criteria to increase these programmes’ “socio-political feasibility” (Del Rio, 2017f). These commitments can nevertheless also increase project costs as developers try to fund these commitments, resulting in higher prices (Leigland & Eberhard, 2018).

The IPP literature, explored above, provides a valuable conceptual foundation for studying private utility-scale investment in the African power generation sector. It uncovers a range of contributing elements at both the country and project levels that, together, advance our understanding of IPP project price and realisation outcomes across the region. The literature highlights the importance of the planning–procurement link and, specifically, competitive procurement for determining sustainable project outcomes. However, questions around the design and implementation of power procurement programmes, including the growing phenomena of renewable energy auctions, remain largely unexplored, despite strong evidence that they play an important role in determining project price and realisation outcomes (Figure 2.1).



Figure 2.1: The programme-level gap

This research gap therefore revolves around this programme level that connects the country- and project levels. We specifically need to understand how the design of these competitive procurement programmes, as well as how they are implemented, impact project prices and realisation. This requires understanding how the determination and division of auction volumes; the setting of criteria to ensure bidder capacity and commitment; and the scoring of bids impacts not only competition levels and affects bidder behaviour, but also how they influence project costs (in particular the cost of capital) and realisation probabilities.

This is the focus of sections 2.3, which is largely concerned with auction design. We furthermore need to look beyond auction design to reckon with the influence of bidders' trust in the implementing institution and the auction implementation process as a further determinant of competition levels (and ultimately, prices). Finally, project realisation can also be positively influenced by strategic support from the auctioning authority. These auction implementation (as opposed to design) factors will be the focus of section 2.4.

2.3 Programme level: Auctions as an effective procurement mechanism

2.3.1 Auction design: An introduction

Auctions have been used to sell a variety of goods and services for centuries. One of the earliest written accounts of an auction mechanism being used was when the Roman Empire was sold by the Praetorian Guard in 193 AD. Since then, auctions have become widespread. Analysis of the auction mechanism has led to new theoretical insights – informing our understanding of pricing theory, competitive markets and game theory. As a public sector procurement mechanism, (reverse) auctions are particularly popular (Hubbard & Paarsch, 2016; Klemperer, 2004).

Auctions are essentially games of asymmetric information (Hubbard & Paarsch, 2016) that rely on the power of competition to close the information gap between the auctioneer and bidders. The level of competition is effectively increased by adding more bidders and/or replacing weaker bidders with stronger ones. To function effectively, auctions rely on rules that should be understood by everyone, not be subject to arbitrary change, and should define how information will be gathered. A well-functioning legal system that ensures everyone sticks to the rules of the game is therefore important to support an effective auction (Kreiss et al., 2016).

In the electricity sector, auctions have been used to procure power for more than two decades. The first auctions took place in Brazil, Canada, Chile, China, Ireland, Portugal and the UK in the 1990s and

early 2000s (Lucas et al., 2013). After the initial power sector reforms in the 1990s, a second wave of power sector reforms – in the 2000s – were introduced (mostly in Latin America) in a context where many low- to middle-income countries were struggling to increase new electricity supply – and needed a new way of attracting generation capacity. Investors were more interested in bidding for long-term contracts than in constructing merchant plants that had to compete to sell power in power exchanges. Auctioning off these long-term agreements to the cheapest bidder proved to be effective at increasing power generation capacity at low cost (Elizondo-Azuela & Barroso, 2014; Maurer & Barroso, 2011).

The historic reality in sub-Saharan Africa is that most IPPs have been procured through direct negotiations, often leading to poorly balanced investment and development outcomes that threaten a project's long-term sustainability and undermine the development of a viable project pipeline (Eberhard et al., 2017; Estache & Iimi, 2012; Gratwick & Eberhard, 2008b). Given the opaque nature of this contracting method, it is often also associated with rent-seeking and corruption in the awarding process (Estache & Foucart, 2016; Estache & Iimi, 2008). Only really in recent years, and primarily off the back of South Africa's successful experience in competitively contracting renewables (Eberhard et al., 2014) – in tandem with rapidly decreasing renewable energy costs – have IPPs, and especially renewable energy IPPs, started to be procured in significant numbers through structured programmes such as feed-in tariffs and auctions (Kruger & Eberhard, 2018).

Auctions have several benefits: they offer flexibility in terms of design; allow for “real price discovery”; offer greater certainty on procured quantities and prices; and provide binding commitments and increased transparency (Ferroukhi et al., 2015). Auctions have been criticised for imposing high transaction costs on bidders as well as on the auction organiser (for example, the host government) (Eberhard et al., 2014). They also face the possibility of underbidding and delays in construction, chiefly as a consequence of overly aggressive bidding by competitors that could result in prices being unrealistically low and projects being financially non-viable and unfinanceable (Del Río & Linares, 2014; Ferroukhi et al., 2015; Maurer & Barroso, 2011). These kinds of criticisms have been the driving force of recent auction scholarship (for example del Rio, 2017f; Gephart et al., 2017; Kreiss et al., 2016) that attempts to identify auction design measures that can address these concerns.

More recent critiques of auctions focused on the ‘squeezing out’ of smaller players, such as community-owned renewable energy projects (Baker, 2021; Grashof, 2019); the apparent prioritisation of financial and investor interests over local political and societal priorities (Baker, 2021; Grashof, 2021); high project prices and the undermining of renewable energy deployment targets in some contexts (Grashof et al., 2020); and the limiting of technological innovation and diversity (del Rio, 2017f; Haelg, 2020). These critiques – important as they are – do not directly address the thesis’

main focus – project prices and realisation (with the possible exception of Grashof et al., 2020) – and as such engagement with the literature will mainly focus on factors that impact these outcomes.

2.3.2 Renewable energy auctions

The first wave of publications on the design of renewable energy auctions was produced in response to the rapid adoption of this procurement method in the post-2010 period, initially mostly, but not exclusively, in emerging economies. These were mainly guidance notes and consulting reports aimed at policymakers and auction designers that relied primarily on empirical evidence from previous auction programmes to inform design recommendations, most often with little or no explicit reference to auction theory. The World Bank (Elizondo-Azuela & Barroso, 2014; Maurer & Barroso, 2011) and the International Renewable Energy Agency (IRENA) (Ferroukhi et al., 2015; International Renewable Energy Agency, 2017a) produced some of the most well-known of these guides. Several donor-backed support programmes similarly produced guides for countries or regions that were in the process of rolling out their own auction programmes (GIZ 2013; Khanna & Barroso, 2014; Lucas et al., 2017; Tietjen et al., 2015; Tongsopit et al., 2017).

One such a programme was the EU-funded AURES applied research project that provided assistance to EU member states on RE auction design. It produced a number of guidance documents and training materials from 2015 to 2018 – drawing not only on international renewable energy auction experiences (Del Río, 2015, 2016, 2017d, 2017b, 2017c, 2017e, 2017a; Fitch-Roy et al., 2015; Fitch-Roy & Woodman, 2016; Noothout & Winkel, 2016; Steinhilber, 2016a, 2016c, 2016b; Tiedemann, 2015; Tiedemann et al., 2016) but also on auctions in other industries such as broadband spectrum sales, oil and gas auctions, and industrial procurement (Haufe, 2016).

Researchers affiliated with the AURES programme have been critical of the lack of engagement with auction theory in most of the renewable energy auction design literature (Haufe & Ehrhart, 2018). Together with Hochberg (2018), Kreiss et al. (2016), and Welisch (2018), these researchers draw on economic auction theory to derive a set of first principles for good auction design that acts as a counterbalance to the over-reliance on empirical studies. These principles will form the theoretical foundation for this chapter's discussion of auction design, to be combined with empirical evidence from the literature and the case study chapters in deriving practical auction design recommendations.

Most authors – whether drawing on auction theory or on empirical cases, or both – agree that good renewable energy auction design is aimed at stimulating as much competition as possible without sacrificing project quality and realisation rates. This requires a fine balancing act, since the push for,

and dynamics of, competition can undermine both. The inverse is, of course, also true, since excessive measures aimed at ensuring project realisation can deter bidder entry, resulting in less competition and more costly projects (Haufe & Gephart, 2018; Kriess et al., 2016; Del Rio, 2017f). The discussion of auction design choices in the following pages will accordingly be guided by, and regularly refer to, their impact on competition levels (and resulting prices) and project realisation³².

2.3.3 Ensuring timely project realisation: Prequalification, penalties and reputation

A key risk in using auctions to procure new power generation capacity is the possibility that winning bids may result in projects not being built – at all, or on time. This has been the experience of several countries that pioneered the use of auctions in renewable energy procurement (for example, Brazil, UK, India). In some cases, less than 50% of the awarded capacity was eventually realised (Bayer et al., 2018; Cassetta et al., 2017; Lundberg, 2019). Theory (Board, 2007; Parlane, 2003) shows that having the option to not realise a project lowers bid prices, and also increases bid non-realisation probability. It is therefore necessary to offset this risk.

There are several potential reasons advanced for non-realisation, but two stand out: bidders are either not committed to project realisation – using the award as a hold option or opening negotiation position (Ferroukhi et al., 2015); or bidders are inexperienced or merely too uncertain (Kreiss et al., 2016) about project costs at the point of bidding, leading to what is called the “winner’s curse”³³ (Haufe et al., 2017; Wilson, 1992). It has also been argued that increased competition leads to aggressive bidding – which, in turn, is assumed to increase the chance of the winner’s curse being realised, either through irrational bidding or through bidders using overly aggressive cost assumptions (uncertainty) (Del Río, 2017f; Estache & Iimi, 2012).

³² Authors such as del Río (2017g) acknowledge that the main auction success criteria are usually project prices (static efficiency 1) and realisation rates (effectiveness). However, he adds six further success criteria to his analytical framework, including static efficiency 2 (balance of system, grid integration costs); dynamic efficiency (impact on technology development, R&D); support costs (premiums vs. market prices); local impacts (social and ecological); actor diversity, and socio-political feasibility (how the auction results impact social and political support for the programme and projects). In the context of sub-Saharan Africa, and to allow for analysis in line with the main criteria used in the IPP literature, this thesis mainly considers impacts on effectiveness and static efficiency 1, although other criteria (for example, socio-political feasibility, local impacts) are taken into account where relevant.

³³ The winner’s curse was first termed by Thaler (1988) and refers to a situation where bidders submit a bid that is so low that realising the project will lead to a financial loss.

2.3.3.1 Physical and financial (pre)qualification requirements

Auction theory discusses two main tools to lower this non-realisation risk in a procurement programme: (pre)qualification³⁴ requirements and penalties. While some of the literature treats these in a similar way – mainly as a cost to accessing the auction (Welisch, 2018) – Kreiss et al. (2016) differentiate between different types of qualification requirements – financial and physical – and penalties.

2.3.3.1.1 Financial qualification requirements (bid bonds)

Financial qualifications comprise instruments such as bid bonds – which is a financial commitment to realising a project that a bidder gets back if not awarded a project or if achieving a specific milestone (usually financial close)³⁵. Bid bonds generally serve two purposes in the literature: they signal that the bidder has the financial capacity to realise the project and they serve as penalty in case of a project failing to be realised (commitment incentive) (Ferroukhi et al., 2015; Kreiss et al. 2016). Setting the right bid bond level is therefore important: setting the level too low will not substantively increase bidder commitment, since the cost of non-realisation will be negligible. Setting the bid bond level too high might decrease the number of bidders who are willing or able to submit a bid, leading to reduced competition and potentially higher prices. The World Bank recommends setting the bond level at between 1–3% of the total project costs (PPP Knowledge Lab, 2019), though there is no explicit theoretical justification for this.

2.3.3.1.2 Physical qualification requirements (project/bid preparation)

Physical qualification criteria include project development tasks that a developer has to perform in the course of project realisation, such as obtaining permits, land rights, building rights, grid access, for instance. While these qualification requirements do not add any additional cost to the project, at the bidding stage these represent sunk costs (that is, if not awarded, the bidder will not be getting these

³⁴ The term “prequalification” usually refers to a two-stage procurement process, where a separate prequalification round establishes which bidders are eligible to submit full bids. Auctions can, however, be set up without this prequalification round, but still use qualification criteria to screen bids. For the sake of accuracy, the researcher will mainly use “qualification” requirements to refer to these screening criteria.

³⁵ Bid bonds are often replaced at this point by even more expensive performance bonds, which function as penalty regimes and are again linked to achieving specific project milestones within a set time: for example, commercial operation. Some performance bonds remain in place for the entirety of a project’s operating life, while others might cover only the first few years.

costs back). Physical qualification requirements arguably reduce the uncertainty of project costs, which is often hypothesized as a main reason for project non-realisation³⁶, and shortens project realisation timelines (Calveras et al., 2004; Gephart et al., 2017; Haufe & Ehrhart, 2018; Kreiss et al., 2016; Welisch, 2018).

Although there are different ways in which a project's physical qualification requirements can be set out, the literature generally looks at how early or how late in the project-preparation phase these requirements are pitched. The closer a project is required to be to reaching financial close at the point of bidding, the later (and more onerous) the physical qualification requirements. Late-stage physical prequalification requirements put more equity at risk – which may translate into a higher cost of capital for a project (Dukan et al., 2019), and which generally reduce competition levels – and this will likely result in higher prices (Ehrhart et al., 2020). Late-stage physical qualification requirements however also reduce project non-realisation risks and can ensure that projects are built quickly and to a better standard (Kreiss et al., 2016).

Once an awarding decision is made, competitive pressures between bidders disappear and the procurer is in a less-powerful position relative to investors. At this stage, project delays can, and often do, occur as projects become beholden to negotiation and administrative processes. By setting late-stage qualification requirements, a procurer reduces the number of these processes coming into play post-award. Setting “late” physical prequalification requirements is thus an effective use of the power of competition to ensure project quality, but procurers need still to minimize the costs of participation to ensure adequate competitive pressure. Finding an optimal balance between project quality and competition levels requires the identification and elimination or minimization of physical prequalification criteria that do not contribute to project quality, as well as consideration of how participation costs can be reduced by streamlining permitting processes and generally reducing inefficiencies in the system (Ehrhart et al., 2020).

³⁶ Estache (2016) argues that competition for the market is largely dominated by rules defined by international organisations, which generally favours more onerous prequalification requirements that ultimately sees international firms being qualified to bid. Estache and Iimi (2012) further argue that while qualification criteria help limit the risk of poor project quality, lowering these requirements can also be a powerful tool in stimulating local economic development. They suggest that high prequalification criteria push up a project's price while not leading to better project outcomes. Their model, however, assumes that there is no uncertainty on project costs at the point of bidding, and takes limited account of bidder identity and strength in setting the level of competition.

An important physical prequalification requirement in the African context concerns land. Is a bidder required to have the project site secured and prepared (including permitting) at the point of bidding? Who should ultimately be responsible for this (the procurer/state or bidder)? It is an issue that has received little scholarly attention, despite being a key potential barrier to the development of renewable energy in the region. In many African jurisdictions, private land ownership is either not allowed or, where possible, mired in uncertainty and controversy. This has led several auctioning authorities to provide land to projects prior to bidding in the hope of reducing uncertainty and costs, but often with unfortunate unintended consequences for the projects (Kruger et al., 2019; Reuters, 2016).

A further key qualification requirement that could arguably be classified as physical (since it is a project development task), but which does not show up in the theoretical literature, is financing commitment. Does the project have committed financing from both sponsors and lenders at the point of bidding, and does this go beyond a mere “in-principle” approval? Given the importance of lenders in a typical project finance structure, and the costs and timelines involved in the lending due diligence process, it is perhaps surprising that this issue does not receive more attention. Lending due diligence includes not only the physical project but, critically, also analyses bankability and coherence of the suite of contracts that surrounds it (for example, the PPA, connection agreement, and so on), the capacity of the offtaker and the sufficiency of any risk mitigation and credit enhancement provisions.

Specifying the level of lender commitment required at the point of bidding is therefore a potentially powerful way of strengthening a project’s realisation probability and reducing associated time frames. It is also seen as a way of “outsourcing” some of the project due diligence work and associated costs to the financing community, thereby reducing the administrative and financial burden of the procurer (Eberhard et al., 2014; Zhu & Chua, 2018).

2.3.3.2 Auction access requirements and staged bidding

Bidder reputation is often also used as a qualification requirement since it functions as a proxy for unverifiable project quality in the bidding process (Estache et al., 2009). Most tender programmes require bidders to show that they have the experience, expertise and financial capacity to successfully carry out the project by meeting certain commercial and technical threshold requirements. This is usually established by providing evidence of past projects and clients, CVs of key personnel, financial statements and might extend beyond the lead developer/sponsor to include EPC and O&M contractors.

Some of the more theoretical auction literature does not consider reputation a qualification requirement since it involves no real cost to the bidder, rather classifying it as an “access requirement” (Kreiss et al., 2016). Nonetheless, these auction access requirements still have an impact on the level of competition in an auction by potentially decreasing the number of bidders as well as increasing the overall strength of the remaining bidding pool. This thesis differentiates between qualification criteria – defined as physical and financial screening criteria that involve a cost to the bidder – and auction access requirements - involving no costs, and mainly concerned with bidder reputation, capacity and track record – in its analytical framework (see Table 2.2 and 2.3. towards the end of this chapter).

Bidding authorities can also decide whether to set up a bidding programme as a one- or two-stage process. A two-stage process typically involves a prequalification round where interested bidders are screened, for example, for reputation, relevant experience, financial standing, and so on. Only bidders meeting the set qualification criteria will be provided with the bidding documents (for example, request for proposals, draft contracts and suchlike). A single-stage process has no dedicated prequalification round; instead, bidders are screened only after submitting their bids, which is why it is sometimes called “post-qualification” (PPP Knowledge Lab, 2019).

There are benefits and potential drawbacks to each approach: a two-stage process can lower the overall costs involved in the bidding programme by eliminating unqualified bidders at an earlier stage – thereby saving them the cost of bidding – and by reducing the number of bids that need to be evaluated – thereby saving the bidding authorities’ time and money (Eberhard & Naude, 2016). It has also been argued that a prequalification round leads to an increase in the quality of projects since experienced bidders are more likely to incur bidding costs if they know that they are not competing against inexperienced, overly aggressive bidders (Hubbard & Paarsch, 2016). By making public a list of prequalified bidders, the two-stage approach can, however, also lead to higher project prices by increasing the likelihood of collusive behaviour (Gephart et al., 2017; Hubbard & Paarsch, 2016).

Prequalification can, furthermore, decrease the level of competition by reducing the number of eventual bidders (Gephart et al., 2017; Hubbard & Paarsch, 2016). It has also been argued that the use of a separate qualification round actually increases the costs of procurement for the public authority (Eberhard & Naude, 2016). The latter point is, however, sensitive to the number of interested bidders: where auctioneers are expecting only a handful of bids, a prequalification round might be unnecessary or even harmful, since eliminating competitors from such a small bidding pool can dramatically lower the level of competition.

Alternatively, where a large number of bids is expected, the costs of full bid- evaluation procedures might end up outweighing the costs of a prequalification round. The likelihood of collusive behaviour is likewise sensitive to the number of bidders (Hubbard & Paarsch, 2016). Bidding authorities are therefore advised to reach out to the market prior to designing the bidding process to get a sense of the level of interest and potential competition for the project(s) (Batoev & Schlosser, 2013; European PPP Expertise Centre, 2011; Farquharson et al., 2012; PPP Knowledge Lab, 2019).

2.3.3.3 Penalties

Penalties are intended to punish the bidder for poor performance, delays and, sometimes, also for non-realisation. Penalty regimes³⁷ include a reduction in a project's support level, a shortened support period, cancellation of contract, liquidated damages or performance bonds (often calculated as a percentage of overall project costs, or a percentage of specific cost items: for example, EPC or O&M) (Kreiss et al., 2016). Penalties that are binary rather than progressive have also been shown to increase a project's perceived risks, leading to higher costs of capital (Dukan et al., 2019).

Penalties are furthermore hypothesized to have different impacts on different types of bidders. While bigger (stronger) bidders might be able to pay the penalty, smaller bidders might not and might actually have the option of declaring bankruptcy when unable to pay. A penalty regime might, therefore, lead smaller (weaker) bidders to bid too aggressively, thereby lowering a project's realisation probability (Chillemi & Mezzetti, 2009).

The discussion around penalty regimes has, so far, focused on the technical performance of the project. But what about the case where a project is required or incentivised to make commitments in terms of, for instance, its socio-economic or environmental impacts (Eberhard & Naude, 2016)? In this case, not meeting its intended socio-economic or economic development commitments (for example, local content, or community investment) will have no direct negative financial impact on the project, although a failure to abide by local impact commitments might increase a project's risk regime (Baker, 2021). It, therefore, seems necessary to explicitly incentivise performance on these issues.

The literature does not provide auctioneers with guidance about how to set these penalties at levels that are high enough to matter, yet not so high that it leads to projects not even attempting to rectify problems. In this context a different kind of penalty regime – such as the threat of contract

³⁷ Although the penalty regimes are not all financial penalties, they have a financial impact and are generally modelled as such by bidders.

cancellation, or a reduction in the support period – might be more effective as an incentive mechanism.

While there is some controversy in the literature around the effectiveness of specific qualification and penalty regimes in ensuring project realisation (Del Río, 2017f; Kitzing et al, 2021; Kreiss et al, 2017; Welisch, 2018), there is agreement on the fact that there is generally a trade-off between the level of competition in an auction (measured by the number of bidders) and the use and level of these requirements. The costs and risks involved will generally decrease the number of bidders that are willing or able to submit a bid, which might lead to higher prices (Bulow & Klemperer, 1994; Del Río et al., 2015).

It has, however, also been shown that competition is not merely a function of the number of bidders but also the type of bidders – with the presence of stronger bidders leading to more aggressive bidding (Ballesteros-Pérez et al., 2016; Del Río, 2017f). This, perhaps, goes some way towards explaining Welisch's (2018) finding that the use of robust prequalification requirements and penalty regimes do not lead to higher bid prices, since bidders know that those who are prequalified are stronger bidders and have more certainty on costs.

2.3.4 Setting and dividing the auction volume

Auction volumes – that is, the amount of power or energy required – should ideally be based on a clear planning framework (Eberhard et al., 2016; Eberhard, et al., 2017). Nevertheless, how this volume is divided across bidding rounds and projects still needs to be determined by the auctioning authority and there is a real risk that the market's appetite and demand can be overestimated. Setting time-consuming physical prequalification requirements (for example, EIA approval) and short submission timelines further increases this risk. This has happened in Brazil, Germany, India and South Africa, effectively leading to limited competition, mostly in initial auction rounds, and high resulting project prices (Bose & Sarkar, 2019; Eberhard & Naude, 2017; Grashof et al., 2020; Hochberg & Poudineh, 2018; Thapar et al., 2018; Winkler et al., 2018).

In general, though, there appears to be a positive theoretical relationship between the auction volume and level of competition in the procurement programme – both in terms of the number of bidders and bidder identity/strength (Ballesteros-Pérez et al., 2016; Friedman, 1956). Where there are severe participation constraints or costs, such as limited land availability or very onerous physical prequalification requirements, large auction volumes (often in service of ambitious renewable energy

expansion targets) are, however, likely to depress competitive pressures and lead to higher prices, as has happened in, for example, Germany (Grashof et al., 2020).

The tension between price and volume have led to proposals for reducing the auction volume based on submitted prices (endogenous rationing), although Ehrhart et al., (2020) show that this would lead to sub-optimal results. Eberhard & Naude's (2017) proposal is to try to find this balance between volume and price by starting with a smaller auction volume during initial auction rounds, albeit large enough to still attract international attention and allowing for project sizes capable of taking advantage of economies of scale.

2.3.4.1 The arguments for and against project size limits

The entire auction volume can be allocated to a single project, or it can be divided into smaller projects by setting project size limits. Arguments for project size limits are often made with reference to energy security concerns, with auctioneers preferring to diversify non-realisation risks through securing a portfolio of projects. For renewable energy projects, the real risk of the sun not shining or wind not blowing in a particular location increases the risk to the overall system, further strengthening the case for project size limits that would see an auction's volume potentially being spread over a wider geographical area (Del Rio, 2017f; Ferroukhi et al., 2015). Within the African context, where many countries' power systems are small (Eberhard et al., 2016), determining the appropriate project size limit is a challenge, since one needs to balance cost (driven by economies of scale and competition) with grid stability concerns.

The arguments against project size limits are primarily driven by price concerns, pointing to the potential impact of economies of scale on project costs (Aquila et al., 2017). Bidding out projects that are too small might lead to limited market interest (and limited competition³⁸) since the costs involved in not only bidding but also structuring these projects is significant, and often bear little relationship to their size (Ferroukhi et al., 2015). In other words, it costs (approximately) as much to develop and structure a small project as it does a bigger one, even though the returns on a smaller project are much lower.

³⁸ Estache et al. (2009) argues that bigger projects generally attract fewer bidders since there are fewer firms able to commit the resources required. While this might be true for more "traditional" electricity generation technologies, this relationship weakens when it comes to more modular renewable energy technologies, where scale does not necessarily influence the level of complexity.

It has also been shown that there is a strong relationship between project scale and project pricing, not only because of the aforementioned costs but also because of increased organizational efficiency and bargaining power for procuring equipment that comes with larger volumes (Dobrotkova et al., 2018; IRENA 2017b).

2.3.4.2 Auction rounds

The auction volume can furthermore be divided into bidding rounds. Repeated auction rounds have been shown to not only capture decreases in technology component costs but also drive down other cost components by, for example, capturing learning rates; providing more comfort to investors and lenders (leading to reduced costs of capital); improving competition in the market (for components, services and development), and creating a pipeline of bankable projects (Del Río & Mir-Artigues, 2019; Eberhard et al., 2014; Egli et al., 2019; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Montmasson-Clair & Ryan, 2014a).

Gil and Marion (2009), furthermore, show that repeat interactions between bidders and their subcontractors reduce project preparation costs, leading to lower prices and a higher likelihood of bidding. The use of bidding rounds also allows unawarded projects to bid again in a later round, thereby offsetting many of the development and prequalification costs incurred. This helps stimulate project pipeline development, leading to better prepared projects (and improved project realisation) as well as higher competition levels. For bidding rounds to be truly effective, they need to be held frequently and based on a predictable schedule (Ferroukhi et al., 2015).

To be clear: the use of bidding rounds do not automatically lead to lower prices. Evidence from Germany (Grashof, 2020) and Brazil (Hochberh & Poudineh, 2018) for example shows that it is very likely for prices to rise in later rounds if, for example, auction volumes are too high (especially when there are significant bottlenecks in for example grid transmission buildout or permitting processes), or bidders are able resubmit bids in undersubscribed rounds. Still, these should not be read as arguments against the use of auction rounds; instead, they emphasise that the structuring of these rounds remain important in determining price outcomes – which is the subject of the rest of this section.

2.3.4.3 Technology specific or neutral

Auctions can be structured as technology neutral programmes or they can make use of specific technology bands within which projects will compete with each other. Technology neutral auctions have been criticized for potentially limiting technological diversity and innovation and, by extension, undermining energy security, but they are also likely to lower overall price outcomes by increasing competition levels (Ferroukhi et al., 2015; Gawel et al., 2017; Kreiss, 2019). In the not-too-distant past, when renewable energy technologies were still comparatively expensive relative to more conventional thermal-based technologies, technology-neutral auctions would have been criticized for limiting the viability of renewables.

In recent auctions in Chile – which made use of time blocks and seasonal blocks to structure the auction demand bands – renewable energy won the majority of capacity, showing that the technology is able to compete with more conventional technologies, especially when the auction incentives align with the energy production profile of the specific technologies (González & Palma, 2018; IRENA 2017a; Lucas et al., 2017; St James, 2017).

Auctions can also be structured in such a way that only renewables compete against each other – without specific demand bands per technology. This has been criticized for benefitting more established technologies – such as solar PV and wind – over less mature technologies (Gawel et al., 2017; Mora et al., 2017). In addition, even among mature technologies such as solar PV and onshore wind, an auction may end up awarding most or almost all capacity to only one technology. This has, for example, happened in recent auctions in Germany, where solar PV was awarded almost all capacity, at the expense of onshore wind (Enkhardt, 2018).

From a pricing perspective, this might not be a problem since the cheapest technology was awarded, but given the specific production profile of solar PV, not specifying technology bands based on an integrated planning framework can put unnecessary pressure on an electricity system (Del Rio, 2017f). An approach that has been gaining ground is to establish specific technology volume bands based on an integrated planning framework, while also allowing for adjustments to these bands post-bidding based on pre-established price-sensitive rules (Eberhard & Naude, 2017).

2.3.5 Determining winners: Auction format, pricing rule, evaluation criteria, ceiling prices

2.3.5.1 Auction format

Auctions can take one of two formats: a sealed-bid auction, in which bidders submit closed bids; or a dynamic auction where bidders are submitting bids in real time (for example, Dutch or descending clock auction). Theoretically, the dynamic bidding format could improve auction effectiveness through revealing more information about costs among bidders, thereby decreasing bidders' cost uncertainty (Haufe & Ehrhart, 2018). Cost uncertainty can, however, also be addressed through setting late-stage prequalification requirements. The dynamic bidding format can also open up the auction to possible collusion among bidders (Hubbard & Paarsch, 2016; Klemperer, 2002).

Most authors, therefore, propose using a sealed bid format, in part because this is an established bidding format well-known to procurement authorities that is simpler to implement (Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016; Klemperer, 2002). Hybrids are also possible. For example, the Brazilian auctions commence with a dynamic auction and then, just before the auction volume is reached, request final sealed bids. This final step has been shown to reduce prices even further, in one instance by as much as 15% (Elizondo-Azuela et al., 2014; Hochberg & Poudineh, 2018; Rego & Parente, 2013).

2.3.5.2 Pricing rule

The pricing rule used in the auction can also have important implications for both the auction effectiveness and prices. Auctioneers can decide to use either a pay-as-bid rule – according to which all winning bidders are paid their submitted price; or they can use a uniform pricing rule, according to which all bidders are paid the same price (Hubbard & Paarsch, 2016). To determine a uniform price, an auctioneer can decide to either use the highest accepted bid (HAB), or the lowest rejected bid (LRB) (Haufe & Ehrhart, 2018).

For both the highest accepted bid pricing rule and pay-as-bid pricing rule, bidders are determining the price that they will be paid and therefore have an incentive to exaggerate their costs – potentially resulting in more expensive bids (Haufe & Ehrhart, 2018). Higher bid prices also decrease a bidder's chances of winning, which implies a balancing trade-off for bidders in this format. Their bids will thus be based not only on their costs but also on their beliefs about other bidders: how many of them there are; who they are, and what their costs are (Hubbard & Paarsch, 2016).

From an auctioneer's perspective, the major difference between a HAB and pay-as-bid pricing rule is that with the former, the auctioneer will need to pay everyone the same price, which will cost more. In the lowest rejected bid (LRB) format, bidders are not price-making since the winner's price will be determined by the runner up's price. Bidders, therefore, have an incentive to bid truthfully about their costs (Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016).

Theoretically, this format should deliver the same project pricing irrespective of the level of competition³⁹. Nevertheless, in real-life bidding situations, it has been shown that bidders often act irrationally (for example, renewable energy auctions in Spain, Germany, India) and/or inexperienced bidders might make mistakes and submit bids that are too low since they do not understand the rule (Del Río, 2017a; Fitch-Roy & Woodman, 2016; Kitzing et al., 2019; Klessmann & Tiedemann, 2017).

When we assume that bidders are not risk-neutral, but rather risk-averse (which is consistent with evidence from behavioural studies (Harrison, 1989; Myerson, 1981)), we see that bidders are likely to bid more aggressively – tending towards lower prices in the hope of winning rather than making higher profits. Most of the renewable energy auction design literature (del Río, 2017f; Haufe & Ehrhart, 2018; Kreiss et al., 2016; Maurer & Barroso, 2011)⁴⁰ consequently proposes using the relatively simple pay-as-bid, sealed-bid format to increase participation and avoid underbidding – especially in new bidding settings.

2.3.5.3 Project evaluation and scoring

To determine the auction winner, projects can be evaluated on a price-only basis, or evaluation can be based on a combination of price and other factors (Ferroukhi et al., 2015) (in practice, evaluation is often weighted in favour of price on, for example, a 70:30 basis.)⁴¹. These “other” criteria are most often technical criteria that try to incentivise bidders to improve a project's quality, commit to quicker realisation periods or generally improve their overall performance. In some instances (for example, in South Africa and Uganda), a basket of socio-economic⁴² and environmental impact criteria are also being used to make the evaluation decision (Kruger & Eberhard, 2018).

³⁹ Theoretically – using certain assumptions – both pay-as-bid and uniform-pricing rules should also deliver similar outcomes, although this is rarely seen in real-life bidding situations (Hubbard & Paarsch, 2016).

⁴⁰ With the notable exception of Hochberg (2018).

⁴¹ Which should be made known beforehand.

⁴² Including local content, local ownership, local investment, job creation, and so on.

Certain markets (for example, Mexico, Germany) also make use of location incentives to adjust the relative weighting of a project during the evaluation process to ensure the optimal cost to the system (Kruger et al., 2018; Lucas et al., 2017).

The use of multi-criteria scoring for determining an auction award is a theoretically controversial topic. There are relatively few theoretical treatments of multiple dimension auctions, limited to analyses based on quality and price (Asker & Cantillon, 2010; Bajari & Tadelis, 2011; Calzolari, 2009; Estache et al., 2009; Manelli & Vincent, 1995; Saussier et al., 2009). These authors recommend using price as the only evaluation criterion when quality criteria are difficult to specify and measure, and/or when projects are complex. Even when quality criteria can be specified and measured, the incentive to reduce the project price at the expense of quality is greater (Manelli & Vincent, 1995), and the relative weighting of criteria to obtain an optimal result is a theoretical challenge without an obvious solution (Estache et al., 2009). This should not necessarily be read as a blanket theoretical argument against using multi-criteria scoring, since socio-economic issues might be better addressed through this format than project quality (Estache et al., 2009).

There is, however, also a second argument against using multiple criteria auctions that is not as easily dealt with: introducing scoring criteria beyond price tends to reduce transparency, introduces vulnerability to corruption and increases project sensitivity to moral hazard and renegotiation (Burguet & Che, 2007) – a particularly problematic set of issues for auctions implemented in weak institutional contexts. Auctioneers may be constrained in their ability to dismiss “price+” scoring categories in favour of price-only evaluation due to, for example, administrative or legal rules. In this case, any “additional” criteria that are used in the evaluation process should be easily quantifiable and scoring formulas and scoring weights need to be known in advance (Branco, 2017; Laffont, 2005; Saussier et al., 2009).

2.3.5.4 Ceiling price (price caps)

Setting an auction ceiling price (price cap) protects the auctioneer from paying more for a project (or projects) than it can afford to. Auction theory points out that setting a ceiling price too low can limit the effectiveness of an auction: less capacity, or fewer projects, than are needed may end up being procured. A ceiling price considered as low by the market – especially in cases of low supply – can also decrease competition by discouraging potential bidders from bidding, which may, ironically, push up prices (Ehrhart et al., 2020; Grashof et al., 2020). This, however, assumes that the price is made known beforehand, which is not necessarily the case.

A number of authors have argued for and against the publishing of ceiling prices; arguments against primarily centre around the potential for collusion among bidders who could “anchor” prices around the ceiling prices⁴³ (Del Río, 2017f; GIZ 2013; Gephart et al., 2017; IRENA 2017a; Steinhilber, 2016a; Tongsopit et al., 2017). When bidders do not know what the ceiling price is, they have more incentive to decrease prices as much as possible. It is, however, also argued that failure to award any projects owing to a non-disclosed ceiling price can depress market sentiment and lead to regret on the part of the auctioneer if the ceiling price is not set optimally (Hubbard & Paarsch, 2016). Hubbard and Paarsch (2016) convincingly argue that the existence of a ceiling price should be made known to the market since this generally leads to more aggressive bidding, but that the exact level of the price need not be revealed (and probably should not be to avoid collusion).

While setting an (undisclosed) ceiling price is mostly seen as prudent auction design practice, there is, unfortunately, no consensus as to how that price should be determined. Suggestions offered include international and regional pricing benchmarking studies; basing the price on cost assumptions used in long-term planning models (for example, IRPs) or electricity market prices; using some price point (for example, average price) established through a previous auction round or through a previous feed-in tariff scheme; or using an avoided cost methodology (Cassetta et al., 2017; Rego, 2013; Tongsopit et al., 2017).

2.4 Trust and implementation: Auction institutions and organisations

Auction design literature and the underlying theory advances our understanding of factors determining auction price and investment outcomes, but is limited by some of the starting assumptions (Athias & Saussier, 2007; Saussier et al., 2009). Auction theorists generally take for granted that an auction programme is a functioning institution embedded within an effective institutional and organizational context. Both theory and empirical evidence show that auction design choices are often rendered irrelevant in the face of weak and ineffective institutions that undermine the capability, commitment and integrity of the procurer and the auction programme (del Río, 2017f; Lucas et al., 2017; Milgrom, 2004; Saussier et al., 2009).

This institutional blind spot leads to auction theory often neglecting two key areas that play an important role in determining project price and realisation outcomes: the impact of trust on potential bidders’ decisions to participate in an auction, and the capability, authority and commitment of the

⁴³ Bidders could also interpret the ceiling prices as a signal from the auctioneer that they are expecting low levels of competition (Hubbard & Paarsch, 2016).

implementing agency to help bring procured projects to commercial operation. This section will analyse both factors, starting with the bidding decision.

Within auction design literature the decision to bid is treated in a purely probabilistic manner based on simple cost-benefit analysis by a rational bidder, most often determined by the costs of bidding, the potential financial returns, the size of the economic opportunity and the probability of winning (Ausubel & Milgrom, 2013; Del Río, 2017f; Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016; Klemperer, 2002; Kreiss et al., 2016; Milgrom, 2004; Milgrom & Weber, 1982). Laffont (2005), however, points out that auctions implemented in weak institutional contexts affect bidders' willingness to participate since contracts are rendered incomplete, thereby introducing additional risk (Saussier et al., 2009).

This finding aligns with Zitron's (2006) bidding decision model for PPP contracts, which shows that the bidding decision is based not only on the perceived risks of the project – a subject already covered as part of the review of the IPP literature – but also by the perceived risks of bidding. These perceived bidding risks are, in turn, impacted by a bidder's perception of his/her probability of winning – an issue covered extensively by auction theory⁴⁴ – but also and, importantly, by the bidders' trust in the auctioneer.

2.4.1 Trust in the auctioneer

Mayer et al. (2011: 712) builds on the work of Bradach and Eagles (1989) to develop a definition of trust as "... the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party"⁴⁵. The level of trust is based on a combination of the auctioneer's perceived ability, integrity and benevolence (Mayer et al., 1995; Zitron, 2006).

Ability is conceptualized as the "...skills, competencies and characteristics that enable a party to have influence within some specific domain" (Mayer et al. 2011; 717), highlighting not only the competence

⁴⁴ Del Rio (2017g), for example, places the "incentive to participate" at the centre of his auction design analytical framework. This incentive is, in turn, impacted by the benefits, costs and risks associated with bidding – mostly determined by auction design decisions in his analysis. He, however, acknowledges that there are many factors beyond auction design that also influence this incentive, and proposes that this be the subject of further research.

⁴⁵ While Mayer et al.'s model is mainly focused on interpersonal trust, Zaheer et al.'s (1998) work on interorganizational trust development shows that it is both built on and supersedes/stabilizes the interpersonal trust effect through the institutionalization of processes or procedures that build and maintain trust, setting the stage for extending Mayer's trust model to the interorganizational level.

but also the authority or power needed to give effect to the needed decisions. Integrity is defined as perceived adherence “... to a set of principles that the trustor finds acceptable” (Mayer et al., 2011: 719; McFall, 1987). Benevolence is both understood as the extent to which the trustee wants to do good by the trustor, or the belief that the trustee will not act opportunistically against the trustor and is generally the most difficult of the three factors to establish during the initial stages of trust building⁴⁶, implying that it plays a more limited role relative to perceptions of ability and integrity during the initial bidding rounds (Chiu et al., 2010; Mayer et al., 1995). Within the context of IPP investments, benevolence is conceptually tied to a generally positive view of the private sector’s role in development and infrastructure investment (Eberhard et al., 2014; Eberhard & Naude, 2017).

It is worth emphasizing that an agency implementing auctions that is perceived by the market as capable, principled and open to the private sector is likely to attract more bids, resulting in more competition and lower project prices. Likewise, an agency perceived to be lacking these qualities will see less bidder interest, less competition and higher prices.

2.4.2 Trust in the bidding process

Recent research on online auctions shows that bidding behaviour – specifically the probability of repeat bidding – is not merely about trust in the auctioneer but also about trust in the bidding process, determined by what is termed “bidding justice” in four dimensions: distributive justice (meaning bidder perception about the relative fairness of outcomes); procedural justice (referring to bidder perceptions about the fairness of policies and processes involved); interpersonal justice (primarily concerned with perceptions of fair treatment and communication); and informational justice (pertaining to the adequacy of information about the policies, procedures and outcomes) (Chiu et al., 2010; Colquitt, 2001).

Bidding justice emphasizes the relevance in auctioneering of the implementation and information-sharing processes for trust-building and determining the probability of repeat interactions – especially in contexts where there is an asymmetrical relationship between bidders and auctioneers (Chiu et al., 2010; Del Río, 2017f). Auction design theorists similarly point out that bids need to be binding; that bidders should receive at least their bid price, and that the best bids should win as necessary conditions of auction outcomes for acceptance among investors and the public (Ausubel et al., 2014;

⁴⁶ Benevolence also underpins many of the strategic management/relationship-building IPP factors highlighted by Gratwick & Eberhard (2008) as well as by Woodhouse (2005a) as being important in being able to withstand external pressure.

Kreiss et al., 2016; Welisch, 2018). The perceived fairness of an auction is a product of how the auction rules are set, communicated, implemented, monitored and enforced – emphasizing the importance of the auction process for building trust and determining bidder behaviour.

Bidders, thus, need to trust the auctioneer (Chan et al., 2010; Dulaimi et al., 2010; Jefferies et al., 2002; Li et al., 2005) and the auction process (Del Río, 2017f; Yescombe, 2007) to be willing to incur the costs of bidding.

Who is running the auction (including their ability, integrity and benevolence/commitment) and how it is being run (that is, whether the process is seen as fair and whether it delivers fair outcomes) plays a notable role in securing bidder trust and increasing competition. Taken in combination with the country- and project-contributing elements to success from the IPP literature, as well as relevant auction design choices (for example, adequate auction volume, reasonable ceiling prices, and so on), we can develop a better understanding of the factors influencing competition levels and price outcomes in auction programmes.

2.4.3 Post-award support by the auctioneer

Explaining auction investment outcomes (as opposed to price outcomes) requires a reckoning not merely with the perception of the auctioneer's capability, which contributes to competition and resulting prices, but also with the reality of it: to what degree the auctioning authority is able to drive and support the processes necessary to enable the private sector to bring projects to financial close and commercial operation.

Once an awarding decision is made, there is still no guarantee that the project will be built within a reasonable time, or at all. As has been discussed, this is one of the main criticisms of auctions as a procurement mechanism, driven primarily by concerns about overly aggressive or opportunistic bidding behaviour (Bose & Sarkar, 2019; Ferroukhi et al., 2015; Haufe et al., 2017; Lundberg, 2019). These concerns are valid in as far as they concern issues that are within the bidders' control. Project quality and bidder capacity have been shown to be important determinants of project realisation rates, alongside project price levels – and are thus important issues in auction design (as has been discussed).

These projects are, nevertheless, implemented in a highly regulated context where the public sector is by necessity or design responsible for core areas of the project development process, such as

providing grid connection facilities; providing the necessary permits and licences, and signing of contracts (for example, PPA, IA), and so on. These are issues that the bidder has limited or no control over and which often span multiple governmental agencies, departments and enterprises (Eberhard & Naude, 2017; Ferroukhi et al., 2015). The public party to the auction has an important role to play in bringing projects to financial close and commercial operation by acting as a focal point that assists with, *inter alia*, coordination of administrative and legal processes across the various government stakeholders (Eberhard & Naude, 2017; Montmasson-Clair & Ryan, 2014a).

This ability to implement (in our case, competitive procurement programmes) forms a distinct area of research in public policy, development economics and organizational management studies. Besley & Persson (2010) conceptualise the state's ability to implement a range of policies as "state capacity", referring to a "...range of competencies that the state acquires in the development process, which includes the power to enforce contracts and support markets through regulation or otherwise" (Besley & Persson, 2010: 1).

In a recent public policy implementation-based analysis of a renewable energy auction programme, Boule et al. (2015), stressed the significance of the programme's context (the corridor through which a programme must pass, including the people and institutions involved); the capacity of the implementing unit (administrative, technical, legal, financial skills and resources); the commitment of implementers and allies (champions, political support); and the influence of coalitions (navigating interests for and against the programme) in the implementation process⁴⁷ (Najam, 1995). Their analysis shows that effective programme implementation requires not only the necessary capacity (technical, administrative, financial, legal) at organizational level but also the ability and commitment to navigate, to use and, at times, to bypass a complex system of formal and informal rules and interests. In short, implementation of the auction programme and the awarded projects are determined by a host of institutional factors.

Both bidder trust and project implementation capability or effectiveness are predicated on institutional quality. The following review of the literature on institutional theory does not pretend to be comprehensive. Rather, the intention is to select key insights which may be useful for a deeper understanding of how the institutional context can shape the effectiveness of the implementation of power procurement auctions. The review is thus limited to factors identified in the literature that

⁴⁷ Supported by an institutional view of transaction cost economics (Estache, 2016; Estache & Foucart, 2016; Laffont & Martimort, 2002).

underpin institutional quality, specifically insofar as it affects bidder trust and implementation capability.

Institutions are defined as “the rules of the game” or “... the humanly devised constraints that structure political, social and economic interaction. They consist of both informal constraints ... and formal rules ...” (North, 1991: 97) that create order and reduce uncertainty, thereby determining transaction and production costs. In brief, institutions provide the incentive structure of an economy (Torvik, 2016). It is helpful to think of institutions as incorporating three dimensions (Levy, 2014b): the *rules* that determine who may participate, what their roles are, how they interact and what their goals are; *monitoring* arrangements that set out how performance is measured, how this measurement is done and by whom, and how performance information is shared, and *enforcement* arrangements that determine the consequences for non-compliance, who adjudicates conflicts and how penalties will be enforced.

Informal and formal institutions can be thought of as being determined by whether they are personalized (that rules, monitoring and enforcement are built around specific identities) or impersonal (that the rules are codified in formal, written law and monitored and enforced by independent third parties (for example, judiciary)) (Levy, 2014b). This distinction between formal (impersonal) and informal (personal) institutions is not always helpful in that they are often treated as being mutually exclusive rather than as being complementary. In practice, formal institutions enable informal institutions to perform better (Fafchamps, 2017).

When discussing institutional quality in the context of renewable energy auctions, it is mainly with reference to the prevalence and strength of formal institutions and their ability to support the setting, monitoring and enforcement of rules at an impersonal level – both at a country level (for example, the rule of law that ensures honouring of contracts) and at a programme level (for example, sticking to the rules of the procurement programme).

Institutional performance or quality (that is, how well rules are set, monitored and enforced) is determined by institutional resources, consisting of existing institutions, and organizational capacity (Marquard, 2006). The influence of existing institutions on institutional performance is due to the fact that institutions evolve incrementally (North, 1991) because institutions allocate power (Torvik, 2016). Those in power will use or maintain institutions to keep their power. Institutions, therefore, tend to reproduce. For any new institutional arrangement (an auction programme, for instance) to be effective, it will need to build on the existing institutional bases by recombining them into new institutions instead of creating entirely new institutions afresh (Levy, 2014a; Marquard, 2006).

This requires institutional work – “... the purposive action of individuals and organisations aimed at creating, maintaining and disrupting institutions” (Lawrence & Suddaby, 2006: 215) – led by institutional entrepreneurs (champions) who are skilled, organized actors with sufficient resources that break with existing rules and practices associated with existing institutional logics and institutionalise alternative rules, practices or logics (DiMaggio, 1988; Garud et al., 2007). In practice, this means that an effective procurement programme setup needs to be driven by an institutional champion (individual and/or network of actors) that understands the institutional landscape and is able to harness and repurpose both informal and formal institutions to shape a new formal institutional arrangement that serves the ultimate purposes of the auction programme.

Institutions such as auction programmes are embedded in specific organizational contexts. We can think of organizations as “...collections of human beings arranged systematically for harmonious or united action (Allison & Zelikow, 1999: 145) where institutions are actualized, sustained and elaborated (Marquard, 2006). Organizational capability, the other determinant of institutional quality, is determined, inter alia, by professional skills, governance (accountability) structures, effective decision-making frameworks, leadership capacity and resources (human and financial) (Bowman & Kearney, 1988; Dubash & Joseph, 2015; Jacobides et al., 2019; Marquard, 2006; Nateson & Marathe, 2017; Skocpol & Finegold, 1982). This capability will be strongest in areas where organizational capacity already exists and resource flows have been established for implementation (Marquard, 2006).

The implication is that effective auction implementation is more likely where the implementing organization (whether an agency, department, ministry, and so on) has both the necessary resources (financial and human) and the proven ability and capacity to implement complex programmes.

An effective auction institutional design that both maximises competition and the project realisation rate will be guided by the existing institutional context and organizational capabilities in a way that makes full use of and repurposes established institutions (setting, monitoring and enforcement of the rules of the game), capacity, capabilities, resources, and processes, and will augment these in a non-disruptive way where needed. Put another way, the institutional resources will determine the optimal institutional design, a point that has also been repeatedly made with reference to auction design (Kreiss et al., 2016).

In the context of emerging markets, it is likely that the existing institutional arrangements might not be appropriate (for example, procurement capability is centred in a conflicted party, like an incumbent utility) or organizational capabilities and resources might be insufficient. This requires institutional

innovation and, possibly, the filling of resource gaps by external sources (both financial and human). A key reason why organizational continuity helps ensure implementation is because (financial) resource flows are already established (Marquard, 2006). The provision of external resources – whether from development partners or project developers – is valuable when setting up an auction programme since it enables institutional change without putting additional strain on or causing changes to existing resource flows.

In summary, the institutional setting is a basic, but often neglected, element of an auction programme that plays a crucial role in determining outcomes. For an auction to be able to deliver projects at low prices, it needs to be implemented by a credible, capable and well-resourced authorized agency in a way that is fair, transparent and consistent. Potential bidders need to trust both the auctioneer and the auction process to be willing to incur the costs of bidding. Furthermore, the implementing organisation plays a crucial role in bringing awarded projects to commercial operation.

To be effective at both establishing and maintaining bidder trust, as well as supporting project implementation, a careful matching of existing institutional resources with the needs of bidders is required. Auction design within a weak institutional context is, therefore, about much more than deciding whether to disclose ceiling prices or choosing a bidding format: it needs to start with establishing an institutional baseline that will set the trajectory for the rest of the programme's design and implementation choices. An effectively designed and implemented auction programme can transcend, or at least mitigate, many of the investment and project development challenges posed by a weak institutional environment.

2.5 Combining categories of analysis

This chapter has sought to identify and review literature that would enable deeper insights into the factors that determine the success of privately funded power projects, especially renewable energy IPPs. The literature on IPPs has identified a number of contributing elements of success at both the country and the project level.

The country level of analysis identifies a number of enabling factors which could facilitate and accelerate investment in power projects. These include the investment climate; policies which explicitly permit and facilitate private investment; capable, independent electricity sector regulation, and power-generation-expansion planning linked to timely initiation of competitive procurements.

Project level analysis focuses on the providers of equity and debt for specific projects; a creditworthy offtaker; securing the revenue stream through bankable PPAs and security measures such as sovereign guarantees, political risk cover and liquidity support; and strategic management- and relationship-building with relevant stakeholders.

While this country-project-level literature has provided a useful way of framing contributing elements of success in IPP investments, it is apparent that there is a missing dimension that connects the two categories – namely, the design and implementation of procurement programmes which connect enabling policy, regulation and planning with projects that need to be developed, financed and constructed (Figure 2.2 and Table 2.3).

The emphasis of this thesis is on this procurement programme level of analysis, specifically auctions, as an effective way of realising competitive prices and ensuring projects reach financial close and commercial operation. We thus propose a new integrated analytical framework as shown in Figure 2.2 and Table 2.2.

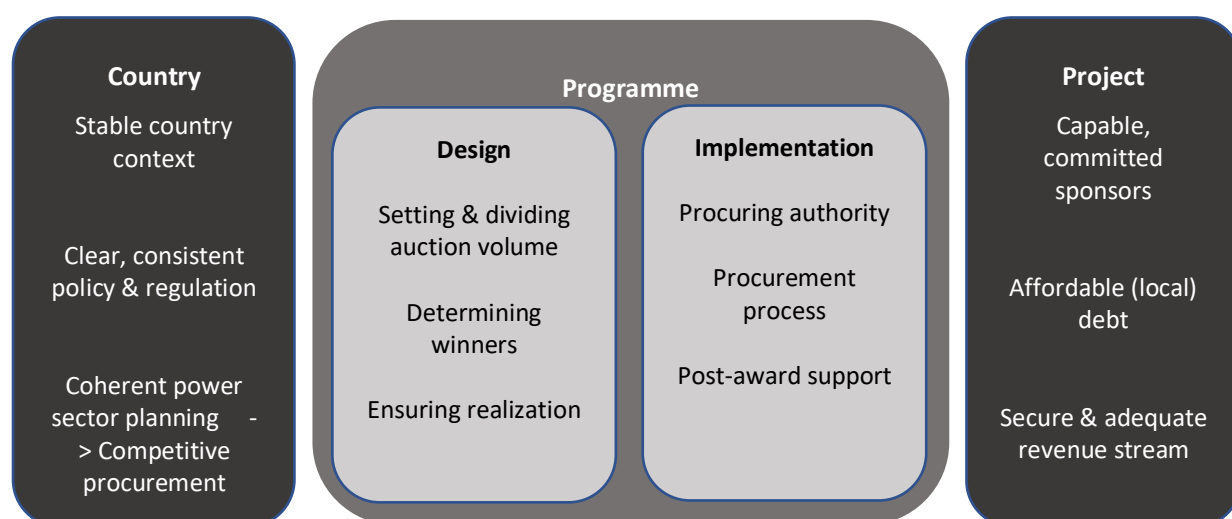


Figure 2.2: Country-, programme- and project-level factors

Table 2.2: Analytical framework with expected price and realization impacts (+ denotes a positive impact on the outcome; - denotes a negative impact; = denotes no clear impact)

Factors	Detail	Impact on Price	Impact on Realisation
Country level			
Stability of economic and legal context	Stability of macroeconomic policies Legal system allows contracts to be enforced, laws to be upheld, and arbitration to be fair Repayment record & investment rating Experience with private investment	(+) Stable investment context lowers investment risks, reducing cost of capital, leading to lower prices	(+) Stability of investment context – incl. judicial quality – improves realisation
Energy policy framework	Framework enshrined in legislation Framework clearly specifies market structure and roles and terms for private and public sector investments	(+) Stable, clear policy framework lowers investment risks, reducing cost of capital, leading to lower prices	(+) Clear energy policy that allows for private investment improves project realisation
Regulatory transparency, consistency and fairness	Transparent and predictable licensing and tariff framework Cost-reflective tariffs	(+) Good regulatory quality lowers investment risks, reducing cost of capital, leading to lower prices	(+) Good regulatory quality, especially on licensing and tariff approval, improve project realisation
Coherent sectoral planning	Power-planning roles & functions clear and allocated Planners skilled, resourced, & empowered Fair allocation of new-build opportunities between utilities & IPPs	(+) Coherent sectoral planning reduces investment risks, reducing cost of capital, leading to lower prices	(+) Coherent sectoral planning improves project pipeline development, improving project realisation
Competitive bidding practices	Planning linked to timely initiation of adequately resourced, fair and transparent competitive tenders/auctions	(+) Competitive bidding practices lower project prices	(=) No theoretical expectation around impact on realisation
Programme level			
<i>Auction Design</i>			
Competition-inducing, scale-friendly auction volume	Auction volume based on dynamic, least-cost power expansion plans Auction volumes large enough to attract bidders, but small enough to ensure competitive pressure	(+) Auction volume that is large enough to attract bidders, but smaller than offered volume, induces competition, leading to lower prices	(=) No theoretical expectation around impact on realisation
Scale-friendly project size limits	Project size limits enable economies of scale	(-) Project size caps limit economies of scale, increasing prices	(+) Smaller projects are more easily realised, improving realisation
Technology choice: neutral vs. specific	Technology choices based on least-cost planning framework Auction volume division between technologies balance price & energy security concerns	(-) Technology bands limit competition, increasing prices	(=) No theoretical expectation around impact on realisation
Bid award limits	Bid award limits used to counter market domination or energy security concerns	(-) Bid award caps limit economies of scale, increasing prices	(+) Bid award limits spread realisation risk, increasing overall realisation

Bidding rounds	Regular, scheduled bidding rounds	(+) Bidding rounds increase competition and induce market learning, lowering prices	(+) Bidding rounds increase project pipeline development and market learning, improving realisation
Winner selection	Winner selection criteria transparent and rational Price remains key determinant	(-) Multiple bid scoring criteria dilute the importance of price and add additional cost drivers, increasing prices	(+) Multiple criteria (esp. technical) improve project preparation, improving realisation
Price caps	Price caps (ceiling prices) set, but preferable undisclosed	(+) Price caps induce competition, lowering prices	(=) No theoretical impact expectation, although price caps being set too low can result in no project being awarded
Physical (project/bid preparation) qualification criteria	Physical (project/bid preparation) qualification criteria set at high enough level to ensure cost certainty and realisation probability	(-) High physical qualification criteria increase bidding costs, lowering competition and increasing prices	(+) High physical qualification criteria improve project preparation & cost certainty, improving realisation
Financial (bid bond) qualification criteria	Bid bonds set to ensure commitment of qualified bidders	(-) Bid bonds increase bidding costs, lowering competition and increasing prices	(+) Bid bonds increase bidder commitment and cost certainty, improving realisation
Auction access requirements	Auction access requirements – technical experience and financial status – limit participation to experienced, capable bidders	(-) High auction access requirements lower competition, increasing prices	(+) High auction access requirements increase likelihood of capable bidders being awarded, increasing realisation
Penalty regime	Reasonable penalties (PPA reduction, liquidated damages, performance bonds) incentivise project performance	(-) Penalties increase project risks, lowering competition and increasing the cost of capital, increasing prices	(+) Penalty regime incentivises project preparation and cost certainty, improving realisation
Staged bidding process	Choice of one- vs. two stage bidding process balances transaction costs with time concerns	(-) Staged bidding reduces competition, increasing prices	(+) Staged bidding increases likelihood of capable bidder being awarded, improving realisation
Pricing rule, auction format	Simple sealed bid, pay-as-bid auction format to reduce bidder risks	(+) Simple bidding format and pricing rule increases competition, leading to lower prices	(+) Simple bidding format reduces winner's curse risk, improving realisation
<i>Auction Implementation</i>			
Procurer	Procuring entity perceived as capable, benevolent and acting with integrity	(+) Trust in the procuring authority increases competition, lowering prices	(=) No theoretical expectation around impact on realisation
Procurement process	Bidding process is perceived as fair, transparent, secure	(+) Trust in bidding process increases competition, lowering prices	(=) No theoretical expectation around impact on realisation

Support to awarded projects	Auctioneer assists awarded projects to reach financial close and commercial operation	(=) No theoretical expectation around impact on price	(+) Auctioneer support to awarded projects to financial close and COD improves realisation
Project level			
Favourable equity partners	Local capital/partner contributions are encouraged Partners have experience with and an appetite for project risk A DFI partner (and/or host country government) is involved Firms are development-minded and returns on investment are fair and reasonable	(+) Favourable equity partners require lower returns, lowering prices	(+) Favourable equity partners are experienced, capable (with potential halo effect) – improving realisation
Favourable debt arrangements	Competitive financing Local capital/markets mitigate foreign exchange risk Risk premium demanded by financiers or capped by offtaker matches country/project risk Some flexibility in terms and conditions (possible refinancing)	(+) Favourable debt arrangements lowers the cost of capital, lowering prices	(+) Debt from DFIs come with a halo effect, improving realisation
Creditworthy offtaker	Utility is investment-grade rated, with full cost recovery through cost-reflective tariffs and high billing collection rates	(+) Credit-worthy offtaker reduces project risks, and thereby the cost of capital, lowering prices	(+) Credit-worthy offtaker enables project to secure funding, improving realisation
Secure and adequate revenue stream	Robust PPA (stipulates capacity and payment as well as dispatch, fuel metering, interconnection, insurance, <i>force majeure</i> , transfer, termination, change-of-law provisions, refinancing arrangements, dispute resolution, and so on) Security arrangements are in place where necessary (including escrow accounts, letters of credit, standby debt facilities, hedging and other derivative instruments, committed public budget and/or taxes/levies, targeted subsidies and output-based aid, hard currency contracts, indexation in contracts)	(+) Secure revenue stream reduces project risks, and thereby the cost of capital, lowering prices	(+) Secure revenue stream enables project to secure funding, improving realisation
Credit enhancements and other risk management and mitigation measures	Sovereign guarantees Political risk insurance Partial risk guarantees International arbitration	(+) Credit enhancement & risk mitigation measures reduce project risks to reduce cost of capital, lowering prices	(+) Credit enhancement & risk mitigation measures enable projects to secure funding, improving realisation

Strategic management and relationship building	Sponsors work to create a good image in the country through political relationships, development funds, effective communications, and strategic management of contracts, particularly in the face of exogenous shocks and other stresses	(-) Strategic socio-economic development commitments increase project costs, increasing prices	(+) Strategic socio-economic development commitments improve project realisation

The programme level of analysis focuses on how procurement programmes are designed (auction design) and implemented (auction implementation). Auction design factors deal mainly with three choices: how the procurement volume (amount of energy or power) is determined and divided (auction volume); how auction winners are selected (winner selection), and how an auction ensures the timely execution (realisation) of procured projects (auction effectiveness).

How the auction volume is determined and divided between technologies, projects, and bidders and, over time (rounds), is crucial for fully realising the benefits of competition. The auction volume needs to be informed by a dynamic, least-cost planning framework that determines how much power is needed, by when and from which sources. Finding the right balance in terms of setting auction volumes at levels large enough to attract sufficient competition, but not so large that there is little competitive pressure, is a crucial but difficult exercise, especially in small power systems such as those found in most sub-Saharan African countries.

Project sizes need also to be large enough to be able to benefit from economies of scale, with some technologies such as solar PV scaling down easier than, for example, wind. Furthermore, dividing the auction volume over time (as regular auction rounds based on a predictable schedule) stimulates market development and enables a country to benefit from industry learning rates, resulting in lower project costs and a pipeline of good quality projects.

Winner selection is concerned with how bidders and/or projects are evaluated, ranked and selected for awarding, and it is here that the need for transparent auction rules and their consistent application is most keenly felt. For the benefit of both the auctioning authority and the bidders, it is recommended that winner selection be as clear and simple as possible – especially in new markets and at least in the first rounds of bidding. Both bidders and the auctioning authorities need to understand, and be comfortable with, the rules and, as such, it is recommended that familiar sealed-bid, pay-as-bid auction formats be adopted.

It is furthermore recommended that bid scoring be based on price only, as far as possible, to allow for straightforward, transparent evaluation. Additional scoring criteria – where used – should ideally be

limited to non-technical factors, such as social (including local ownership and content) and environmental performance – with the understanding that incentivising such performance through the scoring process (instead of, or in addition to, qualification criteria) entails a trade-off in auction objectives (for example, price vs. local content). It is also recommended that a ceiling price (also called a reserve price) be established based on a least-cost planning framework, regional benchmarking or previous auction round result, and its existence – although not necessarily its actual level – be made known to the market to stimulate competition.

Auction effectiveness is concerned with whether awarded projects get built at all and/or on time, and to what standard of quality. Ensuring auction effectiveness is best served by limiting participation in the bidding programme to strong, experienced bidders/sponsors through setting rigorous access requirements (primarily financial and technical track record); good projects, by setting late-stage physical prequalification criteria (project preparation activities), and ensuring bidder commitment to project realisation by requiring substantial financial prequalification commitments (that is, bid bonds/securities). It is also recommended to include any social and environmental performance requirements as part of the physical prequalification criteria. If staged bidding is used – normally with the aim of limiting transaction costs for both bidders and the auctioning authorities - the initial prequalification stage should screen bids based only on access requirements.

Clearly these auction design choices interact with and influence each other, often implying trade-offs and careful balancing to achieve the ultimate auction objectives (Gephart et al., 2017). For example, setting very rigorous qualification criteria meant to ensure auction effectiveness for small auction volumes will likely depress competition levels, resulting in high project costs. In general, the greater the interest and competition in the programme, the less severe these trade-offs become. Ensuring sufficient competition is, however, not only influenced by how the procurement programme is designed, but also by how it is implemented.

Auction implementation factors are essentially about establishing and maintaining the trust of potential bidders, necessary for ensuring sufficient competition; and about bringing procured projects to financial close and commercial operation through the effective coordination of various (primarily public sector) agencies and processes. Both of these goals – building trust, and supporting project realisation - rely on the auction being implemented by a capable, well-resourced auctioning authority in a way that is seen as transparent and fair.

The implementing agency should ideally be results-driven; and have a high level of skills, sufficient financial and human resources, and effective governance and leadership structures in place. The

auction process needs also to be perceived as being just, not merely in terms of outcomes but also in how information is shared; how the process is run, and how bidders are treated.

Effective auction design and implementation is also about taking the various country- and project-level IPP contributing elements of success on board. For example, auctions that are implemented in contexts where the offtaker of power is a sub-investment-grade, state-owned utility need to incorporate risk mitigation and credit enhancement measures to protect the project's revenue stream, including, for example, sovereign guarantees and letters of credit or escrow accounts as part of the request-for-proposals package.

Similarly, auctions that are, for example, implemented in jurisdictions with poor rule of law and/or powerful industry incumbents will need to demonstrate a high level of commitment to independence and transparency, both in terms of who is implementing the programme and how the security and integrity of the procurement process is ensured. Not incorporating these country- and project-level elements will depress competition levels and will likely result in high project costs and/or poor investment outcomes.

The next chapters will see this expanded analytical framework being applied in three sub-Saharan African case study countries deepen our understanding of the factors underpinning renewable energy IPP outcomes. The case studies will go beyond the established country- and project-contributing elements of success to build a robust conception of the influence of programme-level factors, in particular, auction design choices and implementation factors. This analytical framework will not only improve our understanding of the case studies but will also be modified based on the cases' empirical contributions. The case studies will, moreover, allow for an analysis of how the country-, programme- and project-level factors influence and interact with each other, both within and across levels and within and across cases.

Chapter 3: South Africa case study

3.1 Introduction

South Africa has emerged as an unlikely leader for renewable energy-based private power investment and auctions in sub-Saharan Africa. Prior to 2011, the country had almost no⁴⁸ utility-scale renewable energy power plants and all generation assets (>90% coal) were owned and operated by the state-owned, vertically integrated utility, Eskom. By 2015, South Africa had procured 112 renewable energy independent power projects, with a total installed capacity of more than 6300 MW. Initially, prices were high: too much capacity was auctioned; there was insufficient competition and equipment prices were much higher. Project prices fell considerably between 2011 and 2015 to levels below Eskom's average selling price: average prices for solar PV projects decreased by 80% and, for onshore wind projects, by at least 50%. The 92 projects from the main auctions all managed to reach financial close by 2019; 63 (out of 64) projects procured in the first three auctions between 2011 and 2013 managed to reach commercial operation by late 2017 – mostly onshore wind, solar PV and concentrated solar power (CSP).

The scale and pace of private power investment was unlike anything seen in sub-Saharan Africa before (or since) and encouraged the launch of a plethora of similar renewable energy procurement programmes across the region. However, the auction programme ran into difficulties in the fourth round. A two-year delay in signing the PPAs by Eskom, the offtaker, meant that most of the projects procured in 2014 were only starting to come online during 2020.

With the fifth bid window announced in March 2021, it seems that REI4P is being resurrected. A new version of the country's long-term electricity generation expansion plan, the IRP, was gazetted in 2019. It makes provision for an additional 6000 MW of solar PV and 14400 MW of wind by 2030, at which time they are expected to contribute 6% and 18% to national electricity supply, respectively. Ministerial determinations for the procurement of 2000 MW of solar PV and 4800 MW of wind, set to reach commercial operation between 2022 and 2024, were also promulgated in 2020.

From an analysis of the South African case, using the framework emerging from the literature on IPPs, it is clear that there are factors at both the country and project levels that contributed to these outcomes. At the country level, most of our recognized, contributing elements of success are in place. South Africa has been able to maintain relative macroeconomic stability – if not strong economic

⁴⁸ The Darling wind farm (5,2 MW) was commissioned in 2004, but only ever functioned as a demonstration project.

growth – throughout the 2000s. The country managed to maintain investment-grade credit ratings during this period (2000 – 2017). It remains amongst the top two economies in Africa and has a power system to match, with close to 50 GW of installed capacity.

Politically, the country has been relatively stable in the post-Apartheid era – despite concerns about rising inequality, poverty and corruption levels. At a policy level, the country had established (but never implemented) a clear vision for an unbundled power sector with significant private participation in generation in its 1998 White Paper on Energy Policy (Department of Minerals and Energy, 1998), confirmed by the 2003 Renewable Energy Policy Paper (Department of Minerals and Energy, 2003) and the National Development Plan (National Planning Commission, 2013).

South Africa also had an independent national energy regulatory agency (NERSA), and power sector expansion-planning was governed by an Integrated Resource Plan (IRP) that, while perhaps being overly prescriptive, provided some level of certainty to the market. At the project level, South Africa's financial markets could provide finance on reasonable terms through both debt and equity. Having a secure revenue stream was a more challenging aspect, with Eskom, the single buyer of power, facing significant financial (and operational) headwinds and having shown, in the past, that it had no interest in allowing competition from other players.

Despite these mostly favourable country and project level factors, South Africa saw almost no private power investment until government launched the Renewable Energy Independent Power Producers Procurement Programme (REI4P) in 2011. What is it about the auction programme that sparked this remarkable investment drive and competitive price outcomes? Which design and implementation choices were most influential? How did they influence and how were they influenced by the country- and project-level factors?

The remainder of this chapter is structured as follows: the results of the auction programme are discussed – focusing on price and investment outcomes, but also on broader socio-economic and economic development contributions as integral to the design of the programme. The core of this chapter is a narrative-based discussion of the rollout of the auction programme, presented in three phases and highlighting the roles of the country-, programme- and project-level factors during each phase. The conclusion of this chapter derives theory-based determinations based on the analysis of South Africa's experience.

3.2 Outcomes

South Africa's auction programme is noteworthy internationally mainly because of three key outcomes: the dramatic drop in project prices over successive rounds of procurement; the significant investment volumes (Table 3.1) and high realisation rates associated with the projects, and the ambitious socio-economic- and economic-development contributions of awarded projects. This section will look, in turn, at each of these auction outcomes before an analysis is presented of the role that country-, programme- and project-level factors played in determining these.

Table 3.1: Summarised REI4P outcomes (Sources: (Eberhard & Naude, 2017; Filipova et al., 2019)⁴⁹

Bid Windows (BW)	Wind	Solar PV	CSP	Bio-mass	Biogas	Landfill Gas	Hydro	Total
BW 1 (2011)								
Capacity Tendered (MW)	1850	1450	200	13	13	25	75	3626
Capacity Awarded (MW)	649	627	150	0	0	0	0	1425
Number of Projects Awarded	8	18	2	0	0	0	0	28
Average Tariff (US\$/kWh)	0,24	0,57	0,56	-	-	-	-	-
Total Investment (US\$ million)	1734	2945	1486	0	0	0	0	6166
BW 2 (2012)								
Capacity Tendered (MW)	650	450	50	13	13	25	75	1276
Capacity Awarded (MW)	559	417	50	0	0	0	14	1040
Number of Projects Awarded	7	9	1	0	0	0	2	19
Average Tariff (US\$/kWh)	0,16	0,29	0,44	-	-	-	0,18	-
Total Investment (US\$ million)	1736	1743	642	0	0	0	91	4212
BW 3 (2013)								
Capacity Tendered (MW)	645	401	200	60	12	25	121	1473
Capacity Awarded (MW)	787	435	200	17	0	18	0	1457
Number of Projects Awarded	7	6	2	1	0	1	0	17
Average Tariff (US\$/kWh)	0,10	0,14	0,23	0,20	-	0,13	-	-
Total Investment (US\$ million)	1721	826	1820	108	0	29	0	4504
BW 3.5 (2014)								
Capacity Tendered (MW)			200					200
Capacity Awarded (MW)			200					200
Number of Projects Awarded			2					2
Average Tariff (US\$/kWh)			0,18					0,18
Total Investment (US\$ million)			1741					1741
BW 4(a) (2014)								
Capacity Tendered (MW)	590	400	0	40	0	15	60	1105
Capacity Awarded (MW)	676	415	0	25	0	0	5	1121
Number of Projects Awarded	5	6	0	0	0	0	0	13
Average Tariff (US\$/kWh)	0,07	0,09	-	0,17	-	-	0,13	-
Total Investment (US\$ million)	1,122	709	0	100	0	0	20	1951

⁴⁹ Note: prices are stated in 2019 terms, based on the average annual exchange rate in the year that the bid awards were announced.

BW 4(b) (2015)								
Capacity Tendered (MW)								
Capacity Awarded (MW)	686	398	0	0	0	0	0	1084
Number of Projects Awarded	7	6	0	0	0	0	0	13
Average Tariff (US\$/kWh)	0,09	0,10	-	-	-	-	-	-
Total Investment (US\$ million)	1226	669	0	0	0	0	0	1,895
BW 1S2 (2013)								
Capacity Tendered (MW)								
Capacity Awarded (MW)	9	30		10				49
Number of Projects Awarded	2	6		2				10
Average Tariff (US\$/kWh)	0,14	0,15		0,20				
Total Investment (US\$ million)								91
BW 2S2 (2014)								
Capacity Tendered (MW)								
Capacity Awarded (MW)		50						50
Number of Projects Awarded		10						10
Average Tariff (US\$/kWh)		0,09						0,09
Total Investment (US\$ million)								88
TOTALS								
Capacity Tendered (MW)	3744	2701	650	126	38	90	331	7780
Capacity Awarded (MW)	3366	2372	600	52	0	18	19	6328
Number of Projects Awarded	36	51	7	4	0	1	3	92
Total Investment (US\$ million)	7540	6892	5690	207	0	29	111	20649

3.2.1 Price outcomes

The prices achieved through South Africa's auction process has been one of the most prominent and widely discussed features of the programme. During the first two procurement rounds (BW1 in 2011 and BW2 in 2012), project prices were high compared to global averages, especially for solar PV but also for onshore wind and concentrated solar projects (CSP) (see Figure 3.1 below). During the third and fourth bid windows (BW3 in 2013 and BW4 in 2014), as well the expedited round (in 2015), a dramatic reduction in prices was achieved for all three major technologies. There was also a special procurement round for CSP only, called BW3.5. Average bid prices for onshore wind, solar PV and concentrated solar power converged with the global average levelized cost of electricity (LCOE) for each respective technology during this time.

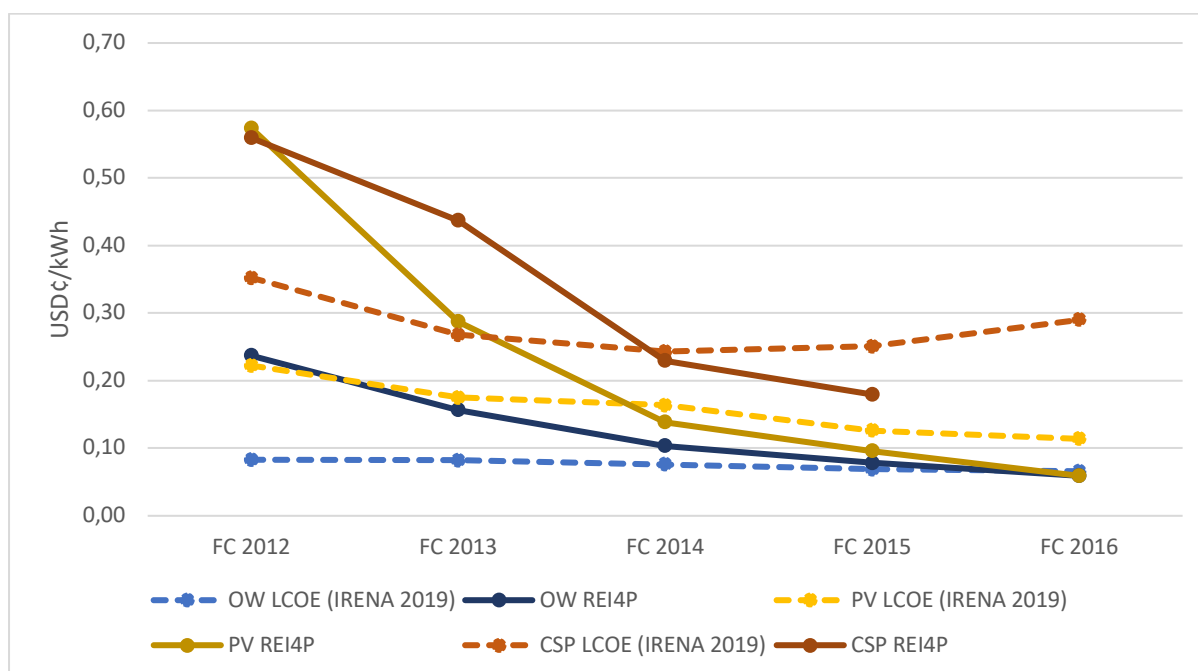


Figure 3.1: REI4P average bid prices (2019) vs. global average weighted LCOE prices (2019) by financial close (FC) deadline date for each bid window (Source: Author compilation based on data from IPP office; IRENA 2020; Eberhard & Naude 2016)

3.2.2 Investment outcomes: Debt & equity

REI4P also resulted in significant investment outcomes: 92 projects were contracted through REI4P between 2011 and 2015, representing 6328 MW of capacity. An additional 20 small projects, representing 100 MW, were contracted in 2014/15 and 2016/17. Together, these projects represent investments of ZAR201,8 billion (US\$20,5 billion). Most of the projects' debt was provided by South African commercial banks, while local development finance institutions (Industrial Development Corporation and the Development Bank of Southern Africa) financed most of the local empowerment (Black Economic Empowerment – BEE)⁵⁰ and a significant share of the community shareholding contributions of the projects (Figure 3.2). A small portion of debt was also provided by foreign (multi- or bilateral) development finance institutions (for example, EKF, IFC, KfW). In total, South African financial entities provided 91,7% of the total project debt. The proportion of debt (project gearing) – a significant indicator of perceived project risk – has remained high across all bidding rounds and technologies at an average of 75% (Table 3.2).

⁵⁰ Broad-based black economic empowerment as defined and dictated by the South African BBBEE Act (Republic of South Africa, 2003). The purpose of the Act is to promote the achievement of higher economic growth, increased employment, and more equitable income distribution through increased broad-based and effective participation of (historically disadvantaged) black people in the South African economy.

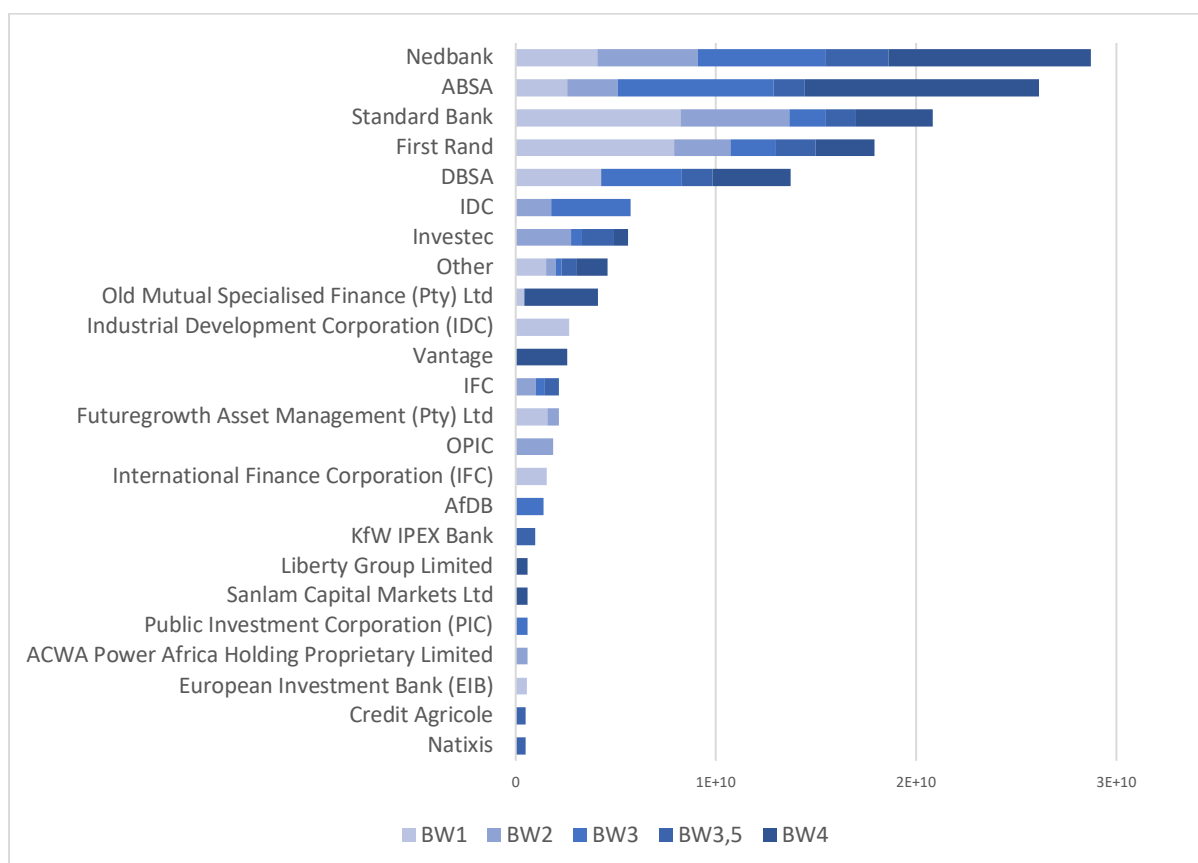


Figure 3.2: Total debt provided (ZAR), by source and bidding window (Source: Eberhard & Naude, 2016; IPP office)

Table 3.2: Average debt funding as percentage of total funding (Source: Author compilation based on bidding data from IPP office)

Technology	BW 1	BW2	BW3	BW3.5	BW4
Wind	74,5%	75,4%	75%	-	70,7%
Solar PV	73,5%	72,6%	77,5%	-	75,4%
CSP	70%	70,5%	75%	71,7%	

South African companies and financial institutions managed to build a portfolio of projects through the programme. Project sponsors also came from a number of other regions such as Europe, the USA, the Middle East and the Far East (Figure 3.3).

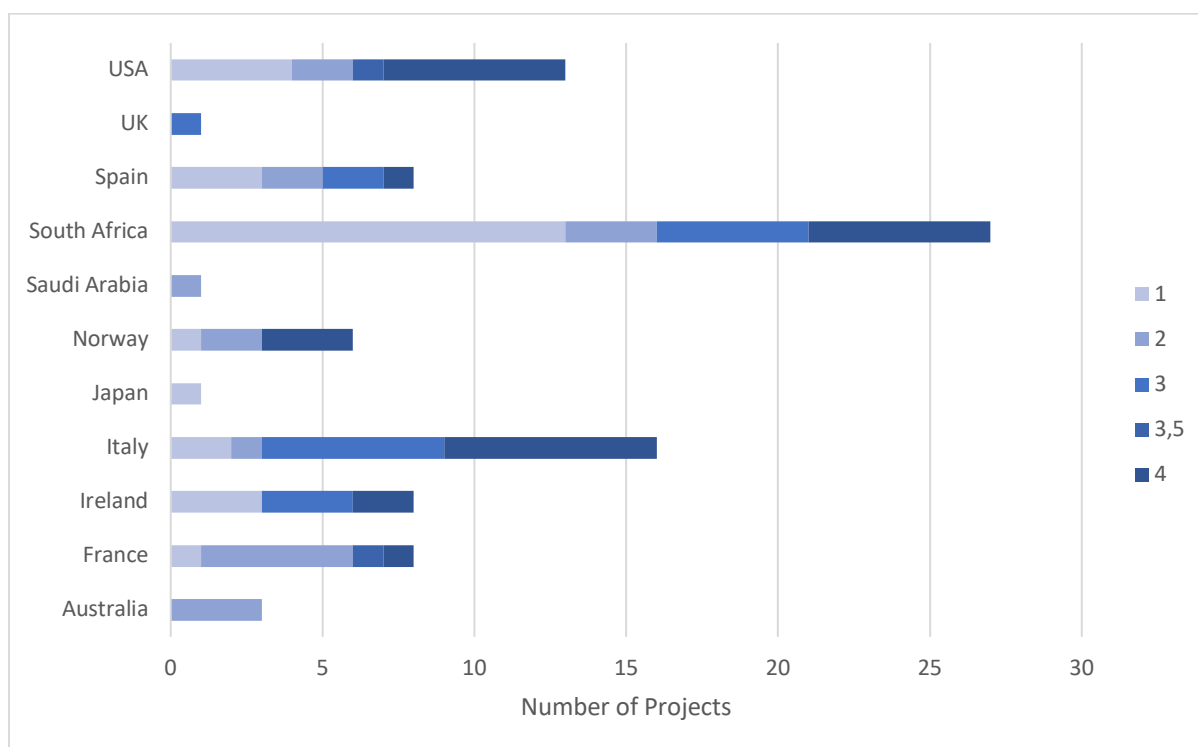


Figure 3.3: Number of lead project developers by country of origin and bidding window (Source: Eberhard & Naude, 2016; IPP office)

South African entities own, on average, the majority (52%) of equity in the projects, with institutional investors such as Old Mutual and the Government Employees Pension Fund holding significant exposures, alongside international majors such as ENEL, Lekela, ACWA and Scatec, as well as BEE investors (Royal Bafokeng, Thebe) (Figure 3.4).

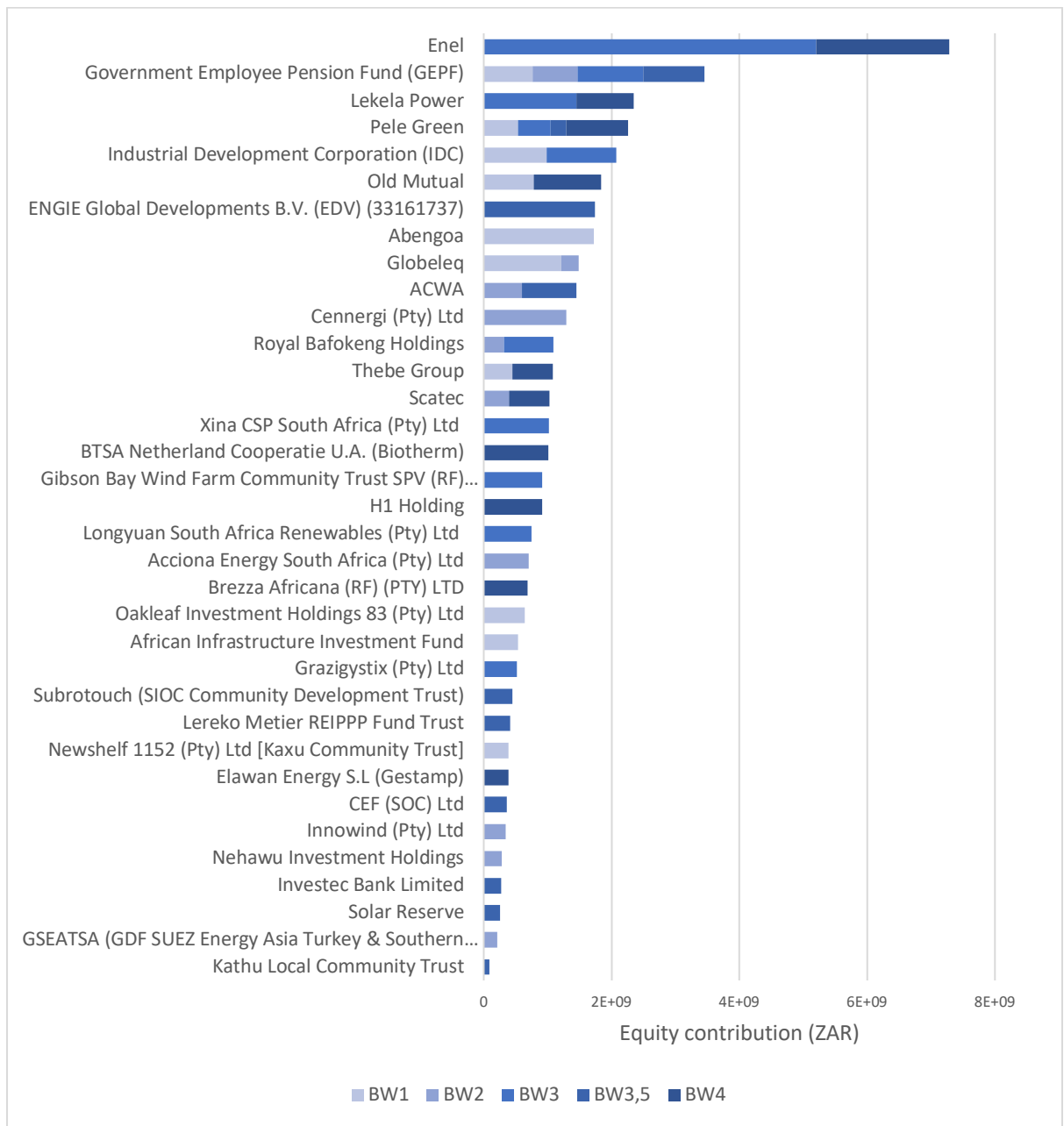


Figure 3.4: REI4P equity investors by BW (Source: Author compilation based on data from Ministry of Energy, (2018); IPP office)

3.2.3 Project realisation outcomes

REI4P is also known, globally, for the relatively fast pace of project execution post-award and the high realisation rate. Projects from BWs 1–3 took, on average, 38,6 months to reach commercial operation from the date that bidders were announced. This increased slightly over time: from an average of 32,8 months in BW1 to 42 months in BW3, most likely because of the increasing size of projects in later

rounds (wind projects increased from an average size of 81 MW in BW1 to 112 MW in BW3; solar PV projects increased from 32 MW in BW1 to 70,5 MW in BW3).

The realisation time also differed according to technology, with wind projects across all rounds taking, on average, 40 months to reach commercial operation, while PV projects were generally completed within 33 months, with the fastest projects being built within 24 months. Once projects reached financial close, most of them took between 15 to 25 months to be constructed (Department of Energy, 2019; Kitzing et al., 2021).

REI4P, furthermore, featured an exceptionally high realisation rate, with only a single 16,5 MW biomass plant failing to reach financial close. This is significantly higher than the completion rate for auctioned projects in countries such as Brazil, Italy, France and the UK (Bayer et al., 2018). Despite the delays experienced during the signing of the BW4 PPAs, all reached financial close in 2019, and three started commercial operation in Q1 2020. Cumulatively, this represents a significant share of the procured capacities (Table 3.3)

Table 3.3: Capacity procured, operational and determined (Source: Mkhize et al., 2020)

Programme	Large-scale IPP		Small-scale IPP	
	Procured	Operational	Procured	Operational
Technology				
Wind	3387	1980	9	-
Solar PV	2292	1474	80	-
CSP	600	500	0	-
Landfill gas	13	22	0	-
Small hydro	19	-	0	-
Biomass	42	-	10	-
Total	6323	3976	99	0

3.2.4 Socio-economic development outcomes

Finally, a defining feature of the SA programme is its incorporation of socio-economic and economic development (SED) outcomes. Projects were all assessed on the basis of price (70%) and a basket of SED indicators (30%) (Table 3.4). While a full review and analysis of the SED contributions and impacts are beyond the scope of this study, it is worth reflecting on some of the more salient points emerging on this topic. It is generally acknowledged that contributions and commitments across the programme have been significant (Baker & Wlokas, 2015; Bayer et al., 2018; Boulle et al., 2015; Department of Energy, 2019; Eberhard & Naude, 2016; Montmasson-Clair & Ryan, 2014a; Wlokas, 2015; Wlokas et al., 2017). Project owners have mostly committed to doing more than was expected of them and based on official reporting from the IPP office, they have outperformed even those commitments on key

metrics (see table 3.4). More than ZAR18,8 billion has, for example, been committed to communities surrounding the projects, and at least 32 000 job years have already been provided (Department of Energy, 2019).

There has, however, also been wide acknowledgement by all involved that this is one of the areas of REI4P where much more can, and should, be done to improve performance (Baker & Wlokas, 2015; Department of Energy, 2019; Eberhard et al., 2014; Eberhard & Naude, 2017; Hansen et al., 2019; Leigland & Eberhard, 2018; Marais et al., 2018; Morris et al., 2020; Mthembi, 2016). In many cases, it represents an important missed opportunity and will be a key area for consideration in any redesign of the programme.

Table 3.4: Average socio-economic and economic development performance (Source: Department of Energy, 2019)

Element (Weighting)	Description	Threshold	Target	Achieved (Average)
JOB CREATION (25%)	RSA based employees who are citizens	50%	80%	90% (Construction) 96% (Operations)
	RSA based employees who are Black people ⁵¹	30%	50%	80% (Construction) 84% (Operations)
	Skilled employees who are Black people	18%	30%	69% (Construction) 80% (Operations)
	RSA-based employees who are citizens and from local communities	12%	20%	49% (Construction) 68% (Operations)
LOCAL CONTENT (25%)	Value of local content spending	40% – 45%	65%	50%
OWNERSHIP (15%)	Shareholding by Black People in the Seller	12%	30%	33%
	Shareholding by Local Communities in the Seller	2.5%	5%	9%
	Shareholding by Black people in the Construction Contractor	8%	20%	21%
	Shareholding by Black people in the Operations Contractor	8%	20%	22%
MANAGEMENT CONTROL (5%)	Black people in Top Management	-	40%	66%
PREFERENTIAL PROCUREMENT (10%)	BBBEE Procurement	-	60%	80%
	QSE & SME Procurement	-	10%	36%
	Women-owned Vendor Procurement	-	5%	5%
ENTERPRISE DEVELOPMENT (5%)	Enterprise Development Contributions	-	0.6%	0.63%
SOCIO ECONOMIC DEVELOPMENT (15%)	Socio-Economic Development Contributions	1%	1.5%	2.2%

⁵¹ Official terminology used by the South African government in the procurement documentation as well as the relevant legislation.

Several researchers have, for example, carried out in-depth work on the impacts of localization (Baker & Sovacool, 2017; Hansen et al., 2019; Leigland & Eberhard, 2018; Matsuo & Schmidt, 2019; Morris et al., 2020), community development (Marais et al., 2018; Wlokas et al., 2017; Wlokas et al., 2012), black economic empowerment (Makamure, 2016) and job creation (Stands, 2015) of the programme and have pointed out that, while commitments on these more complex issues have been notable, execution has been difficult and results oftentimes mixed. In many cases, the REI4P's project-based approach to driving industrialization, community development or broader transformation has struggled exactly because it has been formulated and implemented in this way – with little to no support or drive from line ministries or local authorities.

There has also been criticism of the way that equitable shareholding (BEE, community) has been financed – placing these stakeholders at the bottom of the cashflow waterfall – and structured, often using community trusts – which limit meaningful engagement with project decision-making processes (Baker, 2015; Makamure, 2016; Mthembu, 2016). Without minimizing or diluting the importance of the aforementioned concerns, this case study will focus primarily on the price and investment outcomes of the projects, in light of the broader aims of the research and in recognition of the complexity and the number of resources required to adequately analyse each of these topics.

Having provided an overview of the main outcomes of the REI4P, the following section will unpack the design and implementation of the South African programme in three acts (or three periods) (Figure 3.5). Period 1 will focus on the context, approach and principles that initially shaped the auction programme and its outcomes in BW1 and BW2. Period 2 is mainly concerned with the evolution in the market's response to the auctions, and subsequent changes to the design, scope, and ambition of the auction programme. Period 3 analyses the factors behind the stalling of the programme and the impacts thereof.

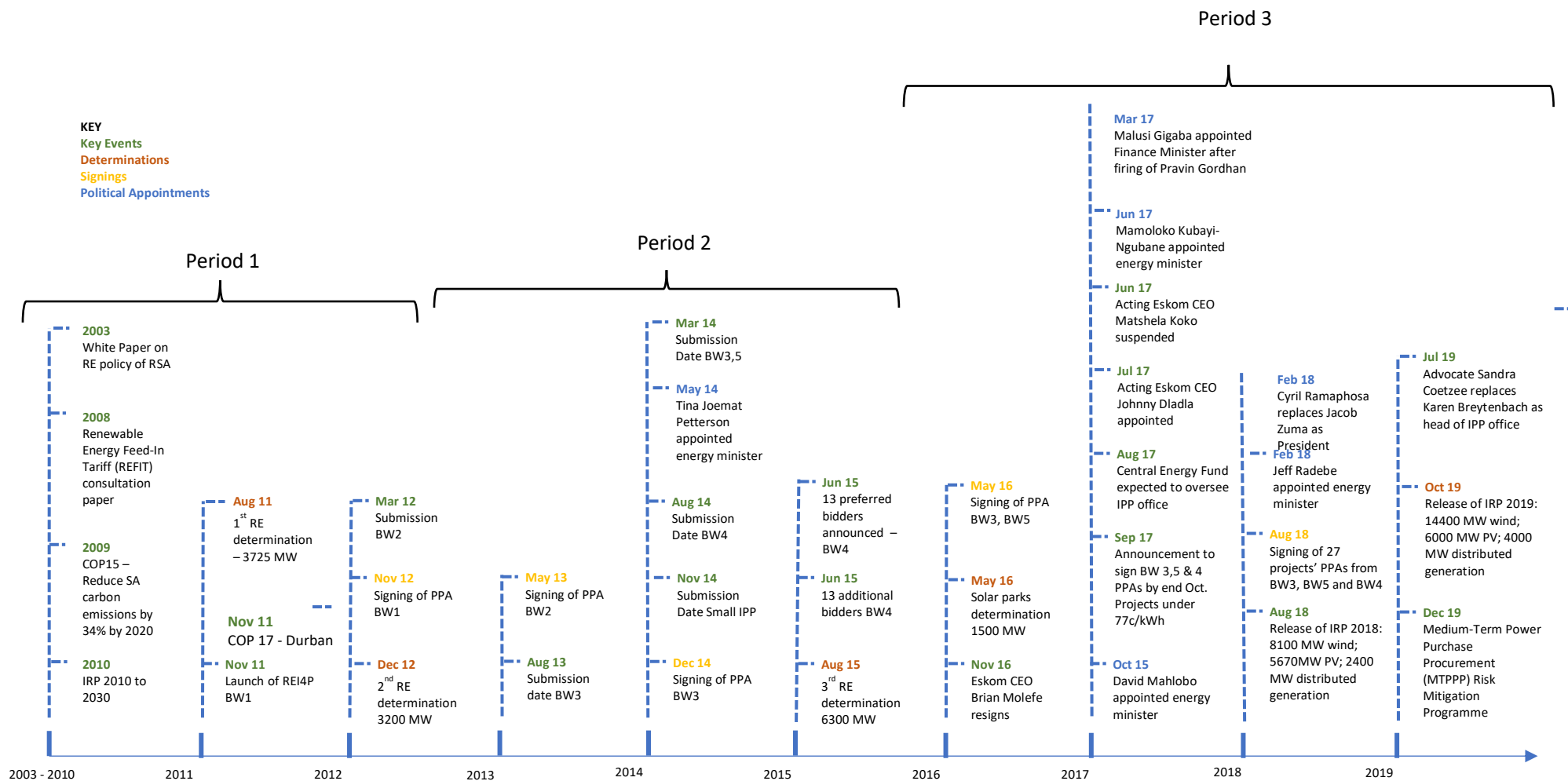


Figure 3.4: Timeline of key events and analytical periods – South Africa

3.3 First period: First shoots

3.3.1 The right conditions

A unique set of circumstances was instrumental in South Africa's finally obtaining its long-standing policy goals of allowing private power investment and increasing renewable energy generation. An important initial driver was power cuts or rolling electricity blackouts ("loadshedding", in Eskom parlance) that started in November 2007 and extended into 2008. The crisis engendered by these power shortages, and Eskom's inability to keep the lights on, provided the impetus to National Treasury and the Department of Energy to procure private power generation, despite opposition from Eskom and the Department of Public Enterprises (Baker, 2015b; Baker et al., 2014; Morris et al., 2020).

The second contributing factor was South Africa's president's voluntary commitment at the United Nations climate change conference (COP15) in Copenhagen in 2009 to cap greenhouse gas emissions in a peak-plateau-decline trajectory. This commitment subsequently made its way into the Integrated Resource Plan (IRP) for 2010–2030 where, for the first-time, renewable energy in the form of solar and wind was included in the least-cost power generation expansion plan. South Africa hosted the next COP17 in Durban in 2011, which acted as a catalyst for demonstrating government's climate change mitigation actions (Eberhard et al., 2014; Morris et al., 2020).

Third was South Africa's national energy regulatory agency (NERSA)'s initiation of a generous (but ultimately unsuccessful) renewable energy feed-in tariff (REFIT) programme from 2008 onwards. The REFIT programme failed to adequately address investor concerns and opposition from within certain sections of government (most notably National Treasury and the Department of Energy). Bankable power purchase agreements were never finalised – in part due to legal constraints that required tendering for contracts - and no projects were procured. The REFIT programme was eventually replaced by the REI4P auctions at the "eleventh hour", but had catalysed developers to begin to secure suitable sites and to undertake resource and environmental assessments, ensuring that these projects were well placed to participate later in the REI4P (Eberhard et al., 2014; Martin & Winkler, 2014; Morris et al., 2020).

3.3.2 A focused, agile approach built on trust

While the conditions seemed ripe for a South African renewable energy investment programme, the REI4P ultimately owes its existence to the dedication, hard work and results-oriented approach of a handful of committed public sector officials, supported by legal and financial consultants. The group

consisted of two experienced and widely respected officials from National Treasury's Public Private Partnership (PPP) unit – Karen Breytenbach (Finance) and Lena Magondo (Legal) – and two officials from the Department of Minerals and Energy (DME) – Ompi Aphane (Deputy Director General: Policy, Planning and Clean Energy) and Maduna Ngobeni (Energy Regulation). These officials first started working together in early 2007 on the contracting of two open cycle gas turbine (OCGT) peaker⁵² IPPs (1005 MW), after which they turned their attention to the renewables sector (Interview 30).

This small group was able to set up an office outside the department, working with agility to find ways around obstacles and emphasizing problem-solving to achieve results. The Development Bank of Southern Africa (DBSA) agreed to host and administer the accounts of the IPP office and procurement programme (Figure 3.6) through being offered 25% senior debt on all procured projects, although it eventually took up only a fraction of this⁵³ (Interview 30). Having the IPP office under the aegis of the DBSA meant that it would enjoy more independence and was able to operate outside the normal governmental bureaucratic processes.

It was also less vulnerable to political meddling. Confronted by a regulatory environment that stifled private power generation and an incumbent utility openly hostile to the idea, the Electricity Regulation Act (Republic of South Africa, 2006) was amended to give the minister of energy the right and responsibility to make determinations on the procurement of new power, including stipulating how much and from which sources of energy; who (public or private) should build, and who should buy the power (Interview 30). The REI4P was also exempted from the arduous and time-consuming PPP processes stipulated by the Public Finance Management Act (PFMA) (Republic of South Africa, 1999) by using a loophole in the Act.

⁵² The term “peaker” refers to the fact that these IPPs were only intended to run during certain hours to help Eskom meet peak demand.

⁵³ A Memorandum of Understanding was concluded between the Department of Energy, National Treasury and DBSA on the establishment and governance of the IPP office.

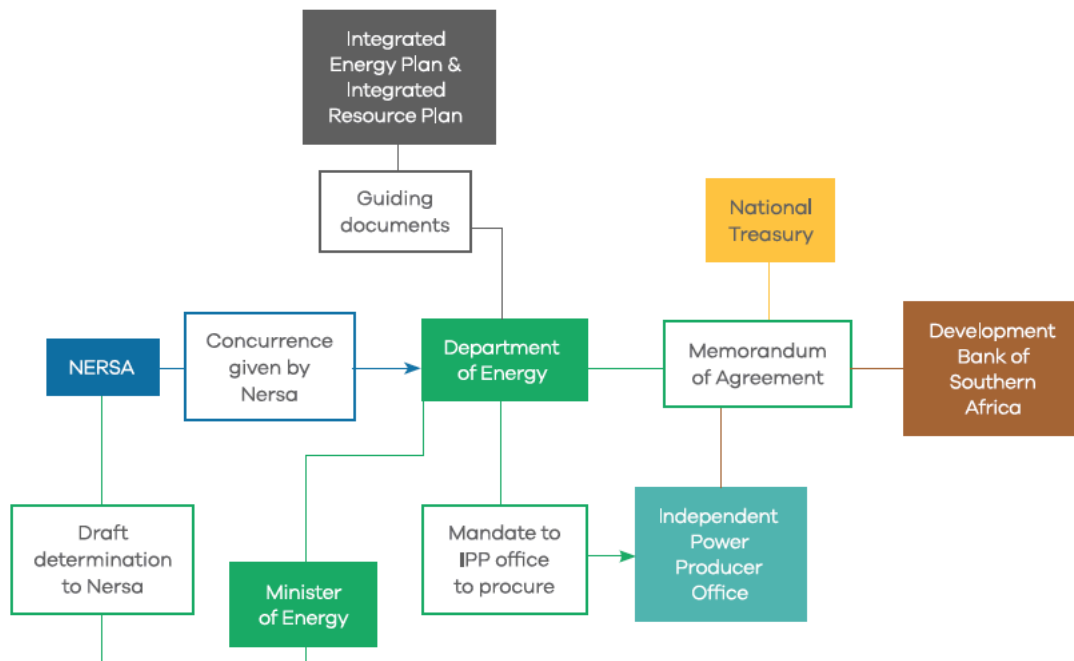


Figure 3.5: Governance structure of the IPP office (Source: Mkhize et al., 2020)

The group was able to work in this way because it had the trust and support of key stakeholders, secured through various informal networks and relationships that had been built up over time (Interview 30). For example, Karen Breytenbach’s relationship with senior managers at the DBSA – where she had worked previously – was essential in securing the institution’s commitment to the programme. The programme also had the critical support of the most powerful ministry – National Treasury – and, in particular, that of Andrew Donaldson (deputy director general). National Treasury provided ZAR100 million (from the ZAR500-million Jobs Fund that had been sitting unutilized at DBSA) to the programme as seed funding based, in large part, on the reputation of and trust in the programme’s leadership (Interviews 23, 30).

3.3.3 Guiding design and implementation principles

Three sets of factors influenced how the programme was initially implemented.

3.3.3.1 Pro-active consultant management and ensuring non-negotiable contracts

The first set of factors was influenced by the team’s difficult prior experience with the procurement of the IPP peaker projects, which, at that stage (2011), after three years, had still not resulted in a successful contract and would turn out to be a five-year-long negotiation process. The lessons the team took from the experience were that consultants needed to be better managed and that project

documents needed to be bankable with adequate risk mitigation. It was thus decided that the IPP office would pro-actively manage consultants' activities and outputs to ensure that they conformed to the IPP office's vision of the programme – a vision that was, at times, at odds with the recommendations or preferences of some of the experts they employed. Many of the consultants and advisors were, for example, not in favour of introducing a competitive model, wanting to limit project sizes to the sub-10 MW range and were against setting up the auction as a rolling procurement programme. The IPP office, nonetheless, set a top-tier team of local and international consultants to work on shaping the procurement programme and the underlying documentation, while a second team was tasked with identifying international best practice in renewable energy auctions and private power investment (Interviews 30, 34, 36).

It was also decided early on that the REI4P would not allow project contracts to be the subject of any negotiation by project developers or bidders (Interview 30). A great deal of time and resources were invested in ensuring that the quality of the programme documentation (especially contracts) was acceptable to the lender community (that is, bankable contracts that appropriately allocate risks) before the procurement process started. The programme was able to secure the trust of South Africa's commercial and development banks through a series of informal Friday afternoon meetings where various funding and risk allocation arrangements were discussed and tested prior to the programme's launching. Through these meetings it became clear that Eskom, as designated buyer of the power, was not considered "bankable" and would require some kind of sovereign support (Interview 18, 30, 36).

The IPP office, thus, developed an implementation agreement that committed government to making payments on behalf of Eskom if it defaulted, and that would see government buying the assets at a price that included outstanding debt and equity returns in the case of expropriation or nationalisation. This was backed by a government support framework agreement (GSFA) between NT, DoE, Eskom and NERSA that ensured that NERSA, in its tariff determinations, would treat the IPP power purchase agreements as a pass-through cost, effectively guaranteeing the revenue stream for IPP payments (and thus effectively reducing the contingent liability of the sovereign) (Interview 30). Because the programme had the buy-in of local banks (Interview 15, 19), it was able to offer local-currency-denominated (ZAR), non-negotiable 20-year PPAs, indexed to local inflation through the official consumer price index (CPI).

3.3.3.2 Procurement process transparency and security

The second set of factors was a recognition that these types of large government procurement programmes can, and often do, end up being targets of corruption and rent-seeking, and that secure arrangements needed be instituted around potential conflicts of interest, transparency and independent auditing. The programme was being conceived and implemented during the first years of the Zuma administration – a presidential term that would later be viewed as a period of accelerated kleptocracy in the South African state (Bowman, 2020; Godinho & Hermanus, 2018). The implementing team was adamant that not even a hint of impropriety should be allowed to taint the programme, also in recognition of the trust displayed by supporters of the programme (most notably National Treasury, which had allowed the programme to be developed and implemented with minimal direct involvement) (Interview 30).

No IPP office or other government officials were thus directly involved in the bid evaluation processes, and several layers of auditing and security were set up to ensure the integrity of the programme. Bid evaluation was conducted by consultants under strict security conditions (including CCTV surveillance) and results were reviewed and audited by a second, independent team. The IPP office also employed an additional team of consultants to review and monitor the overall governance of the programme and alert the implementing team to any possible problems (Interview 30).

3.3.3.3 An emphasis on project realisation

The third factor influencing the design and implementation of the programme was effectiveness – that is, the timeous realisation of high-quality projects. The urgency of the COP17 moment played an important role, but there was also the need to demonstrate to the broader market – both locally and internationally – that South Africa was serious about implementing a programme that would work (Interview 30). The IPP office also believed – wrongly, as it turned out – that the number of interested bidders might be quite small, perhaps as few as 10 in the first round.

Their aim was to attract high-quality projects that would end up being built as quickly as possible. At the time that REI4P was being designed, many RE auction programmes, especially in the global South (for example, Brazil and India) were struggling with low project realisation rates (Bayer, 2018; Elizondo-Azuela et al., 2014; Lucas et al., 2013; Maurer & Barroso, 2011; Ryan, 2020; Shrimali et al., 2016; Thapar et al., 2018). However, at the time there were still relatively few successful auctions internationally from which to draw useful lessons (Interview 30).

3.3.3.3.1 Late-stage qualification criteria

As a result, auction design decisions were initially more concerned with project quality and preparedness than with price competition, limiting participation to high quality, bankable projects delivered by experienced, capable bidders to ensure certainty of project execution (Interviews 23, 30, 36). The programme, accordingly, set several late-stage qualification criteria at levels more demanding than most international auction programmes.

Bids were essentially required to be effectively ready for financial-close by the time of submission – needing to have secured all land rights, and to have in place all resource assessments, grid connection agreements, permits, bankable commitments, and so on (interviews 8, 15, 19). Bidders needed to demonstrate that either the net assets of each corporate and/or equity finance provider(s) over the preceding three years were at least 100% of the financing it was proposing to invest in the project (net asset test), or that the provider, during the preceding five years, had a proven track record of raising corporate/equity finance equivalent to at least 100% of its proposed financing (track record test). A similar test was required for debt financing.

Finance providers also had to provide signed term sheets and signed letters of support requiring them to make firm commitments and pledging that they had conducted due diligence of the proposal. These funder commitments were particularly powerful in proving bidders' bona fide project preparation credentials and effectively shifted much of the due diligence to banks, rather than to the bid evaluators (Interviews 23, 30).

Furthermore, REI4P bidders had to prove that their proposed EPC firms had experience in at least two similar projects and their wind assessment expert had five years of relevant experience. Equipment, including wind turbines and solar PV panels used for proposed projects had to be internationally certified (Eberhard & Naude, 2016; Filipova et al., 2019; Kruger et al., 2021; Kruger et al., 2019).

3.3.3.3.2 Bid bonds and penalties

The seriousness and commitment of the bidders in reaching financial close, construction and commercial operation deadlines was also strengthened through the requirement to lodge bid and performance bonds, and by penalties for non-performance. Bids needed to be accompanied by a

ZAR100 000/MW (US\$8000/MW⁵⁴) bid bond, to be replaced by a ZAR200 000/MW (US\$16 000/MW⁵⁵) performance bond on project award that would be in place until the project reached commercial operation. The Power Purchase Agreement also stipulated that its term would be reduced by three days for every one day that a project ended up being delivered “late” (Department of Energy, 2014; Eberhard & Naude, 2016; Eskom Holdings, 2014; Filipova et al., 2019; Kruger & Eberhard, 2018).

3.3.3.3 The impact on auction volumes, project size limits

This overriding concern with timely project execution also played a determining role in how the auction volumes were set and divided in the first auction round. The IPP office made almost the entire volume of the first ministerial determination (3626 MW out of 3725 MW) available in the first bid window to maintain the market’s confidence by easing the transition from a feed-in tariff-based approach to a competitive one through limiting competition – a decision which has since been acknowledged as a mistake (Interview 23, 30). Project size limits (see Table 3.5) were similarly set to diversify realisation risk, through ensuring that the entire volume for particular technologies would not be awarded to a single project.

In determining the project size limits, the office was guided by what they knew was being developed (for example, 75 MW being the biggest solar PV project being developed in South Africa at that stage) (Interview 30). Not wanting to deviate from the allocations set out by the IRP-based planning framework and the resultant ministerial determinations, the IPP made the decision to limit competition between technologies by setting out dedicated demand bands for onshore wind, solar PV, concentrated solar power, small hydro, biomass, biogas and landfill gas (Interview 30, 34).

Table 3.5: Project size limits (Source: Eberhard & Naude, 2016)

Technology	Minimum Capacity (MW)	Maximum Capacity (MW)
Onshore wind	1	140
CSP	1	75
Solar PV	1	100
Biomass	1	25
Biogas	1	10
Landfill gas	1	20
Small hydro	1	40

⁵⁴ Based on an exchange rate of ZAR12,5 per US\$, which was the rounded-up average in Jun 2015, the date on which BW4 awarded projects were announced. First accessed March 2020. [https://www.x-rates.com/average/?from=US\\$&to=ZAR&amount=1&year=2015](https://www.x-rates.com/average/?from=US$&to=ZAR&amount=1&year=2015)

⁵⁵ See footnote above

3.3.3.3.4 A simple bidding procedure and complicated winner selection criteria

South Africa's programme followed a simple, established bidding procedure, using a single-stage process with a pay-as-bid pricing rule. Bidders had to submit sealed bids. Projects were initially assessed for compliance with general requirements (project size, price cap, contractual agreements, grid provider quotes, bid bonds) and qualification criteria (project structure, legal criteria, land, environmental consent, financial criteria, technical criteria, economic development criteria and value for money). Compliant bids were then scored on price (70 points) and a basket of socio-economic (SED) and economic development (ED) commitments (30 points, including job creation, local content, empowerment shareholding, preferential procurement, and socio-economic development – see Table 3.4) (Eberhard & Naude, 2016).

The IPP office argued that it was important to ensure that these projects contributed to black economic empowerment (BEE) and, also, to the rural communities in which they would be situated, given the prevalence of poverty and joblessness in these areas (Interview 30). Local law firm Ledwaba Mazwai thus developed a bid evaluation scorecard (Table 3.4) that took into account government development priorities – as set out in the National Development Plan – and relevant legislation (for example, BEE codes, Public Finance Management Act).

This scorecard comprised 25 weighted indicators, including local ownership, job creation, local content, BEE contributions (including ownership, management control and procurement) as well community ownership and socio-economic development contributions (see Table 3.4). This was a first for renewable energy auction programmes internationally, but also represented a departure from local, South African standard practice, requiring an exemption from the Preferential Procurement Policy Framework Act's (2000) normal 90:10 split between price and development criteria.

3.3.3.4 Period 1 results

3.3.3.4.1 BW1: High project prices

The chosen approach proved to be effective, but initial bid prices were high. The programme attracted significantly more attention than initially expected but was unable to take full advantage of this fact because overall volumes had been set so high, resulting in limited price competition between bidders (Interview 30). In BW1 (3670 MW offered), 53 projects were submitted, with a total volume of 2128 MW. Of these, 28 projects met the qualification criteria and were awarded (1425 MW). Average bid

tariffs were thus close to the announced ceiling prices (Table 3.6) and close to double the global average weighted levelised cost of electricity (LCOE) for each technology at that time⁵⁶.

Risk perceptions and resultant mark-ups and return expectations (for example, equity IRRs close to 20%), as well as advisory costs, were high (Interviews 23, 30, 34, 36). Projects were, on average, also about 50% smaller than the project size limits (Table 3.6), which played a further role in pushing up prices as many of them were not able to take full advantage of economies of scale.

Table 3.6: BW1 average prices vs. price ceilings (Source: Eberhard & Naude, 2016)

	Average awarded price (ZARc/kWh)	Price ceiling (ZARc/kWh)	Average project size (MW)	Project size limits (MW)
Onshore Wind	114	115	85	140
Solar PV	276	285	36	75
CSP	269	285	75	150

3.3.3.4.2 BW1: Local equity and debt providers dominate

South African developers and project sponsors played a prominent role, with 13 of the 28 awarded projects developed by South African companies and eight of the top 10 equity contributors also being South African (including Old Mutual, IDC, Pele Energy, Thebe Group, and so on), worth more than R5 billion (36% of total shareholding). South African banks played an even more prominent role, with local commercial banks (Absa, Standard Bank, FirstRand and Nedbank) providing a combined 64% (ZAR22,77 billion) of total project debt and local DFIs (DBSA, IDC) contributing a further 19,7% (ZAR 6,95 billion).

3.3.3.4.3 BW1: Slower realisation timelines

Despite the emphasis placed on effectiveness during the auction design process, the project realisation deadlines turned out to be overambitious. Projects were expected to reach commercial operation within 31 months of being awarded preferred bidder status. In reality, 50% (13 projects, totalling 720 MW) of the BW1 awarded projects missed this deadline. The average delays ranged from 3,8 months for onshore wind, to 5,1 months for solar PV and 7,3 months for CSP. Nonetheless, it is also worth reflecting that the remaining BW1 projects were, on average, three months early in

⁵⁶ BW1 average prices were also above the 2011 (but not the 2009) REFIT levels announced by NERSA. The BW1 ceiling prices were generally higher than the 2011 REFIT levels and bidders seemed to anchor their bids around these ceiling price levels (Eberhard, 2013).

reaching COD, and that 100% of the awarded projects eventually reached financial close and commercial operation.

3.3.3.4.4 BW2: Slightly lower project prices

BW2 was launched a mere four months later, and thus did not present much opportunity for reflection and learning (Interviews 23, 30). The BW2 bid documents were consequently similar to those released for BW1. One important lesson that *was* taken on board was the reduction in the offered bid volume to 1276 MW, resulting in more competition. In total, 79 projects totalling 3233 MW were submitted, out of which the 19 highest-ranked projects (1040 MW) were awarded⁵⁷. Some technologies, such as biomass, biogas and landfill gas, did not receive any fully compliant bids (including prices below stipulated price caps), while others – especially onshore wind and solar PV, – saw considerably more volumes being submitted. Average prices were considerably lower – particularly for onshore wind and solar PV – than in BW1, despite average project sizes remaining approximately the same (Table 3.7).

Table 3.7: BW2 average prices and project sizes (Author compilation based on Eberhard & Naude, 2016)

	Average awarded price (ZARc/kWh)	Price ceiling (ZARc/kWh)	Average project size (MW)	Project size limits (MW)
Onshore Wind	90	115	80	140
Solar PV	165	285	46	75
CSP	251	285	50	150

3.3.3.4.5 BW2: Increasing international equity provision, but local debt dominant

In a marked departure – and a sign of things to come – international developers began to play a much more prominent role, with only three of the awarded projects having South African entities as lead developers (at least at the bidding stage): some developers had sold their projects to international sponsors. Only four South African entities (Cennergi, GEPf, Royal Bafokeng and Nehawu Investment Holdings) totalling ZAR2,6 billion in equity (30% of total shareholding) formed part of the top 10 equity investors in BW2. South African lenders, however, remained dominant, with local commercial banks providing 74% (ZAR18,6 billion) of the total debt.

⁵⁷ The IPP office's no-negotiation approach meant that they awarded the highest-ranked projects up to the auctioned capacity for that specific technology. This means that they would almost always award less capacity than they auctioned since they awarded fixed-size projects.

3.3.3.4.6 BW2: Project realisation deadline extension

Another lesson that BW2 took on board was the extension of project realisation timelines – from 31 months (BW1) to 55 months (BW2) – from preferred bidder announcement. This significant extension meant that all BW2 projects reached commercial operation long before the deadline, being, on average, 18 months early. The PPA also provided a powerful incentive for early connection, offering projects 60% of their bid tariff for any energy delivered prior to their scheduled commercial operation date. BW2 also saw much more aggressive bidding on SED/ED factors, with commitments ending up being closer to targets than threshold levels on most metrics.

These results set up the programme for a step-change in the next rounds.

3.4 Second period: A step-change

The time between 2013 and 2015 was a period of increasing sophistication and a paradigm shift in how the programme was being implemented and received. This was a particularly busy time for the IPP office, with the country's first 47 utility-scale renewable energy projects moving towards financial close and commercial operation (Interviews 23, 30). Bid windows 3 (2013) and 4 (2014), along with BW3,5 (an additional round for CSP projects), the expedited round (where previously unsuccessful projects could rebid prices) and some small IPP rounds were also being prepared and implemented, and even though BW3 was launched a year after the submission date for BW2, the opportunities for strategic reflection remained limited. The changes introduced to the design of the programme during this time were incremental, reflecting some of the more obvious lessons learned up to that point.

3.4.1 Auction design changes: BW3 – 4

3.4.1.1 Marginal relaxation of qualification criteria

The IPP office started tweaking the design of the programme – in response to feedback from the market – to reduce transaction costs and broaden its impacts (Interviews 23, 30, 34, 36). As a result, some qualification requirements were relaxed over this period (see Table 3.8 and Table 3.9 below). Bidders could, for example, now submit bids without proof of ownership for land that would be traversed by powerlines, and without zoning, land use change and subdivision approvals. From BW4 onwards, bids also did not need to be accompanied by signed and costed sub-contracts from major equipment and service providers.

Table 3.8: Changes to legal requirements during REI4P bidding windows (BW) (compilation drawing from Eberhard & Naude, 2017; Kruger et al, 2021) (Indicators: √ : same as previous BW; ÷ : requirement removed)

BW 1	BW 2	BW 3	BW 4
Single Purpose Vehicle ¹	Constitutional Documents of the Project Company	Legal status of the Project Company	√
Shareholders' Agreement ²	√	√	÷
Confirmation of the PPA, IA, DA & Connection Agreements and adherence to the requirement that no mark-ups or amendments are permitted.	√	Confirmation of the PPA, IA, DA the & the Connection Agreements and submission of Returnable Schedules	√
Statement by the Members ³	√	÷	÷
Key Sub-contracts ⁴	√	√	÷

1: From BW1, the bidding documents required that sellers under the PPA must be Project Companies that have the sole purpose of undertaking the project. However, BW2 added that if such a company were already established at bid submission, then its Constitutional Documents must be submitted.

2: The bidder was required to submit a fully developed Shareholders' Agreement, between the Project Company and its shareholders, with written proof of acceptance of this agreement by all equity participants.

3: Each shareholder of the bidder had to provide a statement discussing any investigations, complaint proceedings or material legal proceedings, amongst others, against them in the previous five years.

4: The bidder had to submit detailed heads of terms of the contracts it would enter into with its key Contractors, Equipment Suppliers and any other Contractors.

Table 3.9: Changes to permitting requirements during bidding windows (BW) for PV and wind projects (Eberhard & Naude, 2017; Kruger et al, 2021) (Indicators: √ : same as previous BW, ÷ : requirement removed)

BW 1	BW 2		BW 3		BW 4	
PV and Wind	PV	Wind	PV	Wind	PV	Wind
EIA or Basic Assessment Report	√	√	√	√	√	√
Water-use Application	√	√	√	√	÷	÷
Civil Aviation Commissioner Consent	√	√	√	√	÷	√
Consent from the Heritage Authority in terms of the National Heritage Act	÷	÷	÷	÷	÷	÷

This relaxation in qualification criteria did not have a marked impact on bid preparation costs or broader participation rates since they did not address the more expensive components of the bid (for example, environmental permitting) nor did they relax the high access requirements (for example, net asset- and track-record tests) for equity participation (Interviews 8, 20, 36). The fact that bidders were still required to provide signed commitment letters from finance providers also meant that even though some qualification criteria might have been relaxed from the procurer's point of view, these would remain relevant as part of finance providers' due diligence processes (Interviews 8, 20, 36).

3.4.1.2 Socio-economic development criteria: increasing targets and thresholds, scoring changes

The changes introduced to the auction evaluation process and criteria during these rounds were also aimed at increasing the broader socio-economic impacts of the programme (Interviews 30, 34, 36). There was an increase in both the thresholds and targets of local content as a share of total project costs – differentiated by technology (see Table 3.10 below). The threshold for onshore wind was, for example, increased by 15%, from 25% to 40%, and for solar PV from 35% to 45%. Bidders generally responded positively to these changes. Average local content commitment for onshore wind increased from 27,4% in BW1 to 44,4% in BW4. Similarly, solar PV local content commitments increased from 38,4% in BW1 to 62,3% in BW4.

While some researchers have questioned the meaningfulness of some of these numbers (see Baker & Sovacool, (2017); Morris et al., (2020)), it is still worth reflecting that it resulted in the establishment of two wind tower factories with a combined capacity of 350 towers per year; the development of concrete tower technology; the establishment of three solar PV assembly plants, as well as a solar inverter factory in the space of only four years (Mkhize et al., 2020; Morris et al., 2020). It has also been pointed out that South Africa's local content requirements have been effective at helping establish a sizable high-skilled professional services industry around the programme that has not only supported a local renewable energy market but is also being exported to the rest of the world (Matsuo & Schmidt, 2019; Morris et al., 2020).

Table 3.10: Comparison of SED & ED evaluation criteria, BW1 vs BW4 (based on Eberhard & Naude, 2017; Filipova et al, 2019)

		BW1		BW4	
		Threshold	Target	Threshold	Target
1.	Job creation	RSA citizens employed	50%	80%	50%
		Black citizens employed	30%	50%	30%
		Skilled black citizens employed	18%	30%	18%
		Local community citizens employed	12%	20%	12%
2.	Local content	Local content share - wind	25%	45%	40%
		Local content share - PV	35%	50%	45%
		Local content share – CSP (no storage)	35%	50%	45%
		Local content share – CSP (with storage)	25%	45%	40%
		Local content share – Biogas; Biomass; Landfill Gas, Small Hydro	25%	45%	40%
3.	Ownership	Shareholding by black people in project company	12%	30%	12%
		Shareholding by black people in EPC company	8%	20%	8%
		Shareholding by black people in O&M company	8%	30%	8%
		Shareholding by local communities in project company	2,5%	5%	2,5%
4.	Management control	Black top management		40%	40%
5.	Preferential procurement	BEE procurement spend		60%	60%
		QSE & EME procurement spend		10%	10%
		Women-owned vendors' spend		5%	5%
6.	Enterprise development	Enterprise development contributions as % of revenue		0,60%	0,60%
7.	Socio-economic development	Socio-economic development contributions as % of revenue	1%	1,5%	1%

Apart from the increase in local content thresholds and targets, there was also a change from absolute to relative scoring of these commitments (Interviews 21, 30). During the earlier rounds, bidders received 10 points for any commitment in excess of the threshold, and another 10 points for reaching the target as well. In later rounds, the bidder with the highest commitment was awarded full points, while all other bidders were scored relative to how they placed between this bid and the threshold.

3.4.1.3 Removal of ceiling prices, lowering auction volumes

Ceiling prices – which in BW2 and BW3 had been based on the lowest bid received during a previous round (Interview 30) – were completely removed for BW4 (for solar PV and wind), with the IPP office contending that there was sufficient competition to ensure that prices remained at an affordable level

(Interviews 30, 34, 36). The IPP office also adopted an approach to setting auction round volumes that aimed to maintain high levels of competition by keeping offered volumes relatively low – even reducing them for BW4, despite a substantial increase in the number and volume of bids being submitted in previous rounds. The auctioneer was also given discretion to take advantage of low price outcomes by increasing the awarded capacity (to a maximum of double the tendered volume) post-bid submission (Eberhard & Naude, 2016; Kruger & Eberhard, 2018).

3.4.1.4 Fit-for-purpose auction windows: CSP, small projects, expedited bidding

The IPP office also started treating the market in a more nuanced way during this period. For example, it ran a separate bid window (BW3.5) for CSP and, in recognition of the value of these plants to the system, incentivised them to invest in storage by offering a 270% premium on their submitted “base price” during the afternoon peak (16:30 – 21:30). The office also launched the small IPP procurement programme (October 2013) with the aim of providing opportunities for smaller, South African firms that had not been able to qualify for, or effectively compete in, the previous bidding rounds. An expedited bidding window (1800 MW) was also launched after BW4, which would allow previously unsuccessful bidders with a second opportunity to bid (Eberhard & Naude, 2016; Filipova et al., 2019; Kruger & Eberhard, 2018).

3.4.2 The market’s response

3.4.2.1 Aggressive, strategic bidding by large international developers

Whereas changes to the programme were incremental, changes in bidding behaviour and the market were more disruptive. During BW3 and BW4 large international utilities began bidding much more aggressively and strategically:

- i. Larger companies started bringing more services and aspects of the value chain in-house to cut costs and margins (Interviews 18, 19, 20, 23, 26).
- ii. These companies were submitting multiple bids (projects) and using their international project portfolios to take advantage of both economies of scale and their stronger negotiating position relative to suppliers and service providers (Interviews 8, 16, 22, 23 30).
- iii. Large bidders were also able to use cheaper corporate finance (as opposed to more costly project finance) to lower the cost of capital (and, thereby, prices) on their bids (Kruger et al., 2021; Steffen, 2020). ENEL Green Power, for example, used corporate finance in its BW3 and

BW4 bids, and post-award negotiated better priced debt (on a project finance basis) with South African banks (Interviews 22, 30). Up to this point many developers had complained that the big five South African banks were simply too risk-averse and were acting as cartels, offering almost identical loan terms and pricing (Interviews 8, 15, 23). ENEL's approach broke this pattern and the relative power of the banking community in the programme – at least for their awarded projects. From the perspective of a senior official in the IPP office, “they did us a favour” (Interview 30) by forcing the banks to re-evaluate their risk perceptions and return expectations.

The result was that, while equipment costs had gone down considerably over this period⁵⁸, there were also notable reductions in margins across all project cost components (Figure 3.6).

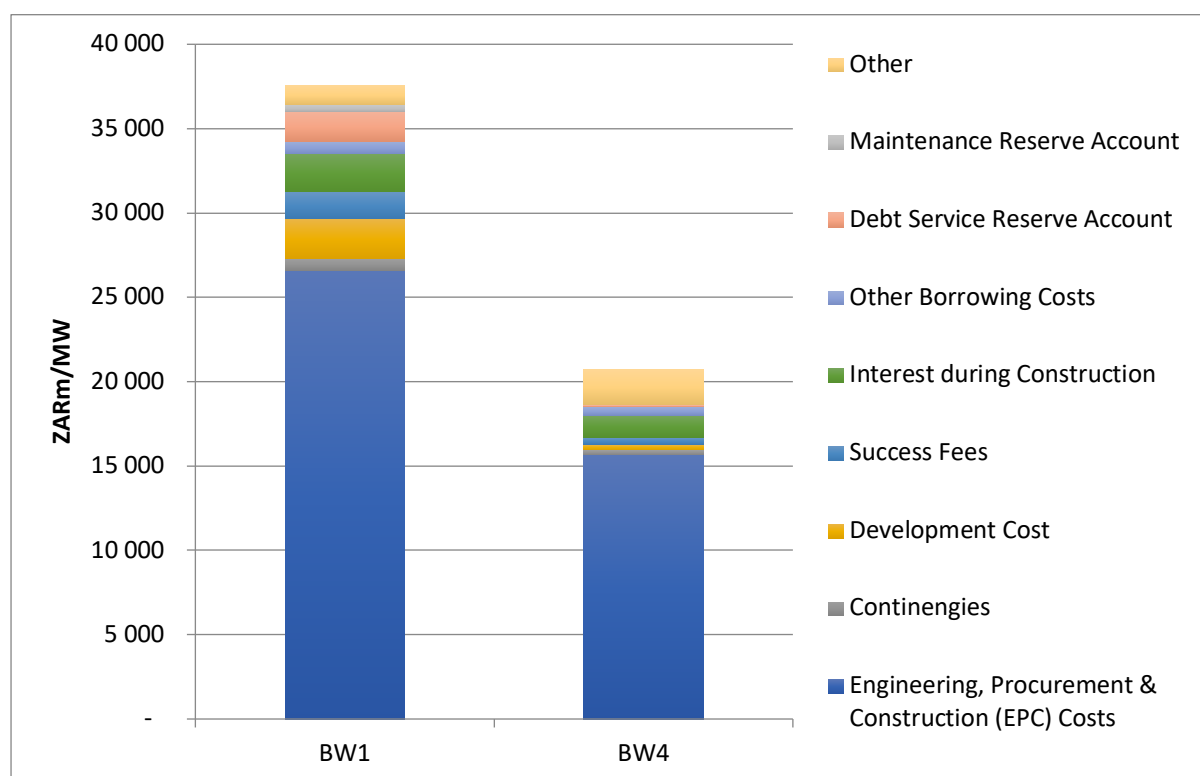


Figure 3.6: Project cost components, BW1 vs BW4 (Source: Bidding data from IPP office; Eberhard & Naude, 2017)

⁵⁸ It is not clear from the bidding data whether this reduction in EPC costs was also in part due to lower local production costs, since this is not disaggregated in the data provided to the IPP office. Anecdotal evidence suggests upward price pressure from local manufacturing (e.g. Morris et al., 2020), although no systematic analysis of this has been done.

These bidding rounds also saw more manipulating of the system by larger bidders. Large bidders, for example, apparently used their portfolio of projects to reduce the weight of the SED & ED scores in the final awarding decisions. By submitting a bid with unrealistically high SED & ED commitments, coupled with a very high price (in other words, a fake bid), it was ensured that all other bids would be scored against this artificially inflated score. This, in turn, lowered the absolute value and influence of the SED & ED scores, thereby giving price a greater weight in the final awarding decision (Interviews 21, 34, 36). Nevertheless, ED & SED commitments continued to increase during each round of bidding (Eberhard & Naude, 2017; Kruger & Eberhard, 2018).

3.4.3 Results: BW3-4

3.4.3.1 BW3-4: Steep project price declines

As a result of these bidding strategies, together with the continued reductions in equipment costs, an increase in competition and the maturation of the sector, the BW3 and BW4 auctions saw steep declines in pricing, especially for solar PV, but also for onshore wind. In all, 93 projects (6023 MW) were submitted for BW3, 79 projects (5805 MW) for BW4 and 106 projects for the expedited bid window. During BW3, 17 projects (1457 MW) were awarded, and the IPP office chose to double the number of awarded projects from 13 to 26 for BW4 (2205 MW). Average prices for onshore wind in BW3 fell to ZAR0.74/kWh and ZAR0.99/kWh for solar PV. In BW 4 these prices fell to an average of ZAR0.67/kWh for onshore wind and ZAR0.82/kWh for solar PV. The average prices for the expedited round, although never formally announced, were even more dramatic at ZAR0.62/kWh for both onshore wind and solar PV (Filipova et al., 2019; Kruger & Eberhard, 2018).

Results from these rounds illustrate the power of competition, not merely for price discovery but also for price reduction. These results also reflect the maturation of the sector, with stakeholders across the value chain (especially investors) learning and becoming increasingly comfortable with the technologies and associated risks (Interviews 23, 30). Loan terms, for example, increased from 15 years to 17 years during this period; IRRs dropped below 15%, and project gearing ratios also increased over the rounds (Pieters et al., 2014), with some projects in Round 4 getting as much as 85% debt (Interviews 30, 34, 36).

3.4.3.2 BW3-4: Market concentration in equity provision

As a result of this combination of bidding strategies and competitive pressures, bigger companies were awarded larger shares of volumes in BW3 and BW4 (Kruger et al., 2021). Whereas 14 lead sponsors had been awarded projects in BW1, only five sponsors (one of which is South African) were awarded the entire volume of projects in BW3. During BW4 this trend seemed to have been somewhat reversed (although, again, only two lead South African sponsors won projects), but this was attributed to double the amount of capacity being awarded (Interview 36). Thus, there was more market concentration during these rounds, although not necessarily patterns of dominance, as the bidders awarded the majority of capacity tended to change from bid window to bid window (Kruger et al., 2021). It is worth noting that these results – insightful and potentially concerning as they are – also tend to focus only on the lead sponsors, thereby obscuring the roles that smaller, local players were continuing to play in the value chain – especially in project development, EPC & O&M contracting but also as minority shareholders (Interviews 22, 23).

Project realisation rates remained high for BW3, with all projects (except a single 16,5MW biomass project) reaching commercial operation on time (on average, 10 months prior to the deadline). However, projects awarded as part of BW4 were delayed (as discussed further under section 3.5).

3.4.4 The Small IPP procurement programme

During this time, the IPP office also launched the small IPP procurement programme (October 2013), with the aim of providing opportunities for smaller, South African firms that had not been able to qualify for, or effectively compete, in the previous bidding rounds (Interview 30). For the programme, 100 MW was set aside, divided into two bidding rounds with 10 x 5 MW projects each. It was run as a two-stage, technology-neutral auction using the same documentation and process as REI4P, with some minor tweaks. Bidders were, for example, required to have a 40% South African entity participation at bid submission (same as under the REI4P), thereafter increasing to 60% within no more than one-third of the scheduled operating period, and SMEs shareholding of at least 10%, which had to increase to 30% within one-third of the scheduled operating period. Bid bonds and SED thresholds were removed, although the programme maintained the categories for bid-scoring purposes, and increased the local content requirement to 50% as well as introducing an additional category – small and medium enterprise (SME) participation and spending.

3.4.4.1 Competitive project price results

Competition was fierce during the first round (102 bids submitted; 43 qualified), but much less so during the second rounds (29 bids submitted, 20 qualified). Despite this lower level of competition, prices reduced even further during this round. At prices only slightly higher than those achieved in BW 3, 20 projects (mostly solar PV) were awarded across the two rounds. Considering the much smaller project sizes and higher localisation requirements, these prices indicated that, even at such a small scale, renewables (and, in particular, solar PV) were increasingly cost-competitive and offered significant opportunities for local, smaller players (Interviews 16, 18, 20).

3.5 Third period: Running to a standstill

3.5.1 Delays in project contract signing and impacts

The REI4P programme came to a grinding halt in 2016 when Eskom's CEO refused to sign the PPAs of projects awarded in BW4 and BW3.5 as well as those projects awarded under the small IPP programme. Eskom senior management persisted in their refusal for more than two years, arguing that Eskom had overcapacity, despite the president, the minister of energy and the national energy regulator (NERSA) affirming that REI4P was government policy (Eberhard, 2016; Fakir, 2020). The results have been devastating for the programme, the sector, and the country. The first shoots of a local renewable energy manufacturing industry have withered, with two wind tower factories, one inverter factory and several solar PV assembly plants having closed down (Table 3.11) (Mkhize et al., 2020). The industry has been bleeding jobs and skills, with many home-grown renewable energy experts having been forced to leave the country to look for opportunities elsewhere (Morris et al, 2020).

There have been no new REI4P procurement rounds since 2014/15, despite South Africa experiencing its deepest and most disruptive episodes of loadshedding during 2018–2020, largely due to a poorly performing, ageing Eskom coal fleet that urgently needs replacing. This situation also undermined investor confidence in South Africa as an investment destination and plays some part in the country's loss of its investment-grade credit rating in 2017/18 (Bowman, 2020).

Table 3.11: Solar PV & wind tower manufacturing facilities – status (Source: Mkhize et al., 2020)

Company	Status
Jinko Solar	Shut down 120 MW manufacturing facility owing to delay in REI4P
Sun Power	160MW/year facility – currently dormant
ART Solar	75 MW/year facility – decreased capacity owing to delay in REI4P
ILB Helios	300 MW/year facility – recently upgraded to tier 1 manufacturer in partnership with Seraphim
DCD Wind Towers	Capacity of 200 towers/year, filed for bankruptcy.
GRI Towers	Capacity of 150 towers/year, not running at full capacity owing to REI4P slowdown.
Concrete Towers	At least 5/12 projects of BW4 are making use of concrete towers

3.5.2 Reasons for the delays

3.5.2.1 Growing opposition to renewable energy

There are a various political economy factors that have come into play to both disrupt and threaten the continued rollout of the programme. The period from 2015 onwards has seen growing opposition to IPPs and RE. Despite significant socio-economic development contributions made through REI4P, those that had benefitted from other government procurement – many politically connected – felt excluded from the REI4P. Influence-peddling and rent-seeking became much more difficult because of the transparency of the programme, especially where decisions on investment partners were made by the private sector. Those who had been benefitting from coal contracts with Eskom (the one mining sector that has seen significant entry by emerging local investors), and those who hoped to benefit from a future large nuclear programme, became alarmed at the potential unbundling and break-up of Eskom and the increasing competitiveness and success of solar and wind.

Round 1 and Round 2 were more or less under the political radar screen, but then the volumes increased and prices were competitive. This spawned the growth of lobby and activist groups and social media platforms organized against IPPs and RE, with relative success in promoting a counter-narrative that RE is expensive and is causing Eskom's financial demise. This opposition has been conflated with important, legitimate concerns about the loss of jobs in the coal-mining regions, and the extent to which the RE programme has truly afforded South African companies opportunities for participation (Bowman, 2020; Eberhard, 2020b; Fakir, 2020; Filipova et al., 2019; Morris et al., 2020).

3.5.2.2 REI4P's threat to the minerals-energy complex and state capture

To understand how and why this resistance to the REI4P came about, it is necessary to consider the broader context, as well the challenges facing South Africa's energy sector. Ever since the discovery of gold on the Witwatersrand in the late nineteenth century, minerals have played a pivotal role in

South Africa's politico-economic system. Under Apartheid, the importance of this sector intensified as the Afrikaner nationalist government sought to harness the country's mineral resources to drive industrialization in the face of growing international political opposition and economic sanctions. The result was the creation of a specific form of capital accumulation, straddling the public and private sectors and connecting energy and mining interests, termed the "minerals–energy complex" (MEC) (Fine & Rustomjee, 1996).

The MEC has long been the locus of considerable economic and political power in the country and has maintained this position in post-Apartheid South Africa as part of the broader political settlement (Bowman, 2020). Eskom, South Africa's vertically integrated, monopoly power utility, has been at the centre of this complex, deliberately designed to use cheap, lower-grade coal – mostly from tied collieries – to produce cheap electricity as input to energy-intensive industrial processes and mining activities (Baker, 2015a; Power et al., 2016).

Eskom was also the major focus of a coordinated state-capture project that repurposed state-owned enterprises to extract rents for predatory elites under the Zuma administration (Godinho & Hermanus, 2018). According to Bowman (2020:4): "Eskom's extreme dysfunctionality derives from long-running contestation of the organization and the rents it controls through its monopoly position in the electricity system ... creat(ing) conditions of organizational chaos in which predatory accumulation associated with "state capture" could flourish and further exacerbate Eskom's dysfunctionality."

Thrown into this mess was a long-standing and controversial attempt at procuring an expensive 9,6 GW nuclear power generation fleet – again with Eskom at its centre – ultimately halted by the courts on procedural grounds but, nevertheless, damaging in its undermining of policy certainty and sector stability (Eberhard, 2020b; Fakir, 2020). As a result, Eskom has recently been characterized as "... the single largest risk to the South African economy" (Department of Public Enterprises, 2019: 18).

The REI4P was pulled into this turmoil by virtue of its success in attracting significant investment (>ZAR200bn) through a transparent process, free of the predatory elites, which set it up as a direct threat to the minerals–energy complex, the state capture project and Eskom's continued dominance. Through the prices achieved in BW4 and the expedited bid window, the programme demonstrated that renewable energy (particularly solar PV and wind) was now the least-cost source of new power generation for the country (Bischof-Niemz & Fourie, 2016; McCall et al., 2019; Wright et al., 2016, 2017).

This undermined the ambitions of the country's coal and nuclear interests, disrupting the country's energy planning process and is one of the reasons why the IRP, which was supposed to be officially

updated every two years, took more than nine years to be updated and approved (Eberhard, 2020b; Martin & Winkler, 2014; Steyn, 2016).

REI4P also demonstrated the efficiency and effectiveness with which the private sector could deploy capital in the energy space, in stark contrast with Eskom's expensive execution of its own capital expansion programmes (Eberhard et al., 2014). These results, in combination with REI4P's competitive price outcomes, built a strong case for the further expansion of private power generators in the country's power sector. Finally, the transparency of the procurement programme effectively meant that those who had benefitted from Eskom's repurposed procurement spend and the state capture project were excluded from the country's biggest PPP programme.

3.5.3 Ending the stalemate

3.5.3.1 High-level changes at political level and at Eskom

Ending the stalemate between Eskom and the REI4P ultimately required a change of leadership at the highest level. Matters came to a head in 2017 when former president Zuma replaced the minister of Finance, Pravin Gordhan – who had been blocking a nuclear deal with Russia – with Malusi Gigaba, former minister of Public Enterprises who had been instrumental in the coordinated repurposing of SOE boards (including Eskom) for rent-seeking purposes (Du Toit, 2020; Godinho & Hermanus, 2018; Head, 2019).

While this period had been marked by increasing governance and managerial instability in the energy sector – Eskom had 12 CEOs between 2007 and 2019, and South Africa had had four ministers of energy between 2012 and 2017 – the firing of the finance minister at the time, Pravin Gordhan, was a watershed moment that transformed the contestation in the energy sector into a public factional battle of the ruling ANC party. A coalition of labour (COSATU) and big business (BUSA and BLSA) consequently mobilized against Jacob Zuma under the banner of rolling back state capture to carry Cyril Ramaphosa to victory in the 2017 ANC electoral conference (Bowman, 2020).

One of President Ramaphosa's first orders of business was to replace the entire Eskom board and senior management, and appoint a new minister of Finance (former Reserve Bank governor Tito Mboweni), a new minister of Public Enterprises (Pravin Gordhan) and a new minister of Energy (Jeff Radebe) (Nicolaides & Motau, 2018; Rabkin & Pather, 2018). Minister Radebe ensured that the PPAs for preferred bidder projects from BW3,5 and BW4 were finally signed in April 2018 (Gosling, 2018), but, at that stage, the IPP office had already broken its non-negotiable contracting approach to

increase the BEE shareholding of projects (at the expense of broader community-based shareholding) in an attempt to convince government to proceed with bid-signing⁵⁹.

Projects awarded as part of the expedited round and the small IPP programme were not included either because they were more expensive than the BW4 projects (in the case of the smalls) or their bid validity periods had lapsed (in the case of the expedited round). Eskom was also claiming to have too much capacity at the time, which further dampened the willingness of government – especially National Treasury – to award more projects. BW3.5 and BW4 projects all reached financial close by late 2019 and the first plants reached COD early in 2020 with the remainder expected by mid-2021.

3.5.3.2 Institutional level changes

Apart from the broader impacts on South Africa's energy sector, this period also had several direct impacts on the IPP office. Eskom's refusal to sign the awarded PPAs precipitated a funding crisis for the programme. The fact that the IPP office did not form part of any official departmental budget meant that it was entirely financially dependent on development fees (1% of total project costs) paid by awarded projects on reaching financial close. But for the signing of BW4 PPAs in April 2018, the office – which was a few months away from not being able to pay salaries – would have had to close down. Another important factor was the departure – two months after Malusi Gigaba's appointment – of Andrew Donaldson, deputy director general with National Treasury, who had long been the chief supporter of the IPP programme (Donnelly, 2017). This moment signalled a shift in the IPP office's strategic relationship with government, as the Department of Energy quickly became the more prominent – albeit more ambivalent – partner to the programme.

The weakening of National Treasury's direct support also had long-lasting impacts on the programme and its leadership. The first impact was an attempt in 2017 to move the IPP office to the tainted Central Energy Fund – a state institution originally set up as a sanctions-busting company by the Apartheid regime and which has been at the centre of several controversial deals and SOE management failures in the post-1994 period (Creamer, 2017).

The proposed move was fiercely, and ultimately successfully, resisted by the IPP office leadership, but illustrated how the unofficial institutional setting that made it possible for the office to work in a

⁵⁹ This initially started when Eskom ex-CEO, Matshela Koko, announced that they would only sign bids below ZAR0.77/kWh. Most projects' BEE partners were not willing to accept the lower return on equity that this implied. It was thus decided rather to increase BEE shareholding, instead of lowering prices, in an attempt to increase political support for contract signing.

flexible way was also a potential vulnerability (alongside the office's funding model). Finally, Karen Breytenbach's contract as head of the IPP office with DBSA was not renewed in Jun 2019, a surprising move that was widely criticized by the industry (Creamer, 2019a; Mahlaka, 2019; Watson, 2020). The seasoned and respected former general manager of Eskom's system operator, Bernard Magoro, was appointed as the new head of the IPP office in April 2020 (Creamer, 2020a).

3.5.4 An uncertain future for the programme

Despite the changes initiated by President Ramaphosa's administration, the future of the REI4P programme and South Africa's energy sector remains uncertain and highly contested – making it difficult to maintain bidder trust for future procurement rounds. Jeff Radebe was replaced in May 2019 by former National Union of Mineworkers secretary general, and ANC Chairman, Gwede Mantashe, an influential power-broker in the ruling party (Morris et al., 2020). Minister Mantashe oversaw the (re-)amalgamation of the former department of energy with the former department of Mineral Resources, a prominent reassertion of the staying power and importance of the minerals–energy complex. None of the minister's or (new) department's announcements or decisions have provided much certainty to the renewables sector, with BW5 of the REI4P continually moved out at the same time as new requests for information for nuclear and coal power are launched (Eberhard, 2020).

There have also been several calls by the department of mineral resources and energy, along with the department of public enterprises, for a renegotiation of tariffs for projects awarded in BW1 and BW2 (Creamer, 2019b; Mohlakoana, 2020; Paton, 2019b) as their tariffs and returns are viewed as “out of balance” (Eberhard, et al., 2017; Eberhard & Gratwick, 2011) – a move that has prompted foreign investors in these projects to take out breach of contract and expropriation cover from the World Bank's Multilateral Investment Guarantee Agency (MIGA) (Africa Global Funds, 2020), further eroding trust in the programme.

The lack of policy certainty has been accompanied by campaigning on social media and through direct lobbying against the renewable energy sector, damaging the reputation of the sector and its future prospects (Fakir, 2020; Godinho & Hermanus, 2018). South Africa's Public Protector also launched a probe into the IPP contracts in July 2019 in yet another attempt at delegitimising the programme (Paton, 2019a), after a legal challenge to the programme by the Coal Transporters Forum had been dismissed – with costs – in March of the same year (Bungane, 2020).

In all of this, the fingerprints of Eskom and its protection of the status quo – the MEC – are clearly visible. Meanwhile, the energy transition is accelerating in neighbouring countries, in large part thanks to the experience of and the proverbial “school fees” paid by South Africa.

Still, there are signs that this the current hiatus may be broken.

South Africa’s Integrated Resource Plan was finally approved by Cabinet and gazetted in 2019, and although some coal and nuclear capacity was forced in through a “policy adjustment” process, it made provision for large volumes of renewables, including 8.2 GW of solar PV and 17.7 GW of wind, raising the proportion of electricity produced by renewables to a third by 2030 (Department of Mineral Resources and Energy, 2019).

A draft section 34 determination by the minister has since been approved by the National Energy Regulator of South Africa for concurrence, and the IPP office opened Round 5 of the programme in March 2021 (Creamer, 2020b). Several utility-scale renewable energy tenders were launched by commercial and industrial entities (including mines) in South Africa during 2019/20, powerfully signalling the industry’s recognition of the inexorability of the transition (Bellini, 2020; Kew, 2020; Mfobo, 2019). Even certain sections of organized labour and Eskom’s new executive leadership now acknowledge the undeniable economic advantages of renewable energy technologies (Bloom, 2020; Creamer, 2020c; Steyn, 2020).

The challenge now is to ensure that South Africa’s transition from a coal-dominated power system to one built on low-cost renewables is just – which means that the impacts on workers and communities currently dependent on the coal industry are mitigated through a range of measures, including reskilling and building of renewable infrastructure in coal areas (Bloom, 2020; Cruywagen et al., 2019). The IPP office’s next challenge will be to identify and integrate transition measures into the programme’s design, also being careful to recognize the limitations of a procurement programme to carry and drive macro-level policy agendas in isolation.

3.6 Concluding analysis

This chapter opened by questioning how the design and implementation of the South African renewable energy auction programme resulted in the price and project realisation outcomes outlined above. Answering this question requires analysing auction design choices and possible impacts through the lens of relevant theoretical propositions, in the tradition of Del Rio (2017f), Ferroukhi et al., (2015), Grashof (2020), Kitzing & Wendring, (2015b, 2015d, 2015e, 2015a, 2015c), and Tietjen et al., (2015). It furthermore requires that we analyse how decisions concerning *how* the auction was implemented (Chiu et al., 2010; Colquitt, 2001; Yescombe, 2007) and by *whom* it was implemented (Chan et al., 2010; Dulaimi et al., 2010; Jefferies et al., 2002; Li et al., 2005; Zitron, 2006) influenced bidder trust and consequent bidding behaviour. Finally, any answer would be incomplete if it failed to reflect how the various country- and project-level IPP success factors (Eberhard et al., 2017; Eberhard & Gratwick, 2011), in particular risk mitigation measures, impacted the outcomes.

Table 3.12 summarises for the South African case the contributing elements and their impacts on both project prices and realisation at all three levels – country, programme and project. A more detailed table, including evidence (for example direct quotes, references to specific sections of the chapter or other authored publications), can be found in appendix E. While useful as a quick reference on how the analytical framework was applied in the South African case, table 3.12 should not be read in isolation of the rest of the concluding section, and indeed the rest of the chapter, as our understanding of the causal paths of and interactions between the various contributing elements cannot be fully captured in this format. It does however provide a valuable starting point for the concluding analysis of the South African case.

Table 3.12: Summarised analytical framework - South Africa

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	- SA characterised by relative macro-economic and political stability, although sovereign credit ratings continued to decline during the 2011 – 2019 period. - No evidence of economic and political conditions directly impacting prices or project realisation, with dramatic price reductions and high realisation levels coinciding with sovereign credit ratings downgrades. Some international bidders did however consider these conditions when deciding whether to enter the market (impacting competition levels). SA's loss of its investment-grade credit rating also limited the sources of international capital available, which could have indirectly impacted project prices (though the impact was muted due to the prominence of local debt finance). - Strong, independent judiciary remained intact and supported the legality of the auction awards, which both supported project realisation of awarded projects in later BWs and featured as a decision-making criterion for international bidders, increasing competition levels.
Supportive energy policy framework	- SA's energy policy framework allows IPPs and has RE targets. Electricity Regulation Act amended to increase ministerial powers to circumvent Eskom's influence on the market. REI4P seen as manifestation of energy policy implementation and certainty. - No evidence of the policy framework directly impacting project prices, but policy stability (as manifested by predictable IRP-based REI4P rounds) increased competition levels. Project realisation would have been near impossible without supportive policy. Policy certainty eroded in post-2015 period as Eskom refused to align with government policy on REI4P; IRP processes delayed and threats of renegotiations surfaced, which negatively impacted the realisation timelines of projects awarded post-BW3 and likely reduced competition levels for later BWs.
Regulatory transparency, consistency and fairness	- Serious concerns regarding regulatory tariff-setting necessitated an intergovernmental framework agreement that mitigated this impact on project prices. The predictable licensing process was not identified as a barrier to project realisation.
Coherent sectoral planning	- IRP planning processes and roles clear and allocated to the ministry (although planning capacity remains located in Eskom), but outputs are highly contested. While the IRP initially provided market certainty, this was gradually undermined as contestation increased and finalisation was repeatedly moved out. - There is some evidence of IRP-based bidding rounds increasing competition (thereby impacting prices) by stimulating project pipeline development, but later IRP-based uncertainty limited investor confidence (for rounds yet to be implemented). Limited evidence of the planning framework directly impacting project realisation, though that fact that the IRP was not updated and approved between 2011 – 2019 was used as a reason to delay the implementation of BW5 onwards.
Competitive bidding practices	- The competitive process provided predictability and certainty to the market, stimulating project pipeline development and increasing competitive pressure to reveal bidder costs and reduce margins, and improve project realisation.
PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	- REI4P featured large overall auction volumes – somewhat reduced in later rounds, but still very large for the region. - Significant evidence that large auction volumes, coupled with onerous qualification requirements and short bidding timelines, resulted in low levels of competition in first two BWs, resulting in high prices. There is also evidence that large overall auction volumes attracted significant competition – especially from large, experienced international bidders – and enabled economies of scale, pushing down prices in later rounds. - No evidence of larger auction volumes directly impacting project realisation, but it did indirectly stimulate longer-term market development (incl. support services) and attract experienced, capable bidders that would ultimately support timely realisation.
Scale-friendly project size limits	- SA set large project size limits, although arbitrarily determined.

	- Evidence that project sizes were large enough to enable price reduction through economies of scale – and that project sizes increased as prices reduced - but also that size caps limited further price reductions. Limited evidence of project size caps improving longer-term competition levels. - There is also evidence of larger project sizes leading to longer realization periods, as realization timelines increased over bidding rounds (as average project sizes increased)
Technology choice: neutral vs. specific	- Technology-specific demand bands set out, effectively neutralising competition between technologies. - Evidence that technology-specific demand bands resulted in higher prices since the auctioneer had to award projects to specific technologies, even when cheaper bids for other technologies were submitted. - Evidence of technology-specific demand bands having an impact on project realisation timelines, with wind projects taking longer to be realised than solar PV.
Bid award limits	- No bid award limits set, which enabled larger players to benefit from economies of scale and stronger negotiation positions with contractors, suppliers, financiers – driving down prices. Also seems to have increased market concentration, but not to the extent that it limits competitive pressure. - No evidence of the lack of bid award limits impacting project realisation.
Bidding rounds	- Regular (annual) rolling bidding rounds scheduled and published from BW1. - Evidence that regular, scheduled bidding rounds drove down prices by increasing competition levels (also reducing margins along the value chain), stimulating cost-effective local services development and increasing investor comfort (reducing the cost of capital). - Limited evidence that regular auction rounds had direct impact on project realisation, although there is some evidence that it stimulated capacity building, project pipeline development and limited the possibility of project awards being challenged – all of which indirectly contributed to project realisation.
Winner selection	- Winner selection based on price (70%) and a basket of socio-economic development criteria (30%) - Evidence that the use of SED criteria resulted in higher prices of awarded projects, but no distinguishable impact on project realisation.
Price caps	- Price caps were set and disclosed for BW1 – 3. They were removed for solar PV and wind from BW4. - Evidence that published price caps led to higher prices in BW1 and that they are not necessary when there is enough competitive pressure. Average BW1 prices were above REFIT levels, very close to price cap levels. - No evidence of price caps directly impacting project realization.
Physical (project preparation) qualification criteria	- REI4P used very onerous (late-stage) physical qualification criteria, including funding commitment from debt and equity providers. - The case produced evidence that onerous physical qualification criteria lowered competition levels, which contributed to higher project prices (especially in the first rounds), and that they also slightly increased the costs of bidding. - Substantial evidence that late-stage physical qualification criteria – incl. financing commitment – improved timely project realization.
Financial qualification criteria (bid bonds)	- REI4P required relatively expensive bid bonds (US\$ 8000/MW). - The case produced evidence that the use of bid bonds probably lowered the quantity of bids submitted, but increased the quality of bids by stimulating interest from larger, more experienced bidders – thereby increasing competitive pressure. - There is also some evidence of the bid bond indirectly increasing project realisation by filtering out inexperienced, unfeasible bids. It acted as a first hurdle to ensure bids were credible, financeable.
Auction access requirements limit participation to experienced, capable bidders	- REI4P set high access requirements, evaluating both bidders' experience/technical capacity and financial capacity. - The qualification requirement for demonstrated funding commitment effectively neutralised or at least severely limited the “additional” screening impact of the access requirements, since lenders evaluated developers' experience and financial health as part of their due diligence process. - The high access requirements therefore appear to have had little to no impact on competition levels or project realisation beyond what lenders would already have evaluated.

Penalty regime	- REI4P uses a performance guarantee, a punitive PPA length reduction regime for project realisation delays, and penalty payments for underperformance on SED commitments. Projects also get paid an “early operating period” tariff, equivalent to 60% of their bid tariff. - There is some evidence of penalties exerting upward pressure on prices (though this seems to be offset by the “savings” of not meeting the respective SED commitments that trigger the penalties). - Some evidence of performance guarantees improving project realisation, but this seems to be limited since they have not been used. The early operating period tariff generally incentivises timely realisation, but the threat of the PPA reduction seems to be more powerful.
One vs. two-stage bidding process	- REI4P used a one-stage bidding process; SPI4P used a two-stage process. - Evidence that the two-stage bidding process increased bidding costs (only used in SPI4P), thereby potentially lowering competition levels and increasing prices (see Kruger et al, 2021). There is also some evidence that one-stage bidding process might induce more aggressive bidding. - No evidence of either one or two stage process having a distinguishable impact on project realisation since SPI4P projects’ contracts have not been signed.
Auction format and pricing rule	- REI4P used a simple sealed bid, pay-as-bid auction format that lowered bidding risks (thereby increasing competition) and that has thus guarded against the threat of the winner’s curse for project realization.
Auction Implementation	
Procuring entity	- IPP office was staffed by capable, experienced officials with a track record of successfully working with the private sector. It initially had strong support from National Treasury – arguably the apex ministry in SA. - Substantial evidence that trust in the auctioneer increased competition levels, thereby increasing price pressure, and attracted strong, experienced bidders, thereby improving project realisation.
Procurement process	- REI4P appears to be viewed as a fair, transparent, well-structured and well-run programme, although negotiations for BW4 projects and subsequent developments somewhat undermined this. - Substantial evidence that trust in the procurement process – as distinct from the procuring entity, but also as a signal of the procuring entity’s capability and integrity – increased competition levels (incl. from large, experienced international bidders) that drove down prices and supported timely project realisation. - Limited evidence that a well-designed and implemented process support project realization.
Support to awarded projects	- IPP office supported awarded projects to reach financial close by coordinating government departments and assisting awarded bidders. - Evidence that this played an important role in improving project realisation, and increased competition levels.
PROJECT	
Favourable equity partners	- Most REI4P projects awarded to purely commercial entities – many with no African track record. Later rounds saw significant volumes awarded to large international companies new to the market. - Evidence that competitive pressure in bidding process elevated larger bidders’ ability to reduce costs as a driver of project pricing. - Evidence that larger bidders’ experience, skills and financial standing improved project realization.
Favourable debt arrangement	- Mostly local debt from commercial banks whose lending costs (premiums) contributed to higher prices of first rounds, but who lowered returns in later rounds, enabling lower prices. Local debt enabled projects to match revenue currency with principal and interest payments, reducing currency hedging costs. Lender involvement in REI4P design and sign-off on bids significantly improved project realisation.
Credit-worthy offtaker	- Eskom’s credit rating was deep into junk status, but this risk on project pricing and realisation was largely mitigated by the provision of a sovereign guarantee.
Secure and adequate revenue stream	- Bidders provided with bankable, non-negotiable contracts, including a robust PPA and a sovereign guarantee (in the IA) - backed by the Government Framework Support Agreement – lowering the cost of debt and equity, increasing competition levels and ensuring the bankability (and in turn, realisation) of awarded projects.

Credit enhancement and other risk mitigation measures	- REI4P includes a sovereign guarantee that enabled the provision of long-term debt on reasonable terms and supported project realisation through ensuring project bankability.
Strategic management & relationship building	- Projects were both required and incentivised to make a number of socio-economic development commitments that exerted upward price pressure while also helping secure projects' social license to operate.

3.6.1 Auction design decisions' impacts on project prices: the good and the bad

From a purely auction design perspective, the results from the South African case largely conform to what one would theoretically expect to see: price levels of awarded projects were mainly determined by the degree of competition, which, in turn, were influenced by how the market reacted to key design features of the programme – most notably the auction volume, project sizes, price signals and auction format. The volumes put out to tender were large compared to most international auctions at the time – both in the initial and subsequent rounds. These large volumes attracted bidders by offering the possibility of multiple project awards and increasing the likelihood of success, in turn increasing their willingness to incur the costs of bidding (Ballesteros-Pérez et al., 2016; Friedman, 1956).

The project size caps and technology bands further prompted bidder interest by limiting the likelihood of the entire volume being awarded to a single project (or bidder) (Interview 16, 19). Large project sizes also enabled bidders to exploit economies of scale to increase investment returns (Dobrotkova et al., 2018), further offsetting the costs of bidding (Interviews 8, 18). The (initial) generous price caps, furthermore, established government's pricing expectations and apparent willingness to pay (Interview 16), while the straightforward, well-known sealed-bid, pay-as bid auction format provided comfort to potential bidders that they were less likely to be tripped up by an unfamiliar or overly complex bidding process.

Together, these auction design factors should have resulted in high levels of competition from the first round of bidding. What ultimately depressed competition levels in Round 1 and resulted in the costly initial projects were the onerous physical qualification criteria – requiring a significant amount of time and resources for bid preparation – coupled with a short bidding timeline motivated by the IPP office's eagerness to exploit the window of opportunity presented by COP17 (Eberhard & Naude, 2016; Kruger & Eberhard, 2018). This meant that few bids were ready by the bid submission deadline Interview 19, 23, 30). As a result, there was effectively little price competition in BW1 and the awarded projects secured prices above the 2011 feed-in tariff levels (and close to the BW1 ceiling price levels).

The fact that South Africa's auction was designed as a multiple-round programme from the start meant that it was subsequently able to capture the competition-inducing benefits of these design

choices (Interviews 15, 16, 19, 30). In fact, the high prices of the initial round acted as a powerful market stimulus (Interview 19). Lower auction volumes and ceiling prices further increased competitive pressures in subsequent rounds (Interview 30). The use of bid bonds, along with stringent access requirements and physical qualification criteria, provided a level of assurance to serious bidders that they would not lose out because of overly aggressive, poorly prepared bids by unexperienced untrustworthy developers (Interviews 8, 16, 19).

Consequently, competition levels increased substantially in each bid window, with not only more bidders but, significantly, also increasingly bigger and more experienced bidders participating (Interviews 18, 22, 23, 30, 36). These larger, experienced bidders were able to make use of economies of scale, more bargaining power relative to suppliers and contractors, a lower cost of capital, value chain integration and the benefits of portfolio bidding to rapidly drive down project prices (Kruger et al., 2021; Dobrotkova et al., 2018; Grashof, 2019). This resulted in dramatic price reductions of awarded projects in each round of bidding.

3.6.2 Improving realisation by incorporating lender requirements in auction design decisions

The REI4P analysis, furthermore, shows that auction effectiveness (that is, project realisation rates) is not merely the result of price levels or how advanced projects are in terms of physical preparation at the point of bidding (Haufe & Ehrhart, 2018; Kreiss et al., 2016; Welisch, 2018) but is fundamentally also a function of how investors' – in particular lenders' – due diligence requirements influence the auction's design. The South African case contributes to the auction design literature by pointing out that qualification criteria that advance a project towards eventual realisation do not only include issues such as land and permits (Del Río & Mir-Artigues, 2019; Haufe & Ehrhart, 2018; Welisch, 2018), but ultimately requires sign-off by investors – in particular, lenders.

The fact that REI4P bidders had to provide signed commitments by lenders to fund the submitted projects increased the cost of bidding (especially for these financial institutions), but also ensured that projects were well prepared – beyond what one would normally see using only late-stage physical qualification criteria – and they were able to reach financial close. This use of financial commitment as one of the key qualification criteria is a key reason for the high realisation rate of awarded REI4P projects, since the due diligence done by lenders provided additional rigour (Interviews 19, 24, 26, 36).

3.6.3 Building and maintaining market trust to drive competition and ensure project realisation

Another auction implementation aspect highlighted by the South African case is the impact of developing and maintaining bidder and investor trust, as well as risk mitigation, to drive competition and lower project prices. Competition levels ultimately depend on multiple intentions to bid by many potential bidders – some stronger or weaker than others – influenced not only by the auction’s design, but also by bidders’ risk perceptions of the bidding process and implementing institution, as well as the broader investment context (Chiu et al., 2010; Saussier et al., 2009; Zitron, 2006). Investors’ risk perceptions also influence the cost of capital (Hatzilambros, 2016; Vaaler et al., 2008), which, in combination with the competition levels in the programme, played an important role in determining the price levels of awarded projects.

Many of South Africa’s IPP office’s auction design and implementation decisions were not only motivated by their established theoretical auction impacts (discussed above) but also by whether they sent the right kind of trust-building and risk mitigating signals to the market (Interviews 26, 30, 34, 36) – something that most auction design literature does not take into account when discussing auction design. In a certain sense this represents a novel application of signalling theory in an auction context, which is normally concerned with how and what bidders signal to other bidders or possible investors with their bidding behaviour (Connelly et al., 2011; Levy & Lazarovich-Porat, 1995), and not what the auctioning authority is signalling to the market.

The IPP office’s approach to the design, and implementation of REI4P, was, to a large degree, shaped by an emphasis on building and maintaining trust, with the goal of reducing perceived risk levels (Interview 30, 34, 36). In both its conception and initial execution, REI4P emphasised stability, predictability and respect for the “rules of the game” (Levy, 2014a:18). Considerable resources were invested in ensuring that the bidding process was secure, transparent, and well-structured (Interview 30). These resources were available because the IPP office (initially) had the full backing of powerful key allies in National Treasury and support from DBSA (Boulle et al., 2015; Najam, 1995).

The IPP office was building on a trusted institutional basis created by National Treasury’s PPP unit. The semi-independent nature of the procurement unit – which reported to the DOE, was hosted by the DBSA and (initially) funded by National Treasury – further protected the integrity of the programme (Interview 30). It also allowed the implementing team to shape and implement the programme in a transparent way that emphasised results and quality (Boulle et al., 2015; Najam, 1995). The decision to effectively limit price competition by committing the entire ministerial determination in the first round was also partly motivated by the desire to maintain the trust of developers that had projects

prepared for the feed-in tariff programme, and this played a role in setting of the initial price ceiling levels close to that of the feed-in tariffs (Interview 30).

Finally, the reputation of the IPP office – with its proven track record, not only in terms of ability but also integrity and a favourable view of the private sector, all factors that support trust building (Mayer et al., 1995; Zitron, 2006) – played a pivotal role in securing and maintaining the private sector's trust (Interviews 3, 18, 19, 26, 39, 41) .

The willingness of major international developers to invest in the programme, the convergence of average project prices in later rounds with price levels in lower risk investment contexts and the fact that (almost) all projects reached financial close in reasonable time frames speaks to the market's growing levels of trust in the programme, built on a solid institutional basis shaped by capable, supported and innovative champions in the IPP office (Garud et al., 2007; Lawrence & Suddaby, 2006; Marquard, 2006). These compelling results – increasing competition, lower prices, high realisation rates – support this trust-emphasising focus of the auction implementation process.

It is also through using the lens and language of trust and risk mitigation that the impacts of the country- and project-level IPP factors on the auction results show up most clearly. At the project level, the South African auction designers understood the importance of equity and debt providers to the ultimate success of the auction programme and, consequently, placed their concerns at the centre of the auction process (Interviews 8, 30). The IPP office engaged key private sector stakeholders – in particular, the banks – in the auction design and execution process and maintained clear lines of communication with the wider sector to build and maintain trust (Chiu et al., 2010; Liu et al., 2016).

Stakeholders could see that their requirements were taken seriously through, for example, the provision of project contracts with reasonable risk allocation provisions (Interviews 8, 26). The willingness of South African banks and institutional investors to invest in the programme was critical to its continued success, since their local currency loans effectively shielded projects from the impacts of credit rating downgrades and currency instability in REIP's later years (Kitzing et al., 2021).

3.6.4 The impact of South Africa's political economy

This case study also shows how South Africa's political economy impacted IPP investment sustainability. While Del Rio (2017f) includes the socio-political feasibility of an auction as both an auction outcome and possible determinant of future auction success – influenced by prices, realisation rates and local impacts – this case study has shown how political economy forces beyond the control

of the auction process can, ultimately, derail these investments. South Africa's prominent inclusion of socio-economic development impacts in the auction's design is unique yet appears to have had limited influence in securing socio-political support for the programme.

Surprisingly, this case illustrates how the auction outcomes normally expected to support socio-political feasibility – low prices, large investments, rapid realisation rates, local (socio-) economic impacts, increased foreign direct investment – might be so disruptive that they threaten existing political and economic interests. In South Africa's case these were interests aligned to a controversial multi-billion-rand nuclear buildout programme and lucrative coal contracts with Eskom.

The transparency and competition of REI4P limited the potential for rent-seeking, effectively shutting out many of these interested parties. This resulted in the mobilization of various local power bases, including labour unions, by framing REI4P as a manifestation of neo-colonial conquest through private sector exploitation that is responsible for destroying the country's largest state-owned enterprise and minerals sector. As a consequence, policy certainty and predictability has been undermined as REI4P procurement was halted and this resulted in the erosion of much of the hard-won trust that is so important to the programme's success (Morris et al., 2020).

Chapter 4: Zambia case study

4.1 Introduction

Zambia has become an unlikely poster child for the potential impact and efficiency of renewable energy auctions in Africa. The country's solar PV auctions broke regional price records twice in the space of three years: first, through the Scaling Solar programme in 2016 when the lowest bid was awarded at US\$6 /kWh, and then again in 2019 (GETFiT) with the lowest bid of US\$ 3,99/kWh. These results – perhaps more than any other in this thesis – powerfully illustrate the importance and impact of the programme-level factors, in particular, auction implementation factors. The prices almost seem to defy important country- and project-level factors as the auction outcomes were announced at a time when the Zambian economy was faltering and ZESCO – the national power utility and single offtaker for the projects – was becoming ever more financially distressed.

Initially these results seemed to indicate that a well-designed and implemented auction could relegate most of the country- and project-level factors that normally constrain African private power investment to background issues with no real impact on project outcomes. Nevertheless, getting these competitively priced projects financed and built, and sustaining the momentum that is crucial for capturing the auctions' longer-term impacts, has turned out to be much more difficult, highlighting, also, the importance of the country- and project-level elements for investment sustainability.

Zambia represents an increasingly difficult investment climate, compounded by a utility that is not creditworthy and is in default on payments to IPPs. Still, Zambia has a broad policy, legislative and regulatory framework for private power investment and one of the continent's oldest energy regulators. Historically, this has not led to much private power investment, in part due to the ineffectiveness of the implementing institutions, the lack of a clearly defined pathway to this highly regulated market, poor sector planning, and no competitive procurement processes (Kapika & Eberhard, 2013). Both the Scaling Solar and GETFiT programmes were able to overcome these challenges, attracting experienced debt and equity providers through well-structured, highly competitive procurement processes.

How were these auction programmes able to achieve these expectation-defying results? And why has Zambia been unable to sustain these gains? The core of this chapter is a narrative-based discussion of the rollout of the auction programmes, presented in three periods, and highlighting the roles of the country-, programme- and project-level factors during each phase (Figure 4.1), followed by a discussion which will derive theory-based conclusions.

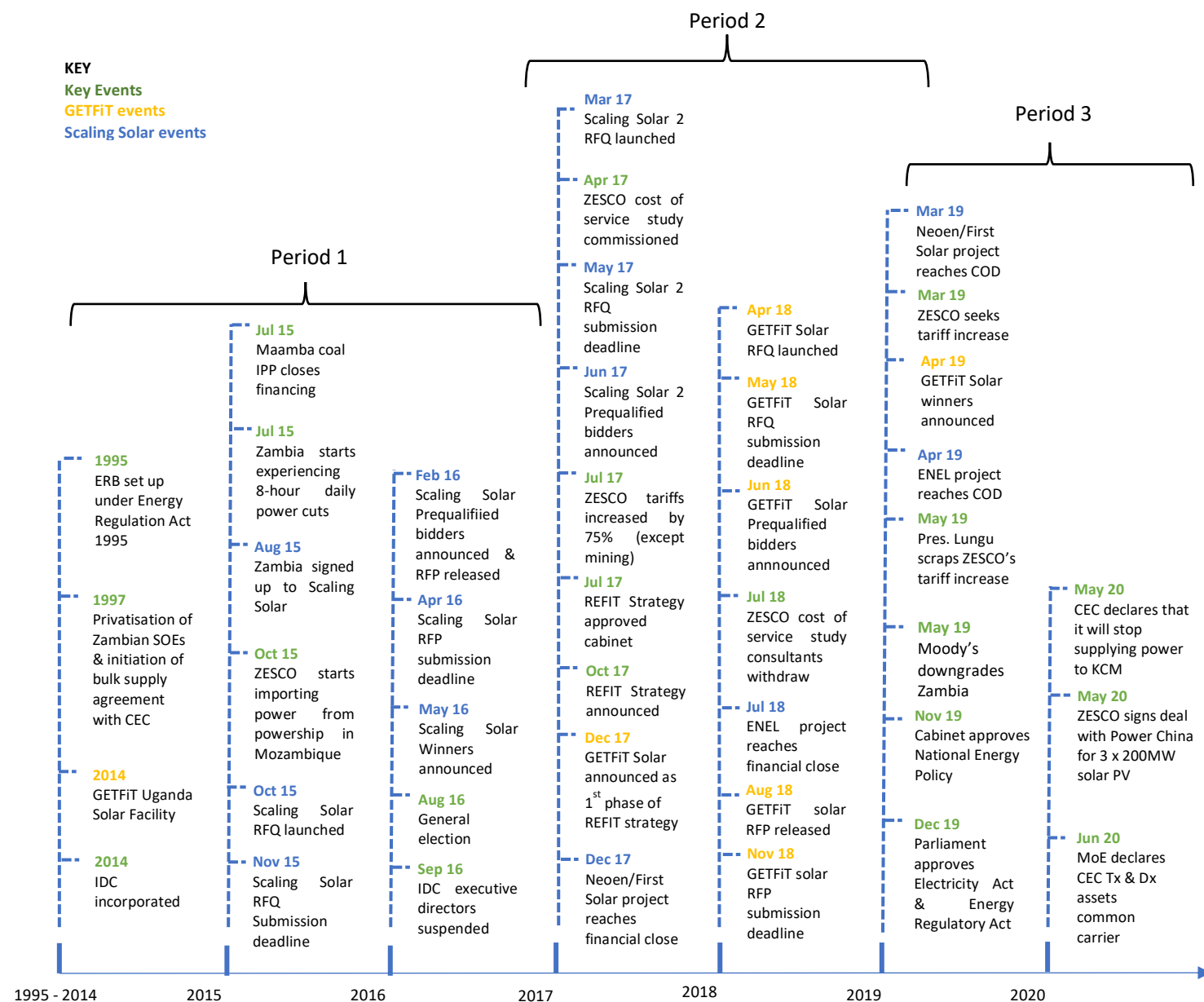


Figure 4.1: Timeline of key events and analytical periods - Zambia

4.2 First period: The right place at the right time

4.2.1 Solving a power supply crisis

Zambia's initiation of renewable energy auctions was precipitated by a set of deleterious circumstances. A severe drought in 2015 caused a 600 MW shortfall in the 2850 MW power system (85% of which is hydro-based) (Mills, 2016; World Bank Group, 2015). The devastating economic impacts of the resulting 8-hour daily blackouts, only months before an upcoming presidential election, coupled with the high costs of importing power from the Southern African Power Pool (SAPP), while, at the same time that the Zambian currency was rapidly depreciating, created a great sense of urgency around finding alternative and timely solutions (Interviews 14, 32, 33).

The newly formed Industrial Development Corporation (IDC), established in 2014 as an investment holding company for Zambia's state-owned enterprises, was tasked by the president with finding such a cost-effective solution (Interview 32, 33). The IDC was looking for a way of evaluating the avalanche of unsolicited proposals from international project developers (many of whom were waiting for the REI4P auctions to recommence in South Africa) aiming to build solar plants but unable to find a viable route to market through the existing institutional and policy processes in Zambia (Interviews 32, 33). The IDC thus approached the World Bank Group's International Finance Corporation (IFC) (Interviews 29, 32, 33) which, providentially, had been developing a programme for rapidly procuring solar power at scale in Africa called "Scaling Solar", based, in part, on South Africa's auction experiences (Fergusson et al., 2015).

4.2.2 The Scaling Solar programme

The Scaling Solar programme was designed to accelerate private investment in Africa by effectively acting as a transnational, large-scale competitive programme, backed by a bankable contractual framework (Ahlfeldt, 2017; Fergusson et al., 2015; Kruger et al., 2019; Kruger & Eberhard, 2018). The design sought to address the main barriers identified by large developers in promising African markets, including limited market sizes, unfamiliar documentation and a range of uncertain costs and risks (Interview 29). In Zambia's case, the programme consisted of the following:

- Project feasibility studies, site selection and legal due diligence (supported by a US\$ 2 million grant from USAID's Power Africa programme)
- Designing and managing a competitive bidding process, with IFC as transaction advisor
- Providing a bankable, standardized set of contractual documents
- Offering stapled finance

- Offering additional risk mitigation instruments (for example, PRGs, MIGA political risk insurance, and so on).

Together, these factors were meant to offer a standardized and replicable solar PV procurement model with significant multilateral backing that translated into low tariffs and rapid project implementation (Kruger et al., 2019; Kruger & Eberhard, 2018).

4.2.2.1 The IDC as a powerful and nimble programme champion

A combination of institutional factors allowed the IDC to respond rapidly and effectively to Scaling Solar's proposals. Zambia's political and administrative system is characterized by highly centralized decision-making processes, inherited from the autocratic Second Republic (which ended in 1995) (Du Plessis, 2006; Fritz et al., 2014; Ofstad & Tjønneland, 2019). The IDC effectively had a direct line to the top of the government hierarchy by virtue of the fact that the Zambian president was also the chairman of the IDC Board (Interviews 1, 29, 32, 33). IDC also had the support of powerful allies, such as the Cabinet Secretary and the Ministry of Finance, and argued that, as shareholder of ZESCO, they had ultimate responsibility for dealing with the country's power crisis (Interview 32). This allowed the IDC to effectively take over certain roles and functions that would normally have resided with energy sector institutions, such as the Ministry of Energy, ZESCO and the ERB (Interviews 14, 29, 32, 33).

This power was wielded by a small IDC team willing to act with urgency and innovation to demonstrate the institution's ability to achieve rapid results. At that early stage, the IDC effectively consisted of two directors and a handful of support staff. The first director – Charles Mate – had a history of private sector experience, having set up the Zambian Stock Exchange and having been involved in several mining and power sector projects. The second director – Andrew Chipwende – had experience working as a public sector official heading up Zambia's privatization agency and the Zambian Development Agency. Together, these two championed the Scaling Solar cause, unencumbered by the bureaucratic processes and decision-making inertia that had become a hallmark of the country's energy sector at that stage (Interviews 32, 33).

4.2.2.2 The quick implementation of a bankable solar PV procurement programme

As a result, the Scaling Solar programme was initiated and implemented in record time. The IDC team was immediately impressed by Scaling Solar's focused approach, and within a month of the initial power cuts, Zambia had signed up to the programme – engaging the IFC as lead transaction advisor

(Interviews 29, 32, 33). 600 MW was announced as the official Scaling Solar procurement volume, divided into separate auction rounds. The first round would procure 100 MW (2 x 50 MW, although bidders were allowed to size their projects between 34 MW and 55 MW), while round 2 was set to procure 200 MW (later increased to 250 MW) (Interview 14). Bidders would compete for a US\$-denominated (to attract international bidders and lenders), non-indexed 25-year PPA with ZESCO, backstopped by a range of risk mitigation measures, through a straightforward sealed-bid, pay-as-bid procurement process (Kruger et al., 2019; Kruger & Eberhard, 2019). A mere two months after signing on to the programme, the official request for qualification was launched (Oct 2015), followed four months later by the release of the full request for proposals to 11 shortlisted bidders (Feb 2016).

4.2.2.3 Access and qualification requirements: an emphasis on bidder quality

The overriding concern for both government and the IFC in Round 1 was to demonstrate that the programme could rapidly deliver additional power at a competitive cost (Interviews , 13, 14, 32, 33). Bidder qualification criteria and performance penalties were thus set at high levels, with the aim of ensuring that only highly capable, well-resourced companies (that is, strong bidders) would compete (Interview 29). Eligible bidders had to have a net worth of at least US\$75 million and needed to deposit bid bonds of US\$1,5 million per project. They also needed to provide evidence of their track record, which needed to include at least:

- one 25 MW solar PV or a 75 MW power plant (any technology) in Africa; or
- three solar PV plants in different countries with an average installed capacity of 100 MW;
- or
- a power plant with 1500 MW installed capacity.

Project reference details also needed to be submitted for proposed EPC and O&M contractors to guarantee project quality and shorten realisation periods (Industrial Development Corporation & World Bank Group, 2016; Kruger & Eberhard, 2019).

4.2.2.4 Penalties and incentives to ensure timely project realisation

The bid bond needed to be replaced by a performance bond of US\$15 million on award that would be in place until a project reached commercial operation. Further performance-inducing incentives included a reduction on a one-to-one basis of the PPA length for every day's delay in reaching commercial operation, effectively shortening the repayment period and squeezing equity returns,

while poor plant performance would result in the project owner having to pay liquidated damages of US\$7500 for every 0,1% that the plant's actual performance ratio was below the contracted number. Timely project realisation was not only incentivised through "stick" control but also through powerful "carrot" reward: early commissioning would see projects being paid 80% of their bid tariff, effectively lengthening the PPA period and resulting in a higher equity return (Industrial Development Corporation & World Bank Group, 2016; Kruger & Eberhard, 2019; ZESCO Limited, 2016).

To keep prices low, the designers of the programme elected not to set minimum local content or local ownership requirements (Interviews 29, 32, 33). To further shorten project realisation timelines, bids needed to be accompanied by signed term sheets from lenders (at least for the one-third of debt not provided by the IFC – discussed further below) (Interview 13, 29). Finally, bids would be evaluated on price alone (Kruger & Eberhard, 2018, 2019).

4.2.2.5 Site selection and preparation

In a further attempt at reducing project tariffs, and making sure projects would be built quickly, two sites (including transmission infrastructure, permits and resource data) in the Lusaka South Multi-facility Economic Zone (LSMFEZ – an IDC subsidiary) were provided, which awarded bidders would need to lease from the IDC (Interviews 28, 29, 32). The IDC also provided site climate studies, grid stability and integration studies, site surveys, environmental and social scoping reports, legal due diligence reports, and tax and accounting due diligence reports. The procurers assumed that the lowered risks and costs associated with the site selection and preparation process would translate into a lower cost of capital and more competition (Kruger et al., 2019).

The LSMFEZ location also came with the added benefit of projects not having to pay tax on profits during the first five years of operation (Interviews 32, 33). Bidders could submit offers for both sites (which all bidders did), but they could only be awarded one of the projects to limit IDC's exposure to possible project realisation problems (Kruger & Eberhard, 2019) – a decision that likely increased competition by improving bidders' probability of being awarded a project, but which also increased the probability of at least one of the project awards being more expensive than needed.

4.2.2.6 Risk mitigation and credit enhancement

A crucial component of the Scaling Solar programme – both in terms of attracting bidders and determining projects' cost of capital – was the provision of a package of risk mitigation and credit

enhancement products (Figure 4.2). This package included a Government Support Agreement (GSA), which covered offtaker default and some *force majeure* risks; letters of credit covering six months of payments, and World Bank partial risk guarantees (PRGs) for payment and loans (if required by lenders). While the GSA essentially fulfilled the same role as a sovereign guarantee, it differed in the sense that the Zambian government would buy the project assets or shares in the project company at a predetermined price (covering outstanding equity, debt and associated costs) in the event of a ZESCO payment default, instead of maintaining ongoing payments to the IPP (Interview 29). The provision of the World Bank PRGs meant that ZESCO did not have to provide cash collateral to cover the letters of credit, since the banks were effectively providing credit to the World Bank (Kruger & Eberhard, 2019).

4.2.2.7 Scaling Solar project prices

The first round of Scaling Solar attracted some of the strongest international bidders in the sector, in large part due to the World Bank Group's prominent presence and role in the programme (Interviews 14, 41), which played a further major role in de-risking the projects in many investors' estimation (World Bank Group, 2018a). Responding to the request for qualification were 48 companies or consortia, and 11 were shortlisted (Imolauer & Becker, 2016) – only seven of which decided to submit a full proposal. The quality of the competitors appears to have had a direct impact on the quantity of bids submitted. At least one prequalified major international developer mentioned the shortlisting of large international utilities able to outprice competitors through economies of scale and cheaper sources of capital (for example, corporate finance) as their reason for not submitting a full proposal (Kruger & Eberhard, 2018, 2019).

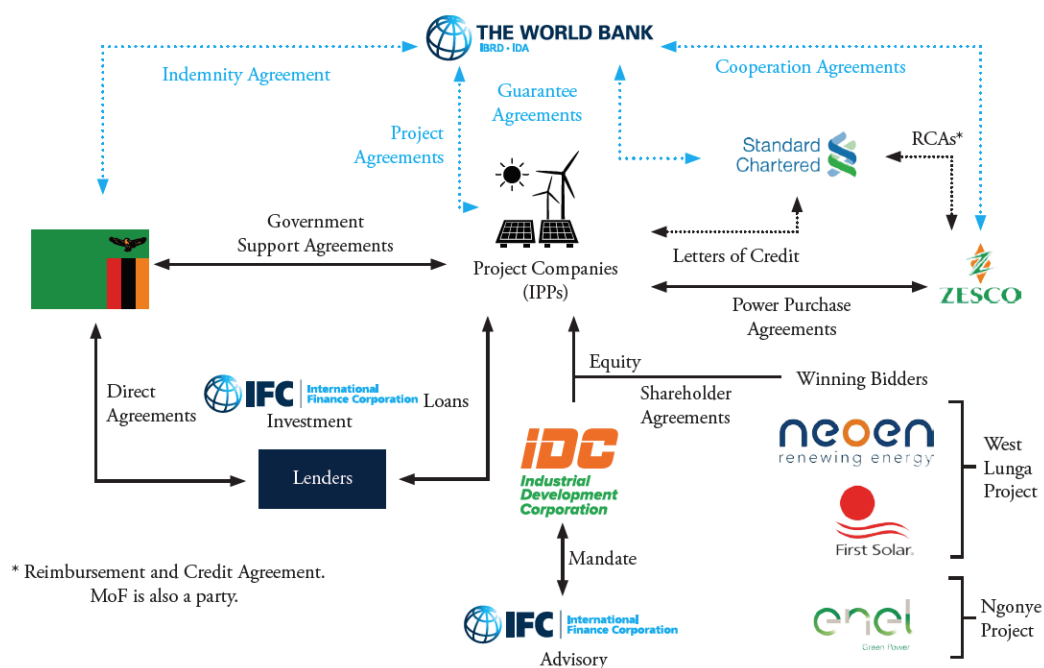


Figure 4.2: Scaling Solar Zambia: Project structure and contractual agreements including guarantee structure (Source: World Bank Group, 2018)

Winners were announced in May 2016 – just in time for the August 2016 general election – at highly competitive prices (Table 4.1): US\$ 6,015/kWh for the West Lunga site, and US\$ 7,83/kWh for the Mosi-oa Tunya site. Had the programme allowed both projects to be awarded to a single developer, the second site would have been awarded at a price of US\$ 6,135/kWh. Some critics claimed that IFC was crowding out commercial financiers, while others noted that the concessional debt created unrealistic market expectations (Dunlop, 2017; Elston, 2016).

Table 4.1: Scaling Solar bid prices US\$/kWh (Source: Kruger & Eberhard, 2019)

Bidders	West Lunga site	Mosi-oa Tunya site
Neoen/First Solar	6.0150	6.1350
Enel Green power	7.7989	7.8390
Access/ EREN Zambia 1	8.2879	8.9509
Mulilo Zambia PV1 Consortium	8.4000	8.4000
EDF Energies Nouvelles	10.0400	9.9850
SEP/AVIC International	10.6000	10.6000

4.2.2.8 Scaling Solar equity providers

Projects were awarded to major international developers with significant financial backing and experience. The West Lunga site project went to a consortium formed by French developer Neoen, with more than 2,8 GW capacity in operation, and First Solar, the second largest PV module manufacturer in the world. The Mosi-oa Tunya site was awarded to ENEL Green Power, a subsidiary

of Italy’s power utility ENEL and the most successful renewable energy project developer in global auctions at the time, with more than 43 GW under management. Apart from the abovementioned shareholders, the IDC also retained a minority (20%) stake in each project at full cost (Table 4.2).

Table 4.2: Shareholding of Scaling Solar projects (Source: Kruger & Eberhard, 2019)

Bangweulu Power Company Limited	Ngonye Power Company Limited
Neoen – 67%	ENEL Green Power – 80%
First Solar – 13%	IDC – 20%
IDC – 20%	

4.2.2.9 Scaling solar debt arrangements

The IFC offered two tranches of debt to strengthen the non-negotiable project contracts: one on “commercial” terms (LIBOR +455–510bps at 17-year tenor), and another on concessional terms (LIBOR +0bps at 20-year tenor) based on grant funding from the Canada Climate Change programme⁶⁰. Neoen/First Solar’s third tranche of debt (US\$19,9 million) was provided by OPIC (US export credit agency) at a blended average of the IFC and climate change loan interest rates, while ENEL Green Power was able to borrow from the European Investment Bank (EIB) (Table 4.3).

Table 4.3: Scaling Solar project debt providers (Source: Kruger & Eberhard, 2019)

	Bangweulu Power Company Limited	Ngonye Power Company Limited
IFC A Loan	US\$12 million	US\$22 million
IFC-Canada Climate Change Programme Concessional Senior Loan	Information not available	Information not available
Parallel Senior Loan	OPIC – 19,9 million	EIB – 11,75 million

Auction results were splashed on the front pages of newspapers and celebrated at ribbon-cutting ceremonies (“Lungu Launches Plant...,” 2016; “Lusaka Solar Power...,” 2016). For Zambia, these were the cheapest sources of power on the grid and offered some hope that the power crisis could be resolved in a rapid and cost-effective manner (Interviews 11, 14, 33). For the IDC, the results proved that this new institution was able to fulfil its mandate and provided the basis for its expansion into other investment areas (Interviews 32, 33). For the World Bank Group, Zambia’s auction was a powerful proof of the Scaling Solar concept (Interviews 14, 29) that soon saw more countries (including Senegal, Madagascar and Ethiopia) signing up to the programme (Sibanda & MacInnis, 2016; Tsagas, 2017).

⁶⁰ Internal IFC sensitivity analyses seem to indicate a price impact of less than US\$10/MWh due to concessional elements in the financing, indicating a limited impact on the market.

4.3 Second period: Divergence

4.3.1 The appearance of positive momentum

The period immediately following the announcement of the results was characterised by a seemingly contradictory set of developments. On the one hand, considerable energy and resources were spent trying to capture the momentum created by the Scaling Solar results. IDC quickly initiated Round 2 of Scaling Solar (increased to 250 MW, from the original 200 MW) with a request for qualification issued in March 2017 (Industrial Development Corporation, 2017). At the same time, KfW's GETFIT programme, which had been struggling since 2014 to get its Zambian renewable energy investment programme off the ground, was finally able to have Zambia's renewable energy feed-in tariff (REFIT) strategy approved by Cabinet, paving the way for yet another procurement programme to proceed.

Zambia's Ministry of Energy even launched their own solar auction in the hopes of reasserting their mandate for the sector, but soon abandoned this once it became clear their process would not be able to deliver prices competitive with Scaling Solar (Interview 14). Finally, there were positive signs around improving ZESCO's financial position as the offtaker, with a cost-of-service study initiated to prepare the way for a more in-depth restructuring process, and tariff increases of 75% approved by the ERB in July 2017 to bring tariffs closer to cost-reflectivity (African Energy, 2019; The World Bank, 2017a).

4.3.2 Project realisation problems and institutional setbacks

On the other hand, there were worrying signs that this positive momentum might be short-lived. The project implementation phase of the Scaling Solar programme was not marked by the same speed and efficiency as the procurement stages, with awarded Scaling Solar projects almost immediately experiencing problems with the allocated project sites and regulatory regime (Kruger et al., 2019). Sinkholes were found on both sites and the geotechnical studies provided by the IDC were not detailed enough to have allowed bidders to fully cost the implications of fixing these (Interview 28, 29). The Mosi-oa Tunya site was also found to extend onto a conservation area, which required a change in law, and resulted in at least a year's delay in commissioning (Interview 2 13, 29, 32). Further delays were caused by the Zambian grid code's incompatibility with solar PV (Interviews 11, 12), which necessitated time-consuming presentations to ERB's technical committee for each exemption required (Kruger & Eberhard, 2019).

The IDC directors that had initiated and driven the Scaling Solar programme were also suspended in September 2016 because of internal conflicts about controversial investment decisions and processes (“IDC Operated without...,” 2018; Mbewe, 2018). This created an institutional vacuum at the time when the awarded projects required a strong host country partner to navigate many of the technical, regulatory and legislative challenges arising during the implementation process, leading to further implementation delays (Interview 12). Zambia’s limited project finance experience, in combination with the IFC’s reduced advisory role post-procurement during the crucial stages leading to financial close, further delayed project implementation (World Bank Group, 2018a). As argued by one of the awarded bidders, navigating the complicated project implementation process ideally required a neutral party (IFC) that could act as an honest broker between the Zambian government and the projects (Kruger & Eberhard, 2019).

In the end, the two awarded Scaling Solar projects took considerably longer to reach financial close and commercial operation than originally foreseen. Neoen/First Solar’s Bangweulu Power Company Limited reached financial close in December 2017 – nine months later than originally planned – and commercial operation in March 2019 16 months later than envisaged (Neoen, 2017; “Zambia Closes in...,” 2017). ENEL’s Ngonye project reached financial close in June 2018 and commercial operation in April 2019 (Groenendaal, 2019).

4.3.3 Cancelling Scaling Solar Round 2

Growing discomfort with ZESCO’s financial and operational performance appear to have ultimately stopped the Scaling Solar programme from fulfilling its original 600 MW mandate. The second round of Scaling Solar never proceeded to the full proposal stage owing to World Bank concerns about ZESCO’s deteriorating financial position (including growing arrears in IPP payments) and government’s seemingly limited appetite to deal with the issues underlying this situation (Interviews 13, 14), even though a strong list of shortlisted Scaling Solar Round 2 bidders were announced in June 2017 (Table 4.8).

4.3.4 The surprising GETFiT programme

It is thus all the more surprising that the GETFiT solar auction was launched during this seemingly difficult time. The GETFiT programme was designed by Deutsche Bank in 2010 after the UN secretary general’s advisory group for energy and climate change asked for new concepts to drive renewable

energy investment in low- and middle-income countries. It combined technical assistance (including developing standardised, bankable documentation), viability gap funding (premium payments, financed by the UK, Norway, Germany and the European Commission) and project de-risking through the provision of liquidity and termination support. Uganda responded positively to this model, and in 2013, Germany's development bank, KfW, and Uganda's regulatory agency, ERA, procured 15 small hydro, bagasse and biomass projects at predetermined feed-in tariff levels. An additional competitive round for solar PV was launched in 2014, resulting in 2 x 10MW projects being commissioned in 2016 (Kruger et al., 2018).

The GETFiT model was subsequently "exported" to Zambia in 2014, with the aim of procuring small-scale renewable energy projects under the auspices of the Ministry of Energy. The programme was initially meant to procure only 50 MW, but this was increased to 200 MW (covering solar PV, wind, geothermal, small hydro and biomass) once ZESCO was convinced that the grid could handle this capacity (Interview 31). Allocated to solar PV was 100 MW (5 x 20 MW)⁶¹.

4.3.4.1 The GETFiT institutional arrangement

The working arrangement between the GETFiT programme and the Zambian authorities was both more confidential, and yet – perhaps as a consequence – also more encumbered than was the case with Scaling Solar. An agency contract from the Ministry of Energy gave KfW the delegated authority to implement the procurement programme; to represent the ministry, and make binding statements and commitments on behalf of the Zambian government. The ministry nevertheless remained deeply involved, and most (even minor) decisions still required sign-off from the permanent secretary, which delayed implementation timelines considerably (Interview 31).

Similar to Uganda, the Zambian GETFiT programme set up an elaborate institutional governance structure (Figure 4.3), comprising a secretariat, a steering committee, an investment committee and a task force. The GETFiT secretariat (staffed by KfW-funded consultants – Multiconsult Norge ASA) was responsible for a wide range of functions, including designing and implementing the procurement programme; contracting advisory services; daily programme management; GETFiT project supervision (including support to achieve financial close and construction supervision to ensure compliance); managing the grid integration programme; building the capacity of the Ministry of Energy, and coordination with programme partners. The Steering Committee – comprising representatives from

⁶¹ Bidders could elect to submit smaller projects, since the 20 MW allocation was only a maximum. All bidders submitted projects at this size ceiling.

the Ministry of Energy (chair), Ministry of Finance, ERB and cooperating partners (German government) as voting members, and the GETFiT secretariat and KfW as non-voting members – was responsible for the programme’s overall strategy. The investment committee was made up of independent (mostly Zambian) experts and reviewed the technical and financial bid evaluations performed by the secretariat. The task force was consulted on the GETFiT programme more generally and included representatives from ZESCO and various government departments (Kruger & Eberhard, 2019).

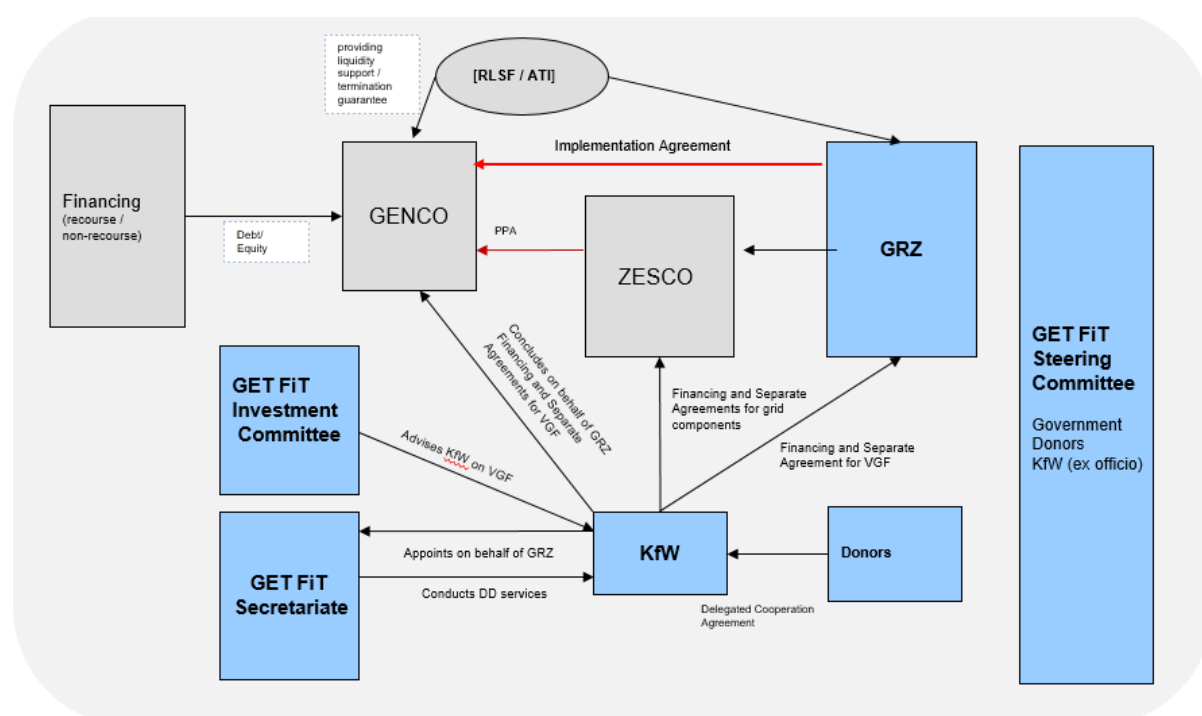


Figure 4.3: GETFiT Zambia’s institutional arrangements (Source: Kruger & Eberhard, 2019)

4.3.4.2 GETFiT: following slowly in Scaling Solar’s footsteps

Not only was GETFiT’s institutional arrangements more thoroughgoing compared to Scaling Solar, but the programme’s overall approach to the bidding process was also more measured (Interview 11) – or generally slower, depending on one’s point of view (Table 4.4). As an example, the project documentation (PPA, Implementation Agreement, Connection Agreement, Direct Agreements, Liquidity Support and principal permits) was developed and negotiated over a two-year period, after which DFIs and commercial lenders conducted early bankability reviews (Interview 31). While this

ensured that the contracts were bankable and adjusted for the Zambian context, GETFiT also took much longer than Scaling Solar to be set up and rolled out.

Table 4.4: Timelines for Scaling Solar Round 1 and GETFiT Solar PV (Source: Author compilation, based on bidding documents)

Scaling Solar Round 1		GETFiT
Phase	Date	Date
Bid announcement	-	11 December 2017
Clarification of announcement #1	-	21 December 2017
Clarification of announcement #2	-	5 February 2018
General guidance note on environmental & social standards	-	5 February 2018
Pre-bid meeting	23 October 2015	7 February 2018 ⁶²
Clarification of announcement #3	-	14 February 2018
RFQ launched	5 October 2015	9 April 2018
RFQ clarification requests deadline	30 October 2015	27 April 2018 ⁶³
RFQ submission deadline	13 November 2015 48 submissions	18 May 2018 41 submissions
Interim rapid grid assessment	-	4 June-13 July
Prequalified bidders announced	16 February 2016 (11 shortlisted)	20 June 2018 ⁶⁴ (10 shortlisted)
RFP released	16 February 2016	31 August 2018 ⁶⁵
RFP submission deadline	8 April 2016 14 proposals from 7 bidders	29 November 2018 ⁶⁶ 15 proposals from 8 bidders
Winner announcement	27 May 2016 2 winners, 2 projects	4 April 2019 ⁶⁷ 3 winners, representing 6 projects
Financial close	21 December 2017 (Neoen/First Solar) July 2018 (ENEL) ⁶⁸	-
Project COD	11 March 2019 (Neoen/First Solar) 29 April 2019 (ENEL)	-

Because GETFiT was only launched after Scaling Solar, it was inevitable that it would be influenced by the Scaling Solar programme, given the path-clearing but also expectation-setting work done by the latter. The PPA provided in the GETFiT programme was, for example, largely similar to the one negotiated with ZESCO for Scaling Solar, with the difference that the operations and maintenance (O&M) component of the tariff (up to 10%) could be indexed to US inflation (CPI). Many of the

⁶² Not compulsory

⁶³ Originally 25 April 2018

⁶⁴ Originally planned for 1 June 2018

⁶⁵ Originally planned for 15 July 2018

⁶⁶ Originally planned for 1 October 2018

⁶⁷ Originally planned for 15 December 2018.

⁶⁸ While financial documents were signed in July 2018, the drawdown has not happened yet, since a number of Conditions Precedent have not yet been met. Construction on the plant, however, started in August 2018.

programme's design decisions were also influenced by the felt need to deliver project prices at, or close to, the levels set by the Scaling Solar programme (Interview 1, 31).

This was a considerable challenge considering that these projects would be smaller, had to find and pay for their own sites, and were not provided with stapled concessionary finance or World Bank risk cover. GETFiT bidders were thus, for example, allowed to submit an optional "conditional" bid in case they were awarded two projects, which would allow them to effectively increase their project size to 40 MW, thereby hopefully reducing the project price (Kruger & Eberhard, 2019).

4.3.4.2.1 GETFiT access and prequalification requirements

The GETFiT bidding process was likewise largely similar to that used for Scaling Solar, with a few important deviations. Bidders were also competing in a two-stage, sealed-bid, pay-as-bid procurement process. Prequalification was mainly based on financial and technical access requirements, which were generally slightly lower than those used in Scaling Solar. Bidders, for example, needed to provide proof that their total assets were worth at least US\$25 million; that their equity-to-total-assets ratio was at least 10%, and that the current ratio was above 0,75%. They also needed to prove that they had the technical experience required by submitting evidence of meeting one of the following requirements⁶⁹:

- Two on-grid PV⁷⁰ projects developed, constructed, and commissioned⁷¹ on an IPP basis with minimum installed capacity of 5 MW each in Africa after 2012, or
- At least 100 MW cumulative installed capacity of solar PV projects developed, constructed and commission on an IPP basis in Africa after 2012, or
- At least 500 MW solar PV IPP projects having reached financial close⁷² globally, or
- At least 750 MW RET-based IPP projects having reached financial close globally (Kruger & Eberhard, 2019).

⁶⁹ For a project to be eligible, the bidder needed to have a minimum of 30% shareholding. This shareholding needed to be in place prior to the project reaching COD (or financial close, in the case of projects not yet at COD), and still applied even if the project has since been sold.

⁷⁰ Qualifying PV projects need to have been operational for at least one year, with a minimum average performance ratio of 78% in Year 1.

⁷¹ Projects needed to have been commissioned in the previous 10 years to qualify.

⁷² When all project and financing agreements have been signed and all CPs to drawdown have been reached. Financial close must have been achieved in the previous five years.

At least one of the projects previously undertaken by the bidder needed to have been commissioned in a country not considered to be a developed economy⁷³. Due to a predetermined limit on the number of bidders that could be shortlisted (in an effort at reducing the transaction costs for the procuring agency) (interview 1), bidders were ranked in the prequalification phase based on the following formula:

*Aggregate sums for bidder members with at least 30% shareholding =
 Total MW of globally installed solar PV in IPP basis (global solar score)
 + Total MW of IPP capacity having reached FC in Africa in last 5 years
 X by number of RE IPP projects having reached FC in Africa in last 5 years (Africa RE IPP score)
 + Percentage points of (envisioned) Zambian ownership/shareholding through Zambian companies (Zambian content score)*

Copyright: Multiconsult (2018)

Financial qualification consisted of a bid bond of US\$15,000 per MW – half the size of the bid bond used in Scaling Solar.

4.3.4.2.2 GETFiT project sites, grid-impacts and proposal documentation

GETFiT also screened proposed projects during the prequalification stage based on their location and likely grid impact. Unlike Scaling Solar, bidders needed to find, secure, and prepare their own project sites within a 10 km radius from a substation with available capacity (a list of substations with their spare capacity was provided to bidders during the prequalification stage⁷⁴). Once shortlisted, the GETFiT secretariat undertook an “Interim Rapid Grid Assessment” (IRGA) power flow analysis meant to confirm grid availability for the shortlisted projects. If a project was found to be unable to connect to its proposed substation during the IRGA stage, bidders could present proposals for addressing this constraint through additional investment in the shallow connection infrastructure or could select a new site. If done within two weeks, a second IRGA could be performed (though it should be noted that this second IRGA was not a prerequisite for full bid submission).

The IRGA did not consider cumulative grid impacts (congestion) that may be caused by the proposed projects, although this was assessed during the full proposal stage. If it were found that two or more

⁷³ Australia, Austria, Belgium, Canada, Chile, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Sweden, Switzerland, Turkey, the UK, USA.

⁷⁴ Substations dedicated to Scaling Solar Round 1 and Round 2 projects would also not be eligible. During the prequalification process ZESCO also informed KfW that they would be building a 100 MW PV project with MASEN (Morocco), and that four substations would no longer be eligible.

projects caused congestion at a particular connection point, the available capacity would be awarded to the highest ranked projects. Projects that required any additional grid strengthening investment (that is, deep connection works) would not be eligible (Kruger & Eberhard, 2019).

Proposed project sites were, furthermore, screened-based on their potential environmental and social impacts and the likelihood of securing land rights. Bids needed to include a draft environmental brief, compliant with IFC social and environmental performance standards, and needed to show that they had the support of the landholders. While this could be addressed through a relatively straightforward (conditional) lease agreement or land title deed in the case of freehold land, it was more complicated in the case of traditional or customary land. These tracts of land would need to be converted into statutory or leasehold tenure land in line with the Lands Act (1995) if projects were awarded. Bidders thus needed to submit an undertaking by the relevant chief in the form of a written undertaking, drafted by the Zambian government, that committed to this conversion if the project was selected.

Bidders seemed to have been unwilling to site projects on traditional land because the bid-scoring process (discussed below) evaluated the likely implementation timeline (which would be negatively impacted by the land conversion process), and because they would be liable for liquidated damages of US\$500/MW per day delay (up to a capped amount). Interestingly, the GETFiT Zambia programme chose not to use increasingly expensive performance bonds to incentivise timely project delivery, a departure from its practice in Uganda and IDC's approach with Scaling Solar (Kruger & Eberhard, 2019).

Projects were expected to be at least at a pre-feasibility stage by the time they were submitted (Interview 1) and technical proposals (Table 4.5) were checked for completeness and compliance before being evaluated. Because bidders were providing their own project sites, the technical evaluation process also included a site visit (Interview 1). Financial proposals (Table 4.6) were evaluated only if bids passed the technical evaluation stage (including approval by the Investment Committee), and required commitments from both lenders (initialled term sheets) and equity investors (letters of support). An innovative clause in the bidding documents determined that projects not reaching commercial operation within 18 months from being awarded would have their financial bids adjusted proportionally to the degree by which PV module costs decreased (or increased) against an international benchmark price (Kruger & Eberhard, 2019).

Table 4.5: Technical Proposal Documentation: GETFiT Zambia (Source: Kruger & Eberhard, 2019)

Document	Required Content
Technical	
Detailed description of site and boundary areas	Site co-ordinates, scale drawing, description of topography, topsoil conditions, obstacles, description of access conditions and restrictions
Detailed description of the conceptual design of the PV plant	Modules, mounting structure, inverters, power transformers, shallow grid connection, balance of plant, O&M procedures
Site-specific yield report	Data sources, incorporation of design concepts, losses due to shading, soiling, cabling; annual and monthly production estimates, yield for Year 1, P50 & P90 estimates for Year 1, 10 and 20
Electrical single diagram	Ownership and operational boundaries, delivery point, substation, shallow grid connection
PQ capability diagram	
Environmental & Social Sustainability	
Draft environmental project brief	E&S min. requirements
Corporate environmental and social management system	As above
Legal	
Consortium agreement	Division of tasks, internal organisation and management, liability, indemnification, confidentiality.
If above not yet executed: MoU for consortium agreement Draft consortium agreement	

Table 4.6: Financial Proposal Documentation: GETFiT Zambia (Source: Kruger & Eberhard, 2019)

Document	Required Content
Financial	
Financial model	For each project plus separate financial models for conditional bids
Initialised term sheet from each envisioned lender and/or guarantee provider	Max/intended amount of loan/coverage; applicable interest rates/pricing; fees; tenor; E&S standards; conditions for final approval; term sheet shall also include statement by each lender/provider to provide the loan/coverage, conditional upon final due diligence
Site-specific yield report	Data sources, incorporation of design concepts, losses due to shading, soiling, cabling; annual and monthly production estimates, yield for Year 1, P50 & P90 estimates for Year 1, 10 and 20
Signed letter of support from equity providers	Availability of required amount (liquid assets); commitment to invest; commitment to make available equity to develop project and bring it to FC in 12–18 months

4.3.4.2.3 GETFiT winner selection

Bid ranking was based on a combined scoring approach (based on KfW's policy procurement disallowing scoring on price only) (Interview 1), weighted on a 80:20 basis in favour of price. The 20 non-price related points (Table 4.7) were meant to incentivise shorter realisation periods, minimal system losses and local capacity building (Interview 1).

Table 4.7: Technical Evaluation Score Criteria: GETFiT Zambia (Source: Kruger & Eberhard, 2019)

Criteria	Points
1. PROJECT READINESS	
A. Technical: details of the project site, resources and contracts	20
B. Additional environmental & social risk mitigation	10
C. Land Acquisition: level of execution of land agreement	5
D. Any other documented project preparation activities tangibly benefiting project maturity and expected project preparation timelines	5
2. SCHEDULED COMMERCIAL OPERATION DATE AS PER PPA	20
3. CONTRIBUTION TO TOTAL SYSTEM LOSSES	25
4. LOCAL CAPACITY BUILDING AND TRAINING	15
TOTAL	100

(Copyright: Multiconsult⁷⁵)

The highest-ranked projects were subjected to a cumulative grid impact assessment which could lead to the rejection of any project found to cause significant congestion. The final award decision also required a no-objection from KfW (Interview 1).

4.3.4.2.4 GETFiT risk mitigation provisions

A potential key shortcoming of the GETFiT programme was its risk-mitigation provisions. Bidders were provided with the same Government Support Agreement used in Scaling Solar, but this was not backed by any kind of multilateral loan- or investment guarantee mechanism. The programme still provided bidders with a commercial letter of credit (valid for 10 years) from ABSA meant to cover nine months' PPA payments through the Regional Liquidity Support Facility (RLSF) (Figure 4.4.), initiated by KfW with grant funding (€31,6 million) from the German government and a matching guarantee from the African Trade Insurance agency (ATI). ATI – an A-rated multilateral⁷⁶ credit and political risk insurer based in Nairobi, with preferred creditor status in its member states and MoU's with ZESCO and Zambia's ministries of Finance and Energy – managed the RLSF (Interview 34). While the liquidity support provided by the RLSF was certainly welcome and necessary, it fell short of the risk-mitigation requirements of lenders, especially as they faced an increasingly insolvent offtaker in ZESCO (Interview 31).

⁷⁵ Multiconsult kindly allowed the use of this information with the provision that its copyright status be clearly identified

⁷⁶ Member states include Benin, Burundi, Cote d'Ivoire, DRC, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, South Sudan, Tanzania, Uganda, Zambia, and Zimbabwe.

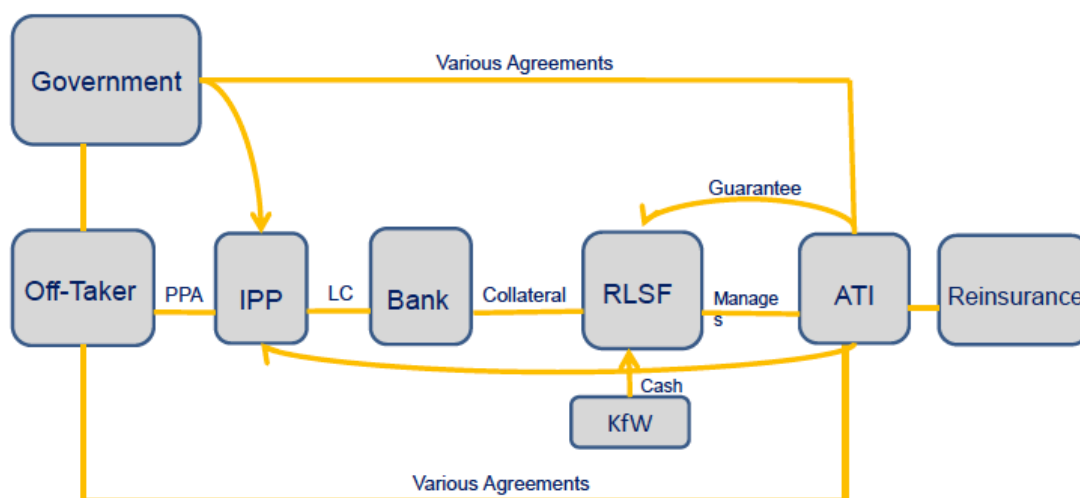


Figure 4.4: RLSF guarantee mechanism (Source: ATI, 2018)

4.3.4.3 GETFiT: surprisingly low project price results

Competition levels were nonetheless close to those seen with Scaling Solar. 41 consortia responded to the request for qualification and 10 were shortlisted. Eight firms submitted full proposals. In yet another interesting departure for the region, potentially interested lenders were invited to make presentations to shortlisted bidders – effectively extending competition to the lending community as well. Several DFIs responded to the invitation, and the AfDB, in particular, knowingly sparked controversy by publicly committing to a very low interest rate on its proposed loan package, which seems to have forced other lenders to follow suit (Interview 31). Six projects from three bidders were awarded, at prices ranging from US\$ 3,999 to US\$ 4,8/kWh – the lowest solar PV tariffs in Africa at the time of their announcement, despite these being smaller projects that had to find and then secure their own sites, without stapled IFC financing and while facing an increasingly risky investment environment and offtaker.

4.3.4.4 GETFiT equity providers

The profiles of the bidders awarded the GETFiT projects is somewhat different from the Scaling Solar programme (Table 4.9), even though several of the same firms prequalified (Table 4.8).

Table 4.8: Shortlisted Bidders: Scaling Solar Round 1 and Round 2 and GETFiT solar PV

Scaling Solar Round 1	Bid submitted	Scaling Solar Round 2	GETFiT solar	Bid submitted
Scatec Solar	No	Scatec Solar	Scatec Solar	Yes
Access EREN Zambia	Yes	Nareva Holdings	Building Energy	Yes
Mulilo Zambia PV consortium	Yes	Acciona Energy, Swicorp, Enara Bahrain	Mulilo Group	No
Neoen/First Solar	Yes	Mitsui & Company	Innovent SAS & Copperbelt Energy Corporation (CEC)	Yes
International Power SA/Engie	No	Engie Global Developments	Engie Afrique	Yes
Enel Green Power	Yes	Enel Green Power	Enel Green Power	Yes
Globeleq	Yes	Globeleq, FRV	Globeleq & Aurora Power Solutions	Yes
Shangai Electric/Avic	Yes	Tata Power Company Limited	Phanes Group	Yes
EDF Energies Nouvelles	Yes		EDF Energies Nouvelles	Yes
Africa Infrastructure Fund2/Old Mutual/Cobra/CDE	No		SolarReserve Development Co	No
Grupo-T Solar	No			

While bids were submitted by many of the largest developers in the region (and, indeed, globally), some of the winning firms had only recently expanded beyond their domestic markets. Building Energy – an Italian developer – has 160 MW in operation, with 81 MW in South Africa and 10 MW in Uganda (awarded as part of the GETFiT solar facility). It partnered with Pele Energy – a South African project developer – as a minority shareholder, the company’s first successful venture outside South Africa. Aurora Power Solutions/SOLA Future – another South African developer and EPC company – had mainly been active in the commercial and industrial solar PV sector in South Africa, Namibia and Mozambique (37,5 MW), but is also a successful developer in the South African REI4P and SP-I4P programmes. Aurora partnered with Globeleq (owned by the Commonwealth Development Corporation (CDC) and Norfund) – Africa’s biggest IPP developer and owner/operator, with more than 1340 MW in operation in South Africa, Cote D’Ivoire, Cameroon, Tanzania, and Kenya. Innovent is a French developer with about 514 MW in operation, 140 MW of which is spread between Senegal, Benin, South Africa, and Namibia. Innovent partnered with the Copperbelt Energy Company (CEC), notable for being the only Zambian shareholder in both the Scaling Solar and GETFiT programmes (apart from IDC’s mandatory 20% shareholding) and a potential positive sign of the development of a domestic market (Kruger & Eberhard, 2019).

Table 4.9: GETFIT Zambia solar project details (Source: GETFIT Zambia, 2019)

Projects	Bidders	Size	Price
Bulemu East & West	Building Energy & Pele Green Energy	2 x 20 Mwac	US\$ 3,999/kWh
Aurora Sola One & Two	Globeleq & Aurora Power Solutions	2 x 20 Mwac	US\$ 4,52/kWh
Garneton North & South	Innovent & CEC	2 x 20 Mwac	US\$ 4,80/kWh

These developments seemed to indicate that the momentum that had been created by Scaling Solar would sustain a deeper transformation of the ailing Zambian power sector. At a project level, the extremely competitive GETFIT results were announced within weeks of the pioneering Scaling Solar projects reaching financial close. At the same time, the Zambian government was developing a new energy policy, a new electricity act and a new electricity regulatory act – approved by Cabinet and Parliament in November and December 2019 – to pave the way for fundamental sector reforms and further accelerated investments (Interviews 14, 31). It appeared that these well-structured, competitive procurement programmes were resulting in transformative momentum at both the project and country levels.

4.4 Third period: Running to a standstill

4.4.1 The impact of ZESCO and Zambia's worsening financial fortunes

The accelerating decline in ZESCO's, as well as Zambia's, fortunes quickly brought much of this positive movement to a halt. It soon became clear that ZESCO was effectively bankrupt, reportedly being more than US\$1 billion in arrears, largely as a consequence of government-negotiated expensive, hard-currency deals for emergency power and unsolicited IPPs (African Energy, 2019; Chakwe, 2019; Garcia, 2018; Hill & Mitimngi, 2019). Zambia's GDP growth rate had, furthermore, fallen to 3% in 2019 from levels above 10% in the early 2000s, driven by low commodity (especially copper) prices, production and profitability difficulties in the copper mining industry and stagnating agricultural output. In addition, aggressive borrowing (88+% debt-to-GDP ratio), a growing fiscal deficit (9% of GDP) coupled with continuing currency depreciation meant that the Zambian state was in a precarious financial position, leading to successive credit rating downgrades in 2019 and 2020, and Africa's first post-COVID bond default (African Energy, 2019; Cotterill & Stubbington, 2020; Fitch Ratings, 2020; Moody's Investor Service, 2019).

Despite the severity of the problems, there appears to be little appetite to deal with the underlying issues. There has, for example, been no real movement on much-needed reforms at ZESCO – officially

blamed on the long outstanding cost-of-service study initiated in 2017⁷⁷, but in large part due to a combination of political economy factors at both the national and sectoral levels (Interviews 14, 31, 35). Zambia has a long history of repeatedly short-circuiting power-sector-reform efforts to maintain the hidden cross-subsidies (rents) in the system and to secure high-level access to the discretionary resources – cash, tenders and jobs – that make its highly centralized, patronage-based system of governance possible (Fritz et al., 2014).

4.4.1.1 Political interference in the Zambian power sector

As economic and financial pressure increased on Zambia and the sector in recent years, there have been several examples of overt high-level political interference that undermined both the governance and the overall financial health of the sector. ZESCO's expensive emergency power purchase agreements and unsolicited IPP deals – directly responsible for the utility's financial distress – were, for example, all negotiated by the Zambian government (in the case of the emergency power deals, shortly before a presidential election) (Interview 35). A surprising announcement in May 2020 also revealed that PowerChina had been awarded 600 MW (the original Scaling Solar allocation) of solar PV projects on an EPC basis through a directly negotiated deal – a move that caught many key energy sector decision-makers off-guard and which appears likely to continue the unfortunate trend of expensive, non-transparent procurement (Largue, 2020; Mavrokefalidis, 2020; Mfula, 2020; Sinynagwe & Marks, 2020). Given the record-breaking solar PV project prices secured through the Scaling Solar and GETFiT programmes, it is difficult to make sense of this decision without seeing it as a cynical attempt at further delaying reforms at ZESCO while also appeasing Zambia's biggest creditor – China (Interview 31).

President Lungu also decided to scrap ZESCO's (ERB-approved) tariff increase in May 2019 (Sinynagwe & Marks, 2020), exacerbating not only the utility's but also Zambia's financial problems while, at the same time, further undermining the sector's governance structures. The Zambian government's extraordinary step of declaring CEC's transmission and distribution lines a "common carrier" in June 2020, effectively nationalizing the private utility's assets in a bid to keep it from suspending power supply to the non-paying, government-controlled Konkola Copper Mines (KCM), certainly did not

⁷⁷ The consultants originally hired to complete the study cancelled their contract in 2018 citing political interference and a lack of support and access to information. New consultants were hired only in December 2019.

improve investor sentiment either (Hamilton, 2019; Sinynagwe & Marks, 2020). This decision meant that ZESCO now had to maintain power supply to a major, non-paying customer, further intensifying its financial problems (Interview 35).

Zambia's "governance by centralized discretion" system is propped up by powerful narratives about the country's colonial history and resentment about the controversial privatization programme of the 1990s, which many saw as stripping Zambia of its crown jewels – the copper mines, along with several state-owned enterprises (Fritz et al., 2014; Larmer, 2005; Mususa, 2014). This resentment is compounded in the energy sector by the fact that the best customers – the mines, which contribute 80% of ZESCO's revenues and pay their tariffs in hard currency – belong to CEC, which was also privatized in 1997 (Interviews 31, 35). There is thus a great deal of sensitivity about the role that seemingly Western-backed, foreign, private sector interests play, especially in the infrastructure sector (Fritz et al., 2014). Long-standing battles about mining royalties, as well as a controversial electricity bulk supply agreement to the mines (which consume about 50% of the country's power) are ongoing manifestations of this tension (African Energy, 2019; Mills, 2016, 2019a, 2019b; Sinynagwe & Marks, 2020).

4.4.1.2 Realisation impacts on GETFIT projects and the Africa GreenCo model

As a result, none of the GETFIT projects have been able to advance to financial close, with lenders insisting on faster and more drastic measures to clean up ZESCO's balance sheet as well as insisting on additional risk mitigation cover (Interviews 1, 31). No such movement appears to be forthcoming. A faint light at the end of the tunnel is the possibility of changing the offtaker to Africa GreenCo – a new, as-yet-untested independent intermediary offtaker, styled on India's SECI model.

Africa GreenCo's proposed approach is to act as an investment-grade offtaker for IPPs in the Southern African region that will be able to sell power to multiple entities – including large industrial and commercial consumers as well as other national utilities through the Southern African Power Pool – in an attempt to offset some of the risks involved in these deals. Africa GreenCo has received a US\$45 million guarantee from the French Development Agency (AFD), backed by the European Fund for Sustainable Development, to provide capital protection to commercial lenders (Africa GreenCo, 2017). By diversifying the pool of possible offtakers, it is hoped that the model will increase the bankability of projects that would normally require a suite of risk mitigation and credit enhancement products.

In the case of Zambia, Africa GreenCo will, for example, sign back-to-back PPAs with ZESCO, but will also be able to sell directly to CEC, the mines or to other large consumers thanks to the recently passed

energy regulation act (2019). This could dampen the impact of a possible ZESCO payment default and offers some comfort to project investors. At this stage, it is unclear whether the already procured GETFIT solar projects will be able to make use of this proposed model as it would potentially open up the procurement process to a legal challenge (Interviews 1, 31, 35). It does however remain an interesting and potentially transformative model that could unlock much more power sector investment in the region.

4.5 Concluding analysis

This chapter opened by posing two questions: How did Zambia's auction programmes manage to achieve such expectation-defying price results? And why was the country unable to sustain this momentum by ensuring the realisation of the awarded GETFIT projects? The preceding analysis has shown that the Zambian case defies easy categorization and simple explanations. Table 4.10 provides a summarised analysis of the contributing elements at country, programme and project levels in Zambia – again with the important caveat that this should not be read in isolation of the rest of the concluding section or chapter. While country- and project-level factors have some relevance, Zambia's experience highlights the importance of the auction implementation factors in explaining the auction price – and to a lesser extent realisation outcomes. These, and other findings, are discussed in further detail below.

Table 4.10: Summarised analytical framework – Zambia

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	- Zambia characterised by relative political stability, but rapidly worsening economic conditions, leading to sovereign loan defaults in 2020. - No evidence of economic or political conditions directly impacting project prices, but significant evidence that project realisation (GETFIT) adversely impacted by worsening economic situation. - No evidence of the impact of the judiciary on prices or realisation, although the impact of Zambia's relatively low scores on judicial quality are mitigated by offshore arbitration clauses in project documents.
Supportive energy policy framework	- Zambia's energy policy framework allows IPPs, but did not provide a clear route to market for projects. - This did not directly impact project prices or realisation (beyond being a binary constraint).
Regulatory transparency, consistency and fairness	- Zambia's regulator is generally seen as technically competent, but regulatory decisions were undermined by political interference. - This impacted price levels by requiring further credit enhancement and risk mitigation cover, which would be a cost to projects. - It also impacted project realisation for GETFIT projects by disrupting the security of the revenue stream. - The regulatory framework was also not suited to solar PV, which delayed the realisation of the Scaling Solar projects, nor was all information on licensing costs etc. included in the procurement package (which could have derailed project realisation).
Coherent sectoral planning	- Zambia has no coordinated power generation expansion plan; decisions on procurement volumes were made arbitrarily.

	- No evidence of this impacting project prices or realisation rates beyond limiting project pipeline development.
Competitive bidding practices	- The competitive bidding processes provided a viable, predictable route to market and harnessed competitive pressure between interested developers to reveal bidder costs. - Some evidence of the time-bound competitive bidding process helping the first (Scaling Solar) projects reach financial close and commercial operation by e.g. doing preparatory work on the site and project documents.
PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	- The auction volume for both Scaling Solar and GETFIT programmes were relatively large for the region (100+ MW) – attracting significant competition, including from large, experienced international bidders – but still small enough to ensure competitive pressure. - No evidence of project sizes directly impacting project realisation (beyond attracting larger, experienced bidders better able to secure funding and ensure realisation).
Scale-friendly project size limits	- Both Scaling Solar and GETFIT programmes allowed bidders to optimise project sizes, enabling economies of scale, although higher limits would have achieved even greater economies of scale and better prices. - No evidence of project sizes directly impacting project realisation.
Technology choice: specific vs neutral	- Both programmes only procured solar PV, mainly due to the technology's cost competitiveness, simplicity and ability to be built quickly. - No evidence of this having a direct impact on price or project realisation.
Bid award limits	- Both Scaling Solar and GETFIT used bid award limits, resulting in higher prices for awarded projects in both programmes. - No evidence of this impacting project realisation.
Bidding rounds	- Neither Scaling Solar nor GETFIT had dedicated rounds, though it could be argued that GETFIT effectively functioned as a second round of Scaling Solar – which increased pressure to reduce prices. - No evidence of a direct impact on project realisation.
Winner selection	- Scaling Solar used price-only scoring, while GETFIT scored projects on a 80:20 Price:Technical basis. - No evidence of significant price impact either way, nor did the project preparation level scores in the GETFIT process impact projects' realisation.
Price caps	- No price caps set. It seems to have created downward price pressure. - No evidence of this impacting realisation rates.
Physical (project/bid preparation) qualification criteria	- Scaling Solar provided the project site, basic data and grid connection provided. Physical qualification requirements were therefore very relaxed. GETFIT projects' qualification requirements were slightly more onerous: needed to find own site (though no existing lease/ownership agreement required) and basic environmental scoping report. In general, both programmes were quite relaxed. - There is some evidence of this impacting price by decreasing bid preparation costs – increasing competition levels – and reducing project costs. - There is also evidence of site provision negatively impacting project realisation timelines.
Financial qualification criteria (bid bonds)	- Scaling Solar set very high bid bond levels, as did GET FIT (though lower than Scaling Solar). - This lowered competition levels, but likely also increased competition between remaining bidders (of which there were more than enough qualified) by signalling that they were all financially capable and serious. - Evidence that bid bonds supported project realisation for Scaling Solar, though their impact was neutralised in GETFIT due to macro-level challenges.
Auction access requirements (experience and financial standing)	- Both Scaling Solar and GETFIT asked bidders to provide evidence of reference projects (incl. minimum size requirements, differentiated by region), financial standing (net worth/financial standing) and signed heads of contracts with EPC and O&M companies. - This limited competition from smaller firms, but again also signalled the strength and seriousness of the remaining bidding pool (though it is not clear that this impacted pricing levels). - Some evidence of these experienced, financially-capable firms in Scaling Solar being able to navigate the complexity of the pioneering financial close and construction

	processes, despite almost no assistance being provided by IDC or the IFC – impacting project realisation.
Penalty regime incentivises timely project realisation	- Scaling Solar and GETFIT both featured robust penalty regimes, though GETFIT did not include a performance bond. - There is evidence of this impacting price levels, but little evidence of a significant positive impact on project realisation.
Staged bidding process	- Both Scaling Solar and GETFIT used two-stage bidding processes. - There is evidence of this reducing the number of bidders, lowering competitive pressure, though qualification requirements in the EOI/RFQ stage were low enough (limited to experience and financial health) that it did not impose a significant participation cost or increase the overall cost of bidding. - No evidence of a direct impact on project realisation.
Auction format, pricing rules	- Both Scaling Solar and GETFIT used sealed bid, pay-as-bid auction processes. - These simple formats lowered bidding risks, increasing competition levels.
Auction Implementation	
Procuring entity regarded as capable, benevolent, supported, having integrity	- Significant evidence of trust in the institutions supporting the procurement programme (IFC, KfW/GETFIT secretariat) and their advisors having an impact on competition levels and resulting prices. - Limited evidence of a direct impact on project realisation, though it did help in attracting experienced developers that were able to close projects in challenging circumstances (for Scaling Solar, at least).
Procurement process regarded as fair, transparent	- Strong evidence that trust in the procurement process was an important driver of competition in both Scaling Solar and GETFIT, which impacted price levels. - Limited evidence of this directly impacting realisation, but the fact that the programmes were able to attract experienced, financially capable bidders to a risky investment context meant that there was a higher likelihood of awarded projects being realised.
Support to awarded projects	- Limited evidence of this positively impacting project realisation. Scaling Solar projects were facing an IDC in turmoil/transition post-award, while the IFC had stepped away; they were therefore largely having to “fend for themselves”. The GETFIT political counterparties appear to have limited power and appetite for getting these projects realised.
PROJECT	
Favourable equity partners	- Both programmes awarded projects to international, experienced, financially capable bidders that were able to use their scale, networks and negotiation positions to reduce costs and prices as much as possible. In the case of Scaling Solar, these investors, alongside the IDC shareholding, helped get projects over the line.
Favourable debt arrangement	- Debt for all awarded projects was provided by DFIs and export credit agencies – often at very concessionary rates. - There is strong evidence that this impacted prices, but limited evidence of this impacting project realisation.
Secure and adequate revenue stream: off-taker, contracts, risk mitigation	- Both programmes provided what was judged at that time to be bankable contracts, including risk mitigation – though there was not multilateral cover in place for GETFIT. This proved to be particularly important due to the severe financial problems with ZESCO, which necessitated increasing levels of risk cover. - There is evidence that this impacted price levels by increasing competition levels and reducing the cost of capital. - The “belts and braces” approach to risk mitigation in Scaling Solar played an important role in getting projects to financial close and commercial operation. ZESCO’s deteriorating financial position, the government’s seeming inability or willingness to deal with this and the resultant inability to get additional risk cover made it impossible to close the GETFIT projects.
Strategic management & relationship building	- Scaling Solar projects featured mandated minority shareholding from IDC (at full cost), which did not appear to impact prices. GETFIT projects did not feature local shareholders as a rule (except for two projects with CEC shareholding). - There is limited evidence of IDC shareholding helping the projects reach financial close and commercial operation.

4.5.1 Project prices

4.5.1.1 Limited impact of auction design decisions and country- and project-level factors

Making sense of the record-breaking prices achieved in both the Scaling Solar and GETFiT programmes at first appears to defy much of the theoretical propositions put forward by the auction design literature. The overall auction volumes were relatively small (100 MW in each case) and project sizes similarly limited to between 20 and 50 MW each⁷⁸. While these sizes are relatively common in the sub-Saharan region, they are considerably smaller than the average international auction project (IRENA 2017c, 2019; Kruger et al., 2018). Bid bond levels were set high – especially for Scaling Solar – as were auction access requirements. It is thus surprising that both programmes attracted significant levels of competition, especially in terms of the number of bidders, though it is perhaps to be expected that the high auction access and qualification requirements would strengthen the qualitative aspect of competition.

Analysing these prices from the perspective of the country- and project-level IPP factors does not fully help us understand why prices were so competitive. The auctions took place during a period of constrained economic growth and with little evidence of successful Zambian IPP investment experience. While both programmes provided bidders with standardized, bankable contracts (including risk mitigation and credit enhancement cover), ZESCO's rapid financial deterioration – including growing payment arrears – hardly inspired investor confidence (Interviews 31, 35).

Instead, the analysis seems partly to confirm Dobrotkova et al.'s (2018) contention that ultra-low, expectation-defying auction prices are largely the result of a combination of concessional finance (mainly debt) and a range of measures meant to reduce project costs and risks, such as the provision of project sites and transmission infrastructure. The first round of Scaling Solar seems to confirm this theory, but the results from GETFiT's solar auction – where none of these factors were in place – limits its explanatory power⁷⁹.

⁷⁸ Although the GETFiT projects could be combined, to 40MW.

⁷⁹ It could perhaps be argued that the GETFiT results should not be taken too seriously, as these projects have thus far failed to reach financial close and might not represent "real" bids. Still, these bids were submitted by experienced bidders, with lender commitments, and cannot be disregarded, despite the implementation delays.

4.5.1.2 The importance of bidder trust and market expectations

The Zambian case rather seems to show that the strong competition and aggressive bidding in both the Zambian Scaling Solar and GETFiT programmes was primarily the result of bidders' high levels of trust in the auctioning authorities (Chiu et al., 2010; Mayer et al., 1995) – leading to strong competition – and their consequent pricing of risk. This high level of trust was, in turn, predicated on the prominent role of international finance institutions in both programmes, leading bidders to believe that not only would the programmes be well structured, fair and investor-friendly (which they were – Interviews 8, 12, 16, 19, 40, 41, 43) (Chiu et al., 2010; Zitron, 2006), but that they were essentially bidding on the basis of World Bank/IFC or KfW risk – and not on Zambia's risk (Interview 14, 16).

The Zambian auctions effectively benefitted from the risk-mitigating “halo effect” that usually accompanies the presence of DFIs in IPP transactions (Eberhard, et al., 2017; World Bank Group, 2018a), extending this effect into the realm of auction implementation. This assertion is supported by Scaling Solar price results in Senegal (Euro c 3,8/kWh) (Tsagas, 2019; World Bank Group, 2018b) and Ethiopia (US\$2,5/kWh) (Tsagas, 2019), both of which defied market expectations and appeared to subvert many of the country- and project-level risk factors that generally influence project pricing (Gratwick & Eberhard, 2008b; Steffen, 2020; Vaaler et al., 2008).

The timing and sequencing of the GETFiT programme specifically also impacted competition levels and project pricing (Interview 31). While the GETFiT programme did not directly benefit from the concessional and risk mitigating factors provided by Scaling Solar, GETFiT bidders were still guided in their bidding behaviour by the pricing expectations set by Scaling Solar, almost as though GETFiT were a second round of Scaling Solar (Interview 1, 31).

GETFiT was also launched more than four years after South Africa's REI4P entered its prolonged hiatus. Many companies set up in response to, or invested in, the South African programme – some of which had specifically entered the market because of downturns in, for example, the European renewables market – were thus desperately looking at the rest of the African region for investment opportunities. It is probable, therefore, that the aggressive bidding in GETFiT was driven partly by the necessity of securing ongoing operational revenue while companies waited for REI4P to recommence (Interview 31).

4.5.2 Project realisation

4.5.2.1 The impact of stringent access and qualification requirements, risk mitigation measures

Despite the impressive prices, the real test was always going to be whether these projects ended up being built. Analysing the auctions' effectiveness strengthens the case for setting high qualification criteria and incorporating robust risk mitigation factors in new auctions' design, especially in risky contexts, but also highlights the limits of auction design in the face of overwhelming country- and project-level risks. The Scaling Solar projects (eventually) reached commercial operation, despite the low prices and a range of implementation hurdles, largely thanks to the awarded bidders' financial strength and operational experience (Interviews 12, 26). Once operational, the suite of risk mitigation measures – including the presence of the World Bank Group – has been particularly important for the projects' sustainability as the Scaling Solar projects' invoices continued to be paid at the same time that ZESCO was being sued by other IPPs for payment delays (Haverty, 2020; "Zesco Sued by...", 2020).

4.5.2.2 Institutional quality influenced by institutional work

The analysis furthermore both supports but also undermines arguments around the influence and determinants of institutional quality on auction effectiveness (project realisation). While both the Scaling Solar and GETFIT programmes featured prominent involvement of DFIs, the local institutions charged with implementing the programmes played a determining role in their timely initiation, execution and, to a lesser extent, completion (or not).

The newly established and agile IDC, with its direct line to the President and support from National Treasury and the Cabinet Secretary, was able to quickly set up and roll out the Scaling Solar programme. IDC was staffed by capable institutional champions willing to challenge and redirect institutional resources to ensure the ultimate effectiveness of the programme (Interviews 1, 14, 31, 32, 330).

In contrast, the GETFIT programme languished for years in the corridors of the existing governmental institutions (including the Ministry of Energy and the regulator) and when eventually rolled out, it remained captive to these institutions' limited capacity, decision-making power and unwillingness or inability to act as institutional champions for the programme (Interviews 1, 31), ultimately undermining the successful realisation of the projects (Boulle et al., 2015; Lawrence & Suddaby, 2006; Levy, 2014a; Marquard, 2006; Najam, 2010).

The implication seems to be that institutional quality underpinning effective auction implementation is less concerned with slavish adherence to existing institutional rules or dependence on existing resource flows (Marquard, 2006), and more concerned about the, at times, opportunistic and disruptive institutional work needed to ensure implementation success (Boulle et al., 2015; Najam, 1995).

4.5.3 Political economy factors undermining long-term auction roll-out and Zambia's power future

This still leaves unanswered questions concerning Zambia's seeming inability to take full advantage of the auctions' benefits. While the prices achieved seemed to indicate that the right mixture of programme level factors could compensate for less than satisfactory country- and project-level success factors, the inability of the GETFiT projects to advance to financial close, alongside the scrapping of Round 2 of Scaling Solar, is a powerful reminder of their enduring importance. On the surface, the issue appears to be ZESCO's deteriorating financial position and its consequent unsuitability as offtaker counterpart to these IPPs, a reminder of the critical importance of project level factors as contributing elements of success.

One would expect that the GETFiT prices, alongside the urgent need for more power, the 100% realisation rate of the first Scaling Solar projects and the local shareholding in at least two of the GETFiT projects would provide a powerful impetus to address this situation. Instead, the Zambian case highlights the enduring importance of a country's political economy in determining IPP success. The fact that there have been no real attempts to implement the reforms required to improve ZESCO's operational and financial performance, at a time when the country is experiencing daily blackouts (and has been since 2015) and is defaulting on its international bond obligations, confirms that there remain powerful interests served by an unreformed utility (Fritz et al., 2014).

At this stage it is unclear what the future holds for the Zambian power sector, and what role auctions might play in it. The auctions succeeded in demonstrating – quite powerfully – that transparent, competitive procurement can unlock affordable, privately financed power generation investment for the country. While this has not directly led to further procurement rounds one would have hoped for, it might have helped create the space for increasing private power sector participation, facilitated through the likes of Africa GreenCo. At the same time, continuing attempts to prop up a hollowed-out ZESCO without doing the hard work of improving its performance and overall sector governance will undermine the sustainability of the sector in the medium- to long-term.

Chapter 5: Namibia case study

5.1 Introduction

In the space of five years, Namibia's power sector has quietly undergone a rapid and fundamental transformation. In 2015, the country had no utility-scale renewable energy installations, and no private power sector investment. NamPower – the state-owned power utility – owned and operated 424 MW of installed power generation assets – mostly hydro, coal and HFO-based – and covered the shortfall in demand (around 60%) with imports from South Africa and the Southern African Power Pool. Fast-forward to 2020 and Namibia had the fourth-most IPPs in sub-Saharan Africa – all renewable energy based – representing more than 25% of the country's installed generation capacity (Alao & Kruger, 2020). This does not include the rapid growth in renewable energy-based embedded generation installations, which increased the contribution to at least 31%. The transformation has been accompanied by some of the lowest solar prices in the region – US\$6,3/kWh in 2016, and US\$2,9/kWh in 2020 - achieved without any risk mitigation or credit enhancement measures provided by the state.

In a certain sense, the Namibian case is probably the best regional example of the cumulative impact of a well-designed procurement programme implemented in a conducive, enabling environment. At a country level, Namibia is generally viewed as a stable democracy with moderate economic growth underpinned by solid macroeconomic fundamentals and strong institutions – especially the judiciary and the electricity sector regulator, the Electricity Control Board (ECB) (African Development Bank, 2020; Dalrymple, 2020; Fauconnier et al., 2017; Kruger et al., 2019; United Nations Namibia, 2019; UNPAF, 2017).

Although energy sector policies and regulations in the past have commonly made provision for private power investment, recent years have seen the promulgation of increasingly supportive policies for IPPs, renewable energy and distributed generation (Kapika & Eberhard, 2013; Kruger et al., 2019; Ministry of Mines and Energy, 2016b, 2017b; The Namibian, 2019). The ECB has, furthermore, presided over a market reform process that has opened up the sector to accelerated investment through publishing new market rules (Electricity Control Board, 2019; The Namibian, 2019).

Until 2018, NamPower had the curious distinction of being the only utility in sub-Saharan Africa with an investment-grade credit rating⁸⁰, thanks in large part to cost-reflective end-user tariffs and good

⁸⁰ NamPower's credit rating was revised from BBB- to BB+ (2019) and BB (2020) based on downward revisions of the sovereign's credit ratings and its high reliance on power imports from Eskom, which itself has faced

management (African Development Bank, 2020; Eberhard et al., 2019; Kaze, 2014; Reuters, 2017b). In the past, these positive country level factors resulted in less than a handful of private power projects being developed, mostly through directly negotiated processes at relatively expensive tariffs. The implementation of a feed-in tariff programme accelerated the pace of investment but did not drive down the cost of power. It was only when Namibia implemented a competitive procurement programme – after an early false start – that the country was truly able to take full advantage of its abundant renewable energy and land resources.

This chapter seeks to understand how the country-, programme- and project-level factors worked together to achieve these remarkable price and project realisation outcomes, tracing the development of the sector and, in particular, the renewable energy auction programme through various iterations over a five-year period. In doing so, the chapter also seeks to uncover what it is about Namibia that allowed the country to embrace the transformative impact of these renewable energy investments – something which seems to have been much more difficult to sustain in many other African countries, despite similar price and investment outcomes.

The core of this chapter is a narrative-based discussion and analysis of the rollout of the auction programme, presented in three phases, and highlights the roles of the country-, programme- and project-level factors during each phase (Figure 5.1). The concluding discussion at the end of this chapter derives theory-based conclusions based on the analyses of Namibia’s experience.

multiple downgrades in recent years. NamPower, nevertheless, remains the strongest performer among its peers, including Eskom, Saudi Electricity Company and Poland’s PGE (Fitch Ratings, 2019a, 2019b)

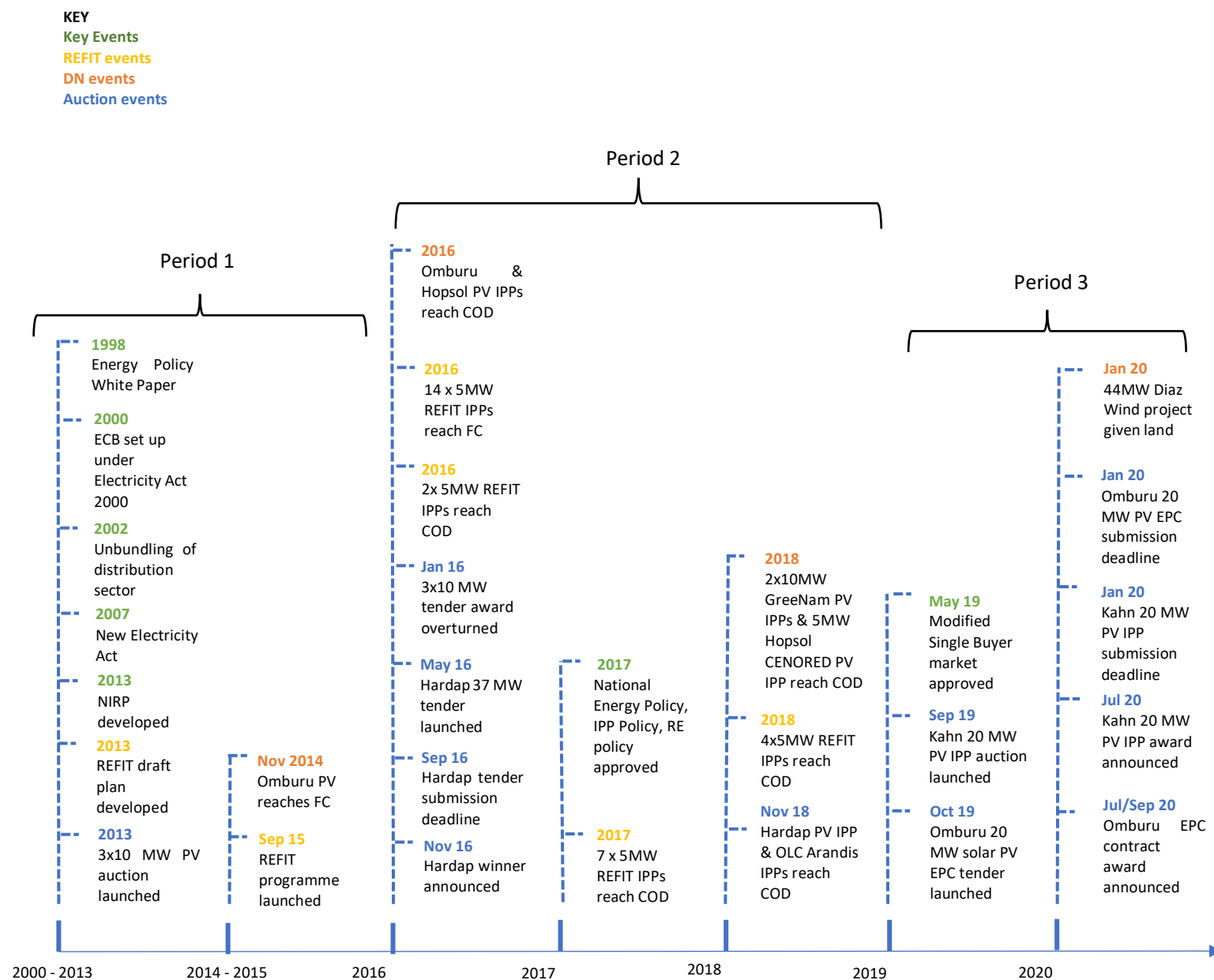


Figure 5.1: Timeline of key events and analytical periods - Namibia

5.2 First period: Green shoots and a false start

5.2.1 A discouraging investment environment for IPPs

Before 2016, many would not have considered Namibia an obvious candidate for large-scale private power sector investment. NamPower, at that stage responsible for all generation and transmission infrastructure in the country, was in a healthy financial position and able to import, on average, 60% of the country's electricity from neighbouring South Africa, based on competitively priced long-term bulk supply agreements⁸¹. NamPower's reluctance to consider private participation in its flagship generation project – the Kudu Gas Field – and government's refusal to renew a private distribution concession agreement with the Northern Electricity company (despite the obvious success of the management company) further seemed to indicate that the country saw little need for private participation in the power sector (Kapika & Eberhard, 2013).

The broader policy and regulatory environment – while not hostile to private sector involvement in the sector – was also not seen as very inviting. The 2007 Electricity Act, for example, did not make provision for private investment in the power sector – it was later redrafted to address this – while the 2013 version of the Namibian Integrated Resource Plan (NIRP) – which nominally provided for some private sector investment – was never officially adopted by Cabinet⁸² (Kapika & Eberhard, 2013; Kruger et al., 2019).

5.2.2 Namibia's close ties to South Africa opens the door for IPPs

Namibia's close ties to South Africa – both economically but also, in the electricity sector, physically – unexpectedly helped create the conditions necessary for the country's first renewable energy auction programme. The Namibian dollar is pegged to the South African rand and about 35% of government's

⁸¹ Namibia has two types of contracts with Eskom. An off-peak bilateral contract (renewed annually) stipulates that electricity can be used only during off-peak periods and is priced based on season and time-period (peak, standard, off-peak). The supplemental contract of 200 MW is a special assistance agreement that is conditional on Eskom's being able to meet demand, and functions as a supply of last-resort option. Namibia also has a 10-year 50 MW contract with ZESCO (Zambia) which expired in 2020, and a 80 MW supply agreement with ZESA (Zimbabwe) that expires in 2025. South Africa's Eskom is the main contributor to the power pool and has been supplying around 2,000 GWh of the 4,800 GWh consumed annually. Namibia had also been increasing its purchases on SAPP's short-term energy market (STEM), from 55 GWh in 2016 to 828 GWh in 2018.

⁸² In 2011, the ECB contracted Canadian consultants to develop a "National Integrated Resource Plan" (NIRP), with financial support from the World Bank. The 2013 NIRP was never sent to Cabinet for approval and consequently was never adopted by government.

revenue comes from the Southern African Customs Union (SACU)⁸³, which is effectively financed by South Africa (Krause-Jackson, 2019; Southern African Customs Union, 2017). A major portion of the companies listed on the Namibian Stock Exchange also have South African links, while the Namibian financial industry is closely tied to South Africa's (Fauconnier et al., 2017; UNPAF, 2017).

As South Africa's economy slowed down in the post-2008 period owing to a mixture of national (power supply crisis, corruption, mismanagement) and international (global economic crisis, falling commodity prices) constraints, it had a significant and disproportionate impact on Namibia's economic growth. This was exacerbated by falling oil prices, which impacted Namibia's other neighbour and major regional trading partner – Angola (Xinhua, 2016).

South Africa's worsening electricity supply shortages, which had started in 2008, threatened Namibia's energy security, but also pushed up the cost of power as Eskom embarked on its massively expensive and flawed capital expansion programme. NamPower's inability to secure finance for its major power generation projects – the 800 MW Kudu gas plant and the 600 MW Baynes Hydroelectric Power Station, both in development since at least the early 1990s (Kapika & Eberhard, 2013; Reuters, 2018) – did little to allay government's energy security concerns.

Namibia's resultant reduced fiscal space, alongside the urgent need for improved energy security, helped open the sector for private power investment (Interviews 4, 5, 10). It was also during this time that South Africa had started implementing its REI4P programme, demonstrating to the region that cost-efficient renewable energy investment was possible.

5.2.3 Green shoots: the REFIT programme and the first IPPs

The 2013–15 period marked a turning point for Namibia's power sector. The 4,5 MW Omburu Solar PV independent power project reached financial close in 2014 at a directly negotiated tariff of NA\$1,50/kWh (US\$11/kWh), proving that it was possible to finance and construct these projects in Namibia without a sovereign guarantee, thanks, in large part, to NamPower's financial health (Kaira, 2017).

⁸³ The Southern African Customs Union is the world's oldest customs union, and effectively means that a single tariff is applied to goods entering the union (South Africa, Botswana, Lesotho, Swaziland and Namibia), and that no customs duties are charged between the members. All revenues are paid into a central revenue pool, which is distributed according to a formula that is heavily weighted in favour of the smaller customs union members (effectively, all member countries except South Africa).

Motivated by this proof-of-principle example, the country moved ahead with designing an interim renewable energy feed-in tariff (REFIT) programme in 2015 aimed at increasing generation from non-hydro sources. Feed-in tariff (FIT) levels were based, in part, on the prices achieved in South Africa's REI4P BW2 and BW3 (Interview 4). FIT prices were nevertheless still generous (Table 5.1) – even by international standards – and managed to attract substantial interest.

Table 5.1: Namibian feed-in tariff rates (Source: ECB, 2017)

RE Technology	Capacity	FIT levels in NA\$/kWh ⁸⁴	FIT levels in US\$/kWh ⁸⁵
Biomass	5 MW	1,28	9,3
Solar PV	5 MW	1,37	9,9
Onshore wind	5 MW	1,08	7,8

Prior to the launch of the FIT programme, the regulator (ECB) had granted 27 provisional licences to projects – all of which had failed to secure financing in the absence of a structured procurement process. These projects were invited to participate in the REFIT programme and were given six months to submit all required documentation to NamPower.

All in all, 14 projects (13 solar PV, 1 wind), totalling 70 MW, were awarded on a first-come first-meeting-the-requirements basis, meaning that they had provided credit-approved term sheets from lenders/funders or, in the case of projects funded through equity/on a company's balance sheet, a guarantee from a commercial bank confirming the availability of funds, as well as shareholding certificates confirming 30% Previously Disadvantaged Nation (PDN) shareholding. The remaining IPPs were placed on a waiting list (Interview 4).

The awarded projects were given six months to submit: a signed PPA and Transmission Connection Agreement (TCA) with NamPower; site permits (including EIA certificate); generation licence; financial close documents, and a PPA regulatory oversight letter from ECB. Commercial operation had to be achieved within 12 months of the above being submitted. (Only one project managed to meet this deadline; nevertheless, the others were permitted to proceed) (Interview 4).

This period also saw Regional Electricity Distribution companies (REDs) starting to sign up IPPs directly. At the time, Namibia's five REDs were allowed to procure up to 12% of their total consumption from IPPs in their region (Interviews 4, 6). The first mover was CENORED – responsible for electricity distribution in a 120 000 square-km area, with about 40 000 customers. An unsolicited proposal from

⁸⁴ The initially announced tariffs were higher for solar PV (NA\$2,46/kWh) and wind (NA\$1,16/kWh). For biomass it was lower (NA\$1,23/kWh).

⁸⁵ Based on a NA\$:US\$ exchange rate of 0,072.

Hopsol – a Swiss solar IPP with offices in Windhoek – was negotiated at a price level close to that of the REFIT programme and partly funded (66%) through a loan from a local commercial bank – Bank Windhoek (“CENORED Signs the...,” 2013).

5.2.4 The failed 3x10MW solar PV procurement programme

Surprisingly, these developments were book-ended by a controversial government-managed competitive procurement process for solar PV plants. Launched in 2013, the programme was conceptualised as a pilot to test the market’s response and to validate the implementing authorities’ underlying assumptions (Interviews 4, 5, 10). The programme was initially slated to be implemented by ECB, but the regulator declined, citing a potential conflict of interest (Interview 42). It was thus decided that the procurement process would be run by the “renewable energy steering committee⁸⁶”, an intergovernmental body chaired by the minister of Mines and Energy, with representatives from ECB, NamPower and the Namibia Energy institute (Kruger et al., 2019).

The committee decided to invite bids for 3 x 10 MW solar projects in the belief that anything bigger might require a sovereign guarantee (Interview 10). The projects were to be located at sites pre-selected by NamPower at Okahandja, Omaruru and Mariental. NamPower had selected the project sites based on the local substations’ evacuation capacity and the available solar resources (Interviews 5, 42). The decision that NamPower – and not the bidders – select and prepare the sites was motivated by a belief that a bidder-led site selection process would result in a bidding war for land, ultimately pushing up the price of electricity from the projects (Kruger et al., 2019).

The steering committee’s lack of experience with the technology, the procurement process and the financing and contractual provisions manifested in two main ways. The first was what could almost be described as a somewhat informal approach to the auction, with the desire to learn from the market and the procurement process at times seemingly overruling considerations of propriety and professionalism.

The most obvious example of this was the mandatory bidders conference. Interested bidders were asked, through a seemingly informal market-testing exercise, to indicate whether they would be able to submit bankable bids without a sovereign guarantee. More surprisingly, bidders were also asked to

⁸⁶ Originally established to advance the development of renewables in the absence of supportive policies (for example, FiTs).

provide an indication of the potential project price by ticking one of three boxes: NA\$1,20–NA\$1,50/kWh; NA\$1,00–1,20/kWh, and less than NA\$1,00/kWh.

While most bidders indicated that they were willing to bid projects at levels below NA\$1,00/kWh, without a sovereign guarantee (Interview 4) – a positive outcome for the procurer – some international developers perceived this as undermining the integrity of the bidding process and the standing of the procurers, which convinced them to not submit a full bid, thereby reducing competition levels (Kruger et al., 2019). In the end, nine entities passed the prequalification stage.

The second manifestation of this lack of experience was more severe, and ultimately more damaging to the programme. While NamPower had selected the three project sites, it had not secured land rights by the time the bidding process was launched. During the procurement process, it became clear that the owner of the Okahandja site – a commercial farmer – wanted shareholding in the project company, to which NamPower would not accede. The sales agreement was thus not executed. Similarly, it turned out that the Omaruru site – which belonged to the local municipality – could not be secured on favourable terms, with the same result (Interviews 5, 42). All of this happened after bids had already been submitted. Six full bids were submitted, with the winning bid at NADc 88,8/kWh.

The decision was consequently taken to change the bid to a 1 x 30 MW project, based at the Mariental site, but to maintain the award to the bidder that had been highest ranked for all three sites (Alten Renewables) (Interviews 5, 42). This was naturally seen as a material change to the bidding rules and one of the unsuccessful bidders – Enel Green Power – consequently took the procurement committee to court to have the award overturned (Mongudhi, 2016). However, before the court could make a decision, the Auditor General decided in early 2016 to set aside the award – not based on the changes made after the bid award decision, but owing to the fact that the steering committee had no legal standing and could, therefore, not make an award (Interviews 4, 5, 10, 42).

The failed procurement process, which had started in 2013, exposed Namibia's lack of preparedness for private power investment and threatened to undermine investor confidence in the country's nascent renewables sector. It was, nevertheless, a valuable – if painful – learning experience for the country, and, in particular, for NamPower, one that would shape the utility's approach to future auctions for the better.

5.3 Second period: A new dawn?

5.3.1 The breakthrough of competitively procured renewable energy IPPs

The 2016–18 period built on the momentum created in the preceding three years, but redirected it to reshape the Namibian power sector in three important ways. The first was a change in the country's energy mix. Within the space of three years, Namibia would move from having less than 1% installed renewable energy capacity (not including large hydro), to more than 25% (mostly solar PV and some wind) in 2018⁸⁷ (Kruger et al., 2019).

This change in technology mix coincided with – or, more accurately, was driven by – increased private sector investment: the second big change. Namibia moved from having no operating IPPs in 2015 to having 20 at the end of 2018 – making it the sub-Saharan African country with the fourth-most independent power projects, surpassed only by South Africa, Uganda and Kenya (Eberhard et al., 2019), and fundamentally changing the character of the Namibian power market.

The third change related to how these IPPs were being procured. At the start of 2016, all new utility-scale private power capacity was being procured through feed-in tariffs or direct negotiation. By late 2018, the country had completely moved to a competitive procurement system, based on the results of the Hardap solar PV IPP project (discussed in more detail below) (Interview 4). Cumulatively, these changes reshaped the character, structure, and ambition of the sector.

Many of these changes were the result of the policies developed in the previous period. For example, 2016 saw all 14 REFIT projects reach financial close (totalling US\$123 million), while 13 of the projects started commercial operation in the 2016–18 period⁸⁸ (Table 5.2). Several projects procured by REDS or directly negotiated with NamPower also reached commercial operation during this time – though it should be noted that the directly negotiated projects have generally struggled to reach financial close and have been signed up at relatively expensive tariffs (Interview 4). The most significant development was, however, the procurement of the Hardap Solar PV IPP.

⁸⁷ This excludes a further 53 MW of net-metering installations, and a 5 MW self-generation plant.

⁸⁸ Projects that have not reached their projected PPA dates have been granted more time by the ECB, primarily due to *force majeure* risks materialising in the construction phase. For example, landmines were discovered on three of the project sites, requiring a lengthy clearing process and official police confirmation prior to development (Interview 4).

Table 5.2: List of Namibia's REFIT projects (Source: Kruger et al., 2019)

Company name	Capacity	Location	PPA Signed	TCA signed	COD
Benzel & Partner Investment Pty Ltd	5 MW	Gobabis (Ejuva 1)	28/10/2015	25/04/2016	19/09/2017
OKA Investment Pty Ltd	5 MW	Gobabis (Ejuva 2)	27/10/2015	25/04/2016	19/09/2017
Camelthorn Business Venture Pty Ltd	5 MW	Outapi	27/10/2015	25/04/2016	
Momentous Energy Pty Ltd	5 MW	Keetmanshoop	30/10/2015	18/03/2016	24/10/2017
Hopsol Pty Ltd	5 MW	Grootfontein	22/10/2015	27/01/2016	30/06/2016
Sertum Energy Pty Ltd	5 MW	Trekopje, Erongo	21/10/2015	20/04/2016	
Aloe Investment Number 27 Pty Ltd	5 MW	Rosh Pinah	29/10/2015	22/04/2016	23/07/2017
ALCON Pty Ltd	5 MW	Aussenkehr	29/10/2015	22/04/2016	29/09/2017
UNISUN Energy Pty Ltd	5 MW	Okatope	29/10/2015	27/04/2016	
Tandii Investment Pty Ltd	5 MW	Okatope	29/10/2015	25/04/2016	
NCF Energy Pty Ltd	5 MW	Okatope	29/10/2015	25/04/2016	
Ombepo Energy Pty Ltd	5 MW	Luderitz	13/01/2016	23/03/2016	08/09/2017
Osona Sun Energy Pty Ltd	5 MW	Okahandja	21/10/2015	05/01/2016	01/09/2016
Metdecci Energy Investment Pty Ltd	5 MW	Karibib	23/10/2015	24/02/2016	07/03/2017

5.3.2 The competitive procurement of the Hardap solar PV IPP

5.3.2.1 NamPower as the procuring entity

It ultimately fell to NamPower, which had both the legal standing as well as the proven ability to lead a complex procurement process, to resurrect and re-tender the failed solar PV IPP⁸⁹. The procurement process was designed and implemented by a small team of 10 NamPower employees representing finance, energy trading, electricity pricing, legal, power system development, transmission, and environmental compliance. The team was headed up by Margaret Mutschler (Head: generation and renewable energy projects), with support from Grant Muller (Senior advisor: project management, contract management and technical advisory) and Gordon Gadney (Senior engineer). Reiner Jagau (Executive: generation) supervised the process (Interviews 5, 42).

This team proved to be exceptionally capable – at least in terms of crafting the bidding documents and contracts (Interview 8, 9). ECB had initially contracted an international consulting firm to develop the key project documents, which ended up being based on a US template that proved to be unsuitable for the Namibian context. The NamPower team thus developed the project documentation internally, with no technical or other advisory support (Interview 42). The documentation turned out to be, in the words of an experienced developer “... as good as those used in [South Africa's] REI4P programme” (Interview 8).

⁸⁹ Other stakeholders – mainly ECB and the Ministry of Energy - maintained an advisory role.

5.3.2.2 The impacts of time pressure and limited experience on auction design decisions

The auction's design was primarily shaped by the need to make up for time lost owing to the first failed auction attempt and – critically – by the utility's self-awareness regarding its lack of experience with the technology and competitive procurement processes for IPPs (Interview 5). To save time, the auction was thus developed as a single-stage bidding programme, with a bid submission deadline about three months (4 August 2016) after the release of the request for proposals (Interview 5). In reality, this deadline turned out to have been overly optimistic, and was moved out by more than a month to 22 September 2016 owing to adjustments to the financial model after NamPower obtained more certainty around the costs of upgrading the transmission infrastructure (Interview 5). Timely project execution was also incentivised by a bid bond of NA\$400,000 (US\$800/MW).

5.3.2.2.1 Project site provision and preparation in exchange for NamPower shareholding

The utility again opted to provide leased land⁹⁰ for the project to speed up the realisation timeline (the previously secured Mariental site), but increased the proposed project's maximum export capacity to 37 MW, based on what the site could accommodate (also taking into account strict capacity factor requirements, detailed further below), in the hopes of achieving a lower tariff through economies of scale (Interviews 5, 42). NamPower undertook all preparatory studies (including EIAs, environmental clearance certificates⁹¹, topographical studies, geotechnical assessments⁹², hydrological studies and meteorological assessments) and provided the transmission connection (including upgrading the Hardap substation), although the ultimate responsibility for site-related risks and final preparation fell to the bidders (Interview 5).

The procurer reinforced this approach by restricting bidder eligibility to parties who had attended the mandatory official site visit that formed part of the pre-bid conference. NamPower did, however, undertake a great deal of work to prepare the site, including securing an exemption from local legislation to ensure that the lease corresponded to the length of the PPA (25 years), since leases on

⁹⁰ Namibia restricts foreign ownership of agricultural land.

⁹¹ The Hardap site's EIA clearance certificate was obtained following an EIA study for the initial development of the three potential sites in 2016. The certificate was still valid at the time of the 37 MW bid. However, NamPower filed for an amendment to the certificate to be exclusive to the site. The original EIA certificates for all three sites were also originally awarded for a maximum of 30 MW projects. When the project size was increased to 37 MW, this necessitated a revision of the certificate.

⁹² The geotechnical assessments were carried out by GEOINTEC for the original 3 x 10 MW project at Mariental. This study was subsequently bought and provided to all interested bidders during the procurement of the 37 MW project.

agricultural land are typically limited to a maximum of 10 years based on the Agricultural Land Reform Act of 1995 (Interviews 5, 42). Bidders commented favourably on the quality of the preparatory work (Interviews 2, 8, 9).

NamPower argued that their provision and preparation of the site would lead to shorter project construction timelines and lower tariffs, but it also came with some strings attached (Interviews 5, 42). In return for the site, preparatory work and connection infrastructure, the bidding documents stipulated that NamPower expected an equity stake of between 10% and 19% in the project company, based on their calculations of the costs incurred (NA\$58,25 million; US\$4,12 million) relative to the overall project equity contributions. The limit of 19% was in deference to the fact that Namibian generation licensing requirements include a minimum 30% PDN (Previously Disadvantaged Nation) shareholding obligation, which meant that anything more than 19% of NamPower shareholding would result in the project developer owning less than a controlling share (51%) (Interview 5).

NamPower's insistence on shareholding was motivated, in part, by their lack of experience with the technology. The utility wanted to "see inside" the project company's decision-making processes to learn about the technology and ensure that the project's technical quality was acceptable. One of the stipulations of the shareholders agreement thus was that NamPower had veto power, despite being a minority shareholder. NamPower's shareholding, furthermore, reinforced its concern about technical quality since it would be exposed to the impact of poor project performance. NamPower's dual role as shareholder and offtaker would prove to be valuable from a learning- and risk-mitigation-perspective, but also opened up the utility to a potential conflict of interest that could be difficult to manage (Interview 5).

5.3.2.2.2 Detailed bidding requirements

The utility's unfamiliarity with the technology also meant that the bidding documents were very technically detailed, including requirements down to the level of wiring to be used. Copies of all prospective contracts with EPC and O&M service providers needed to accompany the bids, with these contractors needing, also, to submit information on reference projects of a similar size and nature to the Hardap PV project as proof of their technical experience and capability. Lead developers also needed to show that they had the required experience and expertise, primarily through submitting evidence of reference projects (min 10 MW solar PV) developed in the previous 8 years (Nampower, 2016).

The seemingly arbitrary 10 MW minimum project size (bearing no relation to the size of the actual Hardap project) appears to have been motivated by a desire not to exclude bidders that had qualified for the failed 3 x 10 MW procurement process.

Bidders, furthermore, needed to list all prospective equipment suppliers and service providers (including proof of Namibian citizenship, where relevant), with an accompanying datasheet for all equipment to be used. All equipment used needed to meet, at a minimum, South African National Standards (SANS). The datasheets also needed to specify the origin and value of all equipment and materials to be used. Although the procurement programme did not set out any local content or local employment requirements, bidders' statements on the above would be captured as part of the performance guarantees and generation licence conditions (Nampower, 2016).

5.3.2.2.3 Technical qualification criteria

Apart from the detailed technical information required, the procurement programme also set the following minimum technical requirements:

- The degradation factor of the plant could not be more than 20% in year 25.
- The capacity factor for the plant needed to be 30% at COD – reducing to no more than 20% in year 25.
- The lifetime of the plant needed to be guaranteed at 25 years.
- An availability guarantee of 98% was required during daytime hours.
- The minimum performance ratio of the plant was specified at 0,75.

Bidders were required to make commitments on each of these requirements (captured as part of the performance guarantees, discussed below), projected annually for the duration of the project's lifetime (Nampower, 2016).

5.3.2.2.4 A risk-averse penalty regime

The design of the penalty rules governing the investment was emblematic of NamPower's deeply risk-averse approach to the procurement programme. Technical quality criteria (along with key project realisation timelines) were incorporated into the penalty regimes, mainly consisting of two performance bonds (to be provided by Namibian banks) and liquidated damages clauses in the PPA. The first performance bond, to the value of 2% of the total EPC costs, would be in place until the project reached financial close. It would then be replaced by a second performance bond, to the value

of 15% of the total EPC costs, valid until the project successfully completed the Final Acceptance Test (effectively meaning that the project has reached commercial operation).

Whereas the first performance bond incentivised timely project completion, the second also covered a wide range of technical criteria, including the project's ability to obtain a generation licence; its compliance with Namibia's grid code; the plant's capacity; the plant's committed (annually projected) capacity factor; the annual degradation factor; the plant's performance ratio; the lifetime of the plant; the availability guarantee; the use of Namibian content, and the health and safety requirements on site (Nampower, 2016).

While some of these technical parameters could be assessed as part of the final acceptance test (for example, grid code compliance), many (for example, the plant lifetime, the annual degradation factor, and so on) could only be evaluated after the performance bond had been returned, effectively negating many of these performance incentives (Nampower, 2016).

To be fair, some of these parameters were also covered by the liquidated damages and termination clauses of the PPA (for example, performance ratio, degradation factors), which makes more sense considering that this contract covers the plant's entire operating life and therefore corresponds to the long-term nature of many of these commitments. The performance bond regime was perhaps overzealous and not particularly well-designed to extract all the intended technical commitments, and since the project's owners and operators – and especially also lenders – had as much interest in ensuring the plant's long-term operating success as the utility, this unnecessarily increased investor risks (Interview 5).

5.3.2.2.5 An emphasis on simplicity and standardisation

NamPower's lack of experience with the competitive procurement of IPPs furthermore meant that the auction design emphasised simplicity and standardisation to reduce risks and to facilitate a speedy process. The auction was thus set up as a straightforward pay-as-bid, sealed-bid process for a standardised, non-negotiable 25-year take-or-pay PPA in local currency⁹³ (NA\$) indexed to local inflation (CPI).

NamPower also took what some saw as a slightly headstrong approach to risk allocation. For example, it did not allow for negotiation on material issues post-award, provided no sovereign guarantee or liquidity support, did not include contractual provisions for political *force majeure* events (including

⁹³ Or South African Rand (ZAR), which the Namibian Dollar is pegged against.

expropriation) and made no provision for the possibility of international arbitration . Risk allocation was nevertheless generally perceived as acceptable⁹⁴ (Interviews 2, 4), taking into account NamPower’s financial standing and the strength of the Namibian judicial system (Kruger et al., 2019).

Bidders remarked on the clear, simple tender rules and regulations and the quick turnaround on clarification requests (Interviews 2, 8, 9). (There were 11 clarification rounds between the release of the RfP and the bid submission deadline). NamPower noted that the comments provided through this clarification process were helpful in ensuring that the bidding documents were bankable by the submission deadline (Table 5.3) and resulted in several important amendments to, for example, the PPA (Interviews 5, 42).

Table 5.3: Timelines for the Hardap solar PV bidding process (Source: Author compilation based on bidding documents)

Phase	Date	Bidders	Description
RfP released	13 May 2016	200	No. of requests for EOI documents
Clarification no.1	7 June 2016		
Mandatory clarification meeting	8 June 2016	200	No. of private attendees (companies/ consortia)
Mandatory site visit	8 June 2016	200	Held with interested developers to allow for issues to be raised
Deadline for clarification requests	5 September		
RfP submission deadline	22 September 2016	13	Number of complete tender submissions

5.3.2.2.6 Technical and financial proposals

Bids were to be submitted in two envelopes: technical and financial. Financial envelopes would only be opened once a bid had passed the technical evaluation process. Technical proposals consisted of more than 45 documents (Table 5.4) aimed at establishing the bidder’s capacity and eligibility, compliance with the bid specifications, and acceptance of the project documents. Only responsive bids (Table 5.5) would proceed to a detailed technical analysis stage, consisting of legal, technical, commercial, financial, environmental, and social reviews.

The commercial and financial review that formed part of the technical analysis stage was concerned with securing the commitment of ultimate finance providers to the project and its implementation schedule (Interview 5), adding a crucial layer of due diligence to the process. Lender and equity

⁹⁴ The contracts provided for the bidder relief from contractual obligations and/or deemed energy payments to the project company if NamPower failed to meet its obligations in terms of the site, transmission infrastructure or its shareholding commitments.

providers thus needed to provide signed term sheets (including financing for PDN shareholders) as well as a signed project implementation schedule, which EPC contractors also needed to sign (NamPower, 2016). Audited financial statements for lead firms formed the basis for assessing bidders' financial health, although the bidding documents made provision for tendering by entities younger than three years and did not specify any minimum turnover requirements or financial health indicators (NamPower, 2016). It is thus not clear on what basis financial standing was assessed.

Table 5.4: Forms to be included in the technical proposal (Source: Kruger et al., 2019)

C1	Form of Letter of Tender
C2	Declaration of Authenticity
C3	Form of Special Power of Attorney
C4	Form of Covenant of Integrity
C5	Minimum Responsiveness Criteria
C6	Proposed Shareholders Agreement for the Project Company
C7	Detailed Corporate and Administrative Information
C9	Reference Projects
C12a	Legal and Commercial Deviations Draft Power Purchase Agreement (PPA)
C12b	Legal, Technical and Commercial Deviation Draft Transmission Connection Agreement (TCA)
C12c	Legal and Commercial Deviations Draft Direct Agreement (DA)
C12d	Legal and Commercial Deviations Draft Land Lease Agreement (LLA)
C12e	Legal and Commercial Deviations Shareholders Agreement Term Sheet (SHA TS)
C13	Technical Deviations
C14	Form of Tender Bond
C15	Form of Performance Bonds
C16	Project Implementation Schedule
C17	Performance Guarantees
C18	Checklist of documentation required for the Specification:
	Preliminary architecture and network layout of the control system
	Correction curves and formulae to correlate actual measurements to standard testing conditions
	Correction procedures for how to apply the correction curves and formulas
	Outline drawings of the support structure and support foundations for the PV modules
	Single line diagram of the power plant (indicative of all voltage levels)
	Preliminary layout drawing of the administration building
	Monthly generation forecast over 25 years, indicating expected degradation and plant availability
	Weekly generation forecast over 25 years
	Preliminary layout drawing of the substation building
	Preliminary layout drawing of the control room building
	Verification of power plant performance with simulations and calculations
	A working PVSYST model, or similar, of the proposed power plant and equipment
	Layout diagram of the power plant
	A working DigiSILENT dynamic model, or similar, of the power plant for harmonic analysis
	Outline drawings of the PV modules
	Type test certificates of PV modules
	Methodology to minimise MV module mismatch losses
	PV module manufacturer proof of BNEF Tier 1 rating
	Detailed drawing of power plant earthing and bonding layout
	Datasheets for all equipment listed
C19	Voluntary Site Visit Form
C20	EPC Contractor(s) Reference List
C21	O&M Contractor(s) Reference List
C22	List of Service Providers
C23	List of Equipment Suppliers
C24	Namibian Content

Table 5.5: Minimum criteria for responsiveness of technical proposal (Source: Kruger et al., 2019)

Minimum criteria	
1.	The tenderer is mandated to complete and submit the “Form of Special Power of Attorney.”
2.	The tenderer is mandated to complete and submit the “Form of Covenant of Integrity.”
3.	The tenderer is mandated to ensure that all deviations from the tender document’s principal requirements/specifications/project agreements are listed in the returnable forms.
4.	The tenderer is mandated to manage its business activities in English and the submitted tender is to be in English likewise.
5.	Tenderer agrees to the mandatory 10% NamPower shareholding of the project company.
6.	Tenderer agrees to the minimum requirement of 30% PDN shareholding of the project company.
7.	Tenderer agrees to reach target COD within 12 months of tender award.
8.	Tenderer agrees to abide by the two separately sealed envelope submission system for the technical proposal and financial proposal.
9.	Tenderer’s tender submission should have a validity period of a minimum of six (6) calendar months, beginning from the closing date of the tender.
10.	Tenderer is required to submit the original copy of the tender bond.
11.	Tenderer is mandated to furnish an original certificate of good standing from the Receiver of Revenue, or a letter of good standing from the government of its country of origin, that confirms its tax payment history.
12.	Namibian tenderer(s) are to present an original certificate of good standing obtained from the Social Security Commission.
13.	Namibian tenderer(s) are to present a certificate of good standing obtained from the Employment Equity Commission; otherwise, present a certificate indicating that it is not a registered employer as stipulated in the Affirmative Action Act, 1998.
14.	Tenderer is required to provide a minimum of two (2) reference projects – equal to or greater than 10 MW, that have been previously completed by the company or a consortium (that the company was part of) within the last eight (8) years.
15.	Tenderer agrees to recognise the Namibian Law as the governing law, with respect to all project agreements with the tender administrator.
16.	Tenderer agrees to recognise the Namibian Dollar (NA\$) or South African Rand (ZAR) as the applicable currency in all project agreements with the tender administrator.

The financial proposal consisted of four components:

- a base tariff calculation,
- a tender financial model,
- price deviations to the tender documents, and
- information required to apply for a generation licence.

The financial model was based on the ECB’s model used in its generation licence approval process. The model was quite basic and there were some mistakes pointed out by bidders during the clarification process (Interview 42). Subsequent adjustments to the model required ECB’s approval, which is part of the reason that the bid submission date was delayed (Interview 5).

NamPower validated all assumptions used in the bidders’ models, and could adjust the listed base tariffs for evaluation purposes if it found that the model inputs were erroneous, inaccurate or not fully reflective of the technical proposal (Interview 42). Because the evaluation process included no external or independent validation review process, this allowance for unilateral bid adjustments could potentially open the awarding decision to an official challenge.

5.3.2.2.7 Winner selection criteria

Bid scoring and ranking was based on a combination of financial and technical criteria, weighted on a 70:30 basis (Table 5.6). It is clear that NamPower's concerns around technical quality (degradation factor⁹⁵, capacity factor) and the speed of deployment (project schedule) featured strongly in the bid evaluation process, although it seems unlikely that this design choice had any additional impact on project performance. Bidders would, for example, already be strongly incentivised to maximise the project's power output over its lifetime to maximise equity returns and ensure long-term debt serviceability (Interview 38).

The strict technical qualification criteria, including the need to use certified equipment and commit to performance indicators as part of the contracting regime, would furthermore already ensure a high level of technical quality for a relatively simple technology such as solar PV. Developers were already being expected to have projects reach commercial operation within 12 months – a very tight deadline that, at least in this case, was not altered through the use of this evaluation criterion. The technical criteria were, nevertheless, easily quantifiable and would not noticeably detract from the transparency of the procurement process, although they might have resulted in NamPower awarding the tender to a more expensive project (Interviews 2, 4, 5, 8).

Table 5.6: Bid scoring criteria – Hardap IPP (Source: Kruger et al., 2019)

<i>Criteria</i>	<i>Points</i>
<i>Technical score</i>	<i>30</i>
Total degradation factor by Year 25	10
Guaranteed capacity factor for Year 2 (as will be estimated)	10
Project schedule from bid award until target COD	10
<i>Base tariff – normalised (financial score)</i>	<i>70</i>
Total score	100

5.3.2.3 A strong market response

The procurement programme elicited a strong response, resulting in robust competition. More than 250 entities attended the pre-bid conference, necessitating a change to a larger venue at the last minute (Interviews 5, 42). In the end, 13 complete bids were submitted by a range of international, regional and local developers (Table 5.7). Tellingly, Enel Green Power – the entity that had challenged

⁹⁵ In the original 3 x 10 MW procurement programme, bids were evaluated on the performance ratio of the plant. NamPower determined through that exercise that it was, in fact, too difficult to accurately estimate the plant's performance ratio, and therefore opted for the simpler "capacity factor" and "degradation factor" metrics in the 37 MW procurement programme. The capacity factor of the winning Alten project was 34.56%.

the original 3x10MW awarding decision – did not submit a bid, possibly signalling their lack of confidence in the transparency and fairness of the procurement process. Another international major that had submitted a bid for the 3x10MW programme – Scatec – also decided to not submit a bid for Hardap based on similar concerns (Interview 19).

Table 5.7: Submitted bids – Hardap solar PV project (Source: Kruger et al., 2019)

Company	MW solar PV developed (experience)
The Power Company	Not clear
Phanes Africa Pty (Ltd)	60+
Aussenyen Energy Investments Pty (Ltd)	Not clear
JV: Jordaan Oosthuysen & Nangolo QS ⁹⁶	5
BioTherm Energy (Pty) Ltd	400+
Alten Energy	30+
JV: China Jiangxi International (Namibia) (Pty) Ltd & Profile Technologies (Pty) Ltd	Not clear
Mulilo Sunpower Total Consortium	185+
Green Energy Technology Holdings	100+
Building Energy SPA	377
Montenya Energy	Not clear
JV: Afres & Deutsche Eco	45+
MBHE African Power	15

5.3.2.4 A challenge to the awarding decision

NamPower's tender and procurement policy sought to ensure the security and integrity of the bid evaluation process, although it was conducted completely in-house with no external validation or auditing of results. Technical bids were opened in the presence of all bidders, while detailed evaluations were conducted in a secure room with CCTV surveillance. Evaluation was conducted by a small team that had to sign a strict code of conduct and were not allowed to leave the facility during the evaluation process nor even take in their own pens or pencils (Interviews 5, 7, 42).

It is somewhat surprising, therefore, that the tender-award decision again proved to be controversial. This is perhaps in part because the bid was awarded to Alten Renewables – the same firm that was awarded the original 3 x 10 MW project (Interviews 2, 8, 16). Part of the controversy related to the financial model, with one of the most experienced bidders having been disqualified for seemingly having altered the financial model to accommodate a more sophisticated financing arrangement (Interview 8). A key official who had been involved in the procurement process also indicated that one

⁹⁶ One of the JV partners would later set up Tulive Private Equity, which would submit a winning bid for the Omburu PV project.

of the bidder's projected equity returns would be too low – a surprising reason for dismissing a bid (Interview 42)⁹⁷.

Controversially, both bidders had also apparently submitted base tariffs that were lower than that of the awarded bidder (Interview 2, 8, 16). This time, instead of approaching the courts, one of the bidders approached the ECB to contest the licensing of the awarded project (Interview 2, 4). NamPower, for its part, maintained that it stuck to the bidding rules, which stipulated that any alteration to the financial model would lead to disqualification (Interview 5, 42). ECB, in its review of the tender evaluation process and outcomes, agreed with NamPower's assertion and upheld the final auction award (Interview 4).

5.3.2.5 Project price and shareholding

Alten's bid was NA\$80,7/kWh (US\$6,3/kWh at the time of award), making it the cheapest source of power on the Namibian grid⁹⁸ (Interview 37). Alten Energías Renovables (Alten Renewable Energy) is a Spanish IPP which, at the time of bidding, had six IPPs in operation in Spain, sized between 1,98 and 9,06 MWp. Although these projects were not large enough to pass the 10 MW reference project qualification threshold, the company's participation as a consortium member with Group Ortis on two other projects (16,51 MW Grupo Solar Alcorena and 11,13 MW Grupo Solar Hinojosa del Valle) allowed it to qualify (Interview 5).

The Hardap tender was Alten's first successful project outside of Spain, although it has since developed a strong emerging market focus, securing 350 MW of solar PV capacity in Mexico's solar PV auction, and developing a project pipeline in Kenya and Nigeria (Interview 3). The EPC contract was awarded to Sterling & Wilson – a respected contractor from India who subsequently subcontracted the majority of works to Namibian companies (Interview 9).

The project was developed as a 45 MWp facility, covering 100 hectares with 140 000 solar panels, with a maximum export capacity of 37 MWac – to meet the high-capacity factor (34,5%, based on the AC export figure for Year 1) and degradation commitments (Interview 5).

⁹⁷ It should be noted that in both cases of disqualification, there were at least two reasons for disqualification. It is however not clear that this was clearly communicated to bidders, both before bidding and definitely not post-award.

⁹⁸ NamPower, together with the ECB, also decided to include an energy payment for reactive power support as an ancillary service post award.

The Hardap project company had five shareholders: Alten Africa (51%), NamPower (19%), and three PDN entities: Mangrove (12%), Talyeni Investments (6%) and First Place Investments (12%). No change in shareholding was allowed within the first three years of operation without ECB's and NamPower's explicit consent (Interview 4). Alten had established Alten Africa as a subsidiary platform for project development and investment in Africa with Inspired Evolution – a South African investment management business specialising in clean energy investments in Africa and emerging markets.

Inspired Evolution had been a prominent investor in South Africa's REI4P projects through its Evolution One fund, and now looked to expand to the rest of the continent through its Evolution II fund. Investors in the Evolution II fund were mainly development finance institutions: the Dutch Development Bank (FMO); Global Energy Efficiency and Renewable Energy Fund (GEEREF); the Swiss Investment Fund for Emerging Markets (SIFEM), managed by Obviam; Quantum Power; the African Development Bank; Swedfund, and the Finnish Fund for Industrial Cooperation (FinnFund) (Interview 3).

Inspired Evolution's participation in the project company appears to have upheld the integrity of the awarding decision and process. Because the fund sits with significant exposure from development finance institutions, it was important that there be no unresolved ethical question marks around the project or its awarding process. Aware of the controversies surrounding the awarding decision (including accusations that the award was swayed by the politically connected nature of the PDN shareholders), Inspired Evolution thus conducted a rigorous due diligence process which ultimately supported NamPower's position on the awarding decision (Interview 3).

The PDN shareholding was financed by a loan – an arrangement that turned out to have been somewhat contentious. The PDN shareholders were all Namibian women aged between 35 and 55. They had secured shareholding through a long-term professional relationship with Alten's Namibian country manager (Interview 9). The PDN shareholders approached several local entities – including the Development Bank of Namibia (DBN) – to finance their shareholding. DBN declined, citing concerns about the low margins (due to the low tariff) and the fact that the shareholders were not committing any of their own resources (Interview 44). Alten then extended a shareholder's loan to the PDN companies, although lengthy negotiations (apparently also involving NamPower, advocating on behalf of the PDN shareholders) about the pricing of the loan, as well as their voting rights in the project company, prolonged the financial close process (Interview 7).

5.3.2.6 An innovative debt provision arrangement

The fact that the project was able to secure a long-term, favourably priced loan is both remarkable and a key reason for the project's competitive tariff levels. Alten had originally bid on a corporate finance basis but decided to secure project financing after the bid award. Since the PPA was denominated in local currency, international lenders – including international DFIs – were unable to lend directly to the project on favourable terms. Despite NamPower's financial health and the country's overall stability, local and South African commercial lenders were also unable to provide long-term loans without some sovereign support – especially since the PPA contained no provisions for offtaker default.

Standard Bank South Africa thus partnered with Proparco – the French development institution – to overcome this challenge. Given that the PPA could be denominated in South African Rand (thanks to the NA\$–ZAR peg), the bank was able to offer a ZAR760-million loan (US\$56,4 million) to the project, equating to an 80% gearing ratio, but only for eight years. Proparco provided a guarantee that covered 30% of the debt (principal and interest) in Year 1, increasing to 100% in Year 8. This enabled Standard Bank to increase the loan tenor to 15 years, comparable to what a DFI would normally provide⁹⁹ (Standard Bank, 2018). It also made it possible for Proparco to help finance this project without being directly exposed to long-term currency fluctuations on the loan amount (although they were exposed on the guarantee fee) (Proparco, 2018).

5.3.2.7 NamPower shareholding as risk mitigant

Apart from the innovative financing arrangement, NamPower's role as project shareholder could arguably also be seen as a form of risk mitigation. This is potentially evident given that the project experienced two delays in reaching commercial operation. Because this was a new type of financing arrangement that finally included a DFI – with its specific due diligence requirements – the project was only able to reach financial close on 28 February 2018, a month after the originally envisaged date. Proparco's due diligence process alone took more than six months to complete, but the delay was mostly due to NamPower's slower pace as project shareholder (Interviews 5, 42).

There was also a delay in reaching commercial operation due to a transport strike, which was deemed a *force majeure* event, and which pushed out COD from 7 September 2018 to 15 November 2018 (Interviews 5, 9). Neither delay turned out to have had a substantial impact on the project, but in

⁹⁹ Standard Bank also provided long-dated interest rate and currency hedges. Facilities provided included the loan, VAT facility and the Debt Service Reserve facility.

neither case did NamPower attempt to call the performance guarantees or institute liquidated damages (Interview 5). While it might be argued that this exposes NamPower's conflict of interest as both offtaker and project shareholder, it also shows that the utility was committed to ensuring the project's ultimate success and would thus act within reason to make this possible. The project reached COD on 15 November 2018 (Interview 4, 7).

5.3.3 The impacts of the Hardap solar PV project

5.3.3.1 Renewable breakthrough

The outcomes of the Hardap project had significant impacts for Namibia's power sector. It proved that renewable energy, and solar PV in particular, was now the cheapest source of new generation capacity available to the country (Interviews 4, 37). One of the most obvious impacts of this is the fact that the least-cost scenario in Namibia's updated integrated planning framework – the NIRP – excludes the Baynes and Kudu projects, replacing them with renewables (Ministry of Mines and Energy, 2016a; Interview 10). To be clear, the plan still makes provision for a 120 MW emergency power plant, as well as 2 x 300 MW thermal (coal, LNG or HFO) plants to be procured by NamPower, although indications are that the latest versions of the plan significantly reduce this allocation (Interview 10).

While the 2016 version of the plan was already outdated by the time it was approved in 2017 – specifically with reference to its renewable energy cost assumptions and demand projections (including the growth of embedded generation) (Interviews 6, 10) – it has, nevertheless, provided some certainty to the market in terms of Namibia's power sector ambitions (if not the exact timing of implementation). For example, it increased the allocation for solar PV to 229 MW, while also making 149 MW of wind, 250 MW of CSP and 80 MW of biomass allocations (to be achieved by 2035). Significantly, the plan also stipulates that Namibia will completely phase out power imports in the short- to medium-term. In 2018, the Minister of Energy made a determination based on the plan for the procurement of 220 MW of new capacity, allocating 150 MW to NamPower and 70 MW (20 MW solar, 50 MW wind) to the private sector (Kaira, 2018; Interview 10).

5.3.3.2 The ascendancy of auctions

The success of the competitive procurement programme also shifted the country's approach to contracting utility-scale private power away from feed-in tariffs and directly negotiated deals, mainly owing to the lower price outcomes achieved in the auction, but also thanks to quicker realisation timelines (Interview 4, 37). The 44 MW Diaz Wind Power project, for example, has been in

development since 2007, but has not yet been able to reach commercial operation. The project was initially unable to secure financing, had a change of technical partners, and struggled to get environmental permitting for its proposed site. ECB also unilaterally lowered the project tariff, from NA\$1,27/kWh (US\$0,09/kWh) to NA\$1,07/kWh (US\$0,077/kWh)¹⁰⁰ (interview 4). Two x 10 MW solar PV projects at Mariental – Karas and Keetmashoop, developed by GreeNam – were only able to sign PPAs in 2016 after a prolonged negotiation process. While the projects reached financial close in 2019, it was at a tariff of NA\$1,16/kWh (The Villager, 2016)¹⁰¹, considerably higher than the Hardap project, which had been contracted at around the same time.

This shift can also be seen at distribution company level (although resulting in less successful outcomes), with Erongo RED's 3,8 MW solar PV project in Arandis, for example, procured through a competitive tendering process, motivated by the need to provide a transparent path to market for the developers that had been trying to negotiate contracts with the utility. Erongo RED provided a connection point, but bidders needed to secure their own site from the municipality. All in all, 22 bids were submitted, and the project was awarded to a joint venture between Cronimet renewables, a renewable energy developer and subsidiary of the Cronimet mining group, and the Olthaver & List group (O&L), Namibia's largest private company group. The final price – NA\$1,18/kWh (US\$0,085/kWh)¹⁰² – was slightly cheaper than Erongo RED was paying NamPower at that stage, but still substantially costlier than the Hardap project (which was, of course, also ten times larger). The project reached commercial operation in November 2018 (Interview 27).

CENORED also awarded a 6,4 MW solar PV project to OLC Arandis in 2017, although the project has failed to reach financial close (interview 4). Windhoek Municipality, furthermore, indicated that it would be procuring 25 MW (5 x 5MW) of solar PV capacity through a competitive procurement process in 2017, although this process has still not been launched (CENORED, 2013; Confidente, 2015; De Klerk, 2016; Kaira, 2017).

This shift in procurement approach was formally captured in a new set of energy policies, including the National Energy Policy (Ministry of Mines and Energy, 2017a), National IPP Policy (Ministry of Mines and Energy, 2017b) and National Renewable Energy Policy (Ministry of Mines and Energy,

¹⁰⁰ This was based on the ECB's internal due diligence and benchmarking analyses. The developers apparently threatened to take the ECB to the minister due to the tariff revision; the ECB countered with the credible threat of putting the project out to tender, which is all but guaranteed to deliver a lower tariff.

¹⁰¹ Negotiations started at NA\$2,40/kWh. The final tariff for the projects is NA\$1,16/kWh. The Karas project will feed into the same Mariental substation as the Hardap PV project.

¹⁰² There were apparently negotiations post award – facilitated by ECB – to lower the initially submitted price.

2017c). The IPP policy specifically stipulated that all power projects larger than 5 MW needed to be procured through a competitive process, while still allowing for FIT arrangements for smaller installations. It also stipulated that all procurement needed to be implemented by the Central Procurement Board instead of by NamPower. What this meant in practice is partly the subject of the next period's analysis.

5.4 Third period: Signs of things to come

5.4.1 Market reforms and new procurement

The 2019–2020 period saw Namibia's power market seemingly enter a bolder new era built on a number of market reforms, on a strengthened utility and on new rounds of renewable energy procurement. A modified single buyer market model was formally adopted in early 2019, which allowed IPPs to sell directly to what ECB terms "contestable customers" (mainly REDs and large industrial consumers connected to the transmission grid) for up to 30%¹⁰³ of their overall consumption (a total of about 451 MW). Further reforms included the unbundling of tariffs (which eased the process of wheeling power across the grid); allowing IPPs to sell cross-border to the Southern African Power Pool (SAPP); incorporating energy traders into the power market, and implementing a net-metering policy (Namibia currently has about 53 MW of net-metered installations) (Interview 37).

Incredibly, NamPower twice applied for a lowering of its tariff – bringing its bundled tariff in 2019 to NAD1,18/kWh - and has also paid out handsome dividends to its shareholder (the Namibian government) – both extremely rare occurrences in the sub-Saharan region (CGTN Africa, 2019; "NamPower Granted Permission...", 2019).

Bolstered by the success of the Hardap project, the country also embarked on a parallel procurement process for 2 x 20 MW solar PV projects: one on an IPP basis (Khan project), and another on an EPC basis (Omburu project) with NamPower as the owner and operator. It has to be concluded that these projects were designed to test whether NamPower or the private sector would be in a position to best be able to finance, build, own and operate utility-scale solar PV plants in the country.

¹⁰³ Prior to the reform this was limited to 12%.

5.4.1.1 The Omburu solar PV project

5.4.1.1.1 An EPC approach

The 20 MW Omburu project was approved for procurement by NamPower's board in 2018, and procurement documents issued to the market in October 2019. The project was located at one of the legacy sites (300 ha) of the 3 x 10 MW procurement process in the Omaruru region. The procurement documents specified that the plant would need to be designed to be able to incorporate a modular storage solution (mainly for testing purposes) in the future – once the technology had reached a specific price point. The contractor would, furthermore, need to include at least 10% local content spend (including services and works) of the total EPC contract value and all unskilled and semi-skilled labour needed to be Namibian citizens.

The EPC contractor would also need to supervise the plant's operation and maintenance for the first two years after commissioning, with the explicit goal of training NamPower staff on the plant's operation. Performance guarantees would be used to ensure that the plant reached its intended lifespan (25 years) and was built to specification, including a very high capacity factor (36%) (Muller & Mukena, 2020).

Apart from the site, NamPower provided the transmission infrastructure (including transmission connection agreement), geotechnical studies, generation licence as well as the environmental clearance certificate. NamPower would also finance the project on a corporate finance basis.

5.4.1.1.2 Procurement handled by CPBN

Namibia's Public Procurement Act (Republic of Namibia, 2015) determined that, because of the size of the project, the procurement would need to be handled by the Central Procurement Board of Namibia (CPBN). The CPBN was established by the Act to improve the transparency and governance of public procurement processes. The CPBN issued the request for proposals in October 2019: 11 bidders responded, and final bids were opened on 29 February 2020. Of the 11 bids, only two qualified for financial bid evaluation.

In the end, the project was awarded to the Hopsol/Tulive consortium, at a price of NAD3,64 billion (including VAT) in July 2020, with a final notice of award in September 2020 (Swartz, 2020). The awarded price is cheaper by more than one billion Namibian dollars compared to NamPower's initial estimate of NAD4,7 billion, representing a considerable benefit to the utility. NamPower's timelines indicate that the project needed to be commissioned by May 2021 (Muller & Mukena, 2020).

5.4.1.1.3 Another controversial awarding decision

Unfortunately, as with previous awards, this decision was again shrouded in controversy. Three unsuccessful bidders officially challenged the awarding decision. One of these – the Shining Energy/Knight Piésold consortium – publicly accused the procurement board of altering the procurement rules, unfairly dismissing bids and threatening disqualified bidders with punitive action for questioning the awarding decision, leading to the Central Procurement Board issuing a public statement on 20 October 2020 that dismissed the allegations and sought to clarify the reasons for the award (Kambala, 2020; Marks, 2020). It nevertheless seems that a failure in communication during the bidding process, a lack of clarity in terms of the bidding rules and a general lack of trust in the CPBN based on previous controversies (Immanuel, 2020) still tainted the decision and is likely to undermine bidder trust in the future.

5.4.1.2 The Khan solar PV IPP

The Khan IPP was put out to tender at about the same time (23 September 2019 – Table 5.8) and was, in many ways, similar to the 2016 Hardap IPP tender, apart from the smaller project size. Bidders were, for example, again competing for a local currency-denominated, 25-year PPA with NamPower. Furthermore, there would be no sovereign guarantee or liquidity support provided; stringent technical qualification criteria would be used to screen bids (including a six-month financial close and six-month construction period), and 30% PDN shareholding remained a generation licensing requirement. The procurement process would be handled by NamPower – not the CPBN – based on the fact that the utility was effectively procuring energy, similar to purchasing power on SAPP, and was therefore granted an exemption under the Public Procurement Act¹⁰⁴ (Interview 37).

NamPower also maintained its commitment to clear and ongoing communication with the market through the clarification request and clarification meeting processes, issuing 23 clarification notices between September 2019 and February 2020. There are, however, a number of important differences to the Hardap tender that illuminate the shifting priorities and potential maturation of the sector. These changes generally related to the following three areas: improved understanding of and comfort with the technology and IPP model; increasing risk allocation to the private sector, and the prioritization of socio-economic development impacts.

¹⁰⁴ Unlike an IPP transaction, the Public Procurement Act seems to view an EPC contract as a works-related transaction, not just as energy (for which NamPower has an existing precedent).

Table 5.8: Timelines for the Khan solar PV IPP bidding process (Source: Author compilation)

Phase	Date	Bidders	Description
RfP released	23 Sep 2019		No. of requests for EOI documents
Mandatory clarification meeting	21 Oct 2019		
Deadline for clarification requests	17 Feb 2020		
RfP submission deadline	28 Dec 2020	16	Number of complete tender submissions

5.4.1.2.1 Increased comfort with solar PV IPPs

For the Khan IPP, NamPower's growing comfort with solar PV technology and private power investment manifested through a reduced focus on technical criteria and a reduction in financial qualification and penalty regimes. While the Khan tender maintained minimum technical qualification criteria covering the plant's lifetime (25 years), the degradation factor (max. 20% in Year 25) and availability (98%), it did not include minimum capacity factor or performance ratio requirements. NamPower argued that the IPP's energy-only payment model meant that setting a minimum capacity factor added no additional performance incentives since the project owners would already want to maximise output to increase revenues¹⁰⁵ (Interview 38).

Furthermore, the technical criteria used to score and rank bids for Hardap were replaced by socio-economic development indicators. The minimum reference project size used to determine bidder eligibility was also lowered from 10 MW (Hardap) to 5 MW, in deference to the smaller Khan project size and with a view to increased participation by Namibian companies (NamPower, 2019).

Surprisingly, NamPower did not ask for a bid bond and only required a single performance guarantee covering the plant's technical compliance. This is mainly because Namibia's new Public Procurement Act does not allow for the use of bid bonds. NamPower, however, also felt confident that they could address what they saw as the major reasons for using a bid bond – establishing bidder credentials and ensuring the bid's credibility – through other measures that would not increase the costs of bidding, also in an attempt at increasing competition – specifically Namibian participation¹⁰⁶.

These measures included the already mentioned provision of reference project details, used to ensure bidder credibility and capacity, and the provision of support letters from lenders and equity

¹⁰⁵ A minimum AC:DC ratio of 1.25 in the performance guarantee documentation did indirectly incentivise a high-capacity factor as well

¹⁰⁶ Awarded bidders also needed to provide NamPower with a bond for the costs of the transmission infrastructure (NAD2,6 million), although this could be replaced by evidence of the bidder's credit rating or a letter from the financiers committing to this payment

investors¹⁰⁷, which assured NamPower that the bid had undergone a thorough due diligence process (Interview 37, 38).

NamPower furthermore removed the liquidated damages clauses from the PPA (though it still maintained a day-by-day length reduction clause in the case of project completion delays). Their reasoning was liquidated damages could be viewed as unnecessarily punitive for performance issues that only added to the risks faced by the IPPs – in turn leading to higher tariffs, while not providing any additional performance incentive (Interview 38).

Perhaps the most telling change was NamPower's decision to take no shareholding in the project, partly motivated by concerns around a potential conflict of interest, but also reflective of the utility's increasing familiarity and comfort with the technology and the IPP model (Interviews 5, 38).

5.4.1.2.2 More risks allocated to the project

NamPower's shareholding decision also impacted how the tender treated risk allocation, specifically impacting the way in which the project site was handled. While NamPower had again selected the project site, it would not be responsible for securing the lease or permits, or providing any site-related (for example, geotechnical) information. Bidders were required to finalise the lease of the site (at a pre-negotiated annual rate of NAD50 000), conduct all necessary studies and commit to securing the necessary permits – though none of this was required as part of the bid. Bidders were, furthermore, required to include a transmission connection cost of NAD2,6 million in their bids to cover NamPower's transmission-related costs for the project (NamPower, 2019).

The other big shift in risk allocation was NamPower's decision to let bidders determine their own indexation rate, instead of guaranteeing automatic, annual inflation adjustments on the bid tariffs. This required bidders to take a view on long-term Namibian inflation and price it into their bids, effectively shifting the inflation risk from NamPower consumers to the project owners (NamPower, 2019; Interviews 37, 38).

5.4.1.2.3 The increasing use of socio-economic development commitments in the auction

The third major categorical change was the way in which this tender featured socio-economic development (SED) commitments, which were incorporated as both qualification and evaluation criteria, covering local ownership, local content/employment and socio-economic development

¹⁰⁷ NamPower did clarify that these letters were not meant to be seen as binding commitments.

spending. Qualification requirements were mainly concerned with the first two categories: all project companies, for example, needed to include at least 45% Namibian ownership, and all operations and maintenance (O&M) functions needed to be performed by Namibians. If a bidder could prove that there were no Namibians with the requisite O&M skills, it needed to put in place a skills transfer programme that would ensure sufficient local O&M capacity within three years from the commercial operation date. All unskilled and semi-skilled labour needed to be sourced from local communities in a 100 km radius from the site.

The bid also included detailed local content requirements, specifying that all of the following goods and services needed to be locally sourced: site clearing, terracing; SHEW; earth excavation; storm water drainage and waste management; geotechnical analysis, hydrological assessment; construction of buildings; construction of roads; civil works; cement supplies; consultancy services; transportation; craneage; scaffolding; ancillary services, and all transmission infrastructure (NamPower, 2019).

The Khan IPP tender also increased the weight of the bid price in terms of bid-scoring criteria from 70% to 80%, with the remaining 20% made up of three socio-economic development (SED) criteria. These SED criteria incentivised the channelling of annual project revenue (1% – 1,8%) to community development projects through NamPower Foundation (including technical assistance or grants to SMMEs or community development initiatives; provision of agricultural equipment; university or college bursaries; the building of classrooms, libraries, and so on; the electrification of public facilities and the provision of medical equipment); the inclusion of PDN members in executive management roles (20%–50%) in the project company, and the procurement of goods and services (to the value of between 10% and 25% of the total EPC value) from PDN companies (Table 5.9).

In general, these changes were motivated by an appreciation on the part of decision-makers of the need to increase the broader impacts of these projects for their and the sector's long-term sustainability (Interviews 37, 38).

Table 5.9: Socio-economic bid scoring criteria - Khan IPP (Source: NamPower, 2019)

Evaluation criteria	Weighting
SED Agreement/MoU: Devote % of annual revenue to community development <1 = 0%; > 1,8% = 5%	5%
PDN in executive management < 20% = 0%; >50% = 5%	5%
Entrepreneurship development: Procurement spending as % of EPC value from PDN companies <10% = 0; >25% = 10%	10%

5.4.1.2.4 Project price outcomes

Although the tender elicited a strong response, with 16 bids submitted, including by major internationals such as Scatec and Globeleq, it is notable that with the exception of Alten, none of the bidders that had submitted a bid for Hardap chose to participate. This is a concerning result. In at least two cases, the decision not to submit a bid was driven primarily by the reduced project size (20 MW), but also by the lack of bid bonds or other credible bidder commitments that would shield genuine bidders from competing with unrealistic bids (Interviews 2, 8, 16). Furthermore, only six of the submitted bids passed the evaluation stages to proceed to the financial bid opening stage (Table 5.10).

In the end, the bid was awarded at a price of NADc 49/kWh (US\$¹⁰⁸c 2,9/kWh), indexed at 3% per annum, making it one of the cheapest solar PV IPPs in Africa. Though the bid scored relatively highly in terms of its economic development commitments, it was ultimately the low price that carried it over the line (Interview 38). NamPower also confirmed that this IPP is cheaper, on a kWh basis, than the competitively awarded EPC contract (Interview 38). This award serves to confirm that renewable energy – and solar PV in particular – is the cheapest source of power in Namibia, and that the private sector is well placed and willing to drive this kind of competitive investment.

¹⁰⁸ Based on a 2020 US\$/NAD exchange rate of 16,6

Table 5.10: Khan IPP bids, ranked according to the indexed PV base tariffs (PVBT) (Source: ECB, 2020; NamPower, 2020)

Project Sponsors	MW Solar PV	BT (NADc/ kWh)	FAER	PVBT (NADc/ kWh)	PVBT (US\$/ kWh)	Stage 1: Responsiveness	Stage 2: Qualification	Financial score	Economic development score	Final Score
Access Ausenkehr	10+	0,49	3%	0,62	0,04	Pass	Pass	80%	15%	95%
Akuo Suneq	250	0,66	0	0,66	0,04	Fail	-	-	-	-
Innosun IJG	5	0,81	-1,50%	0,72	0,05	Pass	Pass	66,92%	20%	86,9%
OLC Highstar	5	0,49	5,50%	0,78	0,05	Fail	-	-	-	-
Anisol	10	0,65	2,75%	0,80	0,05	Pass	Pass	56,99%	10%	66,9%
Afrikuumba	NC ¹⁰⁹	0,88	0%	0,88	0,06	Fail	-	-	-	-
Scatec	3000	0,91	0%	0,91	0,06	Pass	Pass	42,68%	6,75%	49,4%
Alten	70	1,24	-5%	0,91	0,06	Pass	Pass	42,51%	20%	62,5%
Globeleq	220	0,96	0%	0,96	0,06	Fail	-	-	-	-
Green Yellow/ Soventix	335+	1,03	0%	1,03	0,07	Fail	-	-	-	-
Nam Eco 1 OTESA	5	0,68	5%	1,05	0,07	Fail	-	-	-	-
Old Mutual Frans Indongo	500+	0,75	5%	1,13	0,07	Pass	Pass	14,03%	14%	28%
CMB Mergens Benzel	5	0,69	6%	1,15	0,07	Pass	Fail	-	-	-
Green Enterprise Digitec	NC	0,82	5%	1,24	0,08	Fail	-	-	-	-
El Zonnah	NC	0,99	3%	1,26	0,08	Fail	-	-	-	-
Shining Energy/ Knight Piésold/ GBD	NC	-	-	-	-	Fail	-	-	-	-

¹⁰⁹ Not clear (NC) whether these companies have any substantial solar portfolios.

5.4.1.2.5 Equity and debt providers

The project was awarded to the Access-Ausenkehr consortium. Access Power is a medium-sized IPP developer based in the United Arab Emirates, which had previously successfully bid and built a 10 MW solar PV IPP in Uganda through that country's GETFiT solar facility (Kruger & Eberhard, 2019). Its local consortium partner was Ausenkehr Energy Investment, a local special purpose vehicle set up by Transkunene Holdings (active in minerals, civil works and electrical sectors). Ausenkehr was a minority (30%) shareholder in a Namibian 5 MW REFIT project with French developer Innosun (Africa Renewable Energy Initiative (AREI), n.d.).

The project lenders were Standard Bank and Proparco, using a structuring arrangement similar to that developed for the Hardap project. The EPC contract was awarded to Metka, a major international company headquartered in Greece. At the time of writing, the PPA still needs to be signed, and the financial close and commercial operation deadlines have not yet passed. Importantly, the results from the award have not been officially contested, which is a first for the country and hopefully signals an improvement in procurement governance (Interviews 37, 38).

5.4.1.2.6 Ushering in a bold new era

The results from both the IPP and EPC procurement processes appear to have bolstered Namibia's renewable energy ambitions. A bold 5 GW cross-border solar PV plan, for example, was announced with Botswana in late 2020, with the aim of exporting cost-competitive power to the rest of the Southern African Power Pool members (SAPP) (Mguni & Nhongo, 2020). NamPower – aware of the fact that their customers have been buying the region's most expensive power – sees these projects as a way of decreasing its overall cost base, thus reducing its end-user tariffs. The utility is already gearing up for the procurement of wind and biomass projects in the coming year, in the hope that these will support the current downward price trajectory (Interview 38). ECB, for its part, views the results as ringing in a new structure for the sector, with NamPower set, increasingly, to become a transmission-only company that creates the necessary infrastructure for accelerated private investment (Interview 37). Cumulatively, these developments seem to be setting Namibia on a new path that is likely to accelerate the country's energy transition¹¹⁰.

¹¹⁰ Key energy sector institutions are keenly aware of the need to incorporate flexible complementary balancing resources to mitigate the impact of solar PV on the grid, although, at this stage, the fact that NamPower is able to import power from SAPP is helping the country deal with the need to rapidly accelerate power generation at certain times of the day.

5.5 Concluding analysis

It should come as no surprise that Namibia has been able to attract significant renewable energy investments. Apart from the country's excellent renewable energy resources (Von Oertzen, 2012), resulting in some of the highest solar capacity factors in the world (Brandt, 2019), the combination of supportive country and project level factors (Eberhard et al., 2017) created an attractive environment for private power investment. Still, it took a supply-side crisis to create the space for the first IPP investments to start trickling in. While these first investments eventually changed the make-up of the Namibian power system, the competitive prices and scale of investments achieved through the auction programme (compared with directly negotiated projects or feed-in tariffs) fundamentally transformed the sector and set the country on a new course.

To understand how the auctions resulted in these outcomes, this analysis opens by examining how the auction design (Del Río, 2017f; Ferroukhi et al., 2015; Grashof et al., 2020; Haufe & Ehrhart, 2018) and implementation choices (Chiu et al., 2010; Colquitt, 2001; Zitron, 2006) impacted project prices and effectiveness. This inquiry is then extended to include the impact of the country- and project level factors (Eberhard, et al., 2017; Eberhard & Gratwick, 2011) on the auction processes and outcomes (Table 5.11). Finally, an investigation is offered into the factors that have enabled Namibia to sustain not only the procurement programme but also to embrace the changes brought about by the auction results.

Table 5.11: Analytical framework - Namibia

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	- Namibia is characterised by relative levels of economic and political stability, although the country slipped below an investment-grade credit rating (a rarity in the region) in 2019/20. Judicial independence and quality is rated highly. - There is some, albeit limited evidence of these conditions directly impacting price levels and project realisation, although it did create a stable investment context that in part supported projects' ability to be financed and built without any sovereign guarantee (or other risk mitigation) cover or political force majeure provisions.
Supportive energy policy framework	- Namibia's energy policy encourages IPP investments, and recent new policy changes and regulatory amendments have opened up the market even more. Support for renewable energy specifically was limited and necessitated the creation of an intergovernmental RE steering committee, which supported the development of the sector while new policy was being created and specifically initiated the first 3x10MW procurement. The powerful finance ministry is also supportive of the private sector's role in electricity generation. - Beyond creating the general enabling environment that allows private power projects to be realised, there is no evidence of these having a direct impact on project prices or realisation.
Regulatory transparency, consistency and fairness	- Namibia's regulator is rated as one of the top performing in Africa and has consistently ensured the sector's financial health by setting cost-reflective

	tariffs. This impacted prices – by increasing competition levels for a contract with NamPower – as well as allowed projects to be realised without any risk mitigation cover. - Licensing procedures (incl. PPA tariff approval) for new generation facilities were also “built into” the procurement processes, which supported the timely realisation of the Hardap project.
Coherent sectoral planning	- Namibia’s electricity generation expansion plan - the NIRP - was not officially approved, and so the Hardap PV project was slightly bigger than what was provided for in the unofficial plan. A version of the NIRP (2016) has been officially adopted, and was the basis on which ministerial determinations were made that included the Khan project. - No evidence of this directly impacting price or realisation rates.
Competitive bidding practices	- Significant evidence that competitive bidding resulted in superior price outcomes, as tendered project prices were much lower than FIT levels or prices for directly negotiated projects. - The competitively bid Hardap project reached financial close and COD in record time – but it was still broadly in line with timelines for the FIT solar projects in the country. The Khan project is facing significant delays in reaching financial close and commercial operation.
PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	- Auction volumes were modest – between 20MW and 37MW. Despite these modest volumes, the market reacted strongly, with high levels of competition for each bidding process/round. - There is strong evidence that these lower volumes induced competition – driving down prices. - No evidence of a direct impact on project realisation.
Scale-friendly project size limits	- Project sizes were limited to 10MW, then 37MW (Hardap) and 20MW (Khan). - All indications are that these smaller project volumes – while limiting economies of scale – still resulted in competitive price outcomes. Larger projects would likely have resulted in lower prices and some of the bigger bidders decided to not submit bids for Khan because it was deemed too small. - No indications of the project sizes directly impacting realisation, apart from the fact that modestly-sized projects generally tend to have shorter realisation timeline.
Technology choice: specific vs. neutral	- Namibia chose to only auction solar PV capacity, based on the technology’s relative simplicity, the country’s excellent solar resources and the utility’s desire to understand the technology better. - There is no evidence of this directly impacting price levels or realisation rates, beyond the fact that the technology is exceptionally well suited to Namibia’s solar resources and is relatively simple to build.
Bid award limits	- Since only single projects were being awarded, bid awards did not really come into play for the Hardap and Khan projects. For the 3x10MW tender, there were no bid award limits, and Alten was awarded all three projects based on bidding the lowest price – which supports the price reducing impact of not setting such limits. - No evidence of a direct impact on project realisation.
Bidding rounds	- When the Hardap project was announced and later awarded, there was no schedule announced for next tender rounds (or indeed clarity on whether there would be more auctions). Khan effectively functioned as a second round, and it seems clear that the price levels established by Hardap set expectations for Khan’s pricing. - No evidence of bidding rounds having a direct impact on realisation.
Winner selection	- The Hardap project was awarded on a 70:30 Price:Technical basis. - It seems clear that the technical criteria had no additional impact on pricing since bidders were already optimising the project’s technical parameters to maximise revenues and achieve a competitive tariff, but at least one “cheaper” project was not awarded because of the use of the 30% technical scores. Had NamPower thus used price-only scoring, it would have awarded a lower-priced project. The use of a “project schedule to COD” score (as part of the 30%) also seems to have had a limited impact on project realisation since the deadlines set

	in the bidding documents were already extremely tight, and turned out to have been optimistic. - The Khan tender scored bids on an 80:20 Price:socio-economic development basis. It also allowed bidders to state their own escalation rate. - The very competitive price outcomes seem to indicate that there was a limited impact on pricing, although there is some evidence of this creating upward pressure (or at least more risk) on pricing. - There is also some evidence of the self-selected escalation rate lowering competition levels.
Price caps	- No price caps set. - There is no evidence of this impacting price levels (since competition levels were already so high, though the intention of not setting price caps was to reduce prices) or project realisation.
Physical (project/bid preparation) qualification criteria	- Physical (project preparation) qualification criteria for both the Hardap and Khan projects were relatively relaxed, limited to signed term sheets from investors since the sites, environmental permits and grid connections were being provided by NamPower. - This combination of site provision and preparation with financial commitment helped to ensure that bids were mature without imposing substantial preparation costs. This lowered the risks and costs of bidding – increasing competition levels (though some bidders avoided the tender for this reason) – and supported the timely realisation of the Hardap project. The bungling of the sites for the 3x10MW tender however rendered this initial tender process moot.
Financial qualification criteria (bid bonds)	- The Hardap tender required a modest bid bond, while Khan required none. - There is some evidence of the lack of a bid bond lowering competition levels, and this decision also appears to have negatively impacted the realisation of the Khan project.
Auction access requirements (experience and financial standing) limit participation to experienced, capable bidders	- Both Hardap and Khan required evidence of (modest) project development experience (reference projects), but no evaluation of financial strength (turnover/ assets). - This relatively low auction access requirements increased competition levels by allowing local companies with REFIT projects to also participate. - There is no evidence of the access requirements directly impacting realisation, beyond ensuring that the awarded companies had the technical experience to successfully execute projects.
Penalty regime incentivises timely project realisation	- The Hardap tender included a performance bond, several liquidated damages clauses and a PPA length reduction clause (for delays). - These appear to have had some upward impact on price levels. The Khan project only included the PPA reduction clause. - It appears that none of these were used for the Hardap project, despite it experiencing some realisation delays (mostly due to NamPower) – indicating that they had little impact on project realisation timelines. - It also appears that the technical performance-related penalties had no additional impact, and were thus removed for Khan.
One vs. two-stage bidding process	- Both tenders used a one-stage bidding process (although bidders had a sense of who was interested based on the number of entities participating in the site visit). - There is no evidence of this directly impacting prices or project realisation.
Pricing rule, auction format	- Both tenders used pay as bid, sealed bid processes. - There is evidence that this contributed to the perceived simplicity and straightforwardness of the programme, which induced competition (reducing bidding risks). - There is no evidence of a direct impact on realisation.
Auction Implementation	
Procuring entity regarded as capable, benevolent, supported, having integrity	- NamPower suffered reputational losses due to the bungling and consequent court case of the 3x10 MW tender. As a result, at least two major international developers decided not to submit bids for Hardap. - Competition levels were nevertheless still high, with many bidders maintaining that NamPower was still seen as competent.

	- The utility's successful tendering of the Hardap project, as well as some high level governance changes, appear to have improved trust in the procuring entity for the Khan project.
Procurement process regarded as fair, transparent	- Trust in the procurement process remained relatively high for Hardap and Khan – based on the simplicity of the procurement process and documentation, the clear rules and good communication during the tender processes. - There were nevertheless concerns about the awarding decisions for the Hardap project (also based on the 3x10 MW bungling) – in part due to poor communication about rejected bids and procurement criteria. The fact that everything was being done in-house by NamPower, that there was no auditing of results, and that the 37MW project was awarded to the same firm that had secured the 3x10MW tender (despite lower priced bids being submitted) further tainted the process. - In short, the general sentiment was that the Hardap and Khan tenders were professionally run, but that there were also shortcomings – although on balance these were not significant enough to significantly erode trust.
Support to awarded projects	- NamPower was deeply involved in the post-award process as a project shareholder for the Hardap project, which appears to have supported its timely realisation. - While NamPower was not a shareholder of the Khan project, there is no indication that its supporting role has been diminished, or that this is the reason for the project's delays.
PROJECT	
Favourable equity partners	- Both projects were awarded to international, purely commercial developers. While these are not the biggest developers, they appear to have the ability (or willingness) to squeeze margins along the value chain to reduce costs – impacting prices. - The Hardap developers reached financial close and commercial operation in good time – despite this being their first African project; while the Khan developers (with African experience) appear to be struggling to reach this milestone.
Favourable debt arrangement	- Both Hardap and Khan had debt provided by a local bank (Standard Bank), supported by a DFI (Proparco) to extend the loan tenor to 15 years (from an initial 8 years). - This was a significant reason for these projects being able to reach their price levels. - The requirements for banks to provide signed term sheets as part of the bid also seems to have supported bid realisation by improving due diligence and shortening the financial close process for the Hardap project. In the case of the Khan project – which was awarded just before the COVID-19 pandemic hit – the impact of this lender commitment on project realisation timelines appears to have been diluted – despite the lender remaining committed to its terms.
Secure and adequate revenue stream: off-taker, contracts, risk mitigation	- For both projects, bidders were provided with bank-tested (bankable) contracts. NamPower's financial health negated the need for additional sovereign risk cover. - Concerns about long-term political risks (not covered in the PPA) were taken care of by a loan cover arrangement between Standard Bank and Proparco. - The opportunity to sign an off-take agreement with an investment-grade utility appears to have increased competition levels, while the standardised, bankable suite of documents ensured that the financial close process was relatively quick.
Strategic management & relationship building	- The Hardap project included mandated shareholding by NamPower as well as empowerment investors (PDN). While the NamPower shareholding requirement was discarded for Khan, the tender did include incentives for more PDN ownership, as well as local investments. - There is no evidence of the Hardap requirements substantially increasing project prices, although the new Khan requirements increased some risks for bidders. The shareholding in Hardap turned out to have been strategic for the project, helping it achieve timely realisation. - The local shareholding and investment commitments of the Khan project do not appear to have helped it move towards financial close.

5.5.1 The impact of competition levels on project prices

From an auction design perspective, there are mainly three factors that could have contributed to the competitive auction prices: economies of scale¹¹¹ (project sizes), costs (including investment costs and cost of capital) (Dobrotkova et al., 2018), and competition¹¹² (Del Río, 2017f). Looking only at the 45 MW (37 MW export capacity) Hardap project, Namibia's biggest IPP, it would appear that economies of scale played a role in determining price levels. The project was several times cheaper than the smaller, competitively procured RED-based IPPs (for example, 3,8 MW OLC Arandis) and also cheaper (NADc 80,7/kWh vs. NADc 88/kWh) than the initial winning bid for the 3 x 10 MW auction – both awarded to the same bidder.

The explanatory power of the “scale” argument is, however, limited by the price outcomes of the Khan IPP procurement process, with at least 10 of the 16 submitted bid prices being lower (in nominal terms) than that awarded to the Hardap project, despite the Khan project being half the size¹¹³. While it is true that EPC costs – specifically solar PV panel costs – continued their dramatic cost reduction between 2016 and 2019 (IRENA 2020), which would partly explain the lower prices for this later auction, the smaller project size would also have diluted the impact of these capital cost reductions. It is therefore unlikely that project sizes played a determining or, at least, overwhelming role in the auctions' price outcomes.

The impact of auction design choices on projects' cost of capital is also not very clear-cut. The provision of the project site was, for example, meant partially to induce tariff reductions by reducing project risks and costs (Interviews 5, 42). Considering the fiasco with the initial three sites, as well as the fact that bidders had to forfeit a sizable equity portion to “pay for” the project sites (including studies, permits and transmission infrastructure), it is equally likely that this decision resulted in increasing

¹¹¹ Although economies of scale directly impact project investment costs, the author discusses it as a factor in its own right owing to its prominence in analysis of renewable energy costs (Brent & Rogers, 2010; Egli et al., 2018; International Renewable Energy Agency, 2019, 2020)

¹¹² Most of the other impacts of auction design factors on price is moderated through their impact on competition levels, project investment costs or cost of capital, and scale (del Río, 2017f; del Río et al., 2015; Haufe & Ehrhart, 2018). Nevertheless, specific types of bidder behaviour that could also directly impact bid levels, such as collusion among bidders or strategic bidding, are not explicitly included here. Competition levels were high enough to limit the possibility of effective collusion (Hubbard & Paarsch, 2016; Klemperer, 2003) while the presence and impact of strategic bidding is difficult to identify and isolate.

¹¹³ If we assume that the Hardap project's tariff is indexed at an annual escalation rate of 4% – reasonable considering Namibia's recent inflation rates – all the submitted Khan project bids are cheaper over the lifetime of the project.

bidder risks and costs (Interview 16), which would be in line with regional experience (Kruger et al., 2019).

The fact that Alten (which would have been familiar with the benefits of having a project site secured and prepared by NamPower) was willing to submit a much lower price for the Khan project compared to Hardap's tariff¹¹⁴, despite the lack of a similarly prepared and provisioned site, seems to confirm this. Alten's lower bid for the Khan project does, however, seem to support the proposition that the removal of certain penalties (performance bonds, liquidated damages clauses) and the financial qualification requirement (bid bonds) would put less capital at risk and thus lead to a lower cost of capital (Dukan et al., 2019). While this might be case, the fact remains that these cost benefits (including the reduction in solar PV equipment costs) would not have been fully captured in a competitive tariff had it not been for sufficient competitive pressures between bidders (Hubbard & Paarsch, 2016).

5.5.1.1.1 The impact of auction design choices on competition levels – quantity vs. quality

Though it seems clear that competition played an important role in determining price outcomes for both the Hardap and the Khan projects, understanding how specific auction design choices impacted competition levels is a complex undertaking. For one thing, the Namibian case highlights how the quantitative and qualitative factors determining competition levels were influenced in different ways by auction design choices. NamPower was, for example, satisfied that bidders would be able to scale up previous proven project experience, and, as a result, bid qualification requirements were generally set at relatively low levels for the Hardap project, and lowered even further for Khan.

Financial qualification requirements (bid bonds) were similarly set at relatively low levels (Hardap), and later completely removed (Khan). While this probably led to an increase in the number of bids submitted, it also led to a decrease in the quality of competition (inversely similar to Welisch's (2018) findings in the UK¹¹⁵), with some experienced bidders deciding not to submit bids for Khan in part because they saw the lowering of these requirements as exposing them to competition from unrealistic bids (Interviews 2, 8, 16).

¹¹⁴ EPC costs would also have reduced considerably over this period and is likely to have played an important role in this much lower price.

¹¹⁵ Welisch's (2018) research found that while higher qualification criteria led to a general decrease in the number of bids submitted in RE auctions in the UK, it also led to an increase in the quality of bids submitted and the strength of bidders, resulting in competitive price outcomes.

NamPower also took the prudent approach (Eberhard & Naude, 2016) of keeping auction volumes relatively low for its first auctions¹¹⁶, and the equally prudent decision (from a pricing perspective) to allocate the entire volume to a single project. This ensured that competitive pressures between bidders were not diluted by large overall auction volumes or the option of bidding for multiple projects, while the relatively larger project size meant that there was still a higher likelihood of attracting bidders (Ballesteros-Pérez et al., 2016).

When the auction volume was lowered for the Khan project, some of the larger so-called experienced bidders again decided not to submit bids (Interviews 2, 8), further lowering the calibre of competition, though the project still attracted more bids than the Hardap project. Nevertheless, it is notable that both the biggest IPP owner and operator in Africa (Globeleq) and a top-10 global solar PV developer (Scatec) submitted bids for Khan, alongside more than a dozen other international and local developers.

It is furthermore notable that the inclusion of the socio-economic development qualification and evaluation criteria for the Khan bid – probably influenced by South Africa’s REI4P (Interview 38) – did not seem to deter either competition or competitive pricing. This is likely partially attributable to NamPower’s practical approach to setting these criteria (for example, limiting local content requirements to a balance of plant and civil works components as well as to O&M, or using the NamPower foundation as the funding channel for local community benefits). What is evident, though, is that the inclusion of such criteria speaks to a renewables industry that seems to be increasingly comfortable with these requirements as par for the course in the African context – in large part thanks to the pioneering work done by REI4P.

There were some auction design choices that likely increased competition in both qualitative and quantitative terms: The risks of bidding (Zitron, 2006) were lowered by the auctions’ emphasis on simplicity, standardization and clarity in its choice of auction format, pricing rule and scoring criteria (Del Río, 2017f; Haufe & Ehrhart, 2018; Kreiss et al., 2016), and, in the case of Khan, the removal of the excessive penalty regimes. The Khan tender, by mere virtue of the fact that it took place after the Hardap tender, also functioned as a second round of the auction programme and thus benefitted from the reputation of and momentum created by the initial tender, all of which further increased bidder interest (Del Río & Mir-Artigues, 2019; Eberhard & Naude, 2016; Ferroukhi et al., 2015; Haufe &

¹¹⁶ This is easier for solar PV than wind, since solar PV is a more modular technology that scales down easier.

Ehrhart, 2018). Though these auction design choices likely played a role in driving competition for both projects, they are not, on their own, sufficient to explain the resulting price outcomes.

Tracing the impact of the auction implementation factors – that is, who implements the auction, and how it is implemented – on bidder trust and consequent competition levels also eludes simplistic analysis. On the one hand, bidders appeared to trust that NamPower’s capability as an effective and efficient utility would translate into it being a capable procurer. For the most part, this seems to have been correct. NamPower had proven that it was capable of drawing up standardized, bankable procurement contracts; setting out clear auction rules; running an efficient auction programme, and incorporating bidders’ needs in the auction’s processes.

However, bidders’ trust in the auctioning authority is also influenced by the perceived integrity and benevolence of the auctioneer, in addition to its capacity (Liu et al., 2016; Mayer et al., 1995). In the Namibian case, these two aspects appear to have been somewhat tainted by perceived unfairness in the bidding processes (Interviews 2, 8, 16, 19). Almost every auction outcome (3 x 10 MW, Hardap, Omburu EPC¹¹⁷) – with the notable exception of Khan – has been challenged. In the case of the 3 x 10 MW auction, the procedural injustice (Chiu et al., 2010; Colquitt, 2001) of the site changes post-award necessitated a legal remedy that, while protecting the integrity of the auction process (Kreiss et al., 2016), reduced bidder trust and led to a reduction in competition levels for Hardap (Interviews 16, 19).

NamPower’s failure to provide bidders with full and complete information on the bid-scoring criteria and the process (including post-bid debriefings) for the Hardap project led to another challenge based on perceived informational injustice (Chiu et al., 2010; Colquitt, 2001) – this time through the regulator’s licensing process (Interviews 2, 4, 5). While ECB’s investigation cleared NamPower, the challenge further undermined the integrity of the process and the auctioneer, and is likely to have been one of the reasons that so few Hardap bidders submitted bids for the Khan project.

NamPower appears to have taken these lessons on board, and the Khan project was marked by more communication (double the amount of clarification notices compared to that issued for Hardap) and much clearer bid-scoring and evaluation information in the RFP documentation. To date, this approach appears to have been successful, with no official challenges to the Access-Ausenker award. However, the Omburu EPC project award was also challenged, in this case leading to a prolonged public dispute between one of the bidders and the CPBN, based on perceived informational and procedural injustice

¹¹⁷ The Omburu EPC tender is not considered an auction case/round for the analysis since this was not concerned with procuring power from an IPP.

in the bidding process (Chiu et al., 2010; Colquitt, 2001). While not directly impacting NamPower's standing as a bidding authority, nevertheless, it still tarnished Namibia's procurement governance reputation and is likely to decrease bidder trust in the medium-term, again potentially depressing competition levels in future procurement processes.

Of all the factors discussed that could determine competition levels – both in terms of auction design and implementation – it seems that the financial strength of the offtaker might nonetheless have been the most influential. NamPower's financial health, afloat as it is in a sea of insolvent sub-Saharan African utilities, was repeatedly pointed out as a key bidding consideration and one of the strongest drivers of competition in this programme (Interviews 2, 3, 8, 9, 19). This is a notable contribution that, again, illustrates the powerful impact of an analytical framework combining the IPP literature with auction design and implementation theory to make sense of renewable energy IPP price outcomes.

It is also worth reflecting on the fact that NamPower's reputation as a bankable offtaker protected the national fiscus from unnecessary financing costs and risks (through the contingent liabilities represented by sovereign guarantees). This, in turn, contributed to long-term project sustainability through ensuring a fairer balance between investor and development outcomes (Gratwick, 2007).

Despite the importance of NamPower as an offtaker, no single factor, or set of factors, completely stands out for its impact on project price levels. Instead, Namibia's renewable energy project prices are the result of the cumulative impact of country-, programme- and project-level factors working in tandem. The supportive enabling environment, a generally well-designed and well implemented procurement programme (thanks, in large part, to well-run and capable institutions), bankable offtaker, and innovative financing arrangements – contributed to driving competition and lowering risks and costs, which translated into some of the lowest solar PV prices in the region.

5.5.2 Project realisation: the impact of lender commitment and NamPower shareholding

The Namibian case seems to indicate that timely project realisation was most influenced by requirements to demonstrate lender due diligence and by NamPower's shareholding. While the Hardap project reached financial close and commercial operation in good time, any attempt at analysing the effectiveness of the Khan procurement process would at best be speculative since, at the time of writing, financial close has still not been reached. Nevertheless, it is worth examining which factors led to the timely realisation of the Hardap project, and how NamPower's interpretation of these facts led it to shape and adjust the Khan process.

In general, the Hardap procurement process relied (too) heavily on auction design features meant to ensure project delivery effectiveness through a combination of incentives and punitive measures. These included the already discussed penalty regime as well as the use of technical criteria and implementation timelines as bid-scoring criteria, neither of which impacted project implementation timelines in reality. NamPower acknowledged as much by removing these factors from the Khan procurement documents (Interview 38). It is further tempting to consider the provision of the project site (including permits, studies, connection infrastructure) as a way of improving the likelihood of timely project realisation. Nevertheless, the fact that two REFIT projects – which had to find, secure and prepare their own sites – were able to reach financial close and commercial operation within shorter time frames appears to suggest that this impact was not significant. Again, the change in approach for the Khan project, where similar site-related provisions are not in place, appears to support this point.

Two features that do not appear in the auction design theoretical literature seemed to have been crucial for ensuring timely project realisation. The first (which also featured in the FIT programme) was the provision of letters of support from investors – specifically from lenders. By requiring these letters as part of bids, NamPower was shifting the responsibility for bid due diligence to financiers. This ensured that projects were well developed by the time of submission and able to advance quickly to financial close.

A second decision that appears to have unintentionally helped along realisation timelines was NamPower's role as offtaker, procurer and shareholder for the Hardap project. The utility's role as shareholder, in particular, ensured that its interests and those of the project sponsors were closely aligned. This shared interest meant that NamPower was involved, on a day-to-day basis, in moving the project to commercial operation and clearing the path where needed (Interview 5). In combination, lender due diligence and NamPower's dual roles as shareholder and offtaker shortened both financial close and commercial operation timelines and ensured quick project realisation.

A final note on project realisation: the Khan project missed its financial close deadline – blamed on COVID-19 related disruptions (Interviews 37, 38). While the global pandemic has been incredibly disrupting to the industry, the project sponsors' apparent hesitance or unwillingness to advance timeously to financial close and commercial operation seems to indicate that not using bid bonds in the procurement process undermined the auction's effectiveness.

5.5.3 Political economy forces shaping the Namibian power sector's future

Finally, it is worth reflecting on three political economy factors that ensured that the momentum created by the auction programme has not only been sustained but has potentially also changed the direction of the Namibian power sector.

5.5.3.1 Supportive elite-economic nationalism

The first is that, unlike many of Namibia's neighbours (for example, Angola, Botswana, and South Africa), Namibia's minerals–energy cluster is not tied into the power sector in such a way that it would be threatened by the growth in renewables. In fact, the difficulties experienced in creating something approaching such a cluster through the Kudu Power project stands in direct contrast to the quick realisation of renewable energy investments (both through the feed-in tariff and auction programmes) that offered immediate economic benefits to a new, politically-connected economic elite (Fritz et al., 2014; Melber, 2011, 2018). For more than three decades neither the Kudu nor the Baines projects were able to get off the ground, partly because the country never developed an effective PPP or IPP model, and partly because NamPower and Namcor wanted to drive these investments (Kapika & Eberhard, 2013). But the answer also lies in the fundamentally different nature of solar (versus wind, biomass, and small hydro): they are geographically dispersed resources suitable for incremental development at a much smaller scale.

As a result, more investors and industry players – including a broader range of politically-connected elites – are able and willing to participate. While the slow but growing convergence between political and economic elites has done little to meaningfully address Namibia's economic inequality and unemployment problems, it is, however, a powerful political force that has come to shape much of the country's economic (and energy) policy (Melber, 2011, 2018). The PDN shareholding in IPPs, as well as the growing prominence of SED criteria in the procurement process (for example, Khan) is a direct manifestation of this policy and is likely one of the reasons that the growth of the renewable energy sector has been championed by many in government.

5.5.3.2 Energy insecurity

The second factor is the fact that Namibia, unlike many of its neighbours, is a net importer of power. National energy security became a political priority as South Africa and Zambia – both historically net exporters – started experiencing severe supply-side problems (Interviews 4, 5, 10, 37). NamPower's

failure to address this supply-side gap through its flagship gas and hydro projects again sharply contrasted with the private sector's rapid success in increasing renewable energy capacity. As a result, many political decision-makers have been convinced that a private-sector-led capacity-expansion programme built on renewables is a viable path not only to ensuring the country's energy security but also to transforming Namibia into a regional power exporter (Interviews 10, 37).

5.5.3.3 The cost of power

The third, closely related factor, is the cost of power. Namibia has the dubious honour of having among the most expensive retail tariffs in the SADC region (Masawi, 2016). In recent years, rising tariff levels were driven by the increasing costs of importing power from SAPP – both on the day-ahead market as well as through bilateral contracts, as a result of the aforementioned supply-side problems (Burkhardt & Nhongo, 2018; Kapika & Eberhard, 2013). The priority for sector decision-makers – and for NamPower – thus shifted to decreasing power costs, and the most effective proven way of doing this is through the ongoing competitive procurement of renewable energy (Interview 37) – especially considering the fact that the country has among the best solar resources in the world.

Together, these three factors – elite economic nationalism, energy insecurity and high power costs – created the political support necessary to sustain the roll-out of renewable energy auction programmes. At this relatively early stage of the Namibian energy transition, it remains to be seen whether this convergence of interests will result in the stable reconfiguration of economic and political power bases necessary to sustain a long-term renewable energy programme.

Chapter 6: Comparative analysis

6.1 Introduction and outline

The preceding three chapters have analysed the various ways that country, project and programme-level factors contributed to project price and realisation outcomes in South African, Zambian and Namibian auctions. Chapter 6 now takes a step back to allow for an explicit comparative analysis across the three countries, at all three levels. Through focusing on similarities and differences between the cases, this chapter allows for the refining of causal explanations and the identification of causal inferences not yet considered. The chapter first analyses factors at the country and project levels, before proceeding to programme design and implementation factors. It concludes by summarising some of the main findings from the comparative analyses, which are further refined in chapter 7.

6.2 Building up and analysing the factors contributing to successful outcomes

As posited by chapter 2 and illustrated in chapters 3 to 5, an analytical framework that combines all three levels – country, programme, and project – is able to more deeply and comprehensively account for the contributions of elements to price and project realisation outcomes. This combined analytical framework is again captured in Table 6.1 for ease of reference.

Table 6.1: Analytical framework - country, programme and project level factors

Factors	Detail	Impact on Price	Impact on Realisation
Country level			
Stability of economic and legal context	Stability of macroeconomic policies Extent to which the legal system allows contracts to be enforced, laws to be upheld, and arbitration to be fair Repayment record and investment rating Previous experience with private investment	(+) Stable investment context lowers investment risks, reducing cost of capital, leading to lower prices	(+) Stability of investment context – incl. judicial quality – improves realisation
Energy policy framework	Framework enshrined in legislation Framework clearly specifies market structure and roles and terms for private and public sector investments	(+) Stable, clear policy framework lowers investment risks, reducing cost of capital, leading to lower prices	(+) Clear energy policy that allows for private investment improves project realisation
Regulatory transparency, consistency and fairness	Transparent and predictable licensing and tariff framework Cost-reflective tariffs	(+) Good regulatory quality lowers investment risks, reducing cost of capital, leading to lower prices	(+) Good regulatory quality, especially on licensing and tariff approval, improve project realisation

Coherent sectoral planning	Power-planning roles and functions clear and allocated Planners skilled, resourced, and empowered Fair allocation of new-build opportunities between utilities and IPPs	(+) Coherent sectoral planning reduces investment risks, reducing cost of capital, leading to lower prices	(+) Coherent sectoral planning improves project pipeline development, improving project realisation
Competitive bidding practices	Planning linked to timely initiation of competitive tenders/auctions Competitive procurement processes are adequately resourced, fair and transparent	(+) Competitive bidding practices lower project prices	(=) No theoretical expectation around impact on realisation
Programme level			
<i>Auction Design</i>			
Competition-inducing, scale-friendly auction volume	Auction volume based on dynamic, least-cost power expansion plans Auction volumes large enough to attract bidders, but small enough to ensure competitive pressure	(+) Auction volume that is large enough to attract bidders, but smaller than offered volume, induces competition, leading to lower prices	(=) No theoretical expectation around impact on realisation
Scale-friendly project size limits	Project size limits enable economies of scale	(-) Project size caps limit economies of scale, increasing prices	(+) Smaller projects are more easily realised, improving realisation
Technology choice: neutral vs. specific	Technology choices based on least-cost planning framework Auction volume division between technologies balance price with energy security concerns	(-) Technology bands limit competition, increasing prices	(=) No theoretical expectation around impact on realisation
Bid award limits	Bid award limits used to counter market domination or energy security concerns	(-) Bid award caps limit economies of scale, increasing prices	(+) Bid award limits spread realisation risk, increasing overall realisation
Bidding rounds	Regular, scheduled bidding rounds	(+) Bidding rounds increase competition and induce market learning, lowering prices	(+) Bidding rounds increase project pipeline development and market learning, improving realisation
Winner selection	Winner selection criteria transparent and rational Price remains key determinant	(-) Multiple bid scoring criteria dilute the importance of price and add additional cost drivers, increasing prices	(+) Multiple criteria (esp. technical) improve project preparation, improving realisation
Price caps	Price caps (ceiling prices) set, but preferable undisclosed	(+) Price caps induce competition, lowering prices	(=) No theoretical impact expectation, although price caps being set too low can result in no project being awarded
Physical (project/bid preparation) qualification criteria	Physical (project/bid preparation) qualification criteria set at high enough level to ensure cost certainty and realisation probability	(-) High physical qualification criteria increase bidding costs, lowering competition and increasing prices	(+) High physical qualification criteria improve project preparation and cost certainty, improving realisation
Financial (bid bond) qualification criteria	Bid bonds set to ensure commitment of qualified bidders	(-) Bid bonds increase bidding costs, lowering competition and increasing prices	(+) Bid bonds increase bidder commitment and cost certainty, improving realisation
Auction access requirements	Auction access requirements – technical experience and financial status – limit participation to experienced, capable bidders	(-) High auction access requirements lower competition, increasing prices	(+) High auction access requirements increase likelihood of capable bidders being awarded, increasing realisation

Penalty regime	Reasonable penalties (PPA reduction, liquidated damages, performance bonds) incentivise project performance	(-) Penalties increase project risks, lowering competition and increasing the cost of capital, increasing prices	(+) Penalty regime incentivises project preparation and cost certainty, improving realisation
Staged bidding process	Choice of one- vs. two stage bidding process balances transaction costs with time concerns	(-) Staged bidding reduces competition, increasing prices	(+) Staged bidding increases likelihood of capable bidder being awarded, improving realisation
Pricing rule, auction format	Simple sealed bid, pay-as-bid auction format to reduce bidder risks	(+) Simple bidding format and pricing rule increases competition, leading to lower prices	(+) Simple bidding format reduces winner's curse risk, improving realisation
Auction Implementation			
Procurer	Procuring entity perceived as capable, benevolent and acting with integrity	(+) Trust in the procuring authority increases competition, lowering prices	(=) No theoretical expectation around impact on realisation
Procurement process	Bidding process is perceived as fair, transparent, secure	(+) Trust in bidding process increases competition, lowering prices	(=) No theoretical expectation around impact on realisation
Support to awarded projects	Auctioneer assists awarded projects to reach financial close and commercial operation	(=) No theoretical expectation around impact on price	(+) Auctioneer support to awarded projects to financial close and COD improves realisation
Project level			
Favourable equity partners	Local capital/partner contributions are encouraged Partners have experience with and an appetite for project risk A DFI partner (and/or host country government) is involved Firms are development-minded and returns on investment are fair and reasonable	(+) Favourable equity partners require lower returns, lowering prices	(+) Favourable equity partners are experienced, capable (with potential halo effect) – improving realisation
Favourable debt arrangements	Competitive financing Local capital/markets mitigate foreign exchange risk Risk premium demanded by financiers or capped by offtaker matches country/project risk Some flexibility in terms and conditions (possible refinancing)	(+) Favourable debt arrangements lowers the cost of capital, lowering prices	(+) Debt from DFIs come with a halo effect, improving realisation
Creditworthy offtaker	Utility is investment-grade rated, with full cost recovery through cost-reflective tariffs and high billing collection rates	(+) Credit-worthy offtaker reduces project risks, and thereby the cost of capital, lowering prices	(+) Credit-worthy offtaker enables project to secure funding, improving realisation

Secure and adequate revenue stream	Robust PPA (stipulates capacity and payment as well as dispatch, fuel metering, interconnection, insurance, <i>force majeure</i> , transfer, termination, change-of-law provisions, refinancing arrangements, dispute resolution, and so on) Security arrangements are in place where necessary (including escrow accounts, letters of credit, standby debt facilities, hedging and other derivative instruments, committed public budget and/or taxes/levies, targeted subsidies and output-based aid, hard currency contracts, indexation in contracts)	(+) Secure revenue stream reduces project risks, and thereby the cost of capital, lowering prices	(+) Secure revenue stream enables project to secure funding, improving realisation
Credit enhancements and other risk management and mitigation measures	Sovereign guarantees Political risk insurance Partial risk guarantees International arbitration	(+) Credit enhancement & risk mitigation measures reduce project risks to reduce cost of capital, lowering prices	(+) Credit enhancement & risk mitigation measures enable projects to secure funding, improving realisation
Strategic management and relationship building	Sponsors work to create a good image in the country through political relationships, development funds, effective communications, and strategic management of contracts, particularly in the face of exogenous shocks and other stresses	(-) Strategic socio-economic development commitments increase project costs, increasing prices	(+) Strategic socio-economic development commitments improve project realisation

The following sections will provide a comparative analysis of the influence of the country-, project- and programme-level factors on auction outcomes in all three case study countries.

6.2.1 Country level elements

6.2.1.1 Favourable investment climate

The IPP literature posits that a favourable investment climate, which leads to both increased investor interest (thereby improving competition) and a lower cost of capital (through improved sovereign credit ratings), should ideally have a number of macroeconomic fundamentals in place – including low inflation rates, moderate national-debt levels, national wealth (GDP/capita), a large economy, and well-developed, deep local capital markets. Property rights, contract enforcement and the integrity of procurement processes should, furthermore, be protected by a strong, independent judiciary. Less important, but still relevant, are high levels of economic growth, an educated and productive labour force, tax incentives, corruption levels and political stability (Eberhard et al., 2016; Eberhard & Gratwick, 2011; Vaaler et al., 2008; Woodhouse, 2005a).

The three countries in the case studies offer, at best, a tenuous link between investment climate conditions and price outcomes. Remarkably, auction price outcomes improved even as investment climate conditions worsened, especially in Zambia. All three countries, for example, saw average project prices decline over successive auction rounds at the same time as macroeconomic conditions deteriorated – including slower, or even negative, economic growth levels (Figure 6.1), credit rating downgrades, and steeply rising national debt levels (Table 6.2). In South Africa and Namibia, the prominence of local debt providers (thanks to Namibia’s currency peg to the South African Rand) partly shielded the highly geared projects from exposure to higher borrowing costs on international markets as credit ratings declined (Figure 6.2), thus strengthening the case for local capital market depth as contributing to project success (Eberhard & Gratwick, 2011).

Table 6.2: Population; GDP/capita; ease of doing business, and installed capacity - South Africa, Zambia, and Namibia (Source: IMF, 2020; The World Bank Group, 2020)

	Population (million)	GDP (Current US\$, Billion)	GDP/ capita (US\$ 2019)	Ave. inflation rate (2010 – 2019)	Debt to GDP ratio (2010)	Debt to GDP ratio (2019)	Ease of doing business score	Installed power generation capacity (GW)
South Africa	58,56	351,4	6001,40	5,17	34,7	62,2	67,0	45
Zambia	17,86	23,1	1291,34	9 ¹¹⁸	18,9	91,9	66,9	2,8
Namibia	2,49	12,7	4957,46	5,17	16	65,7	61,4	0,6

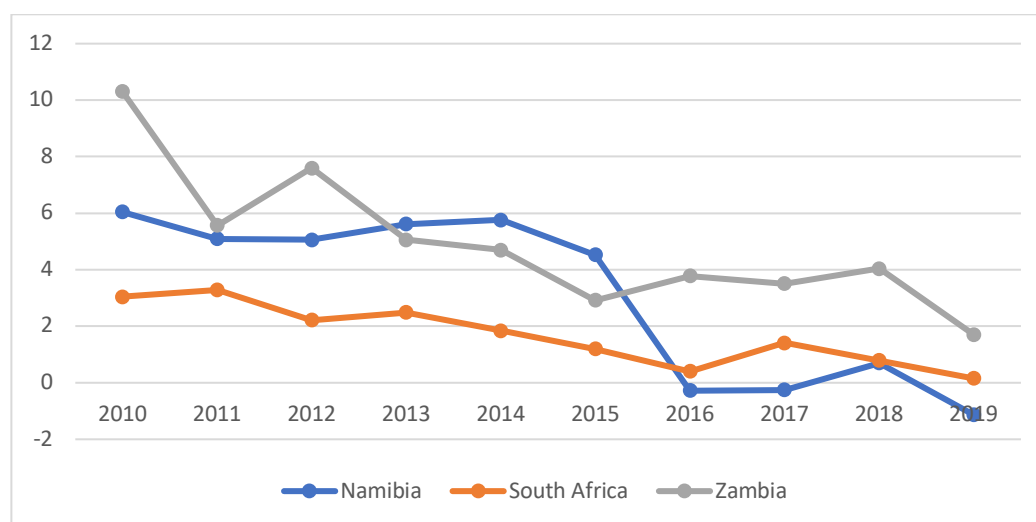


Figure 6.1: Annual GDP growth rate, 2010 – 2019: South Africa, Zambia and Namibia (Source: The World Bank Group, 2020)

¹¹⁸ In 2016 inflation was 17,9%.

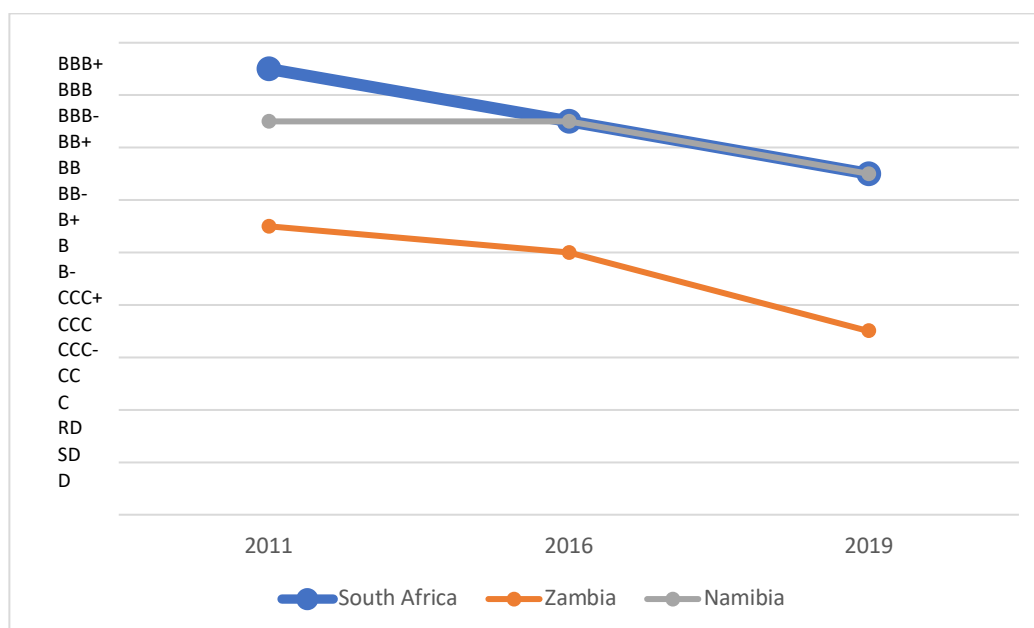


Figure 6.2: Fitch Sovereign Credit Rating, 2011 – 2020: South Africa, Zambia and Namibia (Source: Fitch Ratings, 2021)

The broad convergence of auction price outcomes across the three cases is even more remarkable considering how significantly the scale and pace of macroeconomic deterioration differed between the three countries. While South Africa and Namibia lost their investment-grade credit ratings during the 2017–2020 period, Zambia was already deep into junk status with its speculative-grade rating in 2016. It further slipped to high credit-risk grade¹¹⁹ in the period between Scaling Solar Round 1 and GETFiT (Figure 6.2). One would thus have expected investors to be increasingly cautious of bidding in Zambian programmes and would, likewise, have expected higher risk-return expectations on capital, resulting in higher project tariffs. This was clearly not the case, with GETFiT project prices beating Scaling Solar’s (even though competition levels were also lower). This confirms that economic stability (as least as measured by sovereign credit ratings) cannot be considered a sufficient condition for competitive price outcomes.

Not only was there price convergence across all three countries but project gearing ratios – a reliable indicator of projects’ perceived risk levels – were high across all three cases, ranging between 75%

¹¹⁹ in 2020, Zambia officially defaulted on its bond obligations and consequently slipped to restricted default status.

and 80% on average¹²⁰. The prominent role of DFIs in the auction development and implementation process, as well as the provision of concessional finance¹²¹, and a robust package of risk allocation and mitigation measures¹²², appear to have mitigated Zambia’s risk for investors’ bidding considerations and cost of capital calculations. This finding supports and extends the risk-reducing “halo” effect normally associated with DFI involvement as project investors and risk cover providers (noted by Eberhard & Gratwick (2011)). Zambia’s experience shows that DFI involvement as auctioneers led to both an increase in competition levels (specifically in the quality of competition) and lower cost of capital.

Nevertheless, while auction efficiency (price outcomes) seems to have been somewhat shielded from the impacts of macroeconomic deterioration, auction effectiveness (project realisation) has not. Economic shocks, rapid currency depreciation and long-standing economic mismanagement, for example, have derailed the financial close of the awarded GETFiT projects and have undermined medium-term prospects for private power investment in Zambia. At the same time, both South Africa’s and Namibia’s awarded projects managed to reach financial close in good time (noting some delays), in part thanks to the stability afforded by prudent macroeconomic policy and market fundamentals¹²³ - pointing to the potential necessity of economic stability for project realisation.

These same fundamentals also played a notable role in determining the overall scale of, and ongoing interest in, IPP investment in both countries. Despite a small market, and economic slow-down, Namibia’s relative macroeconomic stability and wealth (GDP/capita), as well as the financial health of NamPower, propelled the country to fourth place in absolute IPP numbers in sub-Saharan Africa in less than four years. Any discussion on the pace and scale of investment in the South African IPP programme – which was more than twice as large in MW terms as the entire Zambian power system, and more than 10 times Namibia’s, making it Africa’s biggest IPP market – has to acknowledge the fact that South Africa’s power sector and economy dwarfs that of its regional neighbours (including Namibia and Zambia).

¹²⁰ Lower levels of perceived risk translate into higher gearing ratios (debt levels).

¹²¹ While only Scaling Solar provided bidders with stapled concessional finance packages, the introduction of competition between lenders – almost all DFIs – during the bidder shortlisting process of GETFiT reduced the cost of lending to what would be considered concessional levels.

¹²² Even though GETFiT bidders did not have access to the same full suite of loan and payment default cover measures that the Scaling Solar projects had, they were bidding on the assumption that their DFI lenders would not allow projects to reach financial close without similarly robust levels of cover, or, at the very least, significant reforms of ZESCO.

¹²³ Namibia’s Khan project is yet to reach financial close, mainly due to COVID-19 related disruptions.

The importance of a strong, independent judiciary was also evident as the courts were called on to protect the integrity of the auction processes and outcomes (and not merely contract enforcement, as originally posited by Gratwick (2007)) in South Africa and Namibia. The outcomes of these judicial processes – overturning awards in Namibia, while confirming the legality of awards in South Africa – bolstered confidence in these institutions and appear to have ultimately strengthened the countries’ overall investment climate. However, investors’ lack of confidence in the Zambian courts (supported by relatively low Rule of Law ratings in the World Governance Index – Figure 6.3) meant that both the Scaling Solar and GETFIT programmes needed to include international arbitration clauses for project contracts to be considered bankable. Taken as a whole, there thus seems to be evidence to support legal stability (or at least contractual provision being made for international arbitration) as a possible necessary condition for project realisation.

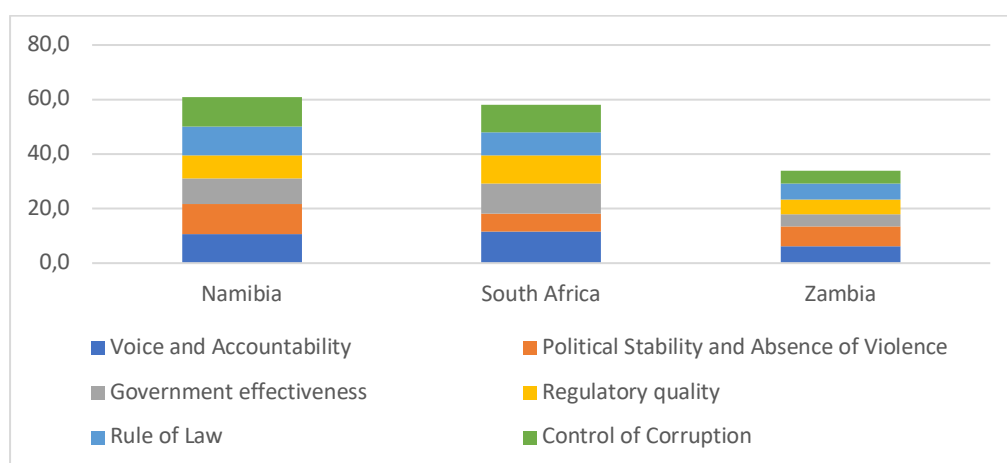


Figure 6.3: World Governance Index scores: Namibia, South Africa and Zambia (Source: (Kaufmann & Kraay, 2019))

The above analysis confirms the importance, but also some limitations, in relying solely on the investment climate as an explanatory factor for auctions’ price and realisation outcomes, necessitating further probing of factors at the country, project and programme levels.

6.2.1.2 Energy policy framework and regulation

Beyond the investment climate, the context for accelerated and sustained IPP investment is further strengthened through an enabling policy and regulatory framework that should, at the very least, make space for the private sector’s participation in power generation. The regulatory framework does this preferably through IPP legislation that allows private investors to generate and sell electricity. It

also ideally clarifies the roles of the private vs public sector entities, and specifies how, and by whom, IPPs should be procured (Eberhard et al., 2017; Eberhard & Gratwick, 2011; Urpelainen & Yang, 2017). This enabling framework is further strengthened through policies that clarify governance arrangements for state-owned utilities and the presence of an independent sector regulatory agency. An independent and capable regulator that is not dependent on government for its funding and is able to make its own staffing decisions can play an important role in ensuring the sector's financial health through setting cost-reflective consumer tariffs, and can streamline IPP investments through implementing transparent, predictable generation-licensing and PPA approval mechanisms (Eberhard et al., 2016; Kapika & Eberhard, 2013).

All three case studies illustrate that enabling policy and planning – while important (perhaps even necessary) – is not a sufficient condition for accelerating private investment in power: they need to be complemented by structured procurement processes that provide a clear route to market. South Africa, Zambia and Namibia all had energy policies in place that allowed for private sector participation in power generation prior to the roll-out of auction programmes. In all three countries, this allocation resulted in three expensive, slow, directly negotiated projects: the gas-peaker plants in South Africa, the Maamba coal IPP in Zambia, and the Omburu PV IPP in Namibia. It was only when a structured procurement process – either an auction or a feed-in tariff programme – was introduced that these policy statements were translated into concrete investment results at scale.

Furthermore, the case studies support the old adage that “perfection is the enemy of progress”. In all three countries auction implementers had to find ways around or through policy and regulatory barriers, instead of merely sticking to established procedure. In some respects, these procurement programmes happened outside, or in spite of, the relevant policy and regulatory arrangements. This included the fact that the procurer of power was either not stipulated in policy (for example, in South Africa and Namibia) or was vested in an incapable or poorly supported entity (for example, OPPPI in Zambia). This necessitated innovative alternative arrangements such as Zambia's newly established IDC, South Africa's interdepartmental IPP office or Namibia's ill-fated Renewable Energy Steering Committee (later successfully supplanted by NamPower).

How and why these implementing entities were able to successfully shape the procurement programmes to deliver efficient and effective project outcomes is discussed in further detail in section 6.3.4.1. The result is, however, that policy, planning and regulatory frameworks have been playing catch-up with the auction programmes, sparking a new wave of policy changes (Namibia and Zambia) and market and regulatory reforms (Namibia and South Africa) aimed at increasing private sector investment and renewable energy roll-out.

The quality of regulation has had substantive impacts on how auctions were designed and implemented, and their price and realisation outcomes (although there is no evidence of this being either a necessary or sufficient condition for either outcome). Zambia and South Africa's experience both illustrate how poor regulation of the sector undermines the long-term sustainability of the sector, while Namibia is a shining example of the inverse. While Zambia's regulator is generally regarded as technically competent, its regulatory independence was undermined in several instances through political interference – most significantly through the reversal of consumer tariff-increase decisions by the president. These decisions undermined the sector's financial sustainability and is a key reason for the GETFiT projects not being able to reach financial close. The poor financial health of the offtaker is also largely responsible for the large suite of risk mitigation products required, which exerted upward pressure on project prices as their costs need to be recovered through the final PPA tariff¹²⁴.

In South Africa, a decline in both regulatory independence and capacity led to a reduction in the general quality of regulatory decision-making. As a result, several of the regulator's recent decisions were overturned by the courts, while its regulatory processes have been characterised as exceptionally slow or veering into policy-making territory. NERSA's inconsistent application of its own regulatory methodology, as well as irrational regulatory tariff decisions – the subject of recent court rulings – have kept retail tariffs below cost-reflective levels and is partly responsible for Eskom's poor financial position (Mahlaka, 2020; Steyn, 2021). The designers of REI4P had to specifically guard against this regulatory risk through instituting the Government Framework Support Agreement – undersigned by the Department of Energy, Eskom, National Treasury and NERSA – which obliges the regulator to allow Eskom sufficient ring-fenced revenue via its tariff awards to fully cover the costs of its PPAs with IPPs (Interview 30).

Namibia's regulator (ECB), in contrast, has been a clearing force for private renewable energy investment. It has consistently ensured that electricity tariffs are at cost-reflective levels, thereby strengthening NamPower's financial position as offtaker and making it possible to finance renewable energy IPPs without the added cost of risk mitigation products. This also made it possible for projects to be financed without the state needing to incur contingent liabilities through the provision of sovereign guarantees, which is normally a substantial deceleration on IPP rollout in cash-strapped African economies. Through incorporating ECB and their licensing requirements in the procurement

¹²⁴ It is also likely, however, that the increase in competition levels resulting from the provision of attractive risk mitigation measures reduced margins (including equity returns), thereby largely offsetting the costs associated with the risk mitigation products.

process' design, Namibia was able to accelerate the pace of implementation of procured projects. Ultimately, ECB has championed the opening up of the Namibian power sector to expedite private sector investment – especially in renewables – through the promulgation of new market rules (including the modified single-buyer market model), as well as through the increasingly supportive policies (including the energy policy, RE policy and IPP policy of 2019) – based, primarily, on the results of the auction programmes.

6.2.1.3 The planning procurement nexus

The contribution of the planning-procurement nexus to IPP outcomes is not as straightforward as originally assumed. Ideally, a regularly updated power sector expansion plan should project demand; establish a system reliability standard; select the technologies that can meet demand at the lowest cost (including alternative scenarios), and make clear the basis on which new-build opportunities are to be allocated to either the private sector or to state-owned utilities. The plan needs to be translated into international competitive bidding rounds on a timely and regular basis so as to be effective. Preferably, the planning and procurement functions should be automatic – which involves plans being frequently updated as a matter of course and translated into procurement rounds without requiring political approval (Eberhard et al., 2017).

This ideal framework was not in evidence in any of the case study countries, and plans have generally failed to keep up with price and technology developments. In fact, auctions were initially triggered in all three countries through either a lack of planning or a failure to translate plans into procurement, resulting in electricity supply crises. Both Namibia and Zambia's energy supply shortages were the result of a lack of planning, whereas South Africa's planning framework was only translated into competitive procurement windows once load-shedding started. While Namibia has seen a gradual strengthening of its planning-procurement framework – with the 2019 auctions based on the officially approved 2016 NIRP – the initial wave of IPPs (including competitively procured ones) were contracted without any reference to planning. Zambia did not, and still does not, have an official power system-expansion plan in place, which means that procurement volumes have been based on little more than back-of-envelope calculations of the shortfall in operating capacity.

The closest any country has come to this ideal was South Africa, where the ministerial determinations that formed the basis for REI4P's procurement rounds were based on the approved 2010 Integrated Resource Plan (IRP). The strong link between planning and procurement has been both a blessing and a curse for the country. South Africa's greenhouse gas mitigation commitments allowed renewables

to be included in the 2010 IRP for the first time. This created the legal and regulatory basis for REI4P and was effective at limiting Eskom's stifling influence on private investment in renewable energy.

However, once it became clear that renewables were now least-cost options for new-build opportunities (based on the auction results), and since the IRP formed the legal basis for any new procurement decisions, the planning process became entangled in a lengthy, fraught contest about the future of the country's energy sector. This meant that the IRP was not updated for almost 10 years as vested interests tried to maintain the status quo and force in new nuclear and coal-build opportunities. Even when a "policy adjusted" IRP was approved in 2019 (at that time already based on outdated cost assumptions), it still required a decision (ministerial determination) by the minister of Mineral Resources and Energy followed by concurrence from the regulator before procurement could commence.

The South African electricity and planning framework vests considerable power in the minister, and as the ministry re-merged with the department of Mineral Resources, the minister has been hostile to renewables. This has led to further procurement delays and has effectively subjected the planning-procurement nexus to the whims of a single public official. While the cases still support the importance of the planning-procurement nexus for long-term investment growth (incl. project pipeline development), there is no evidence of this being a necessary or sufficient condition for either price or realisation outcomes. Furthermore, South Africa's experience suggests that an indicative (as opposed to a prescriptive) planning framework is better suited to a fast-changing technological landscape where auction results routinely defy planning assumptions.

6.2.2 Project level elements

6.2.2.1 Equity and debt providers

While the cost of capital is a key determinant of project prices for capital-intensive renewable energy installations, the IPP literature stresses the importance of the sources of capital – specifically equity and debt – for project sustainability. Equity providers (sponsors) as well as debt providers (lenders) should ideally have a strong track-record – in Africa and beyond – as well as a development mandate to help them withstand and navigate short-term pressures. It has also been posited that projects developed by development-oriented sponsors are also more likely to achieve balanced outcomes (between investment return and prices), strengthening projects' overall sustainability. Finally, IPPs should preferably be financed by long-tenored, local currency debt to reduce prices and protect offtakers from foreign currency fluctuations (Eberhard et al., 2016; Eberhard & Gratwick, 2011).

The three cases make it clear that auctions tend to decrease the importance (incl. necessity) of the developmental mandate of project sponsors for competitive (or, in Gratwick's (2008) terminology, balanced) price outcomes. This is mainly due to the fact that achieving balanced project outcomes (i.e. competitive prices) is no longer determined by this developmental mandate, but rather by the competitive pressures in the auction process. The driver of lower returns on equity has shifted from a primarily internal motivation (developmental mandate) to an external one (competition).

The cases nevertheless emphasise the importance of sponsors having sufficient (international) experience¹²⁵ and/or a strong balance sheet, not only for ensuring effectiveness in the project realisation process, but also due its impact on competition: having "stronger" sponsors bidding in an auction programme increases competitive pressure more than merely adding more bidders – in turn reducing project prices. There is evidence across all three cases of experienced and/or financially capable bidders being necessary for project realisation (discussed further under auction access requirements).

Regarding the impact of local equity or shareholding on project realisation (and sustainability), the evidence suggests that it is not merely the presence of local sponsors (as originally posited by Gratwick (2008)), but rather the identity and mandate of the local equity partner that has an impact. The two programmes with the shortest project realisation periods are the Hardap auction in Namibia (13 months), which featured a 19% NamPower equity stake, and Scaling Solar 1 in Zambia (19,5 months) where both projects included 20% ownership by IDC. Shareholding by the procuring authority (also the offtaker in Namibia) seems to have aligned incentives for timely project realisation and has helped projects navigate the complex local processes towards financial close and commercial operation.

The South African case highlights the impact of another type of local sponsor: when Eskom tried to renegotiate bid prices for BW4 projects prior to signing their PPAs, it was the Black Economic Empowerment (BEE) shareholders' unwillingness to reduce their equity returns that eventually convinced decision-makers to back down. As beneficiaries of the elite economic nationalism and transformation project that has been at the centre of much post-Apartheid economic policy and political rhetoric (Fritz et al., 2014), the BEE shareholders have held considerable symbolic and political power and were thus able, in this instance, to withstand and use to their advantage this pressure, which eventually helped get projects across the finish line. This points to the potential necessity of local strategic shareholders for project realisation.

¹²⁵ In none of the cases are competitive price and timely project realisation outcomes exclusively associated with sponsors that have African experience – in contrast with Gratwick's (2008) findings

The case studies also add more nuance and empirical depth to the discussion around debt and debt providers. The role of development finance institutions as debt providers was generally less pronounced in two of the cases (South Africa and Namibia) than is normally the case with IPP investments in sub-Saharan Africa. Although the cases seem to show an inverse relationship between a country's depth of capital market development and the need for debt from development finance institutions (DFIs), the truth is more complex.

South Africa's RE projects, for example, offered attractive, low-risk returns indexed to inflation and were almost entirely funded by local commercial banks (as well as by institutional investors) thanks to the country's deep capital markets and strong banking sector. Zambia, on the other hand, saw the entire loan portfolio for both the Scaling Solar and GETFiT projects being provided by DFIs, suggesting that (local) commercial banks were unwilling to fund these kinds of infrastructure assets. The truth is, however, not as straightforward: commercial banks in Zambia and the region (especially in South Africa), were approached, and they expressed interest in providing at least part of the loan portfolios, but were unable to match the highly concessional financing terms of the IFC and other DFIs and export credit agencies (Interviews 29, 31).

While these concessional loans allowed bidders to deliver projects at highly competitive prices, they also crowded out the local/regional financial sector and perhaps unnecessarily exposed Zambian electricity consumers to the vagaries of international foreign exchange markets. The ideal would be a complementary approach that uses DFIs' concessional financing or risk cover to crowd in and improve the terms of local commercial debt. The Namibian case is a powerful illustration of such an approach, where the provision of foreign DFI loan cover enabled projects to access long-tenored, competitively priced local commercial debt. Such a complementary lending approach succeeded in both decreasing the cost of capital (thereby enabling a lower price) and in providing long-term cover against forex risk exposure.

It was also clear from the analysis that apart from concessional financing, competition between lenders and an increase in the types of debt available reduced the cost of capital for projects. Competition between lenders can be actively encouraged as part of the bidding programme, as was the case in GETFiT Zambia, but also arose spontaneously as a result of growing pressure on international DFIs (and, to a lesser extent, commercial banks and other funds) to move away from fossil fuel- and large-hydro-based projects in Africa, which limited their deal flow and led to an ever more aggressive approach to finding and funding bankable renewable energy projects, of which there is a significant shortage (Interview 14; Kruger et al., 2018).

Auctions have generally proven to be quite effective at finding or creating bankable projects, in turn increasing competition between lenders (including DFIs) under pressure to increase their loan books. This was not always the case. In previous years, DFIs in particular preferred to work with directly negotiated projects as they were able to secure early commitments to fund the projects, also at higher prices (Eberhard et al., 2016). However, there is now a growing realisation that these directly negotiated projects take a long time to finalise contracts: some get caught up in corruption allegations, and many never move to financial close or construction. Auctions, on the other hand, provide more transparency and certainty.

In South Africa's case, where international DFI funding was limited, the use of corporate finance by large international bidders (as an opening negotiation position) and the entry of institutional investors (for example, pension funds) in later bid windows reduced the cost of lending as commercial banks were forced to improve their financing terms to maintain market share. Across all three countries, then, there is evidence that long-term, low-cost debt was necessary for competitive price outcomes.

Finally, the cases highlight the necessity of lender involvement early in the auction design process as pivotal to reducing the cost of debt and increasing the realisation of procured projects. In all three cases, project contracts (especially PPAs) were tested (sometimes multiple times) with lenders prior to the bidding programmes being launched to ensure that they were "bankable" – that is, that they met the banks' quality standards and allocated risks in a fair, transparent and consistent manner. The testing of project contracts with lenders also meant that bidding documents could be released to the market on non-negotiable terms, which reduced the post-award contract finalisation and financial close timelines. The requirement in many auctions for bidders to demonstrate that they have secured funding increases project scrutiny as senior debt providers, in particular, undertake rigorous assessments of the assumptions and risks built into the bidders' financial models and construction plans, including related contracts. This added due diligence has improved the quality of projects that are bid, and their realisation rates.

6.2.2.2 Ensuring a secure revenue stream: offtakers, contracts and risk mitigation

Because most IPPs are project-financed, it is essential that projects' revenue streams are adequate and secure. Having a solvent, creditworthy offtaker of power is thus a key requirement for ensuring project bankability and long-term sustainability¹²⁶. Investors (including lenders) also require a fair

¹²⁶ Since offtakers in all the case studies, and indeed in most of sub-Saharan Africa, remain state-owned power utilities, this element could just as easily (and some would argue more appropriately) form part of the country-

allocation of risks in the project contracts (most importantly the power purchase agreement – PPA) based on the principle that the entity best positioned and equipped to handle a risk should be the one allocated that risk. Remaining risks to the revenue stream – either because of credit risks posed by, for example, an insolvent state-owned offtaker or because there are gaps in the contractual arrangements – need to be covered by risk mitigation and credit enhancement measures to ensure bankability. The risks include sovereign guarantees, liquidity support arrangements and multilateral, political-risk insurance products to ensure bankability (Eberhard et al., 2016; Eberhard et al., 2017; Eberhard & Gratwick, 2011).

Unsurprisingly, the level of risk cover required for project bankability in the three cases was inversely proportional to the financial health of the offtaker and the host country (Figure 6.2. and Table 6.3). Namibia’s IPPs could all be financed without sovereign guarantees or other forms of risk cover, but South Africa’s programme required a sovereign guarantee (a demand from local banks) to cover the risks associated with Eskom as offtaker given the utility’s precarious financial position and its predilection for quashing competition. In Zambia, the woeful financial state of ZESCO and the Zambian state meant that investors (specifically lenders) required not only a sovereign guarantee but also multilateral political risk cover and liquidity support. This three-part requirement proved to be critical, as the lack of risk cover from multilateral institutions has been pointed out as a key reason for the GETFiT projects not being able to draw down on their loans to realise their projects.

Table 6.3: Risk mitigation and credit enhancement measures - South Africa, Zambia, and Namibia

	Sovereign guarantee	Liquidity support	Multilateral payment/loan cover
<i>South Africa</i>	Implementation Agreement	None	None ¹²⁷
<i>Zambia</i>	Government Support Agreement	Scaling Solar: Letter of credit GETFiT: Regional Liquidity Support Facility	Scaling Solar: Partial Risk Guarantees (payments and loans ¹²⁸) GETFiT: None
<i>Namibia</i>	None	None	None ¹²⁹

level contributors to success. Nevertheless, in keeping with the classification used throughout most of the IPP literature (Eberhard, et al., 2017; Eberhard & Gratwick, 2011; Gratwick & Eberhard, 2008b) and to emphasise the importance of a bankable counterpart to ensure a secure revenue stream for project-financed IPPs, the author has chosen to maintain this as a project-level element.

¹²⁷ Some international equity investors have taken out MIGA cover on South African REI4P projects.

¹²⁸ The loan guarantees were not taken up since all debt was provided by DFIs or export credit agencies.

¹²⁹ While a loan cover package was not officially provided as part of the bidding programme, a loan guarantee from Proparco allowed the project lender – Standard Bank – to improve the terms of its loan package.

Both the South African and Zambian cases demonstrate that robust risk cover arrangements increase project resilience in the face of economic and political pressures. As already mentioned, South Africa's IPPs' sovereign guarantees were backed by a Government Framework Support Agreement (GFSA) between Eskom, the department of Energy, NERSA and National Treasury. The GFSA protected IPP investments on more than one occasion from political manoeuvres around the REI4P programme, for example, by forcing Eskom management to back down from threats of reneging on contracts. The latter would have triggered sovereign guarantees with disastrous macroeconomic consequences. In Zambia, the robust risk mitigation package backing the Scaling Solar projects ensured that projects were paid, even as ZESCO was defaulting on payments to other IPPs, and the Zambian state defaulted on its bond obligations.

Namibia's experience further proved that risk mitigation and credit-enhancement cover can improve project outcomes – especially pricing – by covering gaps in risk allocation, even if projects could theoretically have reached financial close without it. Namibia's PPAs, for example, did not provide any cover for political risk events, such as expropriation, and commercial banks were thus unwilling to provide long-term loans even though NamPower was viewed as a bankable offtaker. A loan guarantee from Proparco extended the length of Standard Bank's loan repayment period and thus decreased the project's cost of capital (and resulting price).

Price outcomes in all three countries were further enhanced through the inclusion of bankable contracts (including risk mitigation cover where needed) with fair risk-allocation provisions (for example, take-or-pay clauses for non-dispatchable RE projects) in the RFP packages that not only reduced sponsors' and lenders' risks (thereby lowering the cost of capital) but also increased competition by signalling to potential bidders that these were serious programmes developed by capable designers committed to seeing projects reach commercial operation. This lowered bidders' risks, thus motivating them to incur the costs of bidding and, consequently, increased competition levels.

It is therefore clear that a secure revenue stream – ensured through robust contracts with a credit-worthy off-taker, or provided by sufficient risk mitigation and credit enhancement cover – is necessary for both competitive price outcomes and project realisation.

6.2.2.3 Strategic management and relationship-building

IPPs inevitably face a number of unforeseen challenges during financial close processes, construction and throughout their operating life. Successfully navigating the pressures created by these events requires flexible contractual arrangements; ongoing strategic management; relationships with key stakeholders (including affected or surrounding communities) and decision-makers (Eberhard & Gratwick, 2011; Woodhouse, 2005a). It has also been posited by the auction literature that positive technical performance, low prices and broader societal benefits generally increase the socio-political feasibility of the auction programme (Del Rio, 2017f).

Various issues that arose in the financial close and construction processes – and how they were navigated – have been illuminating. It is notable that in almost all auction rounds across the three countries, auctioneers played a central role in helping projects navigate unanticipated challenges, acting as a strategic project partner in the post-award period to ensure project realisation (see 6.4.3.2).

The inclusion of socio-economic and economic development criteria in the auction design processes, as well as the involvement of DFIs (which require compliance with IFC performance standards on environmental and social issues) appear to have helped projects secure and maintain a social licence to operate and have largely mitigated localised project realisation risks. In particular, shareholding by strategic local entities (see 6.3.2.1) appears to be a necessary condition for project realisation in these contexts.

6.2.3 Programme-level elements: Auction design

6.2.3.1 Ensuring effectiveness

Auction effectiveness can be strengthened through using appropriate qualification criteria, penalties, and access requirements. Qualification criteria can be classified as either physical (for example, permits, land, transmission access, equipment standards) or financial (for example, bid bonds) – requirements that need to be met for a bid to be considered compliant. The aim of using qualification criteria is to ensure that submitted projects are well prepared and that bidders are committed. High qualification criteria can lead to higher project-realisation rates, but can also reduce competition, which can lead to higher prices. A good auction design seeks an appropriate level of qualification (Del Río, 2017f; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Kreiss et al., 2016; Welisch, 2018).

Auction effectiveness (project realisation) can also be increased through using auction access criteria (Haufe & Ehrhart, 2018; Kreiss et al., 2016), such as requiring that bidders have a minimum level of prior experience and/or capacity, usually covering technical and financial areas. Auction access requirements – unlike qualification requirements - do not require incurring costs, with the objective to limit participation to competent bidders, resulting in realistic prices and high realisation rates. Staged bidding can be used to potentially decrease transaction costs for both auctioneers and bidders by screening out unqualified bidders in a prequalification stage before they submit full bids, although this can reduce competition.

6.2.3.1.1 Auction access requirements

There are two main ways in which bidders' capacity is normally assessed: through interrogating reference projects, normally meeting a minimum size requirement and often needing to be located in specific regions; or by bidders providing proof that they have either a track record of raising financing for similarly sized projects or have sufficient assets to finance projects themselves. Auctioneers can, of course, also use both. Bidders can also be asked to provide proof of proposed EPC and O&M contractors' track records (usually reference projects) (Kreiss et al., 2018).

We see the full range of mechanisms used in the three case studies (Table 6.4): Namibia's auction assessed bidders' ability based on reference projects (including for EPC & O&M contractors), while South Africa's programme only assessed bidders' net assets or track record in raising capital. In Zambia, the Scaling Solar and GETFiT programmes used both approaches. The results were broadly similar across all three cases, with both approaches proving effective at screening out incompetent bidders. Setting high enough auction access requirements, using prior experience and/or financial standing to screen bidders, therefore appears to be necessary for project realisation.

The case studies also showed that two-stage bidding only succeeds in lowering transaction costs if the first stage is limited to screening based on access requirements, as was the case in Zambia. In South Africa's small IPP programme (SPI4P)¹³⁰, the first stage included a large number of onerous physical qualification requirements, which ended up increasing transaction costs for bidders and auctioneers alike (Kruger et al., 2021). There is no evidence of a two-stage bidding process being necessary for either competitive price or project realisation outcomes.

¹³⁰ The SPI4P is not an "official" auction round analysed in this thesis, but for the purposes of exploring the staged bidding phenomena, has been deemed relevant since it was the only instance of a two-stage process being used in SA. The programme has been written about extensively in Kruger et al., (2021).

Table 6.4: Access requirements and staged bidding: South Africa, Zambia, and Namibia

	Reference projects	EPC & O&M	Min. turnover/ net assets	Staged bidding
South Africa	None	Heads of agreements and reference projects	Net assets of all finance providers must be 100% of what they propose in past 3 years OR Proven ability to raise financing similar to what is being proposed in past 5 years	REI4P: one-stage SPI4P: two-stage
Zambia	Scaling Solar: 25 MW PV or 75 MW any tech in Africa; or 3x PV (100MW each) or 1x1500 MW any tech	Scaling Solar: Heads of contracts and reference projects	Scaling Solar: Net worth US\$75 million	Scaling Solar: Two stage
	GETFiT: 2x5MW PV in Africa; or 100 MW PV in Africa; or 500 MW PV globally; or 750 MW RE globally.	GETFiT: As above	GETFiT: Total Assets US\$25 million	GETFiT: Two-stage
Namibia	1 x 10 MW solar PV (Hardap)	Hardap: Heads of agreements and reference projects	None	Hardap: One-stage
	1 x 5 MW solar PV (Khan)	Khan: None	None	Khan: as above

6.2.3.1.2 Physical (bid preparation) qualification criteria

The empirical evidence suggests that setting high bid/project preparation (physical) qualification criteria can support high project-realisation rates, but at a potentially significant cost (at least initially) if auction volumes are too generous, since few projects are likely to be prepared enough to meet these criteria during the first bidding rounds, thereby reducing competition and pushing up prices. South Africa's first auction rounds were, for example, undersubscribed, and delivered projects at high prices in large part thanks to the demanding qualification criteria meant to ensure the timely realisation of projects (heavily influenced by lender requirements). The qualification criteria included proof of land ownership, environmental and other permits, and, most importantly, resource data. What resource data requirements entailed was that projects that had not started measurements at least 18 months

prior to the submission deadline were unable to submit qualified bids, thus drastically reducing the number of eligible bidders in the first rounds.

This impact was mitigated over time as more projects were prepared for later rounds, thereby increasing competition. The impact could also have been mitigated in initial rounds through the provision of project sites, along with grid connections, permits and relevant data (for example, resources, geotechnical studies, and so on). This approach worked well, despite some teething issues in Zambia (Scaling Solar 1) and Namibia (Hardap), leading to low prices and very quick realisation timelines. However, it should be noted that this was only for one relatively simple technology – solar PV – and that overall volumes were much lower than in South Africa. Evidence from other world regions, such as India, the Middle East and North Africa, appears to support the competition-enhancing, cost-reducing, timeline-shortening impact, even for large volumes, of solar parks, for instance (at least in initial rounds). The evidence also highlights the importance of a well-prepared and serviced-site-provision approach (Dobrotkova et al., 2018). If a site and its associated data is not prepared in line with bidder requirements, it can increase project risks and realisation timelines (Kruger et al, 2019).

Beyond the standard physical (bid/project preparation) qualification criteria normally assessed, the requirement, in all three countries, for signed letters of support, or term sheets, from project equity investors and lenders (Table 6.5) appears to be a necessary condition for project realisation. Investors were unlikely to provide these support letters or term sheets without having conducted due diligence on bids, which ensured that projects were well prepared and sufficiently de-risked by the time of submission to ensure timely realisation.

6.2.3.1.3 Financial (bid bond) qualification criteria

Requiring bid bonds appears to have been necessary for timely project realisation, though the actual level of bid bond requirements were less influential on auction effectiveness (realisation) and efficiency (prices). The bidding programmes used a wide range of bid bonds, ranging from US\$800/MW in Namibia to US\$30 000/MW in Scaling Solar (Table 6.5). Despite this wide range, realisation rates remained high across the cases – and was fastest for the project with the lowest bid bond (Hardap) – suggesting that the precise level of bid bonds is perhaps not as crucial. Unfortunately, at the time of writing, the Khan PV project, which did not require a bid bond, has not yet been realised and thus does not offer a clear counterfactual indication of the impact of bid bonds on effectiveness.

The impact of the levels of bid bonds on competition levels also appears to be negligible relative to other factors, such as the size of the market, technical qualification criteria and the perceived capacity of the auctioneer – although setting no or too low a bid bond did lower the quality of competition in at least one case (Khan) as some larger, more experienced bidders withdrew as they anticipated competition from unrealistic bids submitted by inexperienced developers (Appendix G). Evidence from other world regions (for example, Germany) suggests that setting too low bid bond levels leads to opportunistic bidding behaviour, lowering realisation rates and pushing up costs as awarded bidders abandon bids (and opt to pay the bid bond) to secure higher prices in undersubscribed bidding rounds (Kitzing et al., 2021).

Table 6.5: Financial and physical qualification requirements - South Africa, Zambia, and Namibia

	Bid (US\$/MW)	Bonds	Site/land agreements required at submission	Permits required at submission	Transmission connection at bid submission	Lender/ investor letter of support at submission
South Africa	8,000		Lease agreement/ title deed	EIA; aviation; water use licence; heritage; zoning application	Cost estimate letter from Eskom	Binding letters of support (debt and equity)
Zambia	30,000 (Scaling Solar)		Scaling Solar: site provided	Scaling Solar: EIA provided. No others required at submission.	Scaling Solar: Transmission provided	Scaling Solar: Signed term sheets
	15,000 (GETFIT)		GETFIT: conditional lease agreement/title deed/ undertaking (10 km from substation)	GETFIT: draft environmental brief	GETFIT: no formal grid connection agreement required.	GETFIT: Signed term sheets (non-binding)
Namibia	800 (Hardap)		Hardap: site provided	Hardap: EIA provided	Hardap: provided	Signed term sheets (non-binding)/ letters of support
	0 (Khan)		Khan: site selected, but not secured	Khan: none required at submission	Khan: provided, but at cost to project	Signed term sheets (non-binding)/ letters of support

The auction literature generally views the above qualification criteria as lowering competition through increasing the barriers to entry, which means that fewer bids are submitted (Del Río, 2017f; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Kreiss et al., 2016). While the cases illustrate that this is generally true when looking at the number of bids submitted, it is also clear that the impact on competition levels is not straightforward. If anything, the cases have shown that competition is driven as much – if not more – by the quality of competition (meaning the relative strength – experience, financial health, size – of bidders) as by the quantity of competition.

Stronger bidders view auctions with no, or low, access requirements, qualification requirements and penalty regimes as risky since the lack thereof will likely expose them to competition from less experienced bidders that are more likely to submit unrealistic bids, thereby decreasing the likelihood that the costs of bidding from the stronger bidders will be recovered through being awarded a project. Stronger bidders are thus less likely to submit bids for these programmes, thereby lowering the quality of competition and the likelihood of securing competitively priced, realistic projects.

All three cases illustrate that having stronger bidders as part of the bidding pool not only increases competitive pressures between bidders but also lowers prices through these bidders' negotiating power relative to suppliers and service providers. Prices are also lowered through the ability of stronger bidders to bring more elements of the project development, construction and operations value chain in-house – thereby diversifying and increasing their sources of revenue. Such bidders also have the ability to bid on a corporate finance basis, which lowers the cost of capital, and they have the ability to bid a portfolio of projects (if the auction is large enough), thereby reducing costs through economies of scale (Kruger et al., 2021).

6.2.3.1.4 Penalties

The use of penalties (for example, performance bonds, liquidated damages clauses) and incentives (for example, early connection payments) are further meant to incentivise timely project realisation and improved project performance (technical and otherwise); however, they can also lead to higher costs (through increasing risks) and lower competition (by acting as barriers to entry), thereby increasing prices (Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Kreiss et al., 2016; Kruger et al., 2021).

All three countries' programmes included strict, and relatively severe, penalty regimes in the auctions' designs (Table 6.6), with evidence that including these was necessary for timely project realisation. Nevertheless, there appears to have been a reluctance to impose penalties when problems were experienced, with auctioneers not wanting to jeopardise the realisation of distressed projects by

unnecessarily increasing pressure. Sponsors were also under significant pressure to meet deadlines and maintain high levels of technical performance due to the reduction in margins that resulted from the competitive pressures in the auction programmes. This meant that additional financial penalties, coupled with requirements for shorter realisation periods, were likely to have resulted in project failure rather than better performance.

In practice, we have seen a gradual easing of penalty regimes over time in Zambia and Namibia, with performance bonds and liquidated damages clauses either falling away or being significantly reduced. The one performance incentive that has remained in place, and which has been used, is the automatic reduction in the length of the PPA for delays, usually on a day-to-day basis. The reduction in contract length is easily enforceable and the impact gradual, seemingly creating the necessary incentives without disproportionately increasing the pressure on projects. Using early connection payments also appears to provide a strong incentive for timely realisation (Kitzing et al., 2021), especially for projects with lower prices and reduced margins, although only South Africa's projects have managed to make use of this provision – primarily because of more generous realisation deadlines relative to that available in Zambia and Namibia. There is some evidence that penalty regimes (including their relaxation) increased project costs – most notably EPC (and to a lesser extent O&M) margins to hedge against this risk.

The one potential exception to the abovementioned easing of penalty regimes is where penalties are used to incentivise bidders to meet their socio-economic development commitments, since better performance on these indicators does not immediately translate into additional revenue for the project (though they might reduce project risks in the long run). The only case where these penalties have been called on is South Africa, where some bidders in later bidding rounds appear to have opportunistically committed to unrealistic performance targets on procurement from women-owned enterprises, for example, to gain better scores in the evaluation process, all the while assuming that they would merely pay the penalties incurred for underperformance. It seems, however, that these bidders underestimated the cost of penalties, as well as the fact that they would earn termination points for each infringement (9 points means that the PPA can be terminated). The combination of financial penalties, and the threat of PPA termination, appear to have effectively incentivised the affected bidders to improve their performance in their problem areas: affected bidders, for example, have submitted mitigation plans to deal with areas of concern and appear to be sticking to them, thereby reinforcing the value of robust penalties to ensure performance on non-technical issues (Interviews 34, 36).

Table 6.6: Penalties and incentives - South Africa, Zambia, and Namibia

	Performance bonds (US\$/MW)	Liquidated damages	PPA length reduction	Early connection payment
South Africa	16,000	None, though projects were awarded termination points for SED underperformance	3 days' reduction for 1-day delay	60% of Bid tariff
Zambia	Scaling Solar: 300 000	Scaling Solar: US\$7500 for every 0,1% annual plant performance ratio below estimated performance ratio	Scaling Solar: 1 day reduction for 1-day delay	Scaling Solar: 80% of tariff
	GETFiT: None	GETFiT: US\$500/MW per-day delay	GETFiT: As above	GETFiT: As above
Namibia	Hardap: 2% EPC (up to FC); 15% EPC (up to COD)	Hardap: 0,25% of EPC costs/week delay 1% of EPC costs for every 0,1% below contracted performance ratio 1% of EPC costs for every 100 kW of which plant is below contracted capacity	1 day reduction for 1-day delay	None
	Khan: None	Khan: None	1 day reduction for 1-day delay	None

6.2.3.2 Setting and dividing the auction volume

Setting auction volumes, and dividing them between projects, bidders, technologies and spreading them across time is an important part of the auction design process that impacts competition, costs and effectiveness. Volumes should ideally be based on a least-cost, regularly updated, rational power expansion plan that matches demand with supply on a least-cost basis (Eberhard et al., 2017). Theoretically, large auction volumes can attract more competition (Ballesteros-Pérez et al., 2016; Friedman, 1956), but if volumes are set too high, the auction runs the risk of being undersubscribed, resulting in low competition levels and high prices. Auctioneers can also decide to limit the amount of capacity or energy that can be awarded to a single bidder or project. Such limits can increase the costs

of energy through limiting economies of scale but are often included owing to energy security considerations.

6.2.3.2.1 Auction volume

Auction volumes should also, ideally, be bid out over a number of subsequent rounds (Eberhard et al., 2014; Ferroukhi et al., 2015): this has been shown to increase competition and lessen the impact of unsuccessful bids by providing these bidders with the opportunity to resubmit bids in later rounds. Auction rounds should ideally be predictably scheduled to enable the development of a pipeline of quality projects that will increase and maintain competition levels over time. Finally, auctions can be technology-neutral – which means that all technologies, RE and others – compete against each other – or the volume can be divided according to specific technology “bands”. While a technology-neutral approach might lower auctions’ price outcomes by awarding projects only to the most cost-competitive technologies, this needs to be done in a way that matches the power system’s needs with the technical characteristics of different technologies to lower the overall cost to the system. A technology-specific approach can increase energy security, lower the overall costs for the system (through optimising the complementarity of various technologies) and improve system resilience – even though it is likely to lead to lower competition (De Mello Santana, 2016; Gawel et al., 2017; Haelg, 2020).

South Africa’s experience in the first rounds of bidding is a classic example of large auction volumes suppressing competition levels, resulting in higher prices. Auction volumes in Zambia and Namibia were prudently set at much lower levels, resulting in higher levels of competition. While South Africa’s auction attracted more bids overall (including more capacity) – partially because of large auction volumes – competition levels in the other two cases were generally either similar to (Scaling Solar 1) or much higher (Namibia) than South Africa’s most competitive round (BW3). Smaller auction volumes have thus been necessary for inducing and sustaining high competition levels.

6.2.3.2.2 Project sizes

Surprisingly, project-size limits appear not to have as much of an impact on prices as would be anticipated. PV project sizes ranged from 20 MW (Khan) to 75 MW (REI4P projects), yet the lowest-priced projects (20 MW Khan in Namibia and the 2x20 MW Building Energy/Pele project in GETFiT) were also some of the smallest, although these projects have been amongst the latest to be bid and

hence reductions in PV module prices needs to be factored in. Analysis of the South African REI4P projects provides some evidence of lower costs/prices for larger projects, although the data is confounded by later bid rounds: projects were generally larger; there was more competition, and PV equipment costs had fallen over time (Figure 6.4 and Figure 6.5).

Project size limits (which in Namibia was also the overall auction volume) did impact competition – especially the quality of competition – as several larger, more experienced bidders chose not to submit bids for the Khan project in Namibia neither for the small IPP projects in South Africa (Kruger et al., 2021) owing to projects being too small. While this opened the space for smaller, local players (at least in South Africa), it likely also increased project prices by diluting competitive pressures. There is nevertheless no substantial evidence either way of project size limits (or their absence) being necessary for competitive price outcomes.

Project sizes did impact realisation timelines, with the larger projects, on average, taking longer to be built than the smaller ones (Kitzing et al., 2021), and it appears that setting project size limits in these markets is likely necessary to ensure timely project realisation.

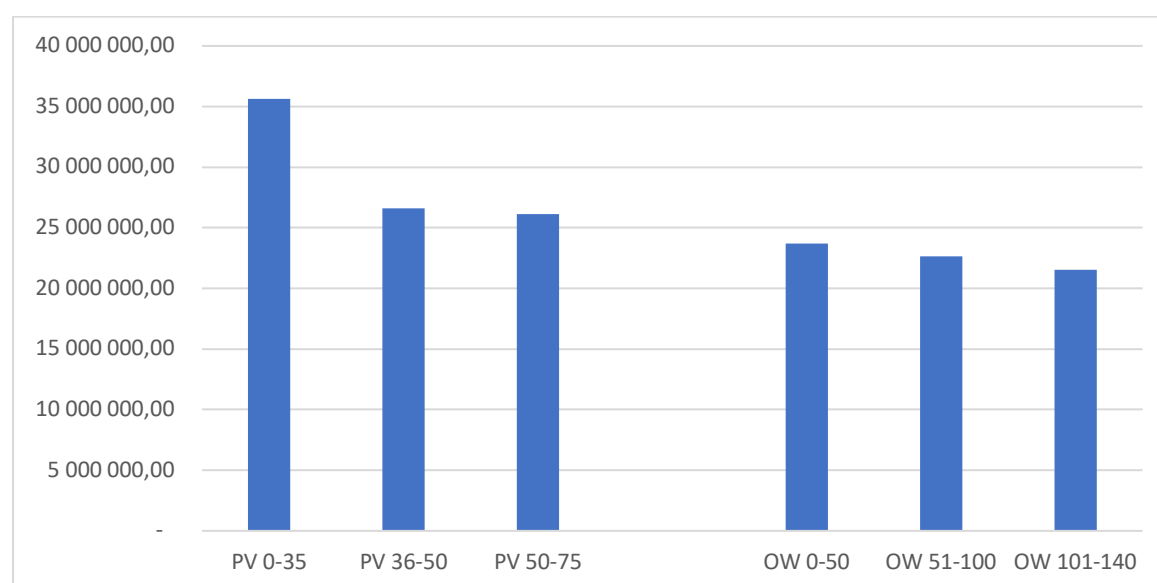


Figure 6.4: Average cost/MW for REI4P solar PV and onshore wind (OW) projects, by size (Source: Based on analysis of IPP office bidding data)

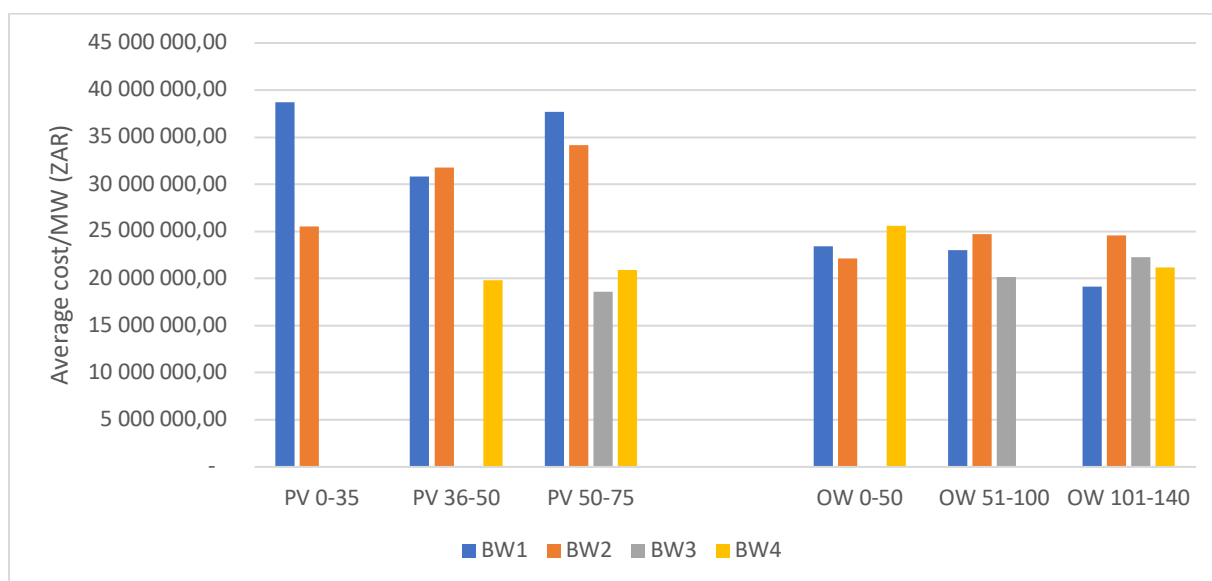


Figure 6.5: REI4P Average cost/MW for solar PV (PV) and onshore wind (OW), by size and bid window (Source: Analysis based on IPP office bidding data)

6.2.3.2.3 Auction rounds

Beyond smaller auction volumes, the use of multiple auction rounds was crucial (though not necessarily necessary) to driving down prices – or, at least, capturing cost decreases, in all three case-study countries. This was most visible in the South African programme, where a combination of technology cost reductions and a squeezing of margins over rounds was responsible for the lower prices in later rounds, but is equally obvious in Namibia and Zambia, where lower prices were secured despite smaller project sizes (Khan) or lower competition levels (GETFiT) in later rounds. Even in contexts where there was limited visibility on auction timelines – for example, Namibia and Zambia – prices continued to decline, driven in part by falling solar PV equipment costs. This re-emphasises the importance of the planning-procurement nexus – not only for securing investment but crucially also for capturing and driving cost reductions in the long-run.

Nevertheless, it is also important to note that, unlike South Africa, the Zambian and Namibian auctions were able to secure competitive price outcomes from their first rounds, pointing out that there were other factors that were more influential in determining prices in these inaugural auctions.

6.2.3.2.4 Technology-specific auction bands

While all three case-study countries decided to divide the auction volume into technology-specific bands, the reasons driving this decision and the resultant impacts differed. In South Africa's case, the

decision was made in deference to the IRP-based planning model and the resultant ministerial determinations, which allocated specific volumes to specific technologies. Because of the large overall volumes of the South African programme, the auction designers also wanted to ensure that there was some level of technological diversity in the auction outcomes to strengthen energy security. Furthermore, it was difficult to maintain a level playing field for the wide range of technologies that were eligible to compete in the auction, and at that point there were no easily transferable international best-practice examples to draw from.

South Africa has since tried to implement a technology-neutral approach in its 2020 2 GW risk-mitigation IPP procurement programme (RMI4P), but it is clear from industry comments that the difficulties in developing a procurement approach which creates equal opportunities while also meeting the system operator's requirements, is not a simple task. Many have noted, for example, that the requirements of RFP documents around dispatchability, fuel cost pass-through provisions and the siting of storage capacity limits the ability of RE technologies to compete on a cost basis with gas, even though their overall costs to the system might be lower (Futuregrowth Asset Management, 2021; Van Rensburg, 2021; Yelland, 2021).

The result of the decision to divide the auction volume between technologies in REI4P was the procurement of a relatively diverse mix of technologies – mostly made up of solar PV and onshore wind – but at a considerably higher cost than had the auctions been run as a technology-neutral programme, in which case most capacity in the first windows would likely have been awarded to onshore wind.

In Zambia and Namibia, the decision to limit the auction to solar PV was based on the technology's relative simplicity and low cost, including the fact that it can scale down relatively easily (for example, compared to wind and CSP) and can therefore be procured at relatively modest volumes while still maintaining cost-competitive outcomes. These characteristics made solar PV an obvious candidate for countries wanting to procure their first utility-scale renewable energy-based projects, at relatively modest scales. Having proven that solar PV is a cost-competitive technology to procure and manage, Namibia took the approach to also procure wind power in the 2021/22 period. The complexity involved in ensuring a level playing field between technologies will likely limit the uptake of technology-neutral auctions in the short term in sub-Saharan Africa, although changes in the costs of storage technology could change this situation in the medium- to long-term. Still, the cases present no evidence that a technology neutral auction is necessary for competitive price outcomes.

6.2.3.3 Determining winners

Auctioneers need to make several decisions regarding the auctions' approach to determining winners, including the auction format (sealed bid vs. descending clock), the pricing rule (pay-as-bid vs uniform pricing), and the criteria used for bid evaluation and scoring. Auctioneers also need to decide whether to set, and whether to disclose, ceiling prices, also called price caps or reserve prices. A sealed-bid auction format offers fewer opportunities for collusion since bidders cannot signal to each other through the bidding process, but a descending clock auction can, theoretically, increase the realisation rate of projects since bidders are better able to benchmark their costing assumptions against their competitors (Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016; Klemperer, 2004a). While pay-as-bid and uniform pricing approaches should theoretically deliver equivalent results, practice has thus far shown that the pay-as-bid rule generally delivers superior outcomes, mainly because it is more easily understood and is seen as less risky by auctioneers and bidders alike (del Río, 2017f; Haufe & Ehrhart, 2018; Maurer & Barroso, 2011).

6.2.3.3.1 Auction format and pricing rule

All three case-study countries elected to make use of the simpler, more straightforward sealed-bid, pay-as-bid approach. This decision seems necessary for competitive price and timely realisation outcomes for auctions in new contexts (considering that the technologies being procured are new in those contexts), where auctioneers want to minimise the risks of getting it wrong. The sealed-bid, pay-as-bid tendering format might be new to the country's power sector, but is well established in most public procurement programmes and thus offers a known, less risky approach for entities embarking on their first RE auctions and as a result increasing competition levels. As renewable energy auction programmes and power markets mature in the region, it is possible that we will see more use of descending-clock, or hybrid style approaches, as is in evidence in Brazil and India, for example (Aquila et al., 2017; Rego & Parente, 2013; Shrimali et al., 2016).

6.2.3.3.2 Price caps

Ceiling prices, also called price caps, generally protect the auctioneer (and, therefore, also electricity consumers) from securing projects at prices that are considered too high – although how one should go about determining acceptable price levels is as much a political decision as a technical one. Setting ceiling prices too low can depress competition or lead to no, or very few, projects being awarded, which can, in turn, threaten energy security. Auctioneers also need to decide whether to publish

ceiling prices (which might lead bidders to anchor prices around these levels, but could also increase competition) or not (Del Río, 2017f; Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016).

Only South Africa used price caps, and then only in the first three rounds of the REI4P. Part of the reason for getting rid of price ceilings in later rounds was the fact that bidders tended to bid close to these levels, rather than push lower price boundaries. This is one of the reasons that the Scaling Solar programme did not set price ceilings (Appendix F). The case studies seem to suggest that not disclosing price caps (or not setting them) is thus necessary for competitive price outcomes in the sub-Saharan context. While all three cases benefitted from high competition levels – which seems to have eliminated the need for price caps – international auction results in Germany, Brazil and India, for example, show that (undisclosed) price caps remain necessary to keep prices from going up and to eliminate opportunistic bidding behaviour (Bayer et al., 2018; Bose & Sarkar, 2019; Grashof et al., 2020; Winkler et al., 2018).

6.2.3.3.3 Bid scoring: determining winners

To determine winning projects, bids can be scored on price only (generally regarded as a theoretically more efficient option) (Estache & Iimi, 2012), or on the basis of other criteria alongside price, such as socio-economic development commitments or technical quality (for example, project preparedness, quality of equipment, and so on) to incentivise additional performance on these metrics beyond what is stipulated as the minimum qualification criteria (Ferroukhi et al., 2015; Haufe & Ehrhart, 2018) (Table 6.7). In general, the use of additional awarding criteria is fraught with potential problems, such as a lack of transparency or sub-optimal outcomes (Estache et al., 2009). Nevertheless, only the Scaling Solar programme amongst the case studies chose to make use of price as the sole awarding criterion, showing that this is not necessary for either competitive price or timely project realisation outcomes.

The consequences of employing additional criteria in deciding bid winners is nevertheless mixed. The use of technical criteria, such as project performance or realisation timelines, as additional awarding criteria appears to have delivered little additional impact. The Hardap project was the single project to include only technical bid scoring criteria, such as capacity factors and project schedules. Results indicate that these criteria did not have an additional impact on project performance or realisation timelines since the performance incentives already in place (for example, energy payments as the only source of project revenue) through the general contractual framework were strong. There is however evidence of these criteria resulting in the Hardap project being awarded to a more expensive bidder.

GETFiT used a combination of technical and socio-economic development criteria, but at least two of these (“scheduled COD as per PPA” and “project readiness”) have been rendered largely inconsequential due to the delays in solving the programme’s general bankability issues. GETFiT’s use of projects’ contribution to system losses is, however, a potentially important technical evaluation criterion that is likely to be used more frequently given recent international trends (for example, Mexico) as countries grapple with integrating larger shares of renewables in their power systems. At present, though, it is impossible to evaluate the impact of the GETFiT criteria on project performance or auction outcomes, since none of the projects have advanced to financial close or commercial operation.

The use of socio-economic development evaluation criteria appears to have delivered better results, and is becoming increasingly ubiquitous throughout the region. Projects’ commitments on key SED metrics in SA’s REI4P have generally increased over the bidding rounds to levels at, or beyond, the targets¹³¹ set by the IPP office, leading to more socio-economic development benefits for the country and local communities as opposed to what would have been the case had these criteria been used only as qualification criteria. There are questions about how well these commitments have translated into actual results (Baker & Sovacool, 2017; Davies & Morar, 2016; Marais et al., 2018; Stands, 2015; Wlokas, 2015; Wlokas et al., 2012), whether they have allowed for gaming of the system and what the impact has been on pricing (there is broad consensus that prices have been pushed up, but it is not clear by how much). There is evidence of these criteria also leading to more expensive projects being awarded (Appendix E; G).

¹³¹ The REI4P RFP specified both threshold levels (that is, qualification criteria) and targets for SED indicators. Targets differed from thresholds in that not meeting them would not disqualify a project, while meeting them would result in a project being awarded the maximum number of points (at least in the initial rounds).

Table 6.7: Bid evaluation and scoring criteria: South Africa, Zambia, and Namibia

	Price	Other
South Africa	70	30 Job creation (25%) Local content (25%) Ownership (15%) Management control (5%) Preferential procurement (10%) Enterprise development (5%) Socio-economic development (15%)
Zambia	Scaling Solar: 100	
	GETFIT: 80	GETFIT: 20 Project readiness (40%) Scheduled COD as per PPA (20%) Contribution to total system losses (25%) Local capacity-building and training (15%)
Namibia	Hardap: 70	Hardap: 30 – Technical Total degradation factor Year 25 (33%) Capacity factor Year 2 (33%) Project schedule to COD (33%)
	Khan: 80	Khan: 20 – Socio-economic development % Revenue to community development (25%) PDN in executive management (25%) Procurement spending as % of EPC value on PDN companies (50%)

6.2.4 Programme level elements: Implementation

Beyond the auction design factors, the literature and the empirical cases further foreground the importance of trust – in the auctioneer and in the bidding process – as a determinant of competition levels (which impact pricing) and the effectiveness of auctions (through attracting stronger bidders). The auctioneer also functions as coordinator, or at least as a neutral third party (honest broker) to help projects reach financial close and commercial operation deadlines.

6.2.4.1 Trust in the bidding authority

To earn bidder trust, the institution designing and implementing the auction should ideally be well resourced and politically supported, capable, and seen as having integrity (Eberhard et al., 2014; Mayer et al., 2011). The implementing team should ideally also be an agile and capable professional group, committed to institutional innovation (Boulle et al., 2015; Garud et al., 2007; Najam, 1995).

The necessity of trust in the bidding authority for competitive price outcomes is evident in all three cases. The identity of the auctioneer, as much as any of the other factors already analysed, determined competition levels (especially the quality of bidders) and resulting prices in all three countries. In some cases, such as GETFIT Zambia, it seemed to be *the* determining factor in price-setting. We also see this play out in other auctions across the continent, with competition levels (especially when it comes to quality) lower in contexts where trust is in question (for example Malawi, Tanzania), whereas the respected Scaling Solar and GETFIT programmes, backed by DFIs, attracted lots of attention, even in difficult country contexts.

Trust in the bidding authority is determined by the auctioneer's perceived capability, integrity and benevolence. Auctioneers' perceived capacity appears to have been assigned and measured differently in the three case study countries. In South Africa's case, bidders based their assessment of the IPP office's capability largely on the track record of the implementing team which had several years' successful experience with PPPs in the country. This was strengthened by the strong, large team of advisors employed by the IPP office to both help design and implement the programme.

6.2.4.1.1 Auctioneer capacity

In both Zambian programmes, bidders based their assessments of auctioneer capacity mainly on the track record of the external organisations (World Bank, KfW) that were central to designing and supporting the implementation of the Scaling Solar and GETFIT programmes, and less on the basis of the hosting institutions (IDC, ERB/DOE). The IDC was only a few months' old when Scaling Solar was launched and, while the directors had some relevant experience, they did not enjoy reputational levels near those of the IFC. Even though this was the first auction launched under the Scaling Solar programme, the IFC (and World Bank group) has a long history of successful infrastructure investment programmes and transactions – particularly in Africa – and exceptionally capable staff. GETFIT was executed by the Zambian Ministry of Energy, an institution that would hardly have inspired confidence since it had almost no track record of successful procurement of private power, despite having a specially designated decade-old office for private power investment.

The GETFIT secretariat (staffed by Multiconsult), on the other hand, had cut its teeth on the successful GETFIT Uganda programme and was backed by KfW, one of the most active and successful infrastructure-focused, bilateral DFIs on the African continent. In Namibia's case, perceptions of the capacity of NamPower's procurement implementing unit appears to have been based on NamPower's

overall reputation in the market as a capable and well-managed utility, as well as the quality of the bidding documentation and pre-submission process (section 6.3.4.2).

6.2.4.1.2 Auctioneer integrity

Bidders' assessment of auctioneers' integrity was based on a combination of track record as well as on how the auctioneers implemented the auction programme (section 6.3.4.2.). In South Africa, the reputation of the IPP office leadership and the lengths the programme designers went to to ensure the integrity and security of the awarding process – including bid evaluation by independent entities; independent verification and auditing of the results; high-level security in the auction evaluation process (including CCTV monitoring), and a further layer of governance-monitoring by another independent entity – bolstered bidder confidence in the integrity of the office and the process. In addition, none of the bid awards were disputed legally, despite more than 100 awards being made.

In Zambia's Scaling Solar and GETFiT programmes, the integrity of the implementing institution was again based primarily on the prominent role of the international DFIs and their advisors (IFC, KfW), which had a generally unblemished reputation (in GETFiT's case strengthened by the Ugandan experience) and were governed by strict policies around corruption and rent-seeking. Perceptions of the integrity of NamPower, as the procuring entity, was somewhat tainted by the controversies surrounding the awarding decisions for the Hardap/Mariental project, although the courts and the regulator cleared NamPower of intentional wrongdoing in both instances. NamPower's procurement committee also employed strict security measures in its evaluation process (including CCTV) but did not use independent auditing or verification of results, which could have strengthened perceptions of the integrity of the process and procurer.

6.2.4.1.3 Auctioneer benevolence

Auctioneers' benevolence was assessed based on their track record and was further established through the bidding process. In South Africa's case, the IPP office officials were known for their generally positive view of the private sector, an exceptional view in a context where there was widespread mistrust by the public sector of private investment. The IPP office's insistence on sticking with the rules of the procurement programme, even when prices were high or a major portion of capacity was awarded to a small group of bidders, and the ongoing, open communication with industry further strengthened bidders' perception of their generally benevolent orientation. In

Zambia, both the IFC and KfW (GETFiT) were primarily private-sector oriented institutions with established track records of success. In Namibia, the successful completion of the REFIT and directly negotiated projects strengthened bidders' perception of NamPower's general benevolence towards the industry.

6.2.4.2 Post-award support

The cases also provide evidence of the auctioneers playing important (though not necessarily necessary) coordination and brokerage roles to get projects over the line. South Africa's IPP office included all relevant government departments, as well as Eskom and the regulator, in the design of the auction programme, which ensured that requirements in the RFP documentation aligned with relevant policy and regulations and that government priorities featured in the programme. This shortened the post-award financial close and construction timelines and sustained a certain level of political support in a difficult climate. The office also played a centralised coordination role in the post-award period, helping projects navigate the complexity of the various permitting and other regulatory approval processes. When Eskom refused to sign the PPAs of the awarded BW4 projects, the IPP office maintained communication with the relevant ministries, the utility and the industry in a bid to resolve the impasse. While it ultimately required a change in leadership at presidential, ministry and utility levels, the IPP office's role as broker proved to have been crucial to maintaining industry's trust in the programme and bringing the various parties closer together.

In Zambia, the IDC played a muted role in getting awarded projects to financial close, mainly due to internal ructions in the organisation, but still helped resolve issues around for example, land ownership. Bidders however lamented the lack of a capable, trusted intermediary, such as the IFC, in the post-award period to get projects across the line. Still, the IDC, with the president as chairman, was a powerful ally of the programme that did a great deal of path-clearing work. In the case of GETFiT, the Ministry of Energy appears to have been a less capable and supportive partner, seemingly incapable or unwilling to remove the roadblocks and, at times, completely locked out of the energy sector decision-making processes (for example, the solar PV award to PowerChina). While there are a broader set of issues at play preventing the GETFiT projects from being constructed, the impotence and foot-dragging response of the ministry has not helped move things forward. In Namibia, NamPower played an important role in getting projects closed and built, not only as procurer but also as shareholder, resulting in the shortest project financial close and construction period among the programmes.

6.2.4.3 Trust in the bidding process

Bidders do not only need to trust the bidding authority, but also the bidding process. This trust is based on perceptions of the integrity, security, transparency and justice of the bidding process – in short, whether the programme and its outcomes are seen as fair and secure (Chiu et al., 2010; Zitron, 2006). The impact of the bidding process on competition levels and auction outcomes is best analysed over longer periods, since bidders' assessments of the auction process is mainly retrospective. With new auctions, bidders are unable to evaluate the perceived fairness of previous auction processes and therefore need to base their judgements on proxies and signals, such as the capacity and integrity of the bidding authority (discussed above), the published auction rules, the quality of the RFP documentation (including the contracts), security measures governing the process, and the quality of communication with the market.

All three countries' programmes appear to have sent the right signals to secure the market's trust as the first rounds of bidding were launched: RFP documentation was generally regarded as well-developed and robust; auction rules were seen to be clear and mostly fair; bid clarification questions were transparently answered and widely circulated, and bid opening and evaluation processes were secured through CCTV, independent observers and/or investment committees. This perhaps explains why there does not seem to be a notable difference between the perceived justice of the auction process and outcomes, especially competition levels. In fact, the country with the most questionable record in terms of officially challenged auction results – Namibia – is also the country with the highest levels of competition – though the roles played by the judiciary and the regulator in protecting the integrity of the auction programme arguably still maintained bidder trust in the long-run. In general, the cases show that trust in the auction process is necessary for competitive price outcomes.

The influence of a well-run, transparent auction process on market trust is most clearly on display in South Africa, where many international bidders have maintained their local presence and the market has repeatedly expressed its trust in the programme and its leadership – if not the South African government or its policies – despite the stalling of the programme in 2015. South Africa went the furthest in its efforts at setting up a fair and transparent auction process, in part to protect the integrity of the auction and its outcomes (especially from politically connected rent-seekers), but also to secure and maintain the trust of a sceptical market that had been gearing up for an aborted REFIT process. This emphasis on building and maintaining the market's trust enabled the auction programme to rise above many of the factors playing out at country level – even as the programme stalled – and will benefit the country as future auction rounds are likely to see highly competitive bids based to some extent on ongoing bidder trust in this solid institutional basis.

6.3 Summary comparison

This final section of chapter 6 seeks to draw together major trends across the analytical levels and case study countries, and to explore their impacts on outcomes. Table 6.8 provides a summarised comparative review of factors at country, programme and project levels across the three case study countries. Sections 6.3.1 and 6.3.2. then seeks to draw out the impacts of these (including important areas of convergence and divergence) on project price and realisation outcomes, before reaching a summary conclusion (6.3.3.) that leads to chapter 7.

Table 6.8: Summary comparison of contributing factors in South Africa, Zambia and Namibia

Factors	South Africa	Zambia	Namibia
Country level			
Stability of economic and legal context	Relative economic, political stability, although sovereign credit successively downgraded; judiciary independent	Rapidly deteriorating state finances, sovereign credit ratings downgrades into imminent default status; relatively low levels of judicial independence	Relative economic, political stability, although sovereign credit successively downgraded; judiciary independent
Energy policy framework	Energy policy allows for private power investment; market structure set out, but not implemented	Energy policy allows for private power investment; new policies see expanded role for renewables	Energy policy allows for private power investment ; modified single buyer market enshrined in legislation
Regulatory transparency, consistency and fairness	Regulatory quality deteriorating over time, despite regulatory independence	Regulatory quality relatively highly rated, but regulatory independence undermined	High levels of regulatory quality
Coherent sectoral planning	IRP provides coherent power generation expansion plan, but overly prescriptive and contested	No coherent power sector expansion plan	NIRP only officially adopted in 2019
Competitive bidding practices	Use of competitive bidding practices informed by IRP planning framework	Use of competitive bidding practices for utility-scale solar IPPs	Switch to competitive bidding practices for utility-scale PV IPPs after FIT and DN project experiences
Programme level			
<i>Auction Design</i>			
Competition-inducing, scale-friendly auction volume	Large (1000MW+) auction volumes from BW1 – slightly reduced for later rounds	Modest auction volumes – ~100MW	Modest to small auction volumes: 20- 37 MW
Scale-friendly project size limits	Large project size limits (75 MW PV; 140 MW wind)	Modest project size limits (40-55 MW)	Small to modest project size limits: 20 – 37 MW
Technology choice: neutral vs. specific	Technology specific demand bands in REI4P; technology neutral SPI4P	Technology specific: solar PV	Technology specific: solar PV
Bid award limits	No bid award limits	Bid award limits	Bid award limits (by default since only single projects auctioned)

Bidding rounds	Regular, scheduled auction rounds announced from BW1	Auction rounds announced for Scaling Solar, but not realised; No schedule for GETFiT solar	No auction schedule
Winner selection	Price (70%) + Socio-economic development commitments (30%)	Price (100%): Scaling Solar Price (80%) and Project preparation + SED criteria (20%): GETFiT	Price (70%) and Technical (30%): Hardap Price (80%) and SED (20%): Khan
Price caps	Announced price caps from BW1-3; removed for BW4	No price caps	No price caps
Physical (project/bid preparation) qualification criteria	Late-stage physical qualification criteria, including investor commitment	Scaling Solar: site provided & prepared, but lender commitment required GETFiT: early stage physical qualification, but with lender signed term sheets	Sites provided and prepared. Investor commitment letters required
Financial (bid bond) qualification criteria	Relatively expensive bid bonds required	Expensive bid bonds required for both Scaling Solar and GETFiT	Modest bid bond required for Hardap. No bid bond for Khan
Auction access requirements	Only analysed financial track record or assets; Heads of EPC and O&M contracts	Project development experience and financial standing; Heads of EPC & O&M contracts	Only analysed project development experience (modest level); Heads of EPC and O&M contracts only for Hardap
Penalty regime	Performance bonds; PPA reduction clause; Liquidated damages only for SED performance	Performance bond (Scaling Solar); PPA reduction clause; Liquidated damages for delays (and underperformance in Scaling Solar)	Performance bonds (Hardap only); PPA length reduction clauses; Liquidated damages for delays and underperformance (Hardap only)
Staged bidding process	Single stage	Two-stage	Single stage
Pricing rule, auction format	Sealed bid, pay-as-bid	Sealed bid, pay-as-bid	Sealed bid, pay-as-bid
Auction Implementation			
Procurer	IPP office viewed as capable, acting with integrity	IFC (through IDC) and GETFiT secretariat viewed as capable, acting with integrity	Generally positive view of NamPower as procurer, but tainted by award controversies
Procurement process	REI4P viewed as fair, transparent, secure	Both Scaling Solar and GETFiT viewed as fair, transparent, secure	Hardap tainted by 3x10MW award controversy, reducing perceptions of award fairness, transparency; Khan process viewed in better light, but concerns about indexation option
Support to awarded projects	IPP office supported projects to reach financial close, COD	IDC/IFC provided little support to awarded projects; GETFiT secretariat supporting, but unable to reach FC	NamPower supported Hardap to reach FC, COD;
Project level			
Favourable equity partners	Mainly large international firms as lead bidders (with local shareholders) – especially later rounds	Large to moderate international firms awarded	International firms with moderate experience awarded
Favourable debt arrangements	High gearing with long-term commercial debt (especially later BWs)	High gearing with long-term, concessionally priced DFI debt	High gearing from commercial debt, with DFI support to enable 15 year tenor

Creditworthy offtaker	Eskom not credit-worthy offtaker	ZESCO not credit-worthy off-taker and in default on IPP and other payments	NamPower credit-worthy offtaker
Secure and adequate revenue stream	PPA and other contractual provisions bankable, secure	PPA and other contractual provisions bankable, secure	PPA and other contractual provisions bankable, secure
Credit enhancements and other risk management and mitigation measures	Sovereign guarantee	Sovereign guarantee, liquidity support and (for Scaling Solar) multilateral termination support	No official risk mitigation or credit enhancement (though DFI loan guarantee provided to Standard Bank)
Strategic management and relationship building	Substantial socio-economic development commitments, incl. empowerment shareholding	IDC is minority shareholder in Scaling Solar projects; some SED commitments from GETFiT projects	NamPower is minority shareholder in Hardap, + PDN shareholding; PDN shareholding + SED commitments for Khan

6.3.1 Comparison of factors impacting price outcomes

6.3.1.1 Country level factors

At a high level, country factors in all three case study countries showed some similarity: economic performance was slipping, energy policy frameworks were broadly supportive of private investment, and competitive procurement was the dominant method being used to contract IPPs. All three countries had also seen auctions being initiated through energy security crises in contexts where power sector planning was either non-existent or in early stages of implementation. While these trends illuminate some of the conditions surrounding the auction programmes, they do not appear to offer much additional insight into how these factors impacted prices beyond what was uncovered in the individual case studies (chapters 3-5).

It is really only when one investigates the differences between the countries that potentially important nuances start to emerge. So, for example, Zambia's rapidly worsening economic crisis is quite different from the economic slowdowns experienced in South Africa and Namibia. The fact that auction prices in all three countries were at comparable competitive levels, despite this important divergence in economic circumstances, confirms that there are other factors that have a greater impact on price setting in challenging investment contexts. The fact that South Africa was the only country with an official power generation expansion plan informing the auction process also calls into question the impact of the planning-procurement nexus on IPP success as originally asserted by Eberhard et al., (2017), at least in terms of price setting.

In general through, the impact of country-level factors on project pricing appears to be relatively limited, at least beyond acting as market entry barriers that potentially impact competition levels.

6.3.1.2 Project

The similarities between project level factors are more illuminating in terms of their impacts on project prices. All three countries saw bids being awarded to relatively large, experienced international firms, with strong balance sheets. It was these firms' ability to use their experience, networks, strong negotiation positions, access to finance and economies of scale that allowed them to beat the competition through offering the most competitive prices. This modifies the importance of the developmental mandate of equity investors (asserted by Gratwick & Eberhard, 2011b), since competitive pricing is now determined through a bidding process, and not negotiation.

Another important similarity, from a pricing perspective, is the provision of large shares of long-term debt to projects. While there are differences in the origins and mandates of the debt providers (mainly commercial banks in South Africa; DFIs in Zambia; and a mix in Namibia), they all were able to provide the majority of project funding on 15+ year bases. This provision of long-term debt was crucial to projects' ability to offer competitive prices, since cost of capital is one of the major drivers of pricing; debt makes up the biggest share of cost of capital; and higher shares of long-term debt allows equity to maintain reasonably return levels.

An important factor in auctions' ability to attract experienced international bidders and long-term debt is the security of the revenue stream. While there are differences in how this revenue stream was secured across the three cases (e.g. sovereign guarantees in South Africa and Zambia, multilateral guarantees in Zambia, a credit-worthy offtaker in Namibia), the centrality of robust, bank-tested project contracts backed by risk mitigation and/or credit enhancement measures (where needed) was clear. This secure revenue stream gave bidders and their investors the confidence to participate in the auction (increasing competition levels) and was an important risk signal in setting investment return expectations – seemingly more important than e.g. a country's economic stability (discussed above).

6.3.1.3 Programme

There were also important similarities and differences in terms of how the auction programmes were design and implemented, and how this impacted pricing.

In terms of similarities: all three auction programmes used simple pay-as-bid, sealed bid auction formats, which reduced bidder risks. Price also carried the most weight in terms of bid scoring criteria, which ensured that bidders were incentivised to optimise their price competitiveness. Auction access criteria were set at relatively high levels for all three programmes (compared to what was being procured), which meant that the pool of qualified bidders was relatively strong. There was also broad

levels of trust in the bidding authorities and processes across the three countries, although this was somewhat diminished in Namibia due to controversies in award decisions (incl. from the failed 3x10 MW auction). The impact of this trust deficit on competition levels in the Namibian programme was nevertheless somewhat diluted by the fact that it was quite a small programme that already attracted a lot of interest, which meant that having a few less bidders participate did not have a major net impact on competition levels.

In combination, these factors lowered bidding risks, increased competitive pressure and drove down prices. There were however also auction design convergence that negatively impacted pricing: all three countries' programmes made liberal use of penalty regimes to incentivise project realisation, which increased bidding risks, thereby increasing pricing levels (Appendix F). The use of technology-specific demand bands also increased prices at an average level in South Africa, although this impact is less obvious in Zambia and Namibia since the auctions were set up as single technology programmes.

Areas of divergence between the three countries were also illuminating, illustrating how differences in auction design decisions affected price outcomes differently. The first obvious difference was the auction volume: South Africa's large auction volume in the first bid window effectively wiped out competitive pressure between bidders, which resulted in the high prices for those rounds. This was clearly not the case in Zambia and Namibia, where auction volumes were relatively prudently set and helped maintain competitive pressure. Projects sizes, on the other hand, spanned quite a range (20 – 75MW) – yet did not seem to impact pricing as much as anticipated, in part due to solar PV's modularity and consequent ability to scale down relatively well, and the dramatic reductions in equipment costs over time. Bid award limits in Zambia also resulted in an increase in average prices for the auction programmes, something that was not happening in South Africa where there were no bid award limits. South Africa's use of price caps in the earlier bid windows also seem to have increased prices as bidders anchored their prices around these – although this phenomenon disappeared as competition levels increased (which was also the case in Zambia and Namibia).

An interesting and important difference between the cases was how they dealt with physical (project preparation) criteria: in South Africa, the late-stage physical qualification criteria made the programme very expensive for bidders, which might have negatively impacted competition levels had the programme not offered additional bid windows. Still, this was one of the reasons for the low competition levels in BW1 (and, to an extent, BW2 which followed a few months after), which resulted in expensive projects. Scaling Solar and Namibia's approach of providing and preparing the project

site seems to have worked well in terms of reducing bidding risks and costs, which increased competition levels and helped reduce pricing.

6.3.2 Comparison of factors impacting project realisation

6.3.2.1 Country

At a country level, we see broad agreement between the three cases in terms of the impact of the enabling environment on project realisation. Energy policy frameworks at a minimum allowed for private investment in the power sector, and regulation on licensing and technical compliance was relatively clear and processes predictable, if somewhat onerous and costly. The enabling environment

An important difference between the three countries was the pace and scale of economic deterioration. Zambia's rapid economic fall from grace meant that while projects secured through the Scaling Solar programme were able to reach financial close and commercial operation during a brief window of opportunity, the GETFiT projects would be stuck, unable to secure loans and unable to start construction. This was not the case in South Africa and Namibia – both of which experienced economic slow downs and even contraction, but not collapse. This enabled projects in these countries to still secure finance and realise projects, despite challenging circumstances.

6.3.2.2 Project

At a project level, there is again strong convergence in terms of the factors that supported project realisation. All three countries' programmes attracted and awarded projects to mainly large, international bidders that were able to use their experiences and resources to ensure project realisation, even in challenging circumstances. The incorporation of debt providers' requirements in project contracts and the provision of risk mitigation and credit enhancement measures, where needed, also ensured that agreements were bankable and the revenue stream secure, which was essential for project realisation. The obvious exception is the GETFiT programme in Zambia, which did not provide the same level of risk mitigation support as Scaling Solar, and whose projects consequently struggled to reach financial close.

Finally, programmes in all three countries also featured requirements for shareholding by strategically and/or politically important actors: BEE shareholders in South Africa; the IDC in Zambia; NamPower and PDN shareholders in Namibia. These shareholders were able to support project realisation in the post-award period, either through active support provided to the project (Namibia) or by virtue of

their political influence when challenges arose (Zambia, South Africa). This level of shareholding did not guarantee project realisation, and it cannot be claimed that this is why the GETFiT and Khan projects (which did not feature these requirements) did not reach COD – but they did help.

6.3.2.3 Programme

At a programme level, similarities between the three countries enhance our understanding of the factors supporting project realisation. All three case study countries for example featured measures that would ensure that projects were awarded to strong bidders. These included relatively high levels of auction access requirements (encompassing prior experience, financial standing, or both), but also included various signals that would have attracted stronger bidders. These signals were not the same in all three countries, but included:

- the announcement of auction rounds (e.g. in South Africa, and to an extent in Zambia) that offers a longer-term market opportunity;
- the setting of relatively large auction volumes (especially in South Africa) which attracted larger bidders;
- the setting of relatively large project size limits (South Africa, and to a degree also Zambia), which again attracted larger bidders; and
- the intentional building of trust in the auctioning authority and auction process through clear communication, sticking to auction rules (incl. timelines) and ensuring the security of the evaluation process.

Other measures supporting realisation found in all three countries included:

- the use of investor (especially lender) commitment to the bids as a qualification requirement – irrespective of whether for example the project site was being provided and prepared by the bidders or the auctioning authority – which ensured that projects were well prepared and vetted, and able to secure funding;
- the inclusion of penalty regimes to incentivise serious bids and timely project execution; and
- the use of a simple bidding format and pricing rule that lowered the risk of bidders misunderstanding the auction rules and submitting unrealistic bids (winner's curse).

There were also important differences between the three cases: bid scoring criteria used in Namibia's Hardap project, and Zambia's GETFiT programme aimed to improve the likelihood of timely project realisation, yet there is no real evidence of any additional impact. Bid bonds, on the other hand, was a requirement for all bidding programmes except Namibia's Khan project, which has not reached

financial close more than 18 months after being awarded. And the level of support provided by the bidding authorities differed between the countries and even programmes – ranging from extensive involvement in day-to-day decisions (NamPower – Hardap), general support in the post-award period (South Africa) to very little support (Zambia’s MoE and, to an extent, the IDC) – which coincided, to a certain extent, with the realisation prospects and timelines of the projects (section 6.2.4.2).

6.3.3 Conclusion

Chapter 6 has shown that there is considerable value in comparing cases to broaden and deepen our understanding of the cases and the factors supporting price and realisation outcomes. The convergence and divergence between factors across cases, and the ways that they map onto the price and realisation outcomes, allowed for the testing and refinement of explanations. The analysis advanced our understanding of how factors at all three levels – country, project and programme – contribute to and shape these outcomes. Chapter 7 will use and build on these findings to comprehensively answer research questions.

Chapter 7: Synthesis and conclusions

Ensuring efficient and effective renewable energy auction outcomes in sub-Saharan Africa is a complex undertaking. While close to 30 sub-Saharan African countries have launched competitive procurement programmes for utility-scale renewable energy IPPs in the period 2015–2020, outcomes have been mixed. Prices of procured projects have not always been in line with regional expectations (for example, in Ghana and Uganda) and even when they were, some projects have struggled to advance to financial close and commercial operation (for example, in Ethiopia, Cote d'Ivoire, and Cameroon) (Alao & Kruger, 2020).

Through an analysis of the factors that contribute to successful outcomes at the country-, project- and programme levels, the preceding chapters explored both the combined impact, as well as the impact of key individual factors, on the auctions' price and investment outcomes in each of the three countries. This final chapter now seeks to:

- Conclusively answer the research questions (section 7.1) and clearly articulate the study's contribution to literature and theory (sections 7.2-7.5); and
- Summarise the thesis (section 7.6) and identify areas for further research (section 7.6)

7.1 Research Questions

Main questions:

RQ1: How have factors at the country, programme and project levels contributed to the price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2: How have factors at the country, programme and project levels contributed to the project realisation outcomes of renewable energy auctions in sub-Saharan Africa?

Secondary questions:

RQ1A: What are the price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2A: What are the project realisation outcomes of renewable energy auctions in sub-Saharan Africa?

RQ1B+2B: Can our understanding of the price and project realisation outcomes in renewable energy auctions in sub-Saharan Africa be deepened through the application of an analytical framework that combines three bodies of literature, covering:

- i. elements contributing to the success of IPPs in Africa;
- ii. renewable energy auction design; and
- iii. renewable energy auction implementation?

RQ1C: What are the *necessary, but not sufficient*, conditions at country, programme and project levels for competitive price outcomes of renewable energy auctions in sub-Saharan Africa?

RQ2C: What are the *necessary, but not sufficient*, conditions at country, programme and project levels for investment outcomes of renewable energy auctions in sub-Saharan Africa?

7.2 How factors contributed to price and realisation outcomes

Figure 7.1 presents an emergent structure for thinking about how factors in the analytical framework (Table 6.1) contributed to project price and realisation outcomes. This structure, though supported by some of the language and concepts used in the literature (chapter 2), ultimately emerged from the empirical analyses of the case studies. It offers both the terminology and categories needed to make sense of the roles played by the contributing factors during the various stages of the auction programmes and will be used to answer the two main research questions (RQ1 and RQ2) in sections 7.1.1. and 7.1.2.

Factors can be functionally categorised according to whether they act as signals, barriers, incentives, constraints or support measures:

- *Signals* are factors that communicate something to the market (mainly bidders and their investors), usually with the aim of shaping risk perceptions and expectations;
- *Barriers* are factors that act as “gatekeepers” to the auction, determining who can participate;
- *Incentives* are measures employed in the auction programme to shape the behaviour of bidders;
- *Support measures* are provided by public authorities (usually the auctioneer) in the post-award period to assist bidders to reach financial close and commercial operation;
- *Constraints* are factors, usually external to the auction programme, that influence auction outcomes (primarily project realisation).

In some instances, factors can have more than one function, depending on the phase of the auction. The functions are placed in figure 7.1 according to whether they fulfil their main role prior to, during, or after the bidding process. The figure also shows that while project prices are mainly determined

during the pre-bidding and bidding stages, project realisation outcomes are the result of factors at all three stages: pre-bidding, bidding and post-bidding.

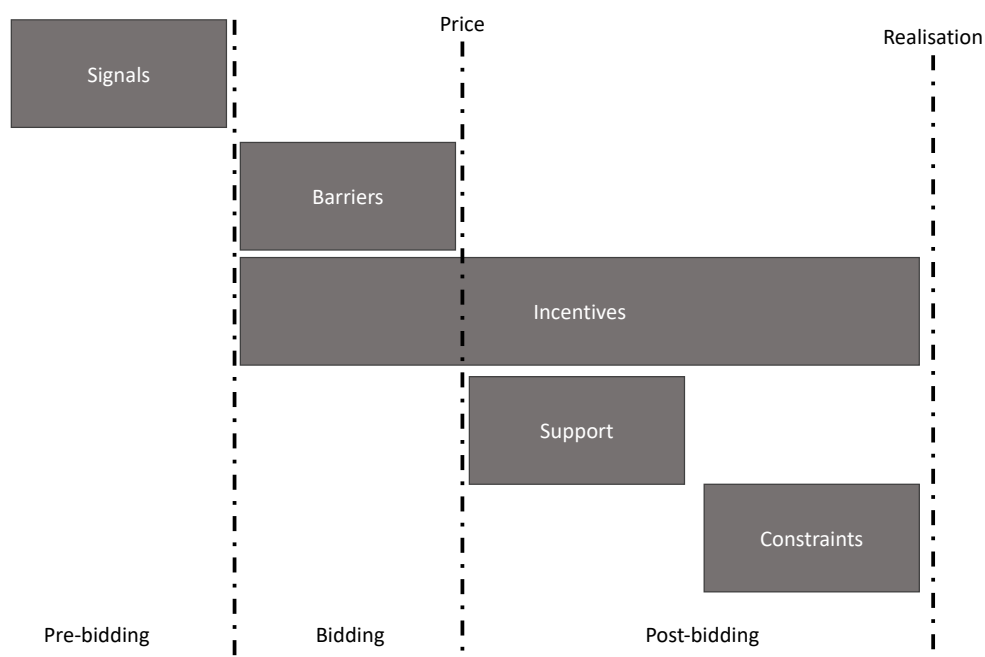


Figure 7.1: A phased functional cascade of factors contributing to project price and realisation outcomes

7.2.1 How factors contribute to price outcomes

The first main research question of this thesis is (RQ1): How have factors at the country, programme and project levels contributed to the price outcomes of renewable energy auctions in sub-Saharan Africa? Price outcomes were mainly determined by competition levels and projects costs – the latter comprising investment costs (cost of equipment, construction, operations, including land, labour, permits) and cost of capital (equity and debt)¹³² (Figure 7.2). I discuss the impacts and determinants of both competition levels and projects costs in sections 7.1.1.1. and 7.1.1.2.

¹³² Prices (measured as the levelized cost of electricity) from renewable energy projects are mainly impacted by three factors: investments costs (cost of equipment, construction, operations, including land, labour, permits), cost of capital (equity and debt), and capacity factors (the amount of energy that can be generated by the plant) (Bazilian et al., 2013; Dobrotkova et al., 2018). Prices have obviously been impacted by the drop in prices of solar PV panels and other equipment, but I argue that without sufficient levels of competition, these cost benefits are less likely to be discovered and captured (as evidenced by the higher prices for directly negotiated and feed-in tariff projects). Other investment cost components have been shown to be less influential determinants of price – at least in the case studies (for example, comparing the prices from the Hardap or Scaling Solar projects, where

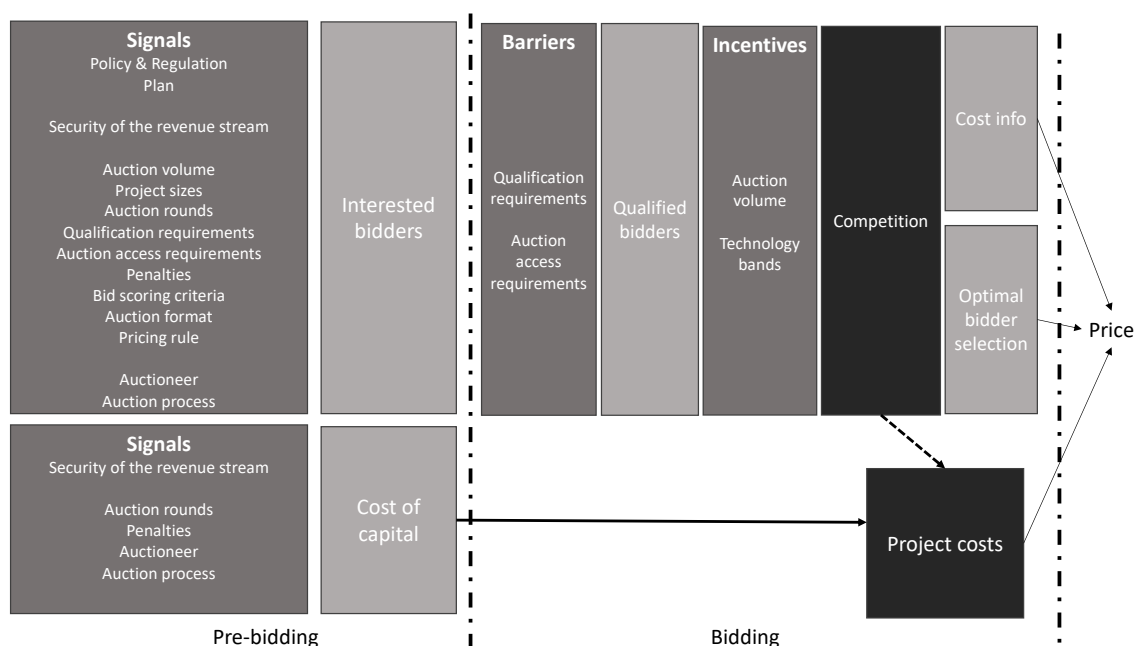


Figure 7.2: Price determination factors

7.2.1.1 Competition

Competition levels impacted price outcomes in three ways:

- Competition between bidders forced them to reveal more information on costs, effectively reducing information asymmetry between the bidders and the auctioning authority. This is often the main benefit of competition for price setting identified in the general auction literature (e.g. Hubbard & Paarsch, 2016). The lack of competition in REI4P's BW1 and, to an extent, BW2 is a key reason for the high prices of awarded projects since there was no real pressure on bidders to reveal their true costs (section 3.3). The information-revealing power of competition also explains why prices for auctioned projects were generally lower than those for feed-in tariff or directly negotiated projects in Namibia (section 5.2 and 5.3, and

many of these cost elements were provided/covered by the auctions, vs. the Kahn and GETFIT project prices, where this was not the case) – and it has also been shown that these costs can be impacted by competition levels (for example, later REI4P rounds). Capacity factors have been shown to be less influential than cost of capital, and solar resource levels between the three countries are relatively similar (Dobrotkova et al., 2018; Frisari & Stadelmann, 2015; Labordena et al., 2017; Ondraczek et al., 2015; Bjarne Steffen, 2020). Dobrotkova et al. (2018) also argue that prices can be impacted by “qualitative” factors, such as the provision of guarantees, measures to reduce currency risks and auction design decisions (for example, simple rules, use of qualification criteria, alignment of policy priorities). I argue (in line with their logic, but taking a different angle) that the provision of guarantees, measures to mitigate currency risk and appropriate auction design decisions will lead to more competition and better priced equity and debt (cost of capital), and is therefore most appropriately discussed through these lenses.

appendix G). When Namibia's regulator set its feed-in tariff levels, it was based on cost assumptions that were out of sync with what the market was able to provide. And the prices of the directly negotiated projects – being higher than competitively set project prices – illustrated how the information asymmetry ultimately benefitted the bidders, who had a better view of their true costs.

- Competition also incentivised bidders to not only reveal more information on their true costs, but also to reduce costs to increase their competitiveness and likelihood of winning. The most obvious example of this is South Africa's REI4P, where not only EPC costs reduced between bid windows 1 to 4 (which one would expect given the drop in equipment prices over this period), but where we also saw reductions for each cost category over time (section 3.4.3 and Appendix E). These cost reductions were achieved through:
 - Bidders bringing more services and parts of the value chain in-house, thereby reducing margins and opening up additional potential revenue streams;
 - Reductions in the investment return expectations from both equity and debt providers;
 - The provision of longer loan tenors, which reduced the overall cost of capital;
 - The use of more cost competitive local service providers (e.g. legal, technical, financial) – as opposed to costly international advisors - that had built up their skills in preceding bid windows;
 - Negotiating better terms and costs with suppliers, contractors and service providers;
 - Innovation in financing and other structuring arrangements (incl. the development of project portfolios to increase economies of scale).

- Strong competition also meant that auctioneers were able to select the most competitive project counterparties, since certain bidders were more capable of reducing costs than others by virtue of their size, experience, financial standing, networks etc. This was again most clearly on display in South Africa's REI4P, where projects in later bid windows were mainly awarded to large, international developers (often utilities) (sections 3.2.2. and 3.4.3.) that were able to outprice the competition through stronger negotiation positions, access to cheaper sources of capital, the vertical integration of the project development value chain and the ability to benefit from economies of scale. It is something that is also on display in Zambia and Namibia, where projects were awarded to international bidders with substantive track records, including relationships with EPC and O&M providers and experience with project finance.

In summary, competition levels impacted prices through revealing information, reducing costs and offering better options. Competition levels were determined by both the quality or strength of bidders (meaning developers & sponsors/equity investors) – that is, their experience, size and access to finance – and the quantity of bidders.

In general, the correlation between higher competition levels and lower-price outcomes across the three cases appears to hold, with competition generally increasing over time as prices reduced (Table 7.1 and Figure 7.2). There are two notable exceptions to this observation:

- South Africa's fourth bid window saw slightly lower levels of competition compared to BW2 and BW3, yet prices were also much lower than in previous rounds (Figure 7.2). This reduction in the number of bids masked a concurrent increase in the quality of bids – as measured by the experience, size, and financial strength of bidders – which effectively increased the quality of competition (despite a lower number of bids submitted), and consequently drove down prices (section 3.4 and Appendix E). The bidding authorities also decided to award double the initially announced volume post-submission (section 3.4), which meant that the competitive pressure during the actual bidding process was higher than what is shown by Table 7.1 and Figure 7.2¹³³.
- The GETFiT results need to be interpreted in light of the fact that the auction restricted prequalification to the 10 highest-ranked bidders. The relatively low number of complete bids submitted is therefore partly the result of an artificial restriction built into the auction programme and thus not completely reflective of the overall competition levels.

¹³³ Had the IPP office stuck to the original bid volume, the BW4 competition level would have been 5,9.

Table 7.1: Competition levels – South Africa, Zambia, and Namibia

	EOI/Qualification	Bids submitted	Projects awarded	Competition level (No. of bids submitted/awarded projects)
South Africa				
BW1	N/A	53	28	1,9
BW2	N/A	79	19	4,2
BW3	N/A	93	17	5,5
BW4	N/A	77	26	3,0
Zambia				
Scaling Solar 1	48	11	2	5,5
GETFIT	41	15 ¹³⁴	6	2,5
Namibia				
Hardap	250	13	1	13,0
Khan	100	16	1	16,0

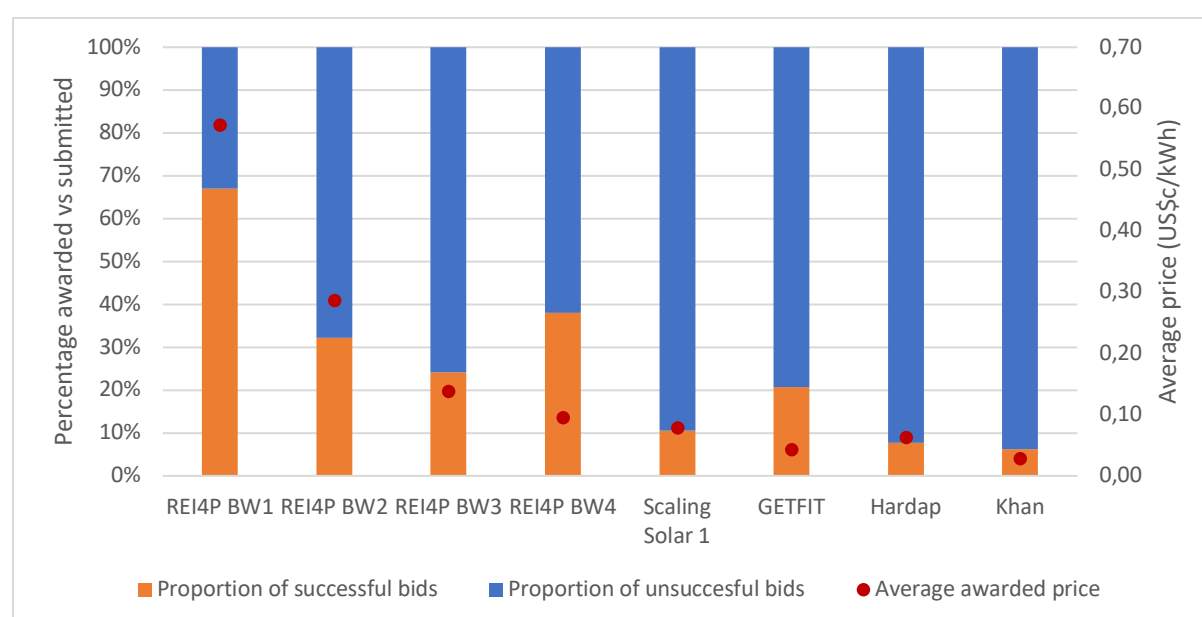


Figure 7.3: Competition levels - MW submitted vs MW awarded: South Africa, Zambia, and Namibia

Competition levels were determined in three functional phases, where contributing factors acted as signals, barriers and incentives.

¹³⁴ This is artificially low since only the top 10 prequalified bidders were allowed to proceed (only 8 did).

7.2.1.1.1 Signals

The first phase consisted of “signals” sent to or picked up by the market that influenced whether bidders would submit a bid or not (the bidding decision). These signals included factors from all three levels. At country and project levels, these signals were largely focused on reducing the bidding (investment) risks, while programme level signals focused on bidding risks and bidding costs.

7.2.1.1.1.1 Country-level signals

Effective country level signals were concerned with the enabling environment – meaning supportive policy, regulatory quality, and (to a lesser extent) coherent sectoral planning. Bidders and their investors needed to know that the country’s energy policy and regulatory framework allowed for private sector investment in power generation. This reduced the risks of awarded projects not being realised (which would be a substantial loss for bidders) and also indicated to interested bidders that there were longer-term investment opportunities in the market (which could offset the costs of bidding, even if bids were initially unsuccessful). A coherent, dynamic power generation expansion plan – such as South Africa’s Integrated Resource Plan (IRP) – or the announcement of further bidding windows or a larger overall auction programme (e.g. the 600 MW Scaling Solar allocation in Zambia) furthermore strengthened this commitment signal from government, giving interested investors a sense of the potential market size and investment timelines (see Appendix E & F).

The quality of regulation further impacted the bidding decision by virtue of its effect on the security of the project’s revenue stream (discussed in more detail below, under project level factors): cost-reflective tariffs were fundamental to determining the financial health of the off-taker of power (in all three cases, the state-owned utility). Where the offtaker was not financially healthy, in part due to too low consumer tariffs (e.g. in South Africa and Zambia), a suite of risk mitigation provisions needed to be put in place to give bidders the comfort they needed to still wish to participate (sections 3.3 and 4.2, and appendices E&F). Inversely, the financial standing of NamPower in Namibia – supported by cost-reflective tariffs set by ECB – acted as a powerful signal to the market which increased competitive interest (section 5.1 and 5.2, and appendix G).

Apart from the enabling environment, the overall investment climate – primarily determined by economic and political stability, and judicial quality – played a surprisingly muted signalling role. Competition levels increased (South Africa, Namibia) or remained high (Zambia) as sovereign credit ratings decreased in all three case study countries (section 6.2.1.1), and bidders seemed more influenced in their bidding decision by project and programme level signals (discussed further below).

This does not mean that the investment climate played no role (Namibia's investment climate has for example been pointed out as an important signal in Appendix F), but rather that in challenging investment climates bidders also look to other, potentially more important signals.

7.2.1.1.1.2 Project-level signals

At the project level, the most important signal was the security of the projects' revenue stream, determined by the provision of bankable project contracts with either a credit-worthy offtaker or an offtaker supported by sufficient credit enhancement and risk mitigation measures. Project contracts – primarily the power purchase agreement (PPA) – needed to allocate risks fairly and meet the quality standards of lenders to be considered "bankable" – a measure achieved in all three case study countries through the deliberate "testing" of project agreements with potential lenders. Auctioneers in all three countries also provided this suite of documents to interested bidders as part of the Request for Proposals (RFP) package.

Where the offtaker was not investment-grade rated – whether due to poor financial and/or technical performance, consumer tariffs set below cost-reflective levels, or all of the above (as was the case with both Eskom and ZESCO) – the off-take agreement (PPA) needed to be backstopped by risk mitigation and possibly credit enhancement provisions. In the case of South Africa, this required the provision of a sovereign guarantee backstopping Eskom's payment obligations. In Zambia, in addition to a sovereign guarantee, liquidity support was provided through letters of credit (PRG-backed for Scaling Solar) and a further payment guarantee (for Scaling Solar). The provision of debt by the IFC for the Scaling Solar projects was a further signal to the market that lowered bidding risks, since not only would awarded projects have access to concessional debt, but it also meant that the World Bank group would become a long-term project partner that could help maintain government's commitment when faced with external pressures.

7.2.1.1.1.3 Programme-level signals

At a programme level, key signals that influenced the bidding decisions were:

1. The size of the opportunity – determined by the auction volume and project size limits. Bidders were less likely to submit a bid if they thought that the auction volume was too small to allow them a reasonable opportunity to be awarded; or if project sizes were too small to allow for proper investment returns compared to the cost of bidding and project realisation.

This for example happened in Namibia's Khan project (see Appendix G), where at least two fairly large bidders that had previously submitted tenders decided to not participate due to the smaller project size. The size of the opportunity is also one of the reasons that South Africa's REI4P has seen more than 300 bids submitted over four bid windows (section 3.2): bidders know that the auction volume is large enough that they stand a relatively good chance of being awarded if their bids are well prepared and competitive, and they also know that project sizes are large enough to allow for economies of scale and reasonable overall investment returns (Appendix E).

2. The longer-term opportunity presented by the procurement programme (auction rounds). Bidders were more likely to incur the costs of bidding if they knew that the market offered longer-term growth opportunities and that they would have another bidding opportunity if unsuccessful. The lack of a scheduled auction programme has for example been pointed out as a reason for some bidders deciding to not submit bids for Namibia's projects (Appendix G). South Africa's publication of a REI4P bid window schedule in 2011 and Zambia's 600 MW Scaling Solar allocation announcement were again significant signals to the market that increased bidder interest in the programmes. In a sense, South Africa's REI4P and its schedule of large-volume bid windows acted as an anchor programme for the region, allowing many bidders that participated in Zambia and Namibia's programmes to maintain an active presence in sub-Saharan Africa that would otherwise not have been feasible.
3. The likely credibility of bid awards - determined by qualification and access requirements, penalties, bid scoring criteria, and the auction format & pricing rule. These auction design decisions signalled to potential bidders how likely it would be that they would be underbid by inexperienced or non-serious bidders. If serious bidders felt that there was a strong probability that they would be competing against these kinds of bidders, they would be less likely to incur the costs of bidding. This is because, in their view, inexperienced or non-serious bidders would be likely to submit unrealistic (too low) prices due to a lack of experience or an opportunistic bidding strategy, which would have a high likelihood of being awarded – effectively wiping out the bidding costs of all the serious bidders (Appendices E-G). The auction programme's qualification and access requirements were meant to ensure that only serious bidders participate, while penalty regimes were meant to ensure their commitment to their bids. The use of straightforward bid scoring criteria and a simple auction format and pricing rule further reduced the likelihood of bidders submitting unrealistic bids due to misunderstanding the bidding rules.

4. The costs of bidding – determined by the qualification requirements and staged bidding – also impacted the bidding decision and is a key consideration, especially for “smaller” bidders that have limited resources. These costs include the resources and time required to prepare the project (bid) and comply with the bidding requirements (qualification requirements). Apart from the internal time and resources dedicated to preparing bids, bidders might also need to pay for environmental impact assessments, water use licenses, legal advisory services, financial model auditing etc. These are for example all costs associated with bidding in South Africa’s REI4P (running into hundreds of thousands of dollars per bid), which has been described as one of the most expensive bidding programmes globally (Appendix E).

The costs of bidding can be reduced if a well-structured two-stage bidding process is used, as was the case in Zambia where the prequalification phases of both the Scaling Solar and GETFIT programmes were mainly concerned with auction access requirements (i.e. bidder experience and/or financial standing). Bidding costs do not seem to have been a major determinant of competition levels in any of the case study countries, since costs for smaller programmes in Zambia and Namibia have been at the lower end of the spectrum, while South Africa’s high cost of bidding was offset by the size of the (long-term) opportunity (discussed above).

5. The credibility/trustworthiness of the auctioning authority and auction process. Bidders needed to know that they can trust the bidding authority and the bidding process to be willing to incur the costs of bidding. They based this trust on a number of signals, often inextricably tied up with each other. Bidders evaluated the experience and capacity of the implementing team and/or their advisors; the quality of the documentation provided (as a signal of this capacity); the frequency and professionalism of communication from the bidding authority; and measures meant to support the security and integrity of the awarding process (Appendices E-G). It took a lot of work to build this trust with the market, but this trust could quite easily be lost (as for example happened with some bidders in Namibia’s Hardap tender, Appendix G). In higher risk investment contexts where institutions are weak, the importance of this trust is enhanced and becomes a key factor in the bidding decision. This for example explains the high levels of competition in Zambia’s auctions – largely due to the prominence of the IFC and the GETFIT secretariat and the way that they helped shape and implement the programmes (Appendix F) – despite the increasingly challenging investment context in the country.

Together, these signals were meant to attract enough of the right kinds of bidders to ensure competitive pressure in the bidding process. For auctions implemented in higher risk contexts, such as sub-Saharan Africa, these signals are absolutely crucial for determining competition levels. The most powerful of these signals were the security of the revenue stream, and the credibility/trustworthiness of the auctioning authority and auction process.

7.2.1.1.2 Barriers

Once the market's interest was piqued and potential bidders decided whether to submit a bid, barriers that determine who can and cannot submit bids further influenced competition levels. These were programme level factors – qualification and auction access criteria – that now functionally changed from signals to barriers that both limited the number of bids, while also increasing the strength of the bidding pool by limiting participation to experienced, capable bidders with well-developed projects.

Auctions in all three case study countries made use of substantial qualification and auction access requirements: for example, bidders needed to submit bid bonds (except for Khan); bids needed to be accompanied by lender commitment letters or signed term sheets; and bidders needed to prove that they had either a track record of utility-scale project realisation (Namibia, Zambia) or the ability to raise the necessary finance (South Africa, Zambia) (section 6.2.3.1). In South Africa (and to a lesser extent also the GETFIT programme in Zambia), bidders also needed to ensure that projects were effectively financial-close ready by the point of submission. In combination, these requirements filtered out poorly prepared bids from inexperienced bidders to enhance the quality of competition in the remaining bidding pool.

7.2.1.1.3 Incentives

Competitive pressure between the remaining pool of bidders is further increased through the following incentives:

1. Setting a prudent, small (relative to the bidding pool) auction volume. This ensured that there was sufficient competitive pressure in the bidding process to incentivise bidders to reveal and reduce costs. The most glaring example of the impact of a too large auction volume is South Africa's first bid window, where there was almost no competitive pressure between bidders, resulting in high project costs (section 3.3).

2. Allowing competition between technologies (if more than one technology is being procured). South Africa's REI4P was the only multi-technology auction analysed, and from the results (section 3.2) it is clear that had there been competition between technologies, prices would have been lower since wind projects were in general much cheaper than other awarded technologies – at least in the first bidding rounds.

In combination, these signals, barriers and incentives create and increase competitive pressure, forcing bidders to reveal costs and incentivising them to further reduce costs (discussed below).

7.2.1.2 Project costs

Project costs comprise investment costs (cost of equipment, construction, operations, including land, labour, permits) and cost of capital (equity and debt) and are the ultimate determinants of a project's price, since a project should at a minimum be able to cover these costs through the tariff it charges to be viable. Project costs (incl. cost of capital) are also impacted by competition levels. The competitive pressure created by an auction programme can induce bidders to not only reveal costs, but also to innovate and reduce costs/margins in an effort at improving the likelihood of award. The factors impacting competition levels (section 7.1.1.1) are therefore equally relevant in determining project costs.

A key driver of project costs is the cost of capital (equity and debt): the pricing of risk. This risk pricing was mainly determined in the pre-bidding phase and thus relied on signals sent to the market.

7.2.1.2.1 Signals

Signals that determined project costs (incl. risk pricing) include factors from all three levels: project, programme and country.

7.2.1.2.1.1 Project-level signals

At the project level, the most important signal was the security of the revenue stream. High gearing ratios and long-loan tenors have been key to driving down capital costs and, consequently, project prices across the auction programmes¹³⁵. For this reason (among others), the deliberate incorporation of lender requirements as well as the testing of project documents with lenders are particularly

¹³⁵ Concessionary interest rates have also contributed to a lower cost of capital in Zambia's programmes.

important elements of auction design in the sub-Saharan African context. Investors needed to be assured that the project would be able to service debt payments and provide equity with a reasonable investment return. The more concerned investors were about the security of the revenue stream, the more likely it was that debt would be short-term and expensive, and that equity hurdle rates will be high.

For this reason, the provision of bankable project contracts with either an investment-grade offtaker (NamPower) or an off-taker backstopped by risk mitigation measures such as sovereign guarantees (South Africa), liquidity support and termination cover (Zambia) as part of the RFP package had been essential in allowing projects to secure long-term, low cost loans (Appendices E-G). Competition between lenders (section 4.3 and 3.4.2), the availability of more sources of debt (for example, corporate finance, institutional funds) (section 3.4.2.1) and complementary debt provision and risk mitigation arrangements between commercial lenders and DFIs (section 5.3.2.6) also lowered the cost of capital through inducing lower pricing of debt and/or longer loan tenors.

7.2.1.2.1.2 Programme-level signals

At the programme level, key signals that impacted project costs were:

1. The longer-term opportunity (auction rounds), with the likelihood of long-term market growth able to induce lower returns on equity. This is due to the fact that bidders might view the opportunity to establish a longer-term base in a market as a sufficient reason for reducing their expected return on a single project (bid). We saw this playing out most clearly in South Africa's bidding programme, where large, international bidders started bidding very aggressively from BW3 in an effort at securing part of what they saw as an important long-term market (section 3.4 and appendix E), though there is a similar sentiment at play in especially Neoen's bid in the Zambian Scaling Solar programme (section 4.2).
2. Penalty regimes, which increased project risks. These risks, in turn, increased investment costs. So, for example, performance bond liabilities ended up in the financial models that determine project prices. This happened in the Scaling Solar programme, which featured exceptionally expensive bid bond requirements (see Appendix F). Liquidated damages provisions and/or penalties for late delivery or underperformance were also, as a rule, passed on to EPC or O&M contractors, who again incorporated these in their overall costs that feed into the project price (Appendix E).

3. The credibility/trustworthiness of the auctioning authority and auction process, which impacted project risks. If bidders were convinced that an auction programme was credible and being implemented by a trust-worthy auctioneer, they were more likely to reduce their expected investment returns to improve their competitiveness. This for example happened in the GETFiT programme (see Appendix F). It was also during the GETFiT programme that it became obvious that a trusted auction process can induce aggressive loan pricing from lenders desperate for well-structured projects, further reducing the cost of capital (Appendix F).

7.2.1.2.1.3 Country-level signals

The overall investment climate – primarily determined by economic and political stability, and judicial quality – again played a surprisingly muted signalling role. Project costs decreased as sovereign credit ratings decreased in all three case study countries (section 6.2.1.1.). Investors thus looked for other signals – primarily at the project and programme levels – to inform their project pricing decisions in challenging investment contexts.

In summary, project pricing was determined by competition between bidders that revealed but also reduced investment costs, and project costs (essentially cost of capital). Competition levels and project costs were determined by a combination of factors at country, project and programme levels that acted as auction signals, barriers and incentives.

7.2.2 How factors contribute to project realisation outcomes

Price is one key outcome; the other is project realisation. The second main research question (RQ2) is: How have factors at the country, programme and project levels contributed to the project realisation outcomes of renewable energy auctions in sub-Saharan Africa? Project realisation was determined by two categories of determinants: the first category effectively centered around bidders and their projects. Within this category are three ultimate determinants: bidder quality, the level of project preparation, and investor commitment. These determinants were influenced by factors from all three analytical levels (country, project and programme). I will analyse this influence again using a functional categorisation based on whether these factors act as signals, barriers, incentives, constraints or support measures in sections 7.1.2.1. and 7.1.2.2.

The second category of project realisation determinants are essentially outside of bidders' control or ambit. These are constraints – factors external to the auction programme that impact project realisation – and post-award support measures provided by the bidding authority. These factors and their impact on project realisation is unpacked in sections 7.1.2.3. and 7.1.2.4. Figure 7.4 provides a visual representation of how these determinants and their influencing factors impacted project realisation.

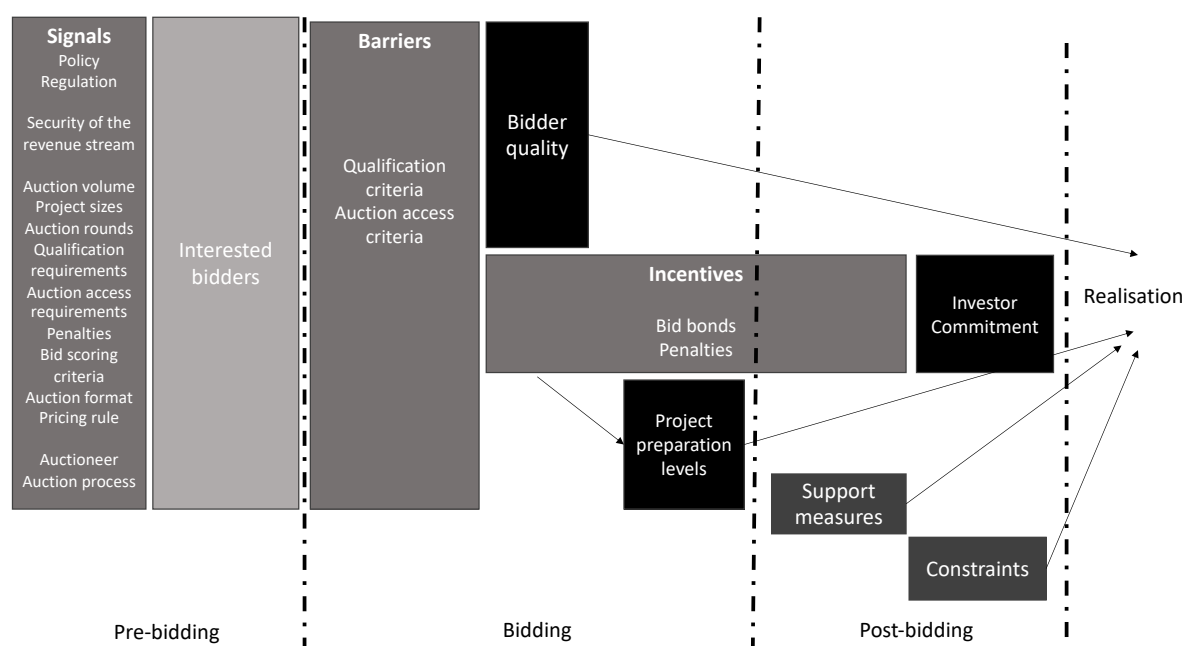


Figure 7.4: Project realisation determinants

7.2.2.1 Bidder quality

Bidder quality – that is, the size, experience, access to resources (especially finance) and commitment of bidders – influenced project realisation in the following way: stronger bidders were able to draw on their experience, financial (and other) resources and their relatively strong negotiating positions to ensure that projects reached commercial operation milestones, even in challenging circumstances. All three countries' auction programmes went to considerable lengths to ensure that projects were awarded to bidders that were qualified to realise their projects, using signals to attract strong bidders (section 7.1.2.1.1.), and barriers to restrict access to the auction to these strong bidders (7.1.2.1.2).

The impact of bidder quality was most clearly on display in Zambia, where both Scaling Solar projects were able to advance to financial close and commercial operation despite a number of setbacks and challenges. These setbacks and challenges included:

- The fact that these were the country's first project financed deals, which meant that there was limited appreciation of the requirements and complexities involved in these types of transactions;
- Problems with the project sites – mainly sinkholes and disputes about boundaries – that required substantial additional work (and costs);
- The rigidity of the regulatory framework (in particular the grid code) which made no provision for solar PV and therefore required numerous exemptions from the regulator (ERB); and
- Ructions within the IDC, which was both procurer and minority shareholder in the projects, and which effectively meant that bidders were left with an at best distracted government counterparty at a crucial time for project realisation.

It was Neoen and ENEL Green Power's experience, size and resources that allowed them to assist government through the project finance process, absorb the extra costs related to the preparation of the sites (despite bidding very low tariffs), maintain local representation to work with ERB on the required regulatory exemptions and ultimately bring projects to realisation with little support from the IDC (sections 4.3. and 4.4. and Appendix F).

Bidder quality was determined in two functional phases:

7.2.2.1.1 Signals

The first phase again consisted of "signals" sent to the market to attract capable, experienced bidders that would be able to realise awarded projects. These signals were largely the same¹³⁶ as those influencing the quality of competition (see section 7.1.1.1.), encompassing:

1. The enabling environment;
2. The security of the revenue stream;
3. The size of the opportunity (auction volume and project size limits);
4. The longer-term opportunity (auction rounds);
5. The likely credibility of bid awards (qualification and access requirements, penalties, bid scoring criteria, and the auction format & pricing rule); and
6. The credibility/trustworthiness of the auctioning authority and auction process.

¹³⁶ With the exception of the "costs of bidding", which mainly determines the number of bids submitted.

South Africa's IPP office in particular went to considerable lengths to ensure that these were the signals that were reaching the market (sections 3.3 and 3.4 and Appendix E). This included the following measures:

- The clear, explicit linkage of the REI4P bidding programme with the IRP in the RFP documents;
- The testing of project contracts with lenders to ensure bankability (incl. the provision of a sovereign guarantee);
- The large auction volumes (especially in the first rounds);
- The use of considerable qualification and high auction access requirements (including bid bonds and net asset tests);
- The use of preferred bidder guarantees (performance bonds) and clauses reducing the length of the PPA for delays in reaching COD (penalties);
- A simple sealed-bid, pay-as-bid auction process;
- The use of clearly quantifiable bid scoring criteria;
- Several measures to ensure the security and integrity of the programme and the ultimate awards, such as the auditing of evaluations and their results, and the use of CCTV monitoring in the bid evaluation process;
- Clear, responsive communication with the market through bid clarification meetings and briefing notes; and
- A strong commitment to stick to the rules of the programme, even if results were not in line with what was expected.

These signals triggered a strong market response, attracting some of the biggest and most experienced global (renewable) energy developers and investors, including ENEL Green Power, Engie, Mainstream, Scatec, Acciona and Globeleq (among others) (section 3.2 and 3.4.2). Zambia and Namibia's auction programmes largely replicated South Africa's approach (with some tweaks) and both were consequently able to attract interest from many of the same companies (sections 4.2 and 4.3; and 5.3).

The most powerful of these signals were again similar to those determining competition levels (7.1.1.1.1): the security of the revenue stream – ensured through bankable contracts with credit-worthy or alternatively sufficiently derisked off-takers; and the credibility/trustworthiness of the auctioning authority and auction process. These were some of the first things bidders considered when weighing up the decision to bid (Appendices E-G). The security of the revenue stream was important since the long-term off-take contract was ultimately what was being bid for. Without the

assurance that projects were acceptable to lenders and that projects would be paid, bidders had no real reason to incur the costs of bidding.

The credibility/trustworthiness of the auctioning authority and process was equally important, since every other “signal” listed above would be of almost no consequence if the auction was being implemented by an incapable or corrupt auctioneer in a flawed manner, which would not only undermine the legitimacy (and probably legality) of the award decision, but would also expose the bidder to an opaque and unpredictable bidding process that made any kind of cost-benefit analysis nearly impossible and increased project development risks.

7.2.2.1.2 Barriers

Once potential bidders decided to submit a bid, barriers that determine who can and cannot submit bids – meaning qualification and auction access criteria – limited participation to experienced, capable bidders. All three countries’ auctions made use of considered auction access requirements (normally testing prior experience, financial assets, or both), as well as physical (bid preparation) and financial (bid bond) qualification requirements to do this. Participating bidders needed to not only be capable – assessed through evaluating their experience and/or financial assets – but also needed to be able to provide sizable bid bonds (except for Khan) and secure lender commitments.

As a result, the pool of qualified bidders in all three countries’ programmes was made up of companies that had either international or local project development experience and had access to the kind of financial resources that would be required to ensure project realisation (section 3.2, Tables 4.8, 5.7 and 5.10) .

In combination, these auction signals and barriers ensured that projects were awarded to capable, experienced bidders that increased the likelihood of project realisation.

7.2.2.2 Project preparation levels

The more advanced a project was in its preparation at the point of bidding, the sooner it was likely to reach financial close and commercial operation. The level to which projects were prepared at the point of bidding could either be the responsibility of the private sector (bidders) or the responsibility of the public sector, which could choose to provide and prepare the project site(s) (including studies, permits, transmission connection, and so on. The more advanced a project was in terms of its preparation at the point of bidding, the more certainty bidders had on project costs – reducing the

likelihood of the winners' curse occurring through overly optimistic costs assumptions. More advanced projects would also have already secured most of the permits, agreements, contracts and permissions necessary to reach financial close, reducing the likelihood of these kinds of issues delaying or derailing the realisation process.

South Africa's project preparation level requirements for bid submission was the most onerous (and expensive) of all three countries and essentially required bids to be financial-close ready. This ensured that qualified projects had secured land, grid access, most environmental and other permits, zoning approvals etc. by the time they were submitted. This is a key reason why the country's auction programme featured such a high realisation rate (sections 3.2, 3.3, Appendix E).

For Zambia's Scaling Solar projects, as well as Namibia's two projects (Hardap & Khan), the project sites were provided and largely prepared by the bidding authorities in an effort at reducing bidding costs. In Zambia's case this decision caused some project realisation delays, since it turned out post-award that there were geotechnical problems (sinkholes) and boundary issues (part of the sites formed part of a national reserve) with the sites. While these issues did not completely derail the projects, they did cause delays in the financial close and commercial operation processes (section 4.3). In Namibia, the Hardap project site was generally well prepared, which contributed to the project's 13-month realisation period (from bid award to COD) (section 5.3. and Appendix G).

Nevertheless, the analyses have shown that the most influential qualification requirement that increased project preparation levels and ensured timely project realisation – regardless of whether the site is provided by the private or public sector – was lender commitment. Lender commitment was a bidding requirement in all three case study countries' auctions (section 6.2.3.1.2). By requiring that lenders commit to funding a project prior to it being bid – either through a commitment letter or signed term sheets – auctioning authorities were effectively ensuring that bids have passed a thorough due diligence process by the most conservative, most exposed project counterparty. This not only shortened the post-award financial close timelines, but also ensured that awarded projects were well structured and prepared (enabling a reasonable project construction period).

Project preparation levels were determined in two functional phases:

7.2.2.2.1 Barriers

Auction barriers such as late-stage project/bid preparation qualification criteria that also required some form of lender commitment (e.g. signed commitment letter or term sheets) increased the

likelihood that submitted projects would secure funding and advance to commercial operation in good time. Lenders were potentially carrying the most risks during projects' construction and operation phases since they providing the majority of project funding (upwards of 70%), often on long-term (15+ year) bases. By asking lenders to provide signed letters or term sheets that confirm their acceptance of the project documents (including contracts) and their willingness to provide finance on these terms, auctioneers were ensuring that the most significant and most risk-averse party to the transaction had already conducted thorough due diligence by the time of bidding.

7.2.2.2.2 Incentives:

Beyond the barriers, commitment to the timely realisation of projects could be further strengthened by the use of incentives. Two auction design factors incentivised project realisation: bid bonds and penalties.

Bid bonds incentivised bidders to sign project contracts once awarded; failure to honour their bids and finalise contracts within specified timelines meant that bidders could forfeit these bonds, which represented considerable amounts of money. Bidders were therefore additionally incentivised to ensure that their bids were well prepared and realistic, since the bid bonds increased the cost of using a bid award as an "option". All three countries' auction programmes thus required bid bonds as part of the bid packages (except for Namibia's Khan project, which had not reached financial close more than 18 months after being awarded) (section 6.2.3.1.3).

Penalties comprised performance bonds, PPA length reduction provisions and/or liquidated damages clauses that would kick in if projects experienced significant delays in reaching commercial operation. They increased financial pressure on bidders and their sub-contractors to reach the commercial operation milestone as quickly as possible. These penalties thus incentivised bidders to ensure that projects were as well prepared and advanced as reasonably possible at the point of bidding to reduce the likelihood of incurring these extra costs. Not all auction programmes required the full suite of penalties, but all three countries' programmes featured at least one of these incentives (section 6.2.3.1.4).

In combination, these auction barriers and incentives improved project preparation levels, thereby increasing the likelihood of project realisation.

7.2.2.3 Investor commitment

The higher the level of investor commitment to project realisation, the more likely it was that projects would be realised. Investor commitment was determined in two functional phases: barriers and incentives.

7.2.2.3.1 Barriers

An influential auction barrier was local strategic shareholding requirements, effectively mandating some level of project ownership by the auctioning authority and/or the offtaker (or perhaps politically influential empowerment investors). This shareholding meant that the procuring entities had a strong incentive to assist awarded projects to reach financial close and commercial operation. It is telling that apart from the GETFIT and Khan projects – both programmes still not able to reach financial close – all three countries' auction programmes required some level of strategic local shareholding (section 6.2.2.1). In Zambia, for example, the IDC's minority shareholding meant that projects essentially had a direct line to the president (as IDC board chairman), which helped ensure that the awarded Scaling Solar projects reached their major milestones (Appendix F). In Namibia, NamPower's shareholding in the Hardap project meant that the utility was able to help the project navigate the post-award processes to financial close and commercial operation, ensuring an impressive 13-month project realisation period (section 5.3).

7.2.2.3.2 Incentives

Investor commitment to project realisation could also be strengthened through the use of bid bonds (financial qualification requirements) and penalties. By adding to the costs of project delays or failure, bidding authorities were able to ensure that equity investors (and perhaps lenders) would suffer financial consequences if projects did not reach major realisation milestones on time. All three case study countries' auction programmes featured some level of penalty regime linked to timely project realisation (sections 6.2.3.1.3 and 6.2.3.1.4), and although these penalties were rarely called on (except for the PPA reduction clauses in South Africa's REI4P – Appendix E), they did nevertheless maintain the commitment of bidders to project realisation.

7.2.2.4 Post-award support

Even when well-developed projects with secure revenue streams were awarded to capable, experienced bidders, there were still administrative, bureaucratic, or even political issues that could delay project realisation. A politically supported, capable auctioneer that also acted as broker and coordinator between bidders (including their investors) and the various public sector stakeholders (for example, ministries, regulators, utilities) in the crucial periods between bid award and financial close and commercial operation could improve project realisation. South Africa's IPP office, NamPower and, to a lesser extent, Zambia's IDC, actively helped bidders in the post-award period to reach financial close and commercial operation (Appendices E-G). It is an important, yet often overlooked role played by the auctioning authority in the project realisation process.

7.2.2.5 Constraints

Finally, projects awarded to capable, committed bidders with sufficient financial backing and auctioneer support could still face a number of constraints that could undermine project realisation. Key among these was the security of the revenue stream. In a country that lacked a supportive investment climate – mainly determined by solid macroeconomic fundamentals (including well-developed, local capital markets) – and/or where the off-taker was not credit-worthy, and this was not catered for through a robust package of credit enhancement and risk mitigation measures, projects struggled to secure funding and reach commercial operation. This was the fate of the GETFit projects in Zambia, which faced an increasingly insolvent off-taker in ZESCO, backed by a financially-constrained sovereign. As a result, project have not been able to draw down on any loans in the more than 2 years after winners were announced and financial close appears increasingly unlikely (section 4.4)¹³⁷.

Certain auction outcomes, such as price levels, or broader socio-economic impacts, can also impact the “socio-political feasibility” of a programme (del Rio, 2017f). Auctioneers could improve the broader socio-political support of auction programmes through designing them in such a way that they maximise these outcomes. The preceding analyses (sections 3.5 and 4.4) have shown that even with – or sometimes because of – very positive auction impacts (for example, very low prices, or substantial socio-economic impact commitments), socio-political support levels can be limited.

¹³⁷ The investment climate has also been highlighted as a necessary but not sufficient determinant of project realization due to its constraining role on investment (see section 7.4.2)

Long-term auction effectiveness was ultimately determined by a number of political economy factors – including the material and political interests of different stakeholders, their access to both de jure and de facto power, the influence on institutions, both formal and informal, and the way in which they employed ideas and ideology to advance their interests or to discredit those of others. Shifts in these factors could create the initial opportunity for the auction programme, but they also determined the reaction to the auction outcomes.

This reaction could go either way, depending on whether the outcomes threatened or supported the ideas and institutions that sustained powerful interests. A hostile reaction could delay or completely derail an auction programme (as happened in South Africa – section 3.5), severely limiting its effectiveness, while a supportive reaction could accelerate the pace and scale of implementation (e.g. Namibia – section 5.4). Auctioneers could try to design auctions in such a way that they align with these political economy factors as far as possible without undermining the credibility or integrity of the programme, but, in the end, one has to recognise that there are limits to what even the best-designed procurement programme can do in the face of macro-level issues.

In summary, project realisation was determined by bidder quality, project preparation levels, investor commitment, post-award support measures and macro-level constraints. These were influenced by factors from all three levels – country, project and programme – that acted as auction signals, barriers, incentives, constraints and support measures.

7.3 Reviewing auction outcomes

Research questions 1A and 2A ask: What are the price outcomes of renewable energy auctions in sub-Saharan Africa (1A) and what are the project realisation outcomes of renewable energy auctions in sub-Saharan Africa (2A)? In this summary review, auction outcomes are analysed and compared in terms of the issues that most concern host countries: i.e. projects delivered or realised at competitive prices. I also briefly consider direct socio-economic development impacts associated with the renewable energy auctions¹³⁸.

¹³⁸ Socio-economic development impacts are not the main outcome focus of this thesis and are not the subject of a research question, but remains an important part of the renewable energy auction story in Africa. A summarized overview of these outcomes is therefore provided for background only.

7.3.1 Price outcomes

Before attempting to make sense of the price outcomes (RQ1A) from the three cases, it is important to note that many have questioned whether auction prices can realistically be compared given the variance in country and project conditions, in contractual and financing arrangements and in bidder assumptions (Del Río, 2017f; Dobrotkova et al., 2018; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018). These criticisms are applicable to the cases under consideration, not merely because circumstances differ markedly between the three countries, but also because of the variances within the three countries over time and between different national power procurement programmes.

Accepting these caveats, it is still possible to undertake a comparative price analysis with useful results and insights. The focus of analysis is primarily on major trends of convergence and divergence between countries' auction price outcomes – in line with the approach taken, for example, by IRENA (2017, 2019). Owing to the fact that Namibia and Zambia's auctions procured only solar PV projects, the analysis will mainly be limited to this technology, although outcomes for other major technologies (for example, onshore wind) will be included, where useful. Finally, project prices are compared according to the year in which projects were expected to reach financial close, as it is assumed that bidders would base their technology and EPC cost assumptions on these dates.

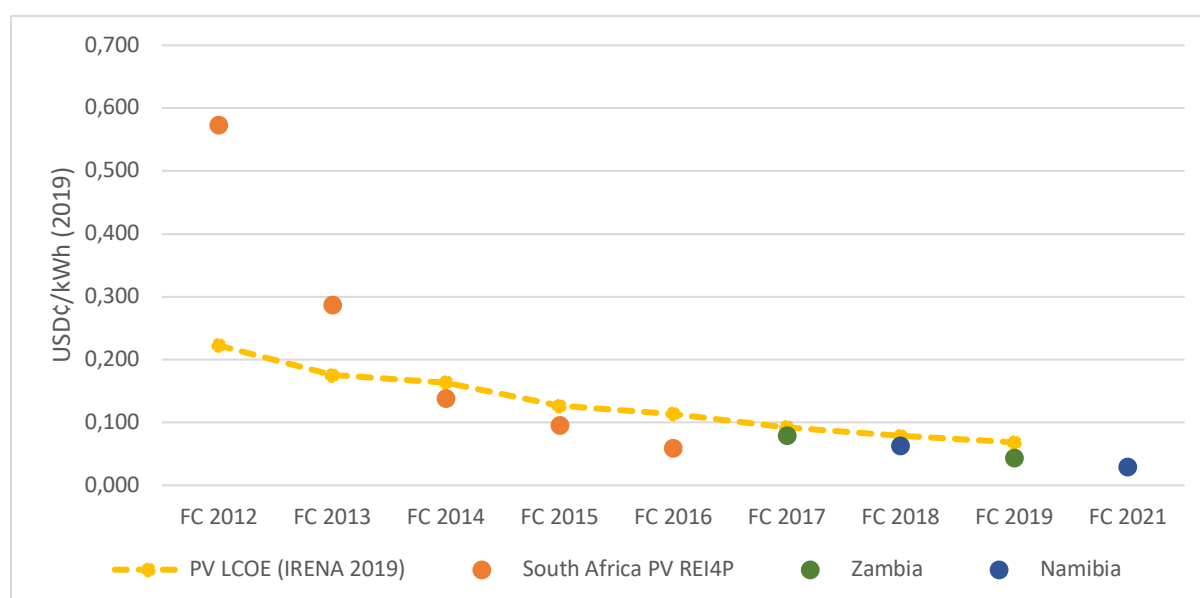


Figure 7.5: Solar PV prices at expected financial close compared to global LCOE – South Africa, Zambia, Namibia¹³⁹

¹³⁹ Bid prices have been adjusted for 2019 and exchange rates are based on the average exchange rate in the year that the bid was announced. Prices are shown for the year in which financial close was expected/required

Overall, the price outcomes show remarkable convergence across cases¹⁴⁰, as well as with the average global levelized cost of electricity (LCOE) for solar PV (Figure 7.2). While South Africa’s earlier rounds delivered relatively expensive projects, the trend was to lower costs and prices, in part because of reductions in global reductions in solar PV costs and also due to learnings and comforts achieved in running effective renewable energy auctions locally. The projects in Namibia and Zambia were able to benefit from these proverbial “school fees” paid in earlier rounds in South Africa¹⁴¹. Auction price outcomes were also below established feed-in tariff levels (for example, solar PV FIT of US\$ 0.09,9/kWh) or prices for directly negotiated deals (US\$ 0.07,9 – 11/kWh for utility-scale solar PV) for comparable operating projects¹⁴² in Namibia, confirming the ability of auctions to reduce the information asymmetry between buyers (government) and sellers (IPPs).

This price discovery is especially important in contexts where governments have limited experience with new renewable technologies, or limited capacity to effectively calculate reasonable price levels for feed-in tariff programmes. Through the auction mechanism, these three African countries have been able to capture the reduction in solar PV equipment costs¹⁴³. The prices are congruent with findings from larger global studies that show similar auction price convergence (Dobrotkova et al., 2018; Ferroukhi et al., 2015; IRENA 2017a, 2019, 2020). The continued price declines over time across all three cases is a notable outcome, and are by no means guaranteed – as recent results from Germany, Brazil and Mexico have shown (Grashof et al., 2020; IRENA 2019; Viana & Ramos, 2018).

according to the bidding rules, based on the assumption that bidders would price their projects based on their expectations of equipment costs in the year that the projects were or are to be built. Global LCOE prices for 2020 are based on 2019 prices as reported by IRENA (2020), since no 2020 figures are available at the time of writing.

¹⁴⁰ This, of course, is also to be expected, since these cases were, in part, selected owing to their relatively similar price outcomes.

¹⁴¹ For comparative purposes, the very competitive price results from South Africa’s expedited bidding round are also included in Figure 6.1, although these projects never reached financial close.

¹⁴² There were no utility-scale solar PV projects in operation in Zambia procured on either a directly negotiated or feed-in tariff basis for comparative purposes. In South Africa, although the feed-in tariff levels were published, they were never implemented. FIT levels in South Africa were initially very generous (for example, US\$0.49/kWh for solar PV; US\$0.15,6/kWh for wind; and US\$0.26/kWh for CSP), but were revised downwards in 2011 (US\$0.28,9/kWh for solar PV; US\$0.11,8/kWh for wind; US\$0.23/kWh for CSP). It should be noted that the REI4P BW1 average prices were generally higher than the 2011 FIT levels, but from BW2 were below the FIT levels (Eberhard, 2013).

¹⁴³ Other factors likely also played a role, such as the excellent solar resources (resulting in very high capacity factors) in Namibia and the use of new technologies (for example, bifacial modules) in Zambia’s GETFIT programme.

7.3.2 Project realisation outcomes

All three cases generally featured high realisation rates (RQ2A) (95%–100%) for procurement rounds (REI4P BW1 – BW3, Scaling Solar 1, Hardap), bucking international auction trends (IRENA 2017a, 2019) – though there were some delays in reaching commercial operation. This necessitated adjustments to the originally specified COD dates and uncertainty remains about the GETFIT projects in Zambia, the small IPP projects in South Africa and the Khan project in Namibia.

Renewable energy projects procured through these auctions now contribute 8%–14% of these countries' installed generation capacities (see Table 7.2). It is notable, nonetheless, that while the auction outcomes resulted in an increasingly ambitious and accelerated energy transition programme in Namibia, auction rounds and programmes were delayed and scuppered in South Africa and Zambia.

On average, projects took twice as long to be built in South Africa compared to in Zambia and Namibia, most likely because of the REI4P's larger project sizes and, to a lesser extent, because of the longer realisation deadlines in the specified COD dates (Kitzing et al., 2021). Namibia's 13-month realisation period (from bid award to commercial operation) for the Hardap project is a notable outlier, being twice as fast as South Africa's quickest solar PV projects and thus warrants further analysis (section 6.3). The scale and scope of South Africa's programme was also vastly different from the auctions in Namibia or in Zambia (Table 7.2), representing more than US\$13,7 billion in investment (vs. US\$230 million in Zambia and US\$90 million in Namibia), 92 projects (vs. 8 in Zambia and 2 in Namibia) and 6127 MW (219 MW in Zambia, 65 MW in Namibia) across six technologies (vs. one in Namibia and Zambia).

While the size of South Africa's power system and economy undoubtedly plays an important part in explaining this divergence in scope and scale, it is also the result of differences in auction design and implementation decisions across the three cases, which reinforces the importance of including programme-related factors along with country- and project-level success factors in the analytical approach of this thesis.

Table 7.2: Summary of auction effectiveness (realization) outcomes - South Africa, Zambia, and Namibia

	MW procured	Technologies	% Total installed capacity	Realisation Rate ¹⁴⁴	Average Realisation period (months from award to COD)
South Africa	6127¹⁴⁵	<i>Solar PV, Onshore Wind, CSP, Biomass, Landfill gas, Small hydro</i>	<i>14%</i>	<i>95%</i>	
BW1	1425				38,6
BW2	1040				32,8
BW3	1457				42
BW4	2205				N/A
Zambia	219				
Scaling Solar 1	89	<i>Solar PV</i>	<i>8%</i>	<i>100%</i>	19,5
GETFiT	120				N/A
Namibia	65				
Hardap	45 (37)	<i>Solar PV</i>	<i>10%</i>	<i>100%</i>	13
Khan	20				N/A

7.3.3 Socio-economic development outcomes

Finally, it is worth considering the wider socio-economic and economic development impacts of the auctions. In this instance, South Africa is again in a different league than Zambia or Namibia. The South African programme, for example, has delivered considerable local content, local- and empowerment ownership, preferential procurement, community investment and job creation benefits (Table 7.3) compared to its regional counterparts. This has resulted in notable secondary benefits, such as the development of local manufacturing/assembly facilities (although, ultimately, these were not sustained) and local specialist skills and service offerings – largely thanks to the scale of the programme and the consequent “pull” effect on the market – in combination with the “push” elements incorporated in the auctions’ design.

Zambian and Namibian auctions have, on the other hand, mostly excluded socio-economic and economic development dimensions from their auction programmes (particularly in earlier auctions). Nevertheless, these smaller auctions have increasingly incorporated socio-economic and economic development impacts in their later designs – aiming to increase the programmes’ socio-political credibility – resulting in increased local (and empowerment) ownership levels, some local content commitments (in the case of the Khan project) and some job creation impacts (although the

¹⁴⁴ Only considering projects for which scheduled COD deadlines had already passed. If the GETFiT and Khan projects fail to reach commercial operation, this will dramatically lower this figure.

¹⁴⁵ This does not include the projects procured through the Smalls programme.

additionality of these impacts is not clear). Of note is the fact that these increased socio-economic impact ambitions have coincided with startling price declines.

Table 7.3: Socio-economic and economic development impacts - South Africa, Zambia, and Namibia

	Local content	Local/ empowerment ownership	Preferential procurement/ enterprise development	Community investment	Job creation
South Africa					
REI4P average	45%	52% SA shareholding; 33% BBBEE shareholding; 9% community shareholding	0,63% of revenue (US\$475 million)	2% of revenue (US\$1,5 billion)	52,603 job years to date (22,903 job years from local communities) 81% black citizens 69% skilled black citizens
Zambia					
Scaling Solar 1	Not available	20% (IDC)	0	0	313 local jobs
GETFIT	Not available	0 (CEC shareholding in 1 project)	Not available		Not available
Namibia					
Hardap	0	30% (PDN)	Not available	Not available	Not available
Khan	10%	30% (PDN); 45% (Namibian)	All O&M local	0,1%	Not available

7.4 The power of a combined analytical framework

This thesis opened by asking how factors at the country, programme and project levels contributed to the price and investment (realisation) outcomes of renewable energy auctions in sub-Saharan Africa (RQ1 + RQ2). To be able to answer these questions, an analytical framework was developed that combined the literature on IPP investments in Africa with the literature on renewable energy auction design and implementation (Table 2.2). An important question (RQ1B+2B) driving this thesis has thus been: Can our understanding of the price and project realisation outcomes in renewable energy auctions in sub-Saharan Africa be deepened through the application of an analytical framework that combines three bodies of literature, covering:

- i. elements contributing to the success of IPPs in Africa;
- ii. renewable energy auction design; and
- iii. renewable energy auction implementation?

The individual and comparative case analyses have shown that the combined framework (Table 2.2) provides us with a more complete and a deeper understanding of the factors contributing to the outcomes of renewable energy auctions in Africa. The IPP literature, for example, helps us understand the influence of country- and project-level factors, including the enabling environment, cost of capital and contractual arrangements on project prices and realisation (Eberhard et al., 2017; Eberhard & Gratwick, 2011; Gratwick & Eberhard, 2008b; Woodhouse, 2005b), but offers few insights as to why outcomes differ between procurement rounds or programmes.

The renewable energy auction literature, on the other hand, illuminates the influence of auction programme design choices on bidder behaviour and project costs and their impact on project prices and realisation (Del Río, 2017f; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018), but cannot account for the influence of country- or project-level factors beyond these auction design choices on outcomes. The auction implementation literature again highlights the importance of bidder trust to determine competition levels and project costs (Chiu et al., 2010; Zitron, 2006), but is unable to account for the other factors influencing competition, such as procurement volumes or the financial strength of the offtaker.

It is only when combining these disparate bodies of literature, and the theoretical and analytical lenses they offer, that we are able to fully appreciate the range of factors that contributed to auction outcomes in the case-study countries (Table 7.4). While the analyses in chapters 3-6 highlighted the influence of individual factors at all three levels – country, programme and project – they also emphasised the combined influence, the complex interactions between, as well as the cross-cutting nature of these factors, deepening our understanding of the pathways to outcomes.

7.4.1 The modified analytical framework

The result of the preceding analyses (Chapters 3-6) has been the development of a modified analytical framework (Table 7.4) that incorporates the most pertinent empirical findings for successful price and realisation outcomes (modifications highlighted in blue). Modifications to the framework are discussed in more detail in section 7.3.2.2., which summarises these adjustments according to their impacts on project price and realisation outcomes. Table 7.4 also provides more relevant details on factors' descriptions, highlights where impacts have been limited, and also indicates which factors are considered "necessary" for a specific outcome (see also section 7.5).

Table 7.4: Modified analytical framework - with price and realisation impacts (+ denotes a positive impact on the outcome; - denotes a negative impact; = denotes no clear impact; underlined factors are necessary conditions; *factors in italics* are limited in their impact)

Factors	Detail	Impact on Price	Impact on Realisation
Country level			
Stability of economic and legal context	Stability of macroeconomic policies (incl. repayment record & investment rating) The legal system allows contracts to be enforced, laws to be upheld, and arbitration to be fair	(+) <i>Stable investment context lowers investment risks, reducing cost of capital and increasing competition levels, leading to lower prices</i> ¹⁴⁶	(+) <u>Stability of investment context – especially judicial quality – improves contractual effectiveness and thereby realisation</u>
Energy policy framework	Energy policy framework allows private power investment Market access through structured (preferably competitive) procurement programmes	(+) <u>Clear energy policy that allows for private power investment reduces investment risks and increases competition levels, leading to lower prices</u>	(+) <u>Clear energy policy that allows for private investment improves project realisation</u>
Regulatory transparency, consistency and fairness	Transparent and predictable licensing and tariff framework (preferably included in bidding requirements/guidance) Cost-reflective retail tariffs	(+) Good regulatory quality lowers investment risks, reducing cost of capital and increasing competition, leading to lower prices	(+) Good regulatory quality, especially on licensing and tariff approval, improve project realisation
Coherent sectoral planning	Power-planning roles and functions clear and allocated to skilled, resourced, empowered planners Fair allocation of new-build opportunities between utilities and IPPs <i>Plans are indicative rather than determinative</i>	(+) Coherent sectoral planning reduces investment risks, reducing cost of capital, and increases competition, leading to lower prices	(+) Coherent sectoral planning improves project pipeline development, improving project realisation

¹⁴⁶ The impact of the investment context on pricing can be moderated through a well-designed, structured auction programme that has a secure revenue stream and is implemented by a trusted auctioning entity.

Competitive bidding practices	IPP procurement happens through competitive bidding programmes Planning linked to timely initiation of adequately resourced competitive tenders/auctions – although auctions can be initiated outside planning framework if necessary	<u>(+) Competitive bidding practices lower project prices</u>	<u>(+) Efficient competitive bidding practices shorten project development and negotiation timelines, improving realisation</u>
Programme level			
<i>Auction Design</i>			
Competition-inducing, scale-friendly auction volume	Auction volumes large enough to attract bidders (20 MW+), but small enough to ensure competitive pressure (especially in early rounds) - and preferably based on least-cost planning framework	<u>(++) Auction volume that is large enough to attract bidders, but <u>smaller than offered volume, induces competition, leading to lower prices</u></u>	<u>(=) No theoretical expectation around impact on realisation</u>
Scale-friendly project size limits	Project size limits – if used – are based on clear market development, energy security criteria & enable economies of scale	<u>(-) Project size caps limit economies of scale, increasing prices¹⁴⁷</u>	<u>(+) Smaller projects are more quickly built, improving realisation</u>
Technology bands	Initial auction rounds based on simple, tested technologies Auction allows for adjustment of technology limits based on price and system optimisation considerations	<u>(-) Technology bands limit competition, increasing prices</u>	<u>(=) No theoretical expectation around impact on realisation</u>
Bid award limits	Bid award limits – <u>if used</u> – set to counter legitimate market domination or energy security concerns	<u>(-) Bid award caps limit economies of scale, increasing prices</u>	<u>(=) Bid award limits appear to have no discernible impact on realisation</u>
Bidding rounds	Regular, scheduled bidding rounds increase competition and capture learning rates	<u>(++) Bidding rounds increase competition and induce market learning, lowering prices</u>	<u>(+) Bidding rounds increase project pipeline development and market learning, improving realisation¹⁴⁸</u>

¹⁴⁷ The size of this impact seems to be somewhat limited by the fact that solar PV is a modular technology that appears to scale down relatively easily and cost-effectively (at least down to 20MW)

¹⁴⁸ The overall impact of bidding rounds on realization is nonetheless impacted by other external (economic, political) factors as well. It is often the path-breaking rounds or projects that appear to have an easier time getting built – due to multiple reasons discussed in chapter 3-5. And 6.

Multi-criteria winner selection	Winner selection criteria transparent and rational Price key (preferably only) determinant Additional scoring criteria focus on socio-economic or system level impacts	(-) <i>Multiple bid scoring criteria dilute the importance of price and add additional cost drivers, increasing prices</i> ¹⁴⁹	(=) Technical & SED scoring criteria appear to have no discernible impact on realisation
Price caps (unknown)	Price caps (ceiling prices) undisclosed, if used	(-) <u>Undisclosed or no price caps discourage price anchoring, lowering prices</u>	(=) No theoretical impact expectation, although price caps being set too low can result in no project being awarded
Physical (project/bid preparation) qualification criteria	Physical (project/bid preparation) qualification criteria include, as a minimum, investor (lender) commitment Late-stage qualification criteria coupled with long bidding timelines (for initial rounds) or site provision and preparation (incl. grid, permits) by auctioneer	(+/-) High physical qualification criteria increase bidding costs, lowering number of bids but increasing quality of bids (and if provided by auctioneer, can lower costs and risks)	(++) High physical qualification criteria (esp. lender commitment) improve project preparation and cost certainty, improving realisation
Financial (bid bond) qualification criteria	Bid bonds set to ensure commitment of qualified bidders and the quality of competition	(+/-) Bid bonds increase bidding costs, lowering the number of bids but increasing the quality of bids	(+) Bid bonds increase bidder commitment and cost certainty, improving realisation
Auction access requirements	Auction access requirements – technical experience or financial status – set to limit participation to experienced, capable bidders	(+/-) High auction access requirements lower number of bids, but improve quality of bids.	(+) High auction access requirements increase likelihood of capable bidders being awarded, increasing realisation
Penalty regime	Reasonable penalties (PPA reduction, performance bonds) incentivise project completion Liquidated damages used to incentivise performance on non-technical aspects (e.g. SED commitments)	(-) Penalties increase project risks, increasing the cost of capital and other project costs, increasing prices	(+) Penalty regime incentivises project preparation and cost certainty, improving realisation

¹⁴⁹ The impact of this depends on the type and quantum of criteria. In general, SED criteria seem to have a more pronounced impact than technical criteria.

Staged bidding process	Choice of one- vs. two stage bidding process balances transaction costs with time concerns	<i>(-) Staged bidding reduces competition, increasing prices</i>	<i>(=) No clear evidence of impact of staged bidding on realisation</i>
Pay-as-bid, sealed bid format	Simple sealed bid, pay-as-bid auction format used to reduce bidder risks and increase competition levels	<u>(+) Simple bidding format and pricing rule increases competition, leading to lower prices</u>	<u>(+) Simple bidding format reduces winner's curse risk, improving realisation</u>
Auction Implementation			
Procurer	Procuring entity perceived as capable, benevolent and acting with integrity to build and maintain bidder trust	<u>(++) Trust in the procuring authority increases competition, lowering prices</u>	<u>(+) Trust in procuring entity attracts capable, experienced bidders, improving realisation</u>
Procurement process	Bidding process is perceived as fair, transparent, secure to build and maintain bidder trust	<u>(++) Trust in bidding process increases competition, lowering prices</u>	<u>(+) Trust in procurement process attracts capable, experience bidders, improving realisation</u>
Support to awarded projects	Auctioneer assists awarded projects as honest broker to reach financial close and commercial operation	<u>(+) Auctioneer assistance improves likelihood of realisation, improving competition and lowering prices</u>	<u>(+) Auctioneer support to awarded projects to financial close and COD improves realisation</u>
Project level			
Favourable equity partners	<u>Experienced (possibly international) firms with strong balance sheets compete to secure project contracts and realise projects</u> <u>Local strategic shareholding encouraged</u>	<u>(+) Strong, experienced equity partners can lower project and capital costs, lowering prices</u>	<u>(+) Experienced, strong equity partners able to navigate realisation risks, improving realisation</u> <u>(+) Local strategic shareholders improve realisation</u>
Favourable debt arrangements	Competitive (low cost, long-tenored) debt – preferably with considerable local capital to mitigate foreign exchange risk <u>Lenders review project contracts/bidding documents to ensure bankability</u>	<u>(+) Favourable debt arrangements lowers the cost of capital, lowering prices</u>	<u>(+) Debt from DFIs come with a halo effect, improving realisation</u> <u>(+) Auction design in line with lender requirements improve realisation</u>

Secure revenue stream	Secure revenue stream ensured through robust, bankable contracts (incl. international arbitration if necessary) with investment-grade utility (with full cost-recovery and high billing collection rates) or the use of risk mitigation and credit enhancement measures (e.g. sovereign guarantee, liquidity support, multilateral risk cover)	<u>(++) Secure revenue stream reduces project risks, and thereby the cost of capital, and increases competition levels, lowering prices</u>	<u>(++) Secure revenue stream enables project to secure funding, improving realisation</u>
Strategic management and relationship building	Project bids include socio-economic development commitments – <u>specifically strategic local shareholding (e.g. offtaker, empowerment shares)</u>	<u>(-) Strategic socio-economic development commitments increase project costs & risks, increasing prices</u>	<u>(+) Strategic socio-economic development commitments improve project realisation</u>

7.4.2 Contribution to the literature and analytical frameworks

This framework makes five contributions to the literature:

7.4.2.1 The combined analytical framework

First is the combined analytical framework itself (Table 7.4). The combined framework allows for deeper insights into, and a more comprehensive analysis of, the factors impacting auction outcomes, as discussed in section 7.2. It shows how a combination of country-, programme- and project-level factors, drawn from the literature on IPPs (Eberhard, et al., 2017; Eberhard & Gratwick, 2011; Gratwick & Eberhard, 2008b), renewable auction design (Del Río, 2017f; Eberhard et al., 2014; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Kreiss et al., 2016; Maurer & Barroso, 2011) and implementation (Chiu et al., 2010; Eberhard et al., 2014; Eberhard & Naude, 2016; Zitron, 2006) explain auction price and investment outcomes much better than these aforementioned bodies of literature alone are able to.

Analysing Zambia's project price outcomes, for example, using only the IPP literature's country- and project-level framework, would completely have missed the impact of competition on pricing levels, and the importance of trust in the bidding process and auctioning authority in driving this competition dynamic. Similarly, analysing South Africa's price outcomes over the bidding rounds, using only country and project level factors (none of which changed significantly over time), would have been a

frustrating exercise leading to incomplete conclusions. It is the combination of factors at all three levels that allows us to arrive at more complete answers regarding the factors and causal mechanisms impacting price and realisation outcomes.

7.4.2.2 Empirical modification of the analytical framework

Secondly, the case studies contributed valuable empirical insights that led to the modification of the analytical framework (table 7.4). In terms of pricing, these modifications illuminate the impact of country and project level factors on competition levels; account for the impact of qualification and auction access requirements on the quality of competition; show how post-award auctioneer support impacts the bidding decision; and shifts the emphasis away from equity investors' developmental credentials to their relative size, experience and capability.

In terms of project realisation, the modifications illuminate the impact of competitive bidding practices on realisation timelines; show the importance of lender commitment as a qualification requirement; recognise the value of bidder trust in the procuring entity and process for attracting strong, capable bidders; incorporate the need for local strategic shareholding; and emphasise the importance of auction design in line with lender requirements for project realisation.

7.4.2.3 Incorporating project level success factors in auction programmes

Thirdly, the thesis provides insight into how factors at the project level shape auction programmes in the case study countries. The auction literature in particular is explicit about the fact that auctions (and their outcomes) are shaped by "market and framework conditions" (Kreiss et al., 2018: 223) beyond the programmes. Or as Del Rio (2017f: 11) notes: "There are some external factors at play in all auctions for RES...the relative influence of those other factors and policies on the success of auctions should be the focus of future research."

To ensure project realisation, the case analyses have shown that the alignment of bidder qualification requirements with lender bankability requirements, and specifically also the requirement for lender commitment as a qualification requirement, is necessary. Not setting qualification requirements at this level, in risky investment contexts, increases the likelihood that awarded projects might not be able to secure funding post-award. This for example happened in Argentina, resulting in low project realisation rates (Pardina & Schiro, 2020). To be clear: investor commitment does not guarantee

project realisation (i.e. it is not a sufficient condition) – as the experience of the GETFIT projects in Zambia clearly illustrates – but without it projects generally struggle to reach financial close.

Similarly, strategic local project ownership – whether by the off-taker, procurer, or empowerment shareholders – has also been shown to be essential for improved project realisation rates. Incorporating this project-level factor in an auction's design as a qualification requirement ensures that awarded projects have (minority) equity investors on board that can help them navigate some of the political processes involved in ensuring project realisation. Again, this is not a guaranteed (sufficient) condition for project realisation, as the failure of awarded projects in South Africa's small IPP programme and expedited bid window to be realised clearly shows. Nevertheless, the presence of these strategic stakeholders in the project appear to be crucial when things go wrong or take long – supporting the importance of local shareholding noted by Gratwick (2007) and Woodhouse (2005a), but locating this importance in the shareholder's political influence.

To ensure competitive price outcomes, the case analyses have furthermore shown that including factors that ensure the security of the projects' revenue stream in the auction's design is essential (necessary) for high levels of competition and competitive prices. Bidders (and their investors) need to see, in the bidding documents, that the PPA is robust and fair and that risk mitigation is being provided (where needed). Without these provisions, projects are unlikely to reach financial close and bidders would be loathe to incur the costs of bidding. Again, the presence of a secure revenue stream does not guarantee high levels of competition (see e.g. South Africa's BW1), but without these the market's response is likely to be lukewarm at best.

This adds to the auction design best practice claims made by Del Rio (2017f), Gephart et al. (2017) and Haufe & Ehrhart (2018) – none of which include project level factors in their recommendations.

7.4.2.4 Detailed auction design insights for IPP investments

As a fourth point, the thesis contributes, in addition, much-needed detail on auction design and implementation to the IPP literature (Gratwick, & Eberhard, 2008b; Eberhard et al., 2017), which acknowledges the importance of competitive procurement for achieving balanced outcomes (i.e. competitive prices) but does not engage with the topic in great detail. The thesis not only addresses this conceptual and empirical gap, but places particular emphasis on both the quantitative and qualitative aspects of competition (as noted by Ballesteros-Pérez et al., 2016; Haufe & Ehrhart, 2018; Hubbard & Paarsch, 2016; Kreiss et al., 2016) and shows how the contributing factors (at all three levels) influence competition levels (and hence pricing) as well as realisation rates. It also shows how

auctions – as a subset of structured procurement processes – often succeed in offering a viable route to market for investors in highly regulated electricity sectors where policy commitments to accelerate private power and/or renewable energy investment have often failed to achieve these goals.

7.4.2.5 Trust in the auctioneer and auction process

Finally, while maintaining the largely risk-based focus of the IPP literature (based on Eberhard et al., 2017; Woodhouse, 2005b), the analytical framework introduces an important risk-mitigating factor from the auction implementation literature: trust in a respected, capable and resourced auction implementing agency and fair bidding processes (Chiu et al., 2010; Eberhard et al., 2014; Zitron, 2006). The focus on the influence of trust on the bidding decision – as determined by the auctioneers’ perceived ability, integrity and benevolence (based on Chiu et al., 2010; Liu et al., 2016; Mayer et al., 1995) as well as the perceived justice of the bidding process (supporting Chiu et al., 2010; Zitron, 2006) – provides the conceptual language and a potential causal explanation for a phenomenon that had been noted in the empirical renewable energy auction literature (Eberhard et al., 2014; Eberhard & Naude, 2016; Montmasson-Clair & Ryan, 2014a). It is also through the lens of trust and its role in the bidding decision (conceptualised by Chiu et al., 2010; Liu et al., 2016; Zitron, 2006) that the competition-enhancing influence of multilateral- and development-finance institutions as auctioneers (or, at least, as strategic auction implementation partners) is best understood. This adds further detail to the auction design best practice claims made by Del Rio (2017f), Gephart et al. (2017) and Haufe & Ehrhart (2018) – none of which include auction implementation factors¹⁵⁰ in their recommendations.

7.5 Necessary conditions

7.5.1 Necessary conditions for competitive price outcomes

Research question 1C asks: What are the *necessary but not sufficient* conditions at country, programme and project levels for competitive price outcomes of renewable energy auctions in sub-Saharan Africa? 31 factors were extracted from the analytical framework to potentially explain auction rounds’ competitive price outcomes (Table 7.5). “Necessary, but not sufficient” conditions were

¹⁵⁰ Del Rio (2017f) refers to “improving administrative procedures”, “supporting dialogue with stakeholders” and “information provision” as “participation conditions” that could arguably fall within the “project implementation” category, but without the explicit identification of trust being the mediator of these elements’ influence on competition levels.

identified based on a modified dichotomous disconfirmatory necessary condition analysis logic (Dul, 2016): if a condition (factor) is not present within all cases exhibiting a particular outcome, then it is not necessary. If a factor is present in all cases, it needs to be theoretically clear why and how this factor leads to the outcome. In a slight departure from the preceding analysis, auction rounds (instead of country programmes) formed the main unit of analysis to enable comparison. Only auction rounds with average price outcomes at or below the global levelised cost of electricity LCOE for solar PV were included in the analysis (see section 7.3.1).

Table 7.5: Necessary conditions for competitive price outcomes

Factors	SA BW3	SA BW4	Zambia Scaling Solar	Zambia GETFiT	Namibia Hardap	Namibia Khan
Country						
Economic & legal stability ¹⁵¹	X	X	X		X	X
Energy policy framework ¹⁵²	X	X	X	X	X	X
Regulatory quality ¹⁵³			X	X	X	X
Coherent sectoral planning ¹⁵⁴	X	X				X
Competitive bidding practices	X	X	X	X	X	X
Project						
Favourable equity partners ¹⁵⁵					x ¹⁵⁶	
Favourable debt arrangements ¹⁵⁷	X	X	X	X	X	X
Credit-worthy off-taker ¹⁵⁸					X	x ¹⁵⁹
Bankable project contracts ¹⁶⁰	X	X	X	X	X	X

¹⁵¹ For the purpose of this analysis, economic stability is defined as a country having a Fitch sovereign credit rating at or above speculative (B) grade.

¹⁵² For the purpose of this analysis, a stable energy policy framework allows private power investment.

¹⁵³ For the purpose of this analysis, good regulatory quality is defined as a regulator falling within or above the yellow band (scoring between 0,6 and 0,8) on the 2019 Electricity Regulatory Index for Africa (African Development Bank, 2020).

¹⁵⁴ For the purpose of this analysis, coherent sectoral planning means that a country has an official, comprehensive power generation expansion plan that is converted into procurement rounds.

¹⁵⁵ For the purpose of this analysis, favourable equity partners are defined as investors that have funds or shareholding by DFIs or government agencies with an explicit developmental mandate

¹⁵⁶ Inspired Evolution, a minority equity partner in the Alten project, has mainly DFI funds in its equity fund.

¹⁵⁷ For the purpose of this analysis, favourable debt arrangements refers to debt being provided for 12+ years.

¹⁵⁸ For the purpose of this analysis, a credit-worthy off-taker is defined as a utility/off-taker with an investment-grade rating from a ratings agency.

¹⁵⁹ NamPower had lost its investment-grade rating due to a downgrade of the sovereign, but maintained its cost-reflective tariff and financial health.

¹⁶⁰ For the purpose of this analysis, bankable project contracts are the suite of project contracts (mainly the PPA) that are acceptable to lenders to provide finance for the project

Credit enhancement & risk mitigation ¹⁶¹	X	X	X	X		
No socio-economic development commitments ¹⁶²			X		X	
Programme – Design						
No bid bond required						X
Early physical (project preparation) qualification requirements ¹⁶³				X		X
Land provided			X		X	X
Low auction access requirements ¹⁶⁴						X
Two stage bidding			X	X	X	X
No PPA reduction penalty clause						
No performance bond				X		X
No liquidated damages penalty clauses	X	X				X
Early connection payment	X	X	X	X		
Large auction volume ¹⁶⁵	X	X	X	X		
Competition-inducing (small) auction volume ¹⁶⁶	X	X	X	X	X	X
No project size limits						
Regular auction rounds	X	X		X		X
Technology-neutral auction						
Sealed-bid auction format	X	X	X	X	X	X
Pay-as-bid pricing rule	X	X	X	X	X	X
Price-only bid scoring			X			
No price caps	X	X	X	X	X	X
Programme – Implementation						
Trusted auctioneer	X	X	X	X	X ¹⁶⁷	X
Trusted bidding process	X	X	X	X	X	X

¹⁶¹ For the purpose of this analysis, credit enhancement and/or risk mitigation measures are measures that backstop the offtaker's payment obligations - which include sovereign guarantees and multilateral political risk cover - and/or provide liquidity support (e.g. escrow accounts, letters of credit)

¹⁶² For the purpose of this analysis, socio-economic development commitments are defined as any obligations on the project to use local content, local labour, promote local ownership, and/or invest in local communities.

¹⁶³ For the purpose of this analysis, late-stage physical qualification criteria are defined as projects needing to have secured land, most permits, a grid connection agreement and investor commitment; early stage is requiring only one (excluding investor commitment) (or none) of these.

¹⁶⁴ For the purpose of this analysis, low auction access requirements are defined as access requirements limited to previous projects – smaller in size than the project(s) being bid for.

¹⁶⁵ For the purpose of this analysis, a large auction volume is defined a 100MW or above.

¹⁶⁶ For the purpose of this analysis, a competition-inducing auction volume is defined as a volume where more than twice the amount of bids were submitted than what was awarded (only determined ex-post).

¹⁶⁷ Trust in NamPower – while not entirely diminished – was negatively affected by the legal challenge to the 3x10MW award.

As a result, seven factors necessary (essential) for competitive price outcomes were identified:

- A supportive energy policy framework that allows for private power investment;
- The use of competitive bidding practices to award IPP contracts;
- A revenue stream secured through robust contracts with either a credit-worthy off-taker, or an off-taker supported by credit enhancement and risk mitigation measures;
- A competition-inducing (relatively small) auction volume;
- The use of a simple auction format (sealed bid) and pricing rule (pay-as-bid) that lowers bidding risks;
- The non-disclosure of price cap levels (if used) to avoid price anchoring by bidders; and
- Bidder trust in the auctioneer, and the auction process.

7.5.2 Necessary conditions for project realisation

Research question 2C asks: What are the *necessary but not sufficient* conditions at country, programme and project levels for investment outcomes of renewable energy auctions in sub-Saharan Africa? 28 factors were extracted from the analytical framework based on the literature to explain auction rounds' project realisation outcomes (Table 7.6). Only auction rounds with realisation rates above 95% were included in the analysis (see section 7.3.2). Table 7.6 provides a summary of this analysis.

Table 7.6: Necessary Conditions- Project Realisation

Factors	SA BW1	SA BW2	SA BW3	SA BW4	Zambia Scaling Solar	Namibia Hardap
Country						
Economic stability ^{Error! Bookmark not defined.}	X	X	X	X	X	X
Legal stability ¹⁶⁸	X	X	X	X	X ¹⁶⁹	X
Energy policy framework ^{Error! Bookmark not defined.}	X	X	X	X	X	X
Regulatory quality ^{Error! Bookmark not defined.}					X	X
Coherent sectoral planning ^{Error! Bookmark not defined.}	X	X	X	X		
Project						

¹⁶⁸ Legal stability is defined as a country having a World Governance Index score above 50 (Kaufmann & Kraay, 2019).

¹⁶⁹ Zambia's project contracts did make provision for offshore arbitration to mitigate this risk.

Experienced equity providers ¹⁷⁰						
DFI equity investors						
Favourable debt arrangements					X	x ¹⁷¹
Creditworthy offtaker						X
Bankable project contracts	X	X	X	X	X	X
Credit enhancement & risk mitigation	X	X	X	X	X	¹⁷²
Socio-economic development commitments	X	X	X	X	x ¹⁷³	X
Programme - Design						
Bid bond required	X	X	X	X	X	X
Late-stage physical qualification requirements	X	X	X	X	x ¹⁷⁴	x ¹⁷⁵
Land provided					X	X
Experience-based auction access requirements					X	X
Financial-based auction access requirements	X	X	X	X	X	
Two-stage bidding					X	X
PPA reduction penalty clause	X	X	X	X	X	X
Performance bond required	X	X	X	X	X	X
Liquidated damages penalty clauses					X	X
Early connection payment	X	X	X	X	X	
Reasonable project size limits ¹⁷⁶	x ¹⁷⁷	x	x	x	X	X
Regular auction rounds	X	X	X	X		
Dynamic bidding format						
Pay-as-bid pricing rule	X	X	X	X	X	X
Price-only scoring					X	
Programme - Implementation						
Post-award auctioneer support	X	X	X	X		X

As a result, 10 factors necessary for project realisation were identified:

- Economic and legal stability (i.e. a favourable investment context), without which projects are unlikely to secure investment;
- A supportive energy policy framework that allows for private power investment;

¹⁷⁰ For the purpose of this analysis, equity investors with African IPP experience are defined as equity investors that have brought at least one African IPP of 5MW or above to commercial operation

¹⁷¹ Debt was provided by Standard Bank, but in partnership with Proparco who provided loan cover

¹⁷² Namibia did not provide risk cover, but the loan cover provided to Standard Bank by Proparco improved the return on the loan

¹⁷³ Both the Scaling Solar and Hardap auction rounds included mandatory shareholding for the auctioneer (IDD & NamPower)

¹⁷⁴ The Scaling Solar project sites, permits and grid connection was being provided to bidders

¹⁷⁵ The Hardap project site, permits (EIA) and grid connection was being provided to bidders.

¹⁷⁶ For the purpose of this analysis, reasonable project size is defined as 100MW or below

¹⁷⁷ SA's solar PV projects were all smaller than 75MW, although many wind and CSP projects were above 100MW.

- A secure revenue stream, ensured through robust contracts with either a credit-worthy off-taker, or an off-taker supported by credit enhancement and risk mitigation measures;
- Socio-economic development commitments (in particular, strategic local shareholding) that strengthens government's commitment to project realisation;
- Bid bond requirements that incentivise bidders to honour their bids;
- Late-stage physical (project/bid preparation) qualification requirements (including investor commitment) that ensure that projects are well developed by the point of bidding;
- Substantial auction access requirements (based on experience or financial standing) that ensure qualified bidders have sufficient experience and/or resources to realise projects;
- The use of robust penalty clauses (performance bonds and PPA reduction clauses) that incentivise bidders to honour their project realisation (timeline) commitments;
- Reasonable project size limits, since smaller projects are generally able to be built more quickly; and
- The use of a simple pricing rule (pay-as-bid) that reduces bidder risks (incl. the risk of the winner's curse).

These 17 factors have been incorporated in the modified analytical framework (table 7.4) as necessary conditions for competitive price and timely project realisation outcomes.

7.6 Synthesis: A summation

Sub-Saharan Africa remains short of power. Current power generation investment levels remain far below those required to meet the continent's suppressed and growing energy needs. Renewable energy auctions – also referred to as tenders, reverse auctions or international competitive bidding programmes - have emerged as a potentially powerful way of accelerating private investment in new power generation technologies at competitive prices. This thesis sought to analyse successful renewable energy auctions in sub-Saharan Africa and identify the factors contributing to efficient price and effective investment outcomes.

I conducted in-depth comparative analyses of three pioneering sub-Saharan African case study countries, using a combination of interviews, bidding document and data analysis and participant observation. The three case study countries were among the first adopters of renewable energy auctions on the continent and had initiated the procurement programmes in the midst of energy

supply crises. All three had managed to secure utility-scale projects at highly competitive prices¹⁷⁸ and were able to see the first rounds of projects reach commercial operation in periods ranging from one to three years after preferred bidder announcement – a remarkable achievement for the region.

The study found that these outcomes are attributable to a mixture of factors primarily drawn from a framework that combines the literature on contributing factors to IPP success (Eberhard et al., 2017; Eberhard & Gratwick, 2011; Gratwick & Eberhard, 2008b) – mainly focusing on the country and project levels of analysis – with the literature on renewable energy auction design (Del Río, 2017f; Eberhard & Naude, 2016; Ferroukhi et al., 2015; Haufe & Ehrhart, 2018; Kreiss et al., 2016) and implementation (mainly focusing on trust in the auctioneer and process) (Chiu et al., 2010; Liu et al., 2016; Zitron, 2006) – also referred to as the “programme” level. This combined analytical framework developed a suite of contributing factors to success at all three levels, that both illuminated the individual and combined contributions as well as the interplay between factors.

The thesis confirmed that this combined analytical framework both broadens and deepens our understanding of auction price and project realisation outcomes in our case study countries, going beyond what was previously possible using only the literature on IPP contributing factors to success or the auction design literature. The analysis showed that the introduction of a competitive procurement programme modifies the relevance and relative impact of many of the country and project level contributing factors to IPP success, and that the implementation of an auction in the relatively risky investment context of sub-Saharan Africa elevates many of the auction implementation and project level factors to new prominence in determining outcomes.

Auction price outcomes were mainly determined by factors that act as auction signals, barrier and incentives primarily geared towards increasing competition in the procurement process and lowering projects’ cost of capital (especially debt. These factors include setting and dividing auction volumes prudently over multiple rounds; building and maintaining bidders’ trust in the auctioning authority and auction process; limiting auction participation to credible bidders; and ensuring that the contract being bid for is acceptable to lenders (bankable) and backed by a secure revenue stream (including robust risk mitigation measures where necessary).

Apart from price, the research was also interested in identifying the factors contributing to the timely realisation of procured projects (also referred to as auction effectiveness) - and understanding how and why they have this effect. The case studies showed that project realisation is determined by

¹⁷⁸ In South Africa’s case, only in later procurement rounds.

bidder quality, project preparation levels, investor commitment, constraints (revenue stream and political economy) and post-award support. These are influenced by factors from all three levels – country, project and programme – that act as auction signals, barriers, incentives and support measures.

Finally, the case studies highlighted the pervasive influence of political economy factors – not included in the analytical framework - as determinative for longer-term auction outcomes (Section 6.6).

7.7 Recommendations for further study

7.7.1 Political economy of renewable energy auctions

A country's political economy – the structural relationships between interests, power relations, institutions and ideas - that shape processes and outcomes (Godinho, 2018) – is a cross-cutting issue that impacts the entire sector, including the investment climate, the policy and regulatory framework as well as the planning-procurement nexus. While the influence of political economy factors are acknowledged in the IPP literature, it is most often through the lens of other country or project level factors. The case study analyses highlighted the pervasive influence of political economy factors on the evolution and outcomes of the auction programmes.

There are some similarities as well as notable divergence between the phased evolution of the three auction cases. In all three countries an electricity supply crisis initially disrupted the status quo, creating the conditions for new ideas and institutions (such as auction-based RE IPP procurement programmes) to emerge while limiting the power of incumbent interests to suppress competition. The second phase involved a second disruption – this time caused by the price and investment outcomes of the auctions. By proving that renewable energy IPPs were cost-competitive and effective at rapidly deploying capital at scale, the auction programmes undermined the ideas that supported the power-bases of incumbent interests – whether located around utilities or adjacent industrial or political configurations. This techno-economic disruption coincided - in the cases of South Africa and Zambia - with institutional disruptions as new entities were created or repurposed to design and implement the procurement programmes, causing a shift in institutional power dynamics that extended the threat posed by these auctions to the political-administrative spheres. In Namibia, the scope of this threat was limited by NamPower's prominent role in the auction design and implementation processes (as well as being a shareholder in the awarded IPP), largely maintaining the utility's power in the sector.

Where things diverged most dramatically was in the later phases of these programmes, as reactions to the impacts of the auctions coalesced around either trying to restrain the scope and scale of the transition or to accelerate it. This divergence is most vividly on display when comparing South Africa and Zambia, on the one hand, and Namibia on the other. In South Africa, the auction results sparked a concerted and coordinated programme of resistance – including aggressive social media and PR campaigns, persistent lobbying, direct court challenges and protests - encompassing interests as wide-ranging as organised labour, the free market foundation, the coal mining industry, Eskom’s board and management, various government departments and officials (most prominently the department of public enterprises – Eskom’s direct shareholder, but also certain sections of the department of energy), the upper echelons of the ruling ANC and even the former president’s office. As a consequence, the implementation of BW4 projects were delayed by three years while government failed to launch new procurement rounds, even as South Africa faced its most severe and devastating electricity supply crisis in decades.

In Zambia, the auction results (from Scaling Solar) were initially greeted with much fanfare and celebration, hailed as a viable solution to that country’s crippling power supply problems. Still, the prominent role of the IDC (as opposed to the Ministry of Energy) in the Scaling Solar programme caused some initial backlash, but also provided impetus for the ministry to reassert its role as custodian of the sector through the GETFiT programme. However, the record-breaking GETFiT price results did not elicit the same response as Scaling Solar – not because they necessarily posed a direct threat to vested interests, but because their contractual conclusion required increased transparency and structural reforms of the embattled offtaker – ZESCO.

As one of Zambia’s biggest SOEs, ZESCO had become a source of considerable political power and patronage through for example, the awarding of contracts (including to unsolicited IPPs) and jobs, and thus played a crucial role in maintaining the political status quo. Advocacy by GETFiT project lenders – as well as the World Bank’s requirements for launching Scaling Solar Round 2 – for a range of reforms to improve ZESCO’s financial health appears to have been a bridge too far. As a result, not only has the country’s electricity supply crisis been prolonged as Round 2 of Scaling Solar was abandoned and the GETFiT projects’ PPAs failed to be signed, but the Zambian government appears to have reverted to its old ways by directly awarding 600 MW of solar PV projects (with little prospect of being financed) to Chinese contractors.

In Namibia, on the other hand, the auctions results elicited a completely different reaction. NamPower, the ECB and the ministry all recognised the opportunity presented by competitively priced renewable energy to not only solve the country’s energy security and cost problems in the short-to

medium-term, but to also transform the country into a regional powerhouse in the long-term. Crucially, this solution did not pose a significant threat to powerful interests in the energy sector (including NamPower, which has always been more focused on transmission than generation), but rather provided an opportunity for the country to increase investment (including for a politically connected elite), resolve its energy security concerns and drive down NamPower's cost of power. As a result, the country has witnessed a significant opening up of the market to private investment in general, and renewables in particular, which is set to accelerate the Namibian energy transition.

The influence of political economy factors was thus most directly observable as the initial effectiveness of the auctions became more apparent and interest groups emerged to contest their future. Political-economy also impacted prices, but indirectly, through pressure on auction design decisions to include broader social and economic development factors in the evaluation of winning bids. There are of course also potential longer-term impacts of political-economy on pricing through increasing sector or project risks, which will only be observable once (or if) new rounds of procurement are launched in South Africa and Zambia.

Political-economy literature and analysis were explicitly excluded from the scope of this thesis but the preceding discussion suggests that it might be a fruitful area of research in the future to better understand the influence of these factors on both short- and long-term auction processes and outcomes – especially in developing country contexts – as a potential additional contributing factor at the country level of analysis.

7.7.2 Identifying necessary and sufficient conditions at country, programme and project levels

The thesis relies heavily on the IPP and RE auction design and implementation literature. All three bodies of literature lack a systematic analysis of necessary and sufficient conditions for project price and realisation outcomes. While the identification of necessary and sufficient conditions was not a main aim of this thesis, I did attempt to move towards greater certainty on potential necessary conditions (Dul, 2016). Nevertheless, the explanatory power of this analysis needs to be strengthened, considering that I only covered three case study countries. Using NCA's disconfirmatory logic, it is recommended that further (African) cases be added to the analysis to refine the list of possible individual necessary conditions. It is also recommended that, through using techniques such as Qualitative Comparative Analysis (QCA) (Ragin, 2008) and increasing the number of cases, the list of contributing factors be tested for necessity and sufficiency configurations. This will greatly add to the practical value of the analytical framework.

7.7.3 Impact of local content and other economic development requirements on project prices

Despite the emphasis on socio-economic development impacts in African auctions, very little systematic analysis has been done on the impacts of these requirements or incentives on the resultant price of electricity. Most analyses on the topic have thus far focused on local community impacts (positive and negative) (see Davies, 2021; Wlokas, 2018) or failed localisation policy attempts (Morris et al., 2020). There is nevertheless a need, from a policy-making (and auction design) perspective, to better understand the impact of these socio-economic development commitments on project pricing – both collectively as well as individually.

7.7.4 Unsuccessful auctions

This thesis focused on successful auctions in sub-Saharan Africa. There are unfortunately also multiple (recent) examples of failed auction programmes (e.g. Ethiopia, Ghana, Tanzania etc.). Understanding the factors that led to the failures of these auction programmes will potentially both strengthen, refine and expand the analytical framework and lead to better policy recommendations. It is therefore recommended that a thorough analysis be undertaken of failed auctions in sub-Saharan Africa (and possibly beyond) – using the modified analytical framework – to deepen our understanding of the factors leading to successful and unsuccessful outcomes.

The detailed case studies, the comparative analysis in chapter 6, and the above analysis in chapter 7 has provided comprehensive answers to the research questions, and the thesis has made a contribution to the literature and theory by bringing together disparate bodies of literature to broaden and deepen our understanding of the factors impacting project price and realisation outcomes in renewable auctions in sub-Saharan Africa.

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Appendix A: Bidding documents reviewed and consulted

A.1 South Africa

IPP NERSA Presentations

BW1

Cookhouse wind farm
CPV power plant nr 1
Dorper wind farm
Klipheuwel dassiesfontein
Metrowind van stadens
Red Cap Kouga wind farm
Slimsun Swartland solar park
Solar Capital de Aar
Mainstream Jeffreys Bay
Witkop Solar Park

BW2

Amakhala Emoyeni Solar
Aries Solar
Aurora - Rietvlei Solar
Blue Falcon 140 Trading
Greefspan AE
Innowind _IDC
Ka Xu Solar One
Kalkbult
Khathu Solar Energy
Khi Solar One
Konkoonsies Solar
Lesedi Power
Micawber 862
Mulilo De Aar
Mulilo Prieska
Noblesfontein
Rhino Energy Solutions
RustMo1 Solar farm
Mainstream De Aar
Mainstream Droogfontein
Soutpan Solar Park

Tsitsikamma Community Wind Farm

Vredendal solar power park

BW3

ACED Cookhouse South

Adams Solar PV

Electra Capital

Ener-G Systems

Gibson Bay Wind farm

Karoshhoek Solar one

Longyuan Mulilo De Aar

Longyuan Mulilo De Aar 2 North

Mulilo Prieska PV

Navosync

Pulida Energy

Mainstream Khobab wind

Mainstream Loeriesfontein 2

Mainstream Noupoot

Tobivox

Xina Solar

BW4

Amstilinx

Garob Wind farm

Karusa Wind farm

Mainstreet 957

Ngodwana Energy

Nxuba wind farm

Oyster Bay wind farm

Ramizone

Riverbank - Wesley - Ciskei

Roggeveld

Scatec Sirius

Scatec Dyasons Klip 1

Scatec Dyasons Klip 2

Soetwater

Solar Capital Orange

Mainstream Perdekraal

Sunedison Droogfontein

Sunedison Greefspan

Sunedison Zeerust

RFP Documentation

BW1

BW1 RFP Part A - General Requirements and Rules

BW1 RFP Part B - Qualification Criteria

BW1 RFP Part C - Evaluation Criteria

BW1 Volume 3

BW1 Technical Requirements

BW1 Volume 4

BW 1 Financial Requirements

BW1 Volume 5

BW1 Economic Development Requirements

BW1 Volume 6

BW 1 DBSA Funding and Financing

BW2

BW2 RFP Part A - General Requirements and Rules

BW2 RFP Part B - Qualification Criteria

BW2 RFP Part C - Evaluation Criteria

BW2 Volume 3

BW2 Technical Requirements

BW2 Volume 4

BW2 Financial Requirements

BW2 Volume 5

BW2 Economic Development Requirements

BW2 Volume 6

BW2 DBSA Funding and Financing

BW3

BW3 RFP Part A - General Requirements and Rules - Marked up to BW2

BW3 RFP Part B - Qualification Criteria - Marked up to BW2

BW3 RFP Part C - Evaluation Criteria - Marked up to BW2

RFP BW3 Summary of Changes Presentation

BW4

BW3 to BW4 RFP PART A

BW3 to BW4 RFP PART B

BW3 to BW4 RFP PART C

RFP BW4 Summary of Changes Presentation

Volume 1

Appendix K - PPA (Biogas Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (Biomass Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (CSP Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (Hydro Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (LFG Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (PV Projects) - MAY 2013 RFP (MARKUP)
 Appendix K - PPA (Wind Projects) - MAY 2013 RFP (MARKUP)
 Appendix L - Direct Agreement - May 2013 RFP (MARKUP)
 Appendix M - Implementation Agreement - MAY 2013 RFP (MARKUP)
 Appendix N - Transmission Agreement - MAY 2013 RFP (MARKUP)
 Appendix O - Distribution Agreement - MAY 2013 RFP (MARKUP)
 Appendix P - Distribution Direct Agreement - MAY 2013 RFP (MARKUP)
 Appendix P - Transmission Direct Agreement - MAY 2013 RFP (MARKUP)
 RFP - VOLUME 1 PART 1 - LEGAL NOTICES POLICIES BW4
 RFP - VOLUME 1 PART 2 - ANNEXURE JB
 RFP - VOLUME 1 PART 2 - FORM OF BID AND BID RETURNABLES - BW4
 RFP - VOLUME 1 PART 2 - FORM OF BID AND BID RETURNABLES - BW4

Volume 2

Appendix K - PPA (Biogas Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix K - PPA (Biomass Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix K - PPA (Hydro Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix K - PPA (LFG Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix K - PPA (PV Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix K - PPA (Wind Projects) - MAY 2014 - BW4 (CLEAN)
 Appendix L - Direct Agreement - MAY 2014 - BW4
 Appendix M - Implementation Agreement - MAY 2014 - BW4 (CLEAN)
 Appendix N - Transmission Agreement - MAY 2014 - BW4
 Appendix O - Distribution Agreement - MAY 2014 - BW4
 Appendix P - Distribution Direct Agreement - MAY 2014 - BW4
 Appendix P - Transmission Direct Agreement - MAY 2014 - BW4

Volume 3

APPENDIX Q1A RFP evaluation matrix for Wind BW4
 APPENDIX Q2A RFP evaluation matrix for PV BW4
 APPENDIX Q3A RFP evaluation matrix for CSP BW4
 APPENDIX Q4A RFP evaluation matrix for Biomass BW4
 APPENDIX Q5A RFP evaluation matrix for Biogas BW4
 APPENDIX Q6A RFP evaluation matrix for LFG BW4
 APPENDIX Q7A RFP evaluation matrix for Small Hydro BW4
 RFP - VOLUME 3 - TECHNICAL REQUIREMENTS - BW4

Volume 4

RFP - VOLUME 4 - FINANCIAL REQUIREMENTS BW4

Volume 5

RFP - VOLUME 5 - ECONOMIC DEVELOPMENT BW4

Expedited BW

BW 4 TO BW EXP RFP PART A

BW 4 TO BW EXP RFP PART B

BW 4 TO BW EXP RFP PART C

Changes to RFP from BW4 to EBW

Small Projects**RFP**

Small Proj REIPPPP RFP doc Part A

Small Proj REIPPPP RFP doc Part B

Small Proj REIPPPP RFP doc Part C

Small Proj REIPPPP RFP doc Part D

Volume 1 - Legal notices and returnables

Small Proj REIPPPP RFP - Volume 1 - Part 1 Legal Notices, and so on

Small Proj REIPPPP RFP - Volume 1 - Part 2 - Stage 1 Returnables (other)

Small Proj REIPPPP RFP - Volume 1 - Part 2 - Stage 1 Returnables

Small Proj REIPPPP RFP - Volume 1 - Part 3 - Stage 2 Returnables

Volume 3 - Evaluation template by technology

RFP Eval Template for Biogas - Stage 1

RFP Eval Template for Biogas - Stage 2

RFP eval template for biomass - Stage 1

RFP eval template for biomass - Stage 2

RFP eval template for landfill gas - Stage 1

RFP eval template for landfill gas - Stage 2

RFP eval template for solar PV - Stage 1

RFP eval template for solar PV - Stage 2

RFP eval template for wind - Stage 1

RFP eval template for wind - Stage 2

Small Proj REIPPPP - Volume 3 - Technical Reqs

Volume 4 - Financial requirements

Small Proj REIPPPP - Volume 4 - Financial Reqs

Small Projects Appendix G5 - 3 November 2014

Volume 5 - Economic development requirements

Small Proj REIPPPP - RFP Volume 5 - Econ Develop Reqs

Briefing Notes

Briefing Note 1

Briefing Note 2

Briefing Note 3

Briefing Note 4

Briefing Note 5

Briefing Note 6

Briefing Note 7

Briefing Note 8

Clarification notices

Small Proj REIPPPP clarification note 1

Small Proj REIPPPP clarification note 2 - part 1 of 2

Small Proj REIPPPP clarification note 2 - part 2 of 2

Small Proj REIPPPP clarification note 3

Small Proj REIPPPP clarification note 4

General Documentation

Eskom Connection Direct Agreement

Eskom Distribution Agreement (21.08.2013)

Small Projects Direct Agreement (Issue Version - 21.08.2013)

Small Projects IPP Implementation Agreement (Issue Version - 21.08.2013)

Small Projects IPP PPA (LFG Projects) Issue Version - 21.08.2013

Small Projects IPP PPA (Biogas Projects) Issue Version - 21.08.2013)

Small Projects IPP PPA (Biomass Projects) Issue Version -21.08.2013

Small Projects IPP PPA (PV Projects) Issue Version - 21.08.2013

Small Projects IPP PPA (Wind Projects) Issue Version -21.08.2013

A.2 Zambia

Scaling Solar 1 RFP

Request for prequalification for utility-scale solar PV IPP projects in Zambia. Scaling Solar 1.

Request for proposals for utility-scale solar PV IPP projects in Zambia. Scaling Solar 1.

Part I: Letter of Invitation

Part II: Disclaimer

Part III: Instructions to Prequalified Bidders

APPENDIX 1 Process Information

APPENDIX 2 Requirements for Technical Proposal

APPENDIX 3 Offer Letter

APPENDIX 4 Project Agreement Information Schedule

APPENDIX 5 Form of Bid Bond

APPENDIX 6 Energy Charge Schedule

APPENDIX 7 World Bank Group Cover Letter

Government Support Agreement relating to the Mosi-Oa-Tunya Solar Power Project in Zambia

Power Purchase Agreement relating to the Mosi-Oa-Tunya Solar Power Project in Zambia

Scaling Solar 2

Minutes - Zambia Scaling Solar Round 2 - Pre-bid meeting. 11 Apr 2017

Scaling Solar Round 2 - Final Q&A from prospective bidders - 29 Apr 2017

Scaling Solar Round 2 - Addendum 2 (RFQ): Financial criteria

Scaling Solar Round 2 - Addendum 2 (RFQ): Technical criteria

GET FIT

Zambia GET FiT Solar PPA (00382034-4xB0385)

Zambia GET FiT Solar Implementation Agreement (00394764xB0385)

GET FiT Solar PV tender announcement

21062018_Invitation to submit site information

180517_GET FiT Presentation_Lenders_AUW_final

180214_RfC3 Annex1

180214_GET FiT Solar PV Tender Announcement clarification final

180214_Attachment_3

180214_Attachment_2

180214_Attachment_1

180205_GET FiT Solar PV Tender ES Guidance

180205_GET FiT Solar PV Tender Announcement Clarification No.2

171221_GET FiT Solar PV Tender Announcement clarification 1

161027_PV_Tariffs_GETFiT_Zambia

GET FiT Solar PV tender announcement updated table

A.3 Namibia

Regulatory documents

Electricity Applications under review - September 2020

Licensed IPPs, Gensets, NamPower plants and Rooftop installations - September 2020

Licensees not part of the REFIT programme

Schedule of approved tariffs (2020/21) - NamPower - Non-seasonal time-of use tariffs

Contestable customers

Bid tariffs: Khan PV IPP

Omburu PV EPC documents

Notice for selection of procurement award - W/ONB/CPBN-01/2019

Submission list for bid opening (28 Feb 2020) - W/ONB/CPBN-01/2019

Bid Documents - 3 x 10 MW PV IPP

Invitation to respond to the pre-qualification of potential project sponsors and request for information document: 3 x 10 MW solar PV project. Tender nr NPWR/2013/46

Bid Documents - Khan IPP

Part 1: Bidding Documents

Open International Bidding. Procurement of Independent Power Producer for the Development of A 20 MW Solar Photovoltaic (PV) Power Plant at Khan Substation on a Build-Own-Operate (BOO) Basis. G/OIB/NPWR - 05/2019. Issued on 23 September 2019. Part I. Section I - Instructions to bidders

Open International Bidding. Procurement of Independent Power Producer for the Development of A 20 MW Solar Photovoltaic (PV) Power Plant at Khan Substation on a Build-Own-Operate (BOO) Basis. G/OIB/NPWR - 05/2019. Issued on 23 September 2019. Part I. Section II - Bidding Data Sheet

Open International Bidding. Procurement of Independent Power Producer for the Development of A 20 MW Solar Photovoltaic (PV) Power Plant at Khan Substation on a Build-Own-Operate (BOO) Basis. G/OIB/NPWR - 05/2019. Issued on 23 September 2019. Part I. Section III - Qualification and Evaluation Criteria

Part 2: Supply Requirements

REIPP_Solar PV_SV_ Minimum Technical Specifications and Requirements _30Aug19_final

REIPP_Solar PV_ ANNEX B1_ Renewable Energy Plants and other Embedded Generation _Rev_12April19

REIPP_Solar PV_ ANNEX B1_ Khan SS_Single Line diagram of Connection Works_12Aug19_final

Part 3: Section VI - Contracts

REIPP_SolarPV_C1_Power Purchase Agreement (Khan)

REIPP_SolarPV_C2_Transmission Connection Agreement (Khan)

REIPP_SolarPV_C3_Direct Agreement (Khan)

REIPP_SolarPV_C3_Notarial Lease Agreement (Khan)

REIPP_SolarPV_C5_Transmission connection offer letter (Khan)

Part 4: Bidding forms in native format

REIPP_SolarPV_D1_Employment Record (Khan)

Section IV - Bidding forms to be submitted in original format

REIPP_Solar PV_A0a_Contents of Bidding Documents_18Sept19_final
REIPP_Solar PV_A0b_ Invitation for Bids (IFB)_18Sept19_final
REIPP_Solar PV_A1_Bidding Documents Cover Page_30Aug19_final
REIPP_Solar PV_A2_Bidder Information Form_30Aug19_final
REIPP_Solar PV_A3_Joint Venture Partner Information Form_30Aug19_final
REIPP_Solar PV_A4_Bid Submission Form_30Aug19_final
REIPP_Solar PV_A5_Base Tariff_30Aug19_final
REIPP_Solar PV_A6_Bid Securing Declaration_30Aug19_final
REIPP_Solar PV_A7_Self Declaration_30Aug19_final
REIPP_Solar PV_A8_Written undertaking_30Aug19_final
REIPP_Solar PV_A8_Confirmation of Projects Agreements_30Aug19_final
REIPP_Solar PV_A10_Form of Special Power of Attorney_30Aug19_final
REIPP_Solar PV_A11_Convenant of Integrity_30Aug19_final
REIPP_Solar PV_A12_Minimum Responsiveness Criteria_30Aug19_final
REIPP_Solar PV_A13_Detailed Corporate and Administrative Information_30Aug19_final
REIPP_Solar PV_A14_Reference Projects_30Aug19_final
REIPP_Solar PV_A16_Legal and commercial deviations on DA_30Aug19_final
REIPP_Solar PV_A18_Project Implementation Schedule_30Aug19_final
REIPP_Solar PV_A19_Performance Guarantees_30Aug19_final
REIPP_Solar PV_A20_Check list of documentation requested in the Specification_30Aug19_final
REIPP_Solar PV_A22_EPC Contractors Reference List_30Aug19_final
REIPP_Solar PV_A23_O&M Contractors Reference List_30Aug19_fina
REIPP_Solar PV_A26_Namibian Content_30Aug19_final
REIPP_Solar PV_A27_Letter Of Support From Provider(S) Of debt Finance_30Aug19_final
REIPP_Solar PV_A28_Financial Model_30Aug19_final
REIPP_Solar PV_A29_Letter Of Support from Provider(s) Equity Finance_30Aug19_final
REIPP_Solar PV_A30_Socioeconomic Development Undertaking_30Aug19_final
REIPP_Solar PV_A31_Local Content Confirmation_30Aug19_final

Annexures

REIPP_Solar PV_Annex 1_Equipment Proforma - 20 MW PV IPP Plant Integration - Khan Substation
(1 Nov 2019)
REIPP_Solar PV_Annex B1_Embedded generation specifications
REIPP_Solar PV_Annex B2_Single Line Diagram_Khan Substation
REIPP_Solar PV_Annex B3_Khan Site Layout
REIPP_Solar PV_Annex B4_Meteorological and solar resource TMY data
REIPP_Solar PV_Annex B5_Topograhpic surveys

Clarifications

Khan PV IPP - Clarification #1
Khan PV IPP - Clarification #2
Khan PV IPP - Clarification #3
Khan PV IPP - Clarification #4

Khan PV IPP - Clarification #5
Khan PV IPP - Clarification #6
Khan PV IPP - Clarification #7
Khan PV IPP - Clarification #8
Khan PV IPP - Clarification #9
Khan PV IPP - Clarification #10
Khan PV IPP - Clarification #11
Khan PV IPP - Clarification #12
Khan PV IPP - Clarification #13
Khan PV IPP - Clarification #14
Khan PV IPP - Clarification #15
Khan PV IPP - Clarification #16
Khan PV IPP - Clarification #17
Khan PV IPP - Clarification #18
Khan PV IPP - Clarification #19
Khan PV IPP - Clarification #20
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Khan PV IPP - Clarification #23

Amendments

Khan PV IPP - Amendment #1
Khan PV IPP - Amendment #2
Khan PV IPP - Amendment #3
Khan PV IPP - Amendment #4
Khan PV IPP - Amendment #5
Khan PV IPP - Amendment #6
Khan PV IPP - Amendment #7
Khan PV IPP - Amendment #8
Khan PV IPP - Amendment #9
Khan PV IPP - Amendment #10

Executive Summary - Notice of Award - G/OIB/NPWR-05/2019 (Khan Solar PV IPP)

Bid documents - Hardap PV IPP

Chapter 1 - Tender documents contents and letters

HARPV_A0a_Contents of Tender

HARPV_A0b_Mandatory Clarification Meeting and Mandatory Site visit form

HARPV_A0c_NamPower Visa Support Letter

Chapter 2 - Tender documents to be printed and signed

HARPV_A1_Instruction to Tenderers

HARPV_A2_Draft Power Purchase Agreement (PPA)

HARPV_A3_Draft Transmission Connection Agreement

HARPV_A3a_Annexure 1_Offer Letter - NPPSD
HARPV_A4 Draft Direct Agreement
HARPV_A5_ Land Lease Agreement
HARPV_A6_Shareholders Agreement Termsheet
HARPV_B1_Technical Specification for Solar PV Power plant
HARPV_B1a_RE Embedded Generation Specifications
HARPV_ANNEX_B3_Single line diagram of Connection works
HARPV_Volume C_Returnable Forms with technical proposal
HARPV_Volume D_Returnable Forms with financial proposal
HARPV_Volume F_Returnable Forms after Tender Award

Chapter 3 Volume C: Returnable forms to be submitted as part of technical proposal

HARPV_C1_Form of Letter of Tender
HARPV_C2_Declaration of Authenticity
HARPV_C3_Form of Special Power of Attorney
HARPV_C4_Convenant of Integrity
HARPV_C5_Minimum Responsiveness Criteria
HARPV_C6_Shareholders Agreement Termsheet
HARPV_C7_Detailed Corporate and Administrative Information
HARPV_C9_Reference Projects
HARPV_C12a_Legal and commercial deviations on PPA
HARPV_C12b_Technical, Legal and commercial deviations on TCA
HARPV_C12c_Legal and commercial deviations on DA
HARPV_C12d_Legal and commercial deviations on LLA
HARPV_C12e_Legal and commercial deviations on SHA_TS
HARPV_C13_Technical Deviations to Tender Documents
HARPV_C14_Form of Tender Bond
HARPV_C15_Form of Performance Bonds
HARPV_C16_Project Implementation Schedule
HARPV_C17_Performance Guarantees
HARPV_C18_Check list of documentation requested in the specification
HARPV_C19_Voluntary Site Visit Form
HARPV_C20_EPC Contractors Reference List
HARPV_C21_O&M Contractors Reference List
HARPV_C22_List of Service Providers
HARPV_C23_List of Equipment Suppliers
HARPV_C24_Namibian Content

Chapter 4 Volume D - Returnable forms to be submitted as part of financial proposal

HARPV_D1_Base Tariff Calculation
HARPV_D2_Tender Financial Model (Word)
HARPV_D2_Tender Financial Model (Excel)
HARPV_D3_Price Deviations to Tender Documents
HARPV_D4_Information required to apply for Generation License

Chapter 5 Volume F. - Forms to be returned during construction

HARPV_F1_Employment Record

Chapter 6 Volume G - Information

HARPV_G1a_EIA Clearance Certificate

HARPV_G1b_Briefing Information Document

HARPV_G1c_Comments and Responses on Briefing Document

HARPV_G1d_Final Scoping Report

HARPV_G1e_Non-technical summary

HARPV_G1f_Application for Clearance Certificate

HARPV_G1g_Comments and Responses on Draft Scoping Report

HARPV_G1h_Ecology Report

HARPV_G1i_Heritage Report

HARPV_G1j_Socio Economic Impact Assessment

HARPV_G1k_Traffic Report

HARPV_G1l_Visual Impact Assessment

HARPV_G1m_General Environmental Specification for construction

HARPV_G1n_EMP Mariental

HARPV_G10_NP-NNF wildlife-power line incident form

Chapter 7 - Clarifications

HARPV_TCLAR_Clarification #1

HARPV_TCLAR_Clarification #2

HARPV_TCLAR_Clarification #3

HARPV_TCLAR_Clarification #4

HARPV_TCLAR_Clarification #5

HARPV_TCLAR_Clarification #6

HARPV_TCLAR_Clarification #7

HARPV_TCLAR_Clarification #8

HARPV_TCLAR_Clarification #9

HARPV_TCLAR_Clarification #10

HARPV_TCLAR_Clarification #11

Chapter 9 - Operating guidelines and codes

Final draft SAPP operating guidelines

Grid code - system operations

Operating rules for high voltage systems

Chapter 10 - Amendments

HARP_Tamend_01

HARP_Tamend_02

HARP_Tamend_03

HARP_Tamend_04

HARP_Tamend_05

HARP_Tamend_06

HARP_Tamend_07

HARP_Tamend_08

Appendix B: Conferences attended

Africa Utility Week 2017
Africa Utility Week 2018
Africa Utility Week 2019
Africa Energy Forum 2016
Africa Energy Forum 2017
Africa Energy Forum 2018
Africa Energy Forum 2019
Africa Investment Exchange 2018
Africa Investment Exchange 2019
Africa Energy Indaba 2018
Windaba 2017
Windaba 2018
Windaba 2019

Appendix C: List of Interviews

Due to the sensitivity of the data provided (especially in the context of ongoing competitive bidding programmes), minimal interviewee data is being provided.

Interview #	Organisation type	Countries covered	Key Informant	Review
1	Implementing partner	Zambia	Key informant	Review
2	RE project developer	SA, Namibia		
3	Private equity	SA, Namibia		
4	Regulator	Namibia		
5	Utility	Namibia	Key informant	Review
6	Consultant	Namibia		
7	Utility	Namibia		
8	RE project developer	SA, Namibia, Zambia		
9	RE project developer	Namibia, Zambia		
10	Ministry	Namibia		
11	Regulator	Zambia		
12	RE project developer	Zambia		
13	Implementing partner	Zambia		
14	DFI	Zambia		
15	RE project developer	SA		
16	RE project developer	SA, Zambia, Namibia		
17	Implementing partner	Zambia		
18	RE project developer	SA		
19	RE project developer	SA, Zambia, Namibia		
20	RE project developer	SA		
21	RE project developer	SA		
22	EPC	SA, Zambia		
23	RE project developer	SA		
24	Procurement office	SA		
25	Ministry	SA		
26	RE project developer	SA, Zambia, Namibia		
27	RE project developer	SA, Namibia		
28	Implementing partner	Zambia		
29	Implementing partner	Zambia		
30	Procurement office	SA	Key informant	Review
31	Implementing partner	Zambia	Key informant	Review
32	Procurement office	Zambia		
33	Procurement office	Zambia		
34	Insurance agency	Zambia		
35	Utility	Zambia		

36	Procurement office	SA		
37	Regulator	Namibia	Key informant	Review
38	Utility	Namibia		
39	RE project developer	SA		
40	Private equity	SA, Zambia		
41	Private equity	SA, Zambia, Namibia		
42	Utility	Namibia		
43	RE project developer	SA, Zambia, Namibia		
44	DFI	Namibia		
45	DFI	Zambia		

Appendix D: Background events and research work

Date	Item/event	Description & impact
Oct-16	Research report: The South African Renewable Energy IPP procurement programme: review, lessons learned & proposals to reduce transaction costs	The Management Programme in Infrastructure Investment, Reform and Regulation (MIR) at the University of Cape Town's Graduate School of Business. Was commissioned by the Norwegian Embassy in South Africa, as well as the UK's Prosperity Fund, to analyse the South African Renewable Energy IPP Procurement Programme (REI4P). The MIR signed a Non-Disclosure Agreement with the Department of Energy's IPP office to be provided access to bidding data (incl.bidding documents) from the programme, and subsequently Anton Eberhard and Raine Naude produced a report (as well as a shorter recommendations report) in 2015/16. I was responsible for the final editing and review of the report, which was still in draft form. I also prepared and submitted a journal paper based on the report to the Journal of Energy in Southern Africa (JESA), which was published in 2017 (I am not listed as a co-author). Part of the report review process was a detailed review by a prominent commercial lender to REI4P projects, an equity investor/developer, and the IPP office. The journal paper was subject to a peer-review process. The finalisation of the report and journal paper provided me with a useful introduction to the renewable energy auction programme, and came to shape my understanding of what is involved. It did not use an explicit analytical framework, rather analysing the RFP requirements from a commercial and legal point of view. The report also mentioned the influence of the IPP office and the security/professionalism of the process as important factors, but did not go into much detail as to how this influenced outcomes. The report did specifically include references to the planning framework, as well as (importantly) risk mitigation provisions (sovereign guarantees) to secure the revenue stream as a core part of the procurement programme's design. It also featured a brief introduction to project finance and its general logic. This shaped my expectations around key auction design elements and was one of the reasons that I was aware of the auction design literature's general lack of engagement with/inclusion of broader investment risk/contextual factors when I first started engaging it. The report also discussed equity and debt providers, but really as outcomes of the auction instead of factors influencing price and investment outcomes in their own right. Still, it showed that there was an important evolution on the equity side of the programme over time – awarding more volumes to larger, international bidders – and that local debt from commercial banks, but also from local pension funds in later rounds – was a prominent feature in the programme.
24-Nov-16	RE auctions workshop	I developed and hosted a workshop for senior ministry officials, utility professionals and regulatory staff from 8 African countries (Ethiopia, Tanzania, Kenya, Namibia, Nigeria, Senegal, Zambia, Zimbabwe) on renewable energy auctions in Africa (based on the analysis in the report, discussed above, as well as additional analysis conducted on auction programmes in Uganda and Zambia). The workshop was funded and co-hosted by the Embassy of Norway in South Africa and IRENA. It was also attended by the IFC and broader World Bank group, who presented the Scaling Solar concept. The aim of the workshop was to expose African power sector decision-makers to the frontiers of experience with

		renewable energy auctions on the continent and understand their requirements and needs. Presentations were also made by lawyers that were intimately involved in drafting some of the REI4P bidding documents and contracts, prominent investors (equity and debt), as well as developers that had been successful in the programme. A great deal of discussion over the two days of the workshops revolved around how bankability requirements could be included in auction programmes in the countries represented: issues such as sovereign guarantees and liquidity support; and take-or-pay clauses in the PPA. These issues generally received more attention from the delegates than auction design topics, since there was a recognition that a failure to address these aspects would limit competition and project realisation for any auction programme in these countries.
01-Mar-17	Financial Times IFC energy infrastructure series: Solar power in a fast-changing African energy market	This event - hosted by the Financial Times and the IFC in Johannesburg - covered solar market developments in Africa, primarily focusing on South Africa and Zambia. It was attended mainly by industry representatives (incl. lenders and equity investors). The event was being held during a time of increasing frustration in South Africa, as Eskom refused to sign the BW4 PPAs and all new procurement was halted. It provided powerful insights into the potential impacts of political economy issues on the continued, sustainable roll-out of an auction programme. The panelists and audience lamented, several times, the lack of policy certainty in South Africa and pointed out that it was undermining investor confidence and forcing companies into liquidation. The SA programme was however hailed as a procurement "revelation" due to its transparency, predictability and simplicity, which was seen as being essential for driving down prices and was a key reason for it being replicated elsewhere. Panelists and the audience referred to the importance of bankable PPAs, clear policy, strong institutions, strong leadership (in the procuring office), a well-structured procurement programme, transparency, good communication from the procuring entity, political stability (among others) as drivers of investment and pricing decisions. The event prompted me to think about how auction programmes in Africa need to integrate a whole range of issues not normally considered by the auctions literature; and how there was a need to find and bring in an implementation level focus for auctions, which clearly seemed to have an impact.
23-May-17	Innovate4Climate panel	I was invited to be a panelist for a workshop on innovative public-private partnerships for low carbon development at the World Bank's Innovate4Climate conference in Barcelona in May 2017. Other panelists included representatives from the World Bank and Argentina (to discuss the country's RENOVAR auction programme). A great deal of discussion centred around the use of auctions in various developing countries, as well as the factors that influenced bidding decisions and price levels. Countries covered included South Africa and Zambia, as well as Argentina and India. The session in particular emphasised transparency and predictability in auction processes for de-risking auction projects, and used the Zambian Scaling Solar programme as an example of this. It also focused on the role of power sector performance and policy certainty in contributing to price and project realisation outcomes. I was again struck by how little relative attention was paid to auction design considerations in explaining

		outcomes. This prompted me to try and articulate, more clearly, how auction design and implementation, alongside broader investment context-type considerations, impacted outcomes.
Jun-17	IRENA report: Renewable energy auctions in sub-Saharan Africa	I was lead author on a report commissioned by IRENA on renewable energy auctions in sub-Saharan Africa, primarily covering South Africa, Zambia and Uganda (draft findings of which were presented at the workshop in March). The report used IRENA's auction design framework to analyse the cases, which - while useful - also made it clear that it was difficult to make sense of the outcomes from these countries' auction programmes without understanding more about the impact of country and project level factors, as well as the auction implementation factors. We therefore explicitly included mainly project level issues around risk mitigation into the IRENA framework, and drilled down into issues around land access and security as particularly important in the case study countries. The report was published in 2018/19 (online and in print). Co-authors was prof. Anton Eberhard and Dennis Volk (IRENA). The report was reviewed by the IFC team responsible for the Scaling Solar programme, who provided valuable feedback and inputs. While I found IRENA's analytical framework useful to initially structure the analysis, it featured little explicit theoretical grounding; it also remained almost exclusively focused on auction design choices and their impact on outcomes, disregarding country- and project-level issues, and failing to reflect on implementation-level aspects. I had also been asked to review IRENA's bi-annual renewable energy auctions reports on two occasions (2017 & 2019), which again contributes to the background knowledge going into this thesis (both reports have been reference where appropriate).
Jun-17	Africa Energy Forum 2017	I attended the Africa Energy Forum (AEF) in Copenhagen as a sponsored student in 2017. AEF is the main investment forum for the African power sector and features several keynote speeches, panel discussions and workshops (as well as an exhibit) over several days. High level representatives from the public sector and industry all converge on this annual event, and major project agreements are signed and announced. At the forum, I interacted personally with IFC representatives that had designed and implemented the Scaling Solar programme (some of whom I had spoken to telephonically before). It was also during this conference where the Scaling Solar programme was publicly criticised by industry for what they saw as setting unrealistic price expectations and derailing several (directly negotiated or feed-in tariff) solar projects across the continent. There was generally a great deal of discussion around the value vs. problems of competitive procurement. South African government representatives at the forum were generally unable to provide investors with any real sense of confidence around the future of REI4P, which at that stage was still stuck due to Eskom's refusal to sign PPAs.

Aug-17	Malawi FIT project (USAID)	In June 2017 I was sub-contracted to develop a report on feed-in tariffs for Malawi, for USAID's Power Africa programme. The report analysed feed-in tariff regimes in sub-Saharan Africa and sought to establish key principle for successful FiT design. It included interviews with 17 renewable energy project developers and investors. Many of the interviews contrasted FiTs with auction programmes, and also discussed the factors underlying investment decisions (incl. for SA, Namibia and Zambia). I have not used the information gained from these interviews directly in this thesis, but the views shared shaped my thinking in terms of the analytical framework and the factors underlying price and investment outcomes. I was able to conduct follow-up interviews for this thesis with many of the people interviewed for this study, and as a consequence many of these views are directly expressed in the thesis.
11-Sep-17	Procurement handbook	I was part of a team assembled by the USAID Power Africa programme, led by representatives from the US department of commerce - to co-author a "handbook" on power project procurement in Africa. The book was produced in a "book sprint", which is an intensive, week-long writing process that involves at least 10 authors. Previous handbooks on power purchase agreements and project finance had been produced in a similar fashion (and with some of the same authors). Co-authors included lawyers, government representatives (incl. IPP office), equity investors, project developers and other advisors. The process exposed me to the various views on (renewable energy) project procurement, but focused mainly on the programme level elements of procurement. It exposed me to many of the realities that investors, developers and their advisors face when confronted with poorly designed and implemented procurement programmes, and their views of what a well-designed programme would include. The handbook was "launched" at Africa Utility Week in May 2018, where I formed part of a panel with two fellow authors.
05-Oct-17	Ethiopia training: RE financing and auctions	I was asked by the Danish Energy Agency and the Danish embassy in Addis Ababa to present some of our research at a small high-level workshop on renewable energy financing and auctions for Ethiopian government representatives and utility officials in Addis Ababa. There were also presentations by representatives from Germany's energy sector regulator as well as a consulting firm on auctions in Europe (incl. the AURES project, discussed below). The questions from the workshop attendants centered largely around the implementing institutions (incl. funding arrangements) of the auctions and how this might be applied in Ethiopia. It again prompted me to think beyond the standard auction design framework, to more actively try and understand the impact of auction implementation factors (which were still not well developed in my mind at that stage, when I still viewed these issues mainly through the lens of public policy design).

20-Nov-17	AURES workshop	I attended the final workshop of the AURES project in Brussels, Belgium. The AURES project is a multi-year applied research project involving several European universities, research institutions and consultancies to generate knowledge on renewable energy auctions and support European countries in their design and roll-out of auction programmes. The research programme produced 43 reports, including 16 international case studies, policy memos, etc. The project also produced an auctions toolkit and web-based designer tool, and ran several auction academy training events (two of which I attended remotely). The project partners also produced several journal articles on renewable energy auctions, several of which are cited in the thesis (and form core texts in some instances). The final workshop included representatives from the EU, the European wind industry and the international energy agency, where results from the project were presented, discussed and analysed. The AURES project played a considerable role in shaping my understanding of auction design, especially in terms of providing deeper theoretical grounding for many of the auction design elements and their associated outcomes. It also exposed the fact that much of the scholarship on auction design does not take into account implementation issues, as well as broader country and project level factors, that determine outcomes. This became especially clear during the workshop, where analysis of auction price and realisation outcomes was almost exclusively discussed through the lens of auction design choices. Issues such as a conducive investment environment, policy certainty, regulatory quality, planning, project bankability, payment security, and institutional capacity were taken for granted. More information on the AURES project is available here: https://www.auresproject.eu/
01-Jan-18	Journal paper: Renewable energy auctions in sub-Saharan Africa: comparing the South African, Ugandan and Zambian programs	I was the lead author of a peer-reviewed journal paper that appeared in Wiley Interdisciplinary Review (WIREs) Energy and Environment (25 March 2018), after being approached by one of the editors for a special issue on renewable energy in Africa. The paper compared auction designs and outcomes in South Africa, Zambia and Uganda and was largely based on the work done for the IRENA report and used a similar analytical framework (limited to auction design issues). The peer-review process helped sharpen the analytical framing and conclusions.
08-Mar-18	Socio-economic development in REI4P workshop	I was invited to attend a workshop on socio-economic development requirements and impacts by dr. Holle Wlokas at the Sustainability Institute at Stellenbosch. The workshop focused mainly on how REI4P's community impacts could be better managed and improved. It was attended by several local and international academics, economic development managers from various renewable energy projects and representatives from the IPP office. It exposed me to the complexity of these projects' socio-economic development impacts as well as the frustrations - from project developers as well as communities - with the process. Developers were in particular concerned about the increased risks and costs involved and the lack of clarity and guidance from the authorities. It is an area that has seen much more academic interest in recent years and which is growing in importance due to the imperative of ensuring a Just Energy Transition. While it was not an area that I was directly working on, it did impact my appreciation for the investment/ project realisation risks

		presented by the SED requirements in the bidding programme, which up until that point I had only really considered from a cost (and not necessarily risk) perspective.
May-18	EEG project: RE auctions in Africa	I led an applied research project on renewable energy auctions in Africa, as part of the Energy & Economic Growth applied research programme (funded by the UK government). Several reports/working papers were produced, including a global overview of renewable energy auctions, with summaries of auction design and (to a limited extent) implementation arrangements. The report analyses 12 auctions from four world regions (Latin America, MENA, Europe, Asia). Beyond the "standard" auction design features, it also explicitly looked at project bankability and risk mitigation features of the various programmes. It furthermore featured a separate section on auction implementation, paying particular attention to the auction implementing agency (but without a clear theoretical grounding that would explain the impact). When writing the report, I had become more convinced of the importance of this additional layer of analysis, but lacked the conceptual tools and language to clearly articulate <i>why</i> this was important. Subsequent reports included auction analyses in Uganda, Ethiopia, Zambia, Namibia and South Africa. The analytical framework applied in these reports included many of the elements of the framework used in the thesis: it analysed both country and project level factors - in addition to auction design decisions - and also sought to understand in more detail the auction implementation institutional arrangements and processes. At the time of writing these reports, I still lacked the conceptual language and theoretical tools to be able to articulate what exactly it is about the way that auctions are implemented that impacts results. I was initially looking at transaction cost theory, contracts theory and quite broadly at institutional theory. I eventually realised that the issue of trust was fundamental, and consequently sought out literature that could help illuminate this element (incl. what determines trust levels). Doing this work also gave me the opportunity to investigate the evolution of the auction programmes in different settings, and I was specifically able to track project realisation processes over time – which again highlighted the impact of the auctioneer in helping projects reach financial close and commercial operation.
15-May-18	Africa Utility Week: GETFIT Zambia	Representatives of the GETFIT Zambia programme (incl. ministry officials and the GETFIT secretariat) presented the intended programme's design and timeline to industry at Africa Utility Week in 2018. The audience's reaction was mainly focused on how bankability issues related to ZESCO's precarious financial position (incl. at that time, arrears in payments to IPPs and others) would be mitigated. A representative from the Zambian government sought to re-assure industry of government's commitment to reform ZESCO and improving its performance, as well as providing risk cover through e.g. a sovereign guarantee.
22-Jun-18	Africa Energy Forum 2018	At the Africa Energy Forum in 2018, I presented our analysis of renewable energy auctions during a dedicated panel on auctions in Africa. Panelists and audience members provided inputs and comments, including in particular that auctions are not immune to the "normal" threats that face private power projects in Africa (primarily citing country and project related factors). There was also a great deal of discussion about the "threat" of ultra-low prices to projects being realised (the winner's curse).

12-Jul-18	ATA webinar: Designing auctions for tariff optimisation	I was a panelist on a webinar organised by a Spanish commercial energy events and communications company ATA. The event focused specifically on auction design for tariff optimisation (i.e. competitive prices). The webinar included consultants/analysts and industry representatives, mainly from Europe. The webinar reiterated the importance of simplicity, predictability and transparency in auction design to support competition and resultant cost reduction.
25-Jul-18	TENTRANS project - kick-off meeting	I formed part of a consortium comprising South African and Danish universities for a research project called Tendering Sustainable Energy Transitions (TENTRANS). The project had three distinct work packages looking at auction design in general, local content and industrialisation, and local community impacts. The project came to a close in 2021. As part of our work package (auction design), we produced two journal papers (Energy Policy): the first focusing on the issue of market domination and concentration in South Africa's REI4P (where I was lead author); the second comparing South Africa's auction outcomes with those of European countries, and seeking to ascertain whether specific auction design choices resulted in these (co-author). The joint drafting and peer review processes for these papers again helped greatly in sharpening the conceptual analysis of the South African case in particular. The first paper, with its emphasis on the role of larger, international bidders in the programme, and their consequent impact on price levels, was important in helping me shape my conceptualisation of both the quantitative and qualitative aspects of competition. The TENTRANS project also included presentations to industry (at the 2019 Windaba conference) for their review, as well as steering committee meetings with representatives from government (incl. the IPP office, GreenCape) and industry (SAWEA) for their inputs and reviews. The project furthermore included quarterly virtual meetings, as well as annual meetings, where findings were shared and interrogated, and where investigators shared their general views on the key dynamics at play within the country's energy system and auction programme.
10-Aug-18	World Bank Spring days - Solar Energy	I was invited to present some of our work on auctions to World Bank staff at their annual Spring Meetings in Washington, as part of a session on solar development. Feedback received during the presentation indicated that analytical framework - while useful - still lacked full explanatory power (especially around implementation aspects). During the session there were also presentations and discussions on the Scaling Solar programme, as well as auctions in other parts of the world (incl. India, Poland).
08-Oct-18	Short course: Managing power sector reform and regulation in Africa	During the annual UCT GSB "managing power sector reform and regulation in Africa" executive education short course, I delivered a training session on renewable energy auction design and implementation. The preparation for this lecture, as well as the interaction during the class and feedback afterwards has been important in helping shape my thinking about auction design and implementation, and its impacts. Classes are usually very interactive and also feature role-playing assignments to explain certain auction dynamics. I have delivered similar lectures to classes in 2019 as part of the same course, as well as in 2018, 2019, 2020 and 2021 as part of the UCT GSB "Finance, contracts and risk mitigation for private power investment in Africa" short course. Each time I've presented on this topic, I've had the

		opportunity to reflect on and fine-tune my understanding of the auction model and its application in Africa.
Nov-18	AURESII advisory board	A second phase of the AURES project was started in late 2018, with funding from the EU (Horizon2020). I was asked to join the project's advisory board, alongside several other international auction experts. Advisory board members were officially part of the project's annual general meeting, where key findings and outputs were presented and input provided. The exposure to the auction analysis work happening in other parts of the world has been truly helpful in helping me shape my understanding of the auctions process and its impacts. A key output of this second phase of the AURES programme was a much stronger focus on the cost of capital as a driver of pricing, and at attempt at understanding how auction design impacts this. In particular though, it re-emphasised the fact that auctions in the African context are being implemented in very different institutional environments and investment contexts than those in Europe, warranting a greater focus on these level factors in my analysis.
12-Nov-18	IRENA PSC presentation	I presented my analysis of auctions in Africa at the 2018 International Renewable Energy Agency (IRENA) Programme and Strategy Committee meeting in Adbu Dhabi. IRENA also presented their global review of auctions, alongside experts from Mexico. This presented another opportunity to refine the analysis and solicit feedback on the practical importance of this research. The meeting focused not only on auction design issues, but also particularly implementation challenges in several jurisdictions. A large global RE developer also emphasised the impact of policy certainty for reducing project prices and increasing project pipeline development; and scale to bring down costs through enabling value chain integration and better financing. A DFI panelist emphasised the fact that while auctions reduce the risk of "am I paying too much?" (referring to the obsolescing bargain dynamic), projects still face the "normal" risks facing RE project development - emphasising the importance of a robust contractual framework as part of the auction design considerations.
14-Nov-18	Africa Investment Exchange	I attended the Africa Investment Exchange - Power and Energy - conference in London. During AIX (conducted under Chatham House rules), there was a long debate regarding the value of auctions vs. direct negotiation in securing lower prices. The debate forced me to go reconsider some of my assumptions regarding the impact of competition on prices and more clearly articulate the reasons for what I was seeing empirically. The main argument was that auctions was not the only way of reducing information asymmetry between the public and private sectors, which up to that point had been the main theoretical argument for increasing competition in my framework. I consequently went back to the data and discovered that competition was also squeezing margins along the value chain (reducing costs), and offering the public sector the opportunity to select better/more cost-effective bidders. It was also argued that prices for renewable energy projects were being driven down by technology cost reductions, lower cost of capital, lower risk and more competition. Panelists also lamented that many projects were not reaching financial close because lenders needed additional risk

		mitigation cover. Policy certainty, predictability and transparency (also in procurement) was also pointed out as reducing risks, and therefore costs. Panelists further pointed out that well structured procurement programmes increased accountability, transparency and predictability, which is largely why more capital was flowing to these programmes. During the meeting I was also approached by members of a certain African state's energy ministry that was, at that stage, designing a renewable energy auction process for their country. It quickly became clear that the auction design decisions being made (e.g. very low price ceilings, no risk mitigation) were suppressing market interest, prompting further interest in pursuing this avenue of enquiry.
05-Mar-19	GET FIT financial bid opening	I was invited to attend the financial bid opening ceremony for the GETFIT Zambia solar auction process as an independent observer. The process was illuminating, and the surprised reactions of the secretariat as well as the GETFIT board to the low prices again prompted me to dig deeper to understand the drivers of pricing in these programmes. The GETFIT case - implemented after Scaling Solar - ended up being particularly important in helping me confirm the impact of trust in the bidding process and auctioneer on project pricing.
01-Feb-20	Journal paper: De-risking solar auctions in sub-Saharan Africa	I was the lead author of a peer-reviewed journal paper (Renewable & Sustainable Energy Reviews), along with researchers from Oxford University's Smith School, that sought to understand the dynamics underlying and impacts of the site selection processes of auctions in Africa. The paper compared the experiences in South Africa and Zambia, based on interviews with the industry (bidders) but also public sector officials. The process of developing this paper emphasised the importance of adopting a "project finance mindset" when it comes to auction design in the African context, which emphasises a clear and consistent risk allocation logic.
05-Mar-20	EEG2 kick off	A second phase of the EEG project kicked off in early 2020. The project was aimed at analysing auctions in Latin America and India to extract lessons for auctions in sub-Saharan Africa. Country experts - most deeply involved in the design and implementation of these programmes - were invited to a kick-off workshop in Cape Town. During the workshop, the country experts were introduced to the analytical framework and general agreement was sought on the way to conduct the analyses. A second workshop day was held during which the country experts presented their experiences to South African government and industry representatives. The workshop, the feedback from the experts and the audience, as well as the subsequent shaping and editing of the reports, again allowed me to reflect more carefully on the value and shape of the auctions analytical model. Even though the analytical model used during this phase was closer to the one used in the thesis, it still lacked sufficient clarity - especially (but not limited to) the implementation aspects.
16-Jul-20	Ministerial RE sector engagement forum	I formed part of the inaugural "Ministerial RE sector engagement forum" held in July 2020. During this forum, the views of various stakeholder groups regarding the role of renewables were expressed, highlighting many of the tensions inherent in South Africa's energy transition.

15-Dec-20	AIX: competitive tenders (webinar, panel)	I was part of a panel at a 2020 AIX webinar, specifically focusing on competitive tenders. Other panel members included IFC representatives involved in the Scaling Solar programme, as well as project developers. Feedback received during the panel discussion again emphasised the importance of clearly articulating the impact of the competitive dynamic, as well as clearly thinking about the reasons for project realisation outcomes.

Appendix E: South Africa analytical framework with evidence

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	SA characterised by relative macro-economic and political stability, although sovereign credit ratings continued to decline during the 2011 – 2019 period. No evidence of economic and political conditions directly impacting prices or project realisation, with dramatic price reductions and high realisation levels coinciding with sovereign credit ratings downgrades. Some international bidders did however consider these conditions when deciding whether to enter the market (impacting competition levels). SA's loss of its investment-grade credit rating also limited the sources of international capital available, which could have indirectly impacted project prices (though the impact was muted due to the prominence of local debt finance). Strong, independent judiciary remained intact and supported the legality of the auction awards, which both supported project realisation of awarded projects in later BWs and featured as a decision-making criterion for international bidders, increasing competition levels. "They (US pension fund) were willing to invest in ZAR, as long as we (SA) retained our credit rating. We lost this, so now we have to look for other funders" (Interview 20) "We looked at whether there is Rule of Law in the country, whether we will be able to enter into and get a contract enforced." (Interview 18) See section 3.5.2.
Supportive energy policy framework	SA's energy policy framework allows IPPs and has RE targets. Electricity Regulation Act amended to increase ministerial powers to circumvent Eskom's influence on the market. REI4P seen as manifestation of energy policy implementation and certainty. No evidence of the policy framework directly impacting project prices, but policy stability (as manifested by predictable IRP-based REI4P rounds) increased competition levels. Project realisation would have been near impossible without supportive policy. Policy certainty eroded in post-2015 period as Eskom refused to align with government policy on REI4P; IRP processes delayed and threats of renegotiations surfaced, which negatively impacted the realisation timelines of projects awarded post-BW3 and likely reduced competition levels for later BWs. See section 3.5. "The policy uncertainty is tarnishing (the image of REI4P)" (Interview 26) "With ESKOM not signing PPAs since 2016, many companies have left. You don't pull the carpet out from under a new industry...The players that can actually stay in the market are the ones that can weather the REI4P uncertainty" (Interview 18) "We trust that a bid window wouldn't go ahead without the necessary legislative framework." (Interview 39)
Regulatory transparency,	Serious concerns regarding regulatory tariff-setting – which resulted in non-cost reflective tariff levels – necessitating an intergovernmental framework agreement that

consistency and fairness	mitigated this impact on project prices. The predictable (albeit onerous) regulatory licensing process was not identified as a barrier to project realisation. "We had to set up the intergovernmental framework agreement (GFSA) thinking maybe NERSA or DOE would not play their role. Eskom tried to undermine the agreement, but it was watertight" (Interview 30)
Coherent sectoral planning	IRP planning processes and roles clear and allocated to the ministry (although planning capacity remains located in Eskom), but outputs are highly contested. While the IRP initially provided market certainty, this was gradually undermined as contestation increased and finalisation was repeatedly moved out. There is some evidence of IRP-based bidding rounds increasing competition (thereby impacting prices) by stimulating project pipeline development, but later IRP-based uncertainty limited investor confidence (for rounds yet to be implemented). Limited evidence of the planning framework directly impacting project realisation, though that fact that the IRP was not updated and approved between 2011 – 2019 was used as a reason to delay the implementation of BW5 onwards. "Without the IRP it would have been hard to make development risk approvals. The IRP provided the certainty, line of sight needed to substantiate project and bid development" (Interview 3) "The IRP didn't necessarily influence our decision to bid in the REI4P, a programme we deem very solid, so we trust that a bid window wouldn't go ahead without the necessary legislative framework. It (IRP) did influence our development pipeline, and generally allowed us to make medium- to long-term plans for the company, including staffing, training etc." (Interview 39)
Competitive bidding practices	SA implemented competitive bidding rounds for utility-scale RE projects based on approved IRP from 2011 – 2015. Significant evidence that the competitive pressure in later bid windows both revealed bidder costs and reduced margins, resulting in competitive prices, as well as provided a viable route to market for the private sector (thereby indirectly supporting project realisation). There is also evidence that competitive processes provide more predictability and certainty to the market – again stimulating project pipeline development and increasing participation rates (competitive pressure). See figure 3.6. and section 3.4.2. There is also evidence that the lack of competitive pressure in BW1 resulted in prices higher than the REFIT levels (section 3.3.3.4). "Everyone adjusted their behaviour to be more competitive" (Interview 15) "We underestimated the competition. Our tariffs were too high. We thought they (tariffs) would remain high." (Interview 18) "Margins are becoming very slim (referring to later bid windows)" (Interview 19) "Auctions are almost always better because they cannot be changed arbitrarily by lawmakers" (Interview 18)

PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	REI4P featured large overall auction volumes – somewhat reduced in later rounds, but still very large for the region. Significant evidence that large auction volumes, coupled with onerous qualification requirements and short bidding timelines, resulted in low levels of competition in first two BWs, resulting in high prices. There is also evidence that large overall auction volumes attracted significant competition – especially from large, experienced international bidders – and enabled economies of scale, pushing down prices in later rounds. No evidence of larger auction volumes directly impacting project realisation, but it did indirectly stimulate longer-term market development (incl. support services) and attract experienced, capable bidders that would ultimately support timely realisation. See section 3.3.3.4. “We could only put together one bid in time (referring to BW1). This was what everyone experienced. The timelines were too short.” (Interview 19) “We did not cap BW1. Everyone said we will destroy the market. We wanted to be as friendly as possible to the market.” (Interview 30) “South Africa was the only real market in Africa, except Egypt, so it kept bringing them (international investors) back” (Interview 19) “Because of scale, it makes sense to bundle projects, raise financing for all of them. Get discounts for turbines, better negotiation position with contractors, financiers.” (Interview 18)
Scale-friendly project size limits	SA set large project size limits, although arbitrarily determined. Evidence that project sizes were large enough to enable price reduction through economies of scale – and that project sizes increased as prices reduced - but also that size caps limited further price reductions. Limited evidence of project size caps improving longer-term competition levels. There is also evidence of larger project sizes leading to longer realization periods, as realization timelines increased over bidding rounds (as average project sizes increased) (see also Kitzing et al, 2021). “Project sizes were a thumb-suck. We now know we can go bigger...” (Interview 30) “The whole industry is going for bigger and bigger projects” (Interview 8) “Economies of scale really matter for wind” (Interview 18) “Project sizes (for wind) are higher. Why? Surely solar PV would benefit from the same economies of scale.” (Interview 19) “What we really like is programmes where multiple projects get awarded. Like REI4P” (Interview 16)
Technology choice: neutral vs. specific	Technology-specific demand bands set out, effectively neutralising competition between technologies.

	Evidence that technology-specific demand bands resulted in higher prices since the auctioneer had to award projects to specific technologies, even when cheaper bids for other technologies were submitted. Evidence of technology-specific demand bands having an impact on project realisation timelines, with wind projects taking longer to be realised than solar PV. See Table 3.1. and Figure 3.1.
Bid award limits	No bid award limits set, which enabled larger players to benefit from economies of scale and stronger negotiation positions with contractors, suppliers, financiers – driving down prices. Also seems to have increased market concentration, but not to the extent that it limits competitive pressure (see Kruger et al, 2021). No evidence of the lack of bid award limits impacting project realisation. “Bigger players are more powerful. They have more power to negotiate with suppliers, able to access capital at a lower cost. Because of the design of the tender in SA, where there is no cap on the amount of MW going to one company, some people can take it all.” (Interview 21) “People try to bid more projects together... if you win more projects, then you get economies of scale. Go in hard assuming you win it all. It is risky, but you can win with that approach” (Interview 16) “We decided SA needs the cheapest electricity. If a bidder can stomach a corporate deal and it is still the cheapest, why worry? None of the bidders were “Mickey Mouse” and reputation is for them important, therefore we felt it is unnecessary to interfere. It also had a very positive impact. It made the old boys club of the banks think twice about their risk appetite. ENEL did us a favour.” (Interview 30)
Bidding rounds	Regular (annual) rolling bidding rounds scheduled and published from BW1. Evidence that regular, scheduled bidding rounds drove down prices by increasing competition levels (also reducing margins along the value chain), stimulating cost-effective local services development and increasing investor comfort (reducing the cost of capital). See section 3.4.2. Limited evidence that regular auction rounds had direct impact on project realisation, although there is some evidence that it stimulated capacity building, project pipeline development and limited the possibility of project awards being challenged – all of which indirectly contributed to project realisation. “Each REI4P round has been more aggressive” (Interview 15) “Costs have come down significantly from BW1 to 4, even through to financial close. No one had the skills previously. All skills, especially legal, had to be imported. This has changed, with project finance now being established in South Africa.” (Interview 19) "Financing costs have come down. Banks have become sharper. We saw lower interest rates in later rounds. Competition between financiers is also important. If they are too expensive, their projects will not win." (Interview 16) "With our PPPs, we realised that when there is only 1 winner, everyone is unhappy. It increases the possibility of a (legal) challenge. We wanted to mitigate the risk of this

	challenge, which is why we used the rolling procurement model to give people another chance." (Interview 30)
Winner selection	Winner selection based on price (70%) and a basket of socio-economic development criteria (30%) Evidence that the use of SED criteria resulted in higher prices of awarded projects, but no distinguishable impact on project realisation. "The 30% scoring did swing some bids" (Interview 30) "On the ED side the 30% influences the price significantly." (Interview 19) "Local content requirements drive up EPC prices. Any socio-economic development usually gets a percentage of revenue" (Interview 43)
Price caps	Price caps were set and disclosed for BW1 – 3. They were removed for solar PV and wind from BW4. Evidence that published price caps led to higher prices in BW1 and that they are not necessary when there is enough competitive pressure. Average BW1 prices were above REFIT levels, very close to price cap levels (See table 3.6). No evidence of price caps directly impacting project realisation. "We chose not to set disclosed price caps because we did not want the market to bid at these levels, like what happened in South Africa" (Interview 28)
Physical qualification (project/bid preparation) criteria	REI4P used very onerous (late-stage) physical qualification criteria, including funding commitment from debt and equity providers. The case produced evidence that onerous physical qualification criteria lowered competition levels, which contributed to higher project prices (especially in the first rounds), and that they also slightly increased the costs of bidding. Substantial evidence that late-stage physical qualification criteria – incl. financing commitment – improved timely project realisation (see Kitzing et al, 2021). "It is a very onerous bidding process because most authorisations need to be ready when bidding. Development costs are therefore high. You eliminate the chancers, but also the smaller players." (Interview 24) "It (referring to onerous physical qualification criteria) is good since you can't really speculate... all the basics should be in place for you to be able to bid...it is probably the most onerous process in the world" (Interview 19) "South Africa requires bids at a very mature stage." (Interview 26) "We need 58 permits to reach financial close. We will have all the major ones ready by the point of bidding. This is a major cost area..." (Interview 15)
Financial (bid bond) qualification criteria	REI4P required relatively expensive bid bonds (US\$ 8000/MW).

	The case produced evidence that the use of bid bonds probably lowered the quantity of bids submitted, but increased the quality of bids by stimulating interest from larger, more experienced bidders – thereby increasing competitive pressure. There is also some evidence of the bid bond indirectly increasing project realisation by filtering out inexperienced, unfeasible bids. It acted as a first hurdle to ensure bids were credible, financeable. “Bid bonds have an impact on who will bid. It weeds out those who are not serious...A bid bond makes the programme more credible. It signals that it is a serious programme. When bidding, you are always afraid that people are coming in with crazy bids, so this is a deterrent. We always have the risk of being a serious bidder vs. smaller, crazier guys.” (Interview 16) “The bid guarantee was a big factor. For a big company like Building Energy, this means nothing. They can do it. For us, it is a big cost.” (Interview 20) “It (bid bond) is relatively small compared to the size of the project. You put down a R14 million bid bond for a wind farm, but the capex for the project is R2,5 billion.” (Interview 8)
Auction access requirements	REI4P set high access requirements, evaluating both bidders’ experience/technical capacity and financial capacity. The qualification requirement for demonstrated funding commitment effectively neutralised or at least severely limited the “additional” screening impact of the access requirements, since lenders evaluated developers’ experience and financial health as part of their due diligence process. The high access requirements therefore appear to have had little to no impact on competition levels or project realisation beyond what lenders would already have evaluated. “It is not only qualification requirements that you need to pass. Lenders will look at your balance sheet... you need to demonstrate that you are fully funded (to bid).” (Interview 24)
Penalty regime	REI4P uses a performance guarantee, a punitive PPA length reduction regime for project realisation delays, and penalty payments for underperformance on SED commitments. Projects also get paid an “early operating period” tariff, equivalent to 60% of their bid tariff. There is some evidence of penalties exerting upward pressure on prices (though this seems to be offset by the “savings” of not meeting the respective SED commitments that trigger the penalties). Some evidence of performance guarantees improving project realisation, but this seems to be limited since they have not been used. The early operating period tariff generally incentivises timely realisation, but the threat of the PPA reduction seems to be more powerful. “People have always priced in penalties (referring to projects not meeting SED commitments)...” (Interview 24) “Performance bonds are not being called for any project” (Interview 24)

	"We have...seen lots of projects not reaching financial close, COD on time – but their guarantees are not being called. It is in government's interest to not lose these projects..." (Interview 15) "The minute you are in as an awarded sponsor, no one has the courage to disqualify you." (Interview 21) "The preferred bidder guarantee (performance bond) would be more effective if used, but it is perhaps not that important (to incentivise project realisation)" (Interview 15) "The impact (of penalties) might be more psychological" (Interview 16) "The PPA reduction was automatic. It was a big incentive. We did not call on the performance guarantees, since we did not want to lose any projects. It was a way to build the market. We really needed the power and wanted closure. We did not want to penalise people when you wanted to keep them in the market." (Interview 30) "I guess the devil is in the detail with those things (penalties and early connection payments)... the more "powerful" is probably the threat, however it also has the effect of increasing the tariff because of the increased risk across the construction value chain (from sponsors to debt funders to contractors), so it's really about striking the right balance. Early payments are usually a sufficient incentive for everyone to keep on track, as the rewards are usually shared across the same value chain...The performance bond is mostly to disincentivize us from walking away from the project should we face issues post-financial close, while the PPA reduction is a clear timing penalty. The mechanism makes sense, and can easily be modelled for IPPs and banks, and we usually prefer it to a binary mechanism of PPA cancellation or bond pulling even for a single day of delay" (Interview 39)
Staged bidding process	REI4P used a one-stage bidding process; SPI4P used a two-stage process. Evidence that the two-stage bidding process increased bidding costs (only used in SPI4P), thereby potentially lowering competition levels and increasing prices (see Kruger et al, 2021). There is also some evidence that one-stage bidding process might induce more aggressive bidding. No evidence of either one or two stage process having a distinguishable impact on project realisation since SPI4P projects' contracts have not been signed. "The two-stage bidding process was nice... it meant that competition was already less by the time you bid, so you knew that you could win. You felt like you had a better chance through the two-stage process." (Interview 16) "The two-stage process made it more difficult... more expensive than just a single stage." (Interview 18) "The two-stage process's intent did not happen. The second stage evaluation meant again going through a rigorous process, which doubled the costs." (Interview 24)
Auction format, pricing rule	South Africa used a simple sealed bid, pay-as-bid auction format that was familiar to the market, thus lowering bidding risks and increasing competition levels. "Dynamic bidding is worse. We don't like live auctions, where you have anonymous other bidders. You're not even sure if they're real or just bots. I have had a very bad

	experience with them...we stopped participating. The selected bidders failed, and we then re-engaged with the client.” (Interview 16)
Auction Implementation	
Procurer	IPP office was staffed by capable, experienced officials with a track record of successfully working with the private sector. It initially had strong support from National Treasury – arguably the apex ministry in SA. Substantial evidence that trust in the auctioneer increased competition levels, thereby increasing price pressure, and attracted strong, experienced bidders, thereby improving project realisation. “Trust plays an important role - in the entity and the process. Does the procuring entity have credible advisors onboard? Is there sufficient government support? Effectively you need ... seriously credible international advisors.” (Interview 19) “Trust in the IPPO played a very big role in our decision to bid” (Interview 18) “We spend significant time and money on bids. We must feel certain it is a substantive process with a reasonable outcome. We look at the entity’s track record. If that entity has no experience, who are their advisors. What other types of projects even in other sectors have been done to show they are serious about doing deals.” (Interview 40) “If you lack trust in the procuring entity then there is a good chance you’ll also distrust the process.” (Interview 3) “Trust in the procuring entity plays a fairly big role in our bidding decision. We consider whether they have a successful track record in running similar procurements and adequation of the resources with the size and complexity of the procurement. For ‘first time’ procurers, we would value their transparency and willingness to engage with key stakeholders. We don’t often give procuring entities second chances if they bungle a procurement as a result of not taking our feedback into consideration.” (Interview 39) “In my experience reliability, transparency and tender authority capability are the baseline for an investor to prepare and decide to submit a bid, mainly if the process is extremely expensive such as the REI4P.” (Interview 26) “What was important for REI4P was building this reputation from the first three rounds...in short, trust (and reputation) in the procuring entity and bidding process is very important to bidders, and can be crucial in making a decision to bid or not” (Interview 16)
Procurement process	REI4P appears to be viewed as a fair, transparent, well-structured and well-run programme, although negotiations for BW4 projects and subsequent developments somewhat undermined this. Substantial evidence that trust in the procurement process – as distinct from the procuring entity, but also as a signal of the procuring entity’s capability and integrity – increased competition levels (incl. from large, experienced international bidders) that drove down prices and supported timely project realisation. Limited evidence that a well-designed and implemented process support project realization.

	“The integrity of the procurement process, whether public or private, is fundamental to investment decisions. This is because the pre-financial close development risk component is driven by the confidence / trust that the subsequent process will be transparent, fair, open etc. So we will not put money into countries or processes that are opaque or lacking well-crafted best practice rules or integrity. Sometimes private sector is worse because they may run processes and then halt them just to gain information on the landscape and for self-interest to see if they should fund their own power generation themselves and not via IPPs.” (Interview 3) “What made us trust the process was the quality and completeness of the RFP documents provided and rigour of the process, incl. briefing notes and so on” (Interview 19) “Trust in the procurement process and the likelihood of follow-through is more important (than trust in the procuring entity)... it is a key deciding factor in whether or not to participate in a tender process. A lot of time and resources are invested in each tender process as a bidder, so we need to make a decision on where to apply these limited resources” (Interview 41) “Trusting the procurement process has a very big impact. A poorly designed process and suite of project documents usually reveals the level of maturity or seriousness of the procuring entity. From experience, I can’t recall a single poorly designed procurement process for an IPP scheme that successfully closed.” (Interview 39) “With REI4P, once you submit you know what you’re gonna get. Obviously the trust part helps a great deal and this was also seen in REI4P and the IPP office, and led to big interest from bidders after the first rounds showed that South Africa was serious and committed, and resulted in the subsequent price decline” (Interview 16)
Support to awarded projects	IPP office supported awarded projects to reach financial close by coordinating government departments and assisting awarded bidders. Evidence that this played an important role in improving project realisation, and increased competition levels. “We consider (in our bidding decision) processes with evident track records like REI4P, in which the procuring entity are afterwards involved in the financial close process as providing additional reliability for the investor.” (Interview 26) “The IPP office played a facilitation role, especially during what we called the contractual close process, making sure that all the state’s processes and signatures were in place. Some things will be difficult for the IPP; they might for example not know who to talk to. If there was a crisis – for example with Eskom, or communities - we also tried to help where we could.” (Interview 30)
PROJECT	
Favourable equity partners	Most REI4P projects awarded to purely commercial entities – many with no African track record. Later rounds saw significant volumes awarded to large international companies new to the market. Evidence that competitive pressure in bidding process elevated larger bidders’ ability to reduce costs as a driver of project pricing. Evidence that larger bidders’ experience, skills and financial standing improved project realization.

	"They (big companies) have access to the best technology. They can buy in bulk and benefit from economies of scale. They have all the skills in-house and they have a more powerful negotiation position with contractors." (Interview 20) "Global utilities have become more aggressive to get market share... it is a combination of lower returns, integrated value chains, and spreading risks and returns across different markets." (Interview 15) "They (big bidders) are used to doing large deals around the world, they know which buttons to push. They have the commercial know-how to improve bankability" (Interview 21)
Favourable debt arrangement	Mostly local debt from commercial banks (with limited DFI funding for empowerment shareholding). Seemingly limited competition between lenders, but lower returns and more sources of debt in later rounds. Evidence that lending costs (premiums) contributed to higher costs of first rounds, and that lower returns in later rounds enabled lower prices. Evidence that lender involvement in REI4P design and sign-off on bids significantly impacted project realisation. "At the time (BW1 & 2), the lenders had not done these projects and were quite scared... all their term sheets were the same. Lenders were giving shorter tenor of debt and wanted debt service coverage ratios completely out of market range. It made debt very expensive." (Interview 23) "Banks in SA don't compete against each other. They divided the market among each other... DFIs in SA are not reliable partners. They are changing the goalposts all the time. This introduces risk in the system." (Interview 15). "Financing costs have come down. Banks have become sharper. We saw lower interest rates in later rounds. Competition between financiers is also important. If they are too expensive, their projects will not win." (Interview 16) "REI4P was developed with the banks...The only way that REI4P works is if the banks back it up" (Interview 8) "Banks and bidders had to sign off that they sign off (on funding). So we made sure that each project would get money to start construction." (Interview 30)
Credit-worthy offtaker	Eskom's credit rating is deep into junk status, and was already below investment grade when the programme started. Tariffs are below cost-reflective levels, debt levels are unsustainable and collection rates are falling. No evidence of this directly impacting pricing since this risk was mitigated by the sovereign guarantee. No evidence that off-taker credit-rating directly impacted project realisation, but Eskom's willingness and comply with government policy and take the power significantly delayed project realisation in later rounds (and effectively killed the SPI4P). "Eskom in general is such a mess that no PPAs they sign are bankable on their own. They are the dark shadow hanging over everything. If the sovereign guarantee falls away, you won't get funding." (Interview 18)

	"Eskom is in dire financial straits. Treasury does not want more Eskom exposure, but we're not sure that the banks will be comfortable with Eskom as offtaker without a Treasury guarantee" (Interview 25)
Secure and adequate revenue stream	Bidders provided with bankable, non-negotiable contracts, including a robust PPA and a sovereign guarantee (in the Implementation Agreement) - backed by the Government Framework Support Agreement. Evidence of this impacting price levels through lowering the cost of debt and increasing competition levels. Substantial evidence of these provisions supporting project realisation through ensuring project bankability. "She (Karen Breytenbach) was good at making sure that the large programme stayed bankable. You want foreign entities to be bidding and operating. You want people who knew what they were doing." (Interview 23) "It is very onerous in SA, but there is a return on investment because the whole thing is bankable" (Interview 21)
Credit enhancement and other risk mitigation measures	REI4P includes a sovereign guarantee that commits government to honour Eskom's payment obligations and pay outstanding equity and debt (+ returns) in case of nationalisation or expropriation. Evidence that this enabled the provision of long-term debt on reasonable terms (incl. from institutional investors), thereby reducing prices. Substantial evidence of these measures supporting project realisation through ensuring project bankability. "Our trust assessment is made up of a number of factors, such as: financial position, bankability, the availability of sovereign or other forms of guarantees." (Interview 27) "Eskom in general is such a mess that no PPAs they sign are bankable on their own. They are the dark shadow hanging over everything. If the sovereign guarantee falls away, you won't get funding." (Interview 18) "Eskom is in dire financial straits. Treasury does not want more Eskom exposure, but we're not sure that the banks will be comfortable with Eskom as offtaker without a Treasury guarantee" (Interview 25)
Strategic management & relationship building	Projects were both required and incentivised to make a number of socio-economic development commitments. Evidence of these commitments exerting upward pressure on project prices. Evidence that SED commitments both helped secure projects' social license to operate and introduced additional risks. "Most of the BEE investors in BW4 were not part of the development process. None of the development risks affected them, but they had to come in on par terms. The risk-reward balance with these entities is therefore out of balance, and this affects the tariff..." (interview 19)

	"Higher local content has a higher tariff as a result" (Interview 21) "We estimated a 1,5 cent price impact per 1% ED point" (Interview 20) "We faced strikes and protests at many of our sites, because communities are not interested in whether the BEE or local shareholder is South African. They want real benefits for their local businesses. This is something we need to manage." (Interview 19) Also see: Wlokas, (2018); Davies (2021)

Appendix F: Zambia analytical framework with evidence

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	Zambia characterised by relative political stability, but rapidly worsening economic conditions, leading to sovereign loan defaults in 2020. No evidence of economic or political conditions directly impacting project prices, but significant evidence that project realisation (GETFIT) adversely impacted by worsening economic situation. No evidence of the impact of the judiciary on prices or realisation, although the impact of Zambia's relatively low scores on judicial quality are mitigated by offshore arbitration clauses in project documents. ““About 7 years ago, GDP started going down. There was heavy borrowing, lots of waste. This impacted the exchange rate. Overall, there was a lack of financial discipline....[now Zambia's government] hasn't convinced anybody that they can pay back the loans” (Interview 35) “All DFIs were shocked at how bad things (finances) were” (Interview 31) “The tender authority and process play an important role, but the country's financial level of indebtedness, corruption or access to hard currency (convertibility) play an essential role for project implementation (after awarding).” (Interview 26) See section 4.4.
Supportive energy policy framework	Zambia's energy policy framework allows IPPs, but did not provide a clear route to market for projects. This did not directly impact project prices or realisation (beyond being a binary constraint). “We had a meeting with Total, who wanted to come into the solar sector. They shared that they had experienced frustration, faced significant blockages. There was no coherent mechanism by which they could play a role... many others were also turning up... it became apparent that there was no structure, no coherence...” (Interview 41)
Regulatory transparency, consistency and fairness	Zambia's regulator is generally seen as technically competent, but regulatory decisions were undermined by political interference. This impacted price levels by requiring further credit enhancement and risk mitigation cover, which would be a cost to projects. It also impacted project realisation for GETFIT projects by disrupting the security of the revenue stream. The regulatory framework was also not suited to solar PV, which delayed the realisation of the Scaling Solar projects, nor was all information on licensing costs etc. included in the procurement package (which could have derailed project realisation). “The auctions process was held up because there was no clarity in the regulatory framework. With Scaling Solar we were playing catch up. This is potentially dangerous... all information on license fees etc. was not included in the procurement package. Developers said: ‘you didn't tell us this!’ it was very hot” (Interview 11)

	“The ERB had no grid code design for solar. We thus had to submit lots of requests for exemption. It was complicated, and there were no incentives for their timely resolution.” (Interview 12) “The ERB experienced political override on tariffs” (Interview 35) See section 4.4.1.
Coherent sectoral planning	Zambia has no coordinated power generation expansion plan; decisions on procurement volumes were made arbitrarily. No evidence of this impacting project prices or realisation rates beyond limiting project pipeline development. “Planning is a big gap. There is no power sector masterplan. The plans that are there are sector-based, or institutionally based. There is no integration, and plans are highly fluid.” (Interview 11) “We did a big study to look at solar, but the targets were just plucked out of thin air” (Interview 28)
Competitive bidding practices	The competitive bidding processes provided a viable, predictable route to market and harnessed competitive pressure between interested developers to reveal bidder costs. Some evidence of the time-bound competitive bidding process helping the first (Scaling Solar) projects reach financial close and commercial operation by e.g. doing preparatory work on the site and project documents. “Scaling Solar will always attract competition and low tariffs, because the market is willing to invest the time and provide the most competitive tariffs possible, due to the higher likelihood of follow-through. A programme like Scaling Solar also provides us with greater certainty that key elements required to make a project bankable... have already been thought about and structured in a way to make the arrangements bankable” (Interview 41) “We had a meeting with Total, who wanted to come into the solar sector. They shared that they had experienced frustration, faced significant blockages. There was no coherent mechanism by which they could play a role... many others were also turning up... it became apparent that there was no structure, no coherence... what struck us about (Scaling Solar) was that it was a one-stop solution. GETFIT also adopted the price discovery approach. It was very positive. We wanted to sustain this momentum” (Interview 32) “If we are serious about this (GETFIT), we want to go for this as hard as possible. It is one of those things. If you are not aggressive, you won’t win. It is super difficult to hold back” (Interview 16)
PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	The auction volume for both Scaling Solar and GETFIT programmes were relatively large for the region (100+ MW) – attracting significant competition, including from large, experienced international bidders – but still small enough to ensure competitive pressure.

	“Competition is so extreme in renewables space (at least for wind and solar) that other bidders are the key element enforcing downward pressure.” (Interview 16) See table 4.8.
Scale-friendly project size limits	Both Scaling Solar and GETFIT programmes allowed bidders to optimise project sizes, enabling economies of scale, although higher limits would have achieved even greater economies of scale and better prices. No evidence of project sizes directly impacting project realisation. “Scaling Solar created a lot of pressure. The messaging became: just get the lowest tariff possible. So we had to increase project sizes, and the overall allocation” (Interview 31)
Technology choice: neutral vs. specific	Both programmes only procured solar PV, mainly due to the technology’s cost competitiveness, simplicity and ability to be built quickly. No evidence of this having a direct impact on price or project realisation. “The question was: how could they (Zambian government) do something that would be visible in an election cycle? The answer: Solar!” (Interview 28) “The situation was dire, and IDC was requested to respond with a quick solution to an emergency and national crisis. Therefore IDC looked for credible options that could provide cost effective and sustainable power in the shortest possible time. Solar PV... was the most cost-effective and quickest sustainable solution.” (Interview 32) See also Kruger & Eberhard, 2018.
Bid award limits	Both Scaling Solar and GETFIT used bid award limits, resulting in higher prices for awarded projects in both programmes. No evidence of this impacting project realisation. “What we really like is programmes where multiple projects get awarded. Like REI4P. it’s the same with GETFIT. At least three bidders are going to get something out of this process.” (Interview 16) “Other important factors (for the bidding decision) are how many bidders can win? Is this once off or is there more future volume available? Reason being, establishing a business in a new and “colourful” geography is tough and you don’t want to be doing it once off.” (Interview 19) See table 4.1.
Bidding rounds	Neither Scaling Solar nor GETFIT had dedicated rounds, though it could be argued that GETFIT effectively functioned as a second round of Scaling Solar – which had an impact on prices. No evidence of a direct impact on project realisation. “Scaling Solar created a lot of pressure. The messaging became: just get the lowest tariff possible.” (Interview 31)

Winner selection	Scaling Solar used price-only scoring, while GETFiT scored projects on a 80:20 Price:Technical basis. No evidence of significant price impact either way, nor did the project preparation level scores in the GETFiT process impact projects' realisation. "We scored on tariff only. It would be transparent and comply with public procurement... tariff was the most important consideration" (Interview 33) "80:20 scoring did not impact our price at all..." (Interview 16)
Price caps	No price caps set. It seems to have created downward price pressure. No evidence of this impacting realisation rates. "It is standard for Scaling Solar to not set price caps. The rationale is that caps tend to anchor sponsors around a specific threshold." (Interview 44) "I don't consider the caps very useful (at least for all cases where you have enough competition). Competition is so extreme in renewables space (at least for wind and solar) that other bidders are the key element enforcing downward pressure. The caps (if they are given) are usually outdated and too high anyways... they help understand what expectations government has, but they don't influence what tariff we will bid. In general price caps are not very useful in my opinion and very difficult to set/get right. I think it's only useful if a government or the procuring entity really has a certain extremely solid price threshold and want to be sure they don't want to go over, or if the competitive element in a tender is absent." (Interview 16)
Physical (project/bid preparation) qualification criteria	Scaling Solar provided the project site, basic data and grid connection provided. Physical qualification requirements were therefore very relaxed. GETFiT projects' qualification requirements were slightly more onerous: needed to find own site (though no existing lease/ownership agreement required) and basic environmental scoping report. In general, both programmes were quite relaxed. There is some evidence of this impacting price by decreasing bid preparation costs – increasing competition levels – and reducing project costs. There is also evidence of site provision negatively impacting project realisation timelines. "GETFiT and Scaling Solar was more relaxed than REI4P. For Scaling Solar we only needed to shortlist four EPCs and O&Ms. We only needed to provide certificates of technology providers, proof of equity and debt finance. That is as relaxed as you can get." (Interview 8) "The low prices for Scaling Solar is because the land was free, and development costs were for the IDC...there are lots of things that IDC did that developers would normally do." (Interview 14) "Bidders will... make a judgement based on how onerous the bidding is... if it's not too much work, bidders will be tempted to just give it a shot. If government is providing the site – which has its own advantages – you get more competition, but there is more interface risk and discussion about this. I think this happened for ENEL in Zambia." (Interview 16)

	“There was a post-RFP issue with geotechnical elements at the Scaling Solar sites. They needed to get a consultant... part of the land (also) does not belong to IDC.” (Interview 14) Also, see Kruger et al (2019).
Financial qualification criteria (bid bonds)	Scaling Solar set very high bid bond levels, as did GET FIT (though lower than Scaling Solar). This lowered competition levels, but likely also increased competition between remaining bidders (of which there were more than enough qualified) by signalling that they were all financially capable and serious. Evidence that bid bonds supported project realisation for Scaling Solar, though their impact was neutralised in GETFIT due to macro-level challenges. “We like bid bonds...” (Interview 12) “There were complaints from smaller bidders about the big bid bond” (Interview 29) “The bid bond was not too pleasant, but because we had (a big partner company) it is not really an issue. They put up the bid bond. It wasn’t reducing our working capital. There is only so much money you can tie up... as a developer and participant we feel it is good to keep bidders honest. It creates additional pressure on bidders to be more realistic. It balances against unrealistic bid. If you really do something stupid, they can say your bid bond is gone.” (Interview 16)
Auction access requirements (experience and financial standing)	Both Scaling Solar and GETFIT asked bidders to provide evidence of reference projects (incl. minimum size requirements, differentiated by region), financial standing (net worth/financial standing) and signed heads of contracts with EPC and O&M companies. This limited competition from smaller firms, but again also signalled the strength and seriousness of the remaining bidding pool (though it is not clear that this impacted pricing levels). Some evidence of these experienced, financially-capable firms in Scaling Solar being able to navigate the complexity of the pioneering financial close and construction processes, despite almost no assistance being provided by IDC or the IFC – impacting project realisation. “We had over-competition. Hyper-competition!” (Interview 31) “We reached financial close in 2017. This was the first project financed deal in Zambia.” (Interview 12) See section 4.4.4.8., table 4.6 and Kruger et al (2019)
Penalty regime	Scaling Solar and GETFIT both featured robust penalty regimes, though GETFIT did not include a performance bond. There is evidence of this impacting price levels, but little evidence of a significant positive impact on project realisation.

	“Zambia required a ZAR 200 million performance bond. We factored this into our price. We can’t take a risk like this.” (Interview 8) “We will not see financial close in 6 months...performance bonds don’t really work. The timeline always turns out to be optimistic” (Interview 12) Also see Kruger et al (2019)
Staged bidding process	Both Scaling Solar and GETFiT used two-stage bidding processes. There is evidence of this reducing the number of bidders, lowering competitive pressure. Qualification requirements in the EOI/RFQ stage were low enough (limited to experience and financial health) that it did not impose a significant participation cost or increase the overall cost of bidding. No evidence of a direct impact on project realisation. “We prefer programmes where you can prequalify. It is always nice to know for sure that you qualify. It is actually nice to know that there is a finite group of bidders for the projects. It give you at least a perception that your chances are higher of winning something. The chances might still be small...” (Interview 16) See tables 4.4. and 4.8., and Kruger et al (2019)
Auction Implementation	
Procuring entity	Significant evidence of trust in the institutions supporting the procurement programme (IFC, KFW/GETFiT secretariat) and their advisors having an impact on competition levels and resulting prices. Limited evidence of a direct impact on project realisation, though it did help in attracting experienced developers that were able to close projects in challenging circumstances (for Scaling Solar, at least). “The large developers are seeking a credible auction process. How do you determine credibility in sub-Saharan Africa? Having the World Bank Group behind it helps! And the provision of guarantees. Where a lot of projects fail is how you package the security. Because of the World Bank guarantee, there is some belief in the market that the World Bank will talk to the government in a manner that many others can’t. Credibility and risk containment are the two elements that made this (Scaling Solar) a success” (Interview 14) “Trust in the reputation of the procuring entity and bidding process is very important to bidders, and can be crucial in making the decision to bid or not...Zambia was a bit more expensive. But it (GET FiT) was a serious programme... the professionalism and trust in the process and advisors is also something bidders will dig into. This was a key reason for us to participate in GETFiT, even though Zambia wasn’t too trust-inspiring by itself...Multiconsult did a really great job with GETFiT. They were really professional to answer questions” (Interview 16) “I feel this (trust in the procuring entity) is the most important consideration, not only in trusting their financial creditworthiness for credit approvals with the lenders, but also on softer items, such as how easy it will be to engage with them if there are any issues...” (Trust in the procurement process plays a role, but) to a lesser degree, and we looked at who is actually behind the program (advisors, funders and personnel on the

	ground) and their technical, regulatory and fiduciary knowledge and ability to enable the projects to be bankable and reach financial close.” (Interview 8) “Trust plays an important role – in both the entity and the process. Do the procuring entity have credible advisors onboard? Is there sufficient government support? Effectively you need DFI involvement and/or seriously credible international advisors.” (Interview 19) “In processes like Scaling Solar and GETFIT the fact that the tender authority (government entity) was supported by proper advisory services/teams (namely IFC advisory and Multiconsult, acting on behalf of KfW/Ministry of Energy) is often considered an additional element for creating trust in the framework/process.” (Interview 26)
Procurement process	Strong evidence that trust in the procurement process was an important driver of competition in both Scaling Solar and GETFIT, which impacted price levels. Limited evidence of this directly impacting realisation, but the fact that the programmes were able to attract experienced, financially capable bidders to a risky investment context meant that there was a higher likelihood of awarded projects being realised. “Trust in the procurement process and the likelihood of follow-through is more important (than the entity)... and so probably a key deciding factor in whether or not to participate in a tender process. A lot of time and resources are invested in each tender process as a bidder, so we need to make a decision on where to apply these limited resources. Consequently, a programme like Scaling Solar will always attract competition and low tariffs, because the market is willing to invest the time and provide the most competitive tariffs possible, due to the higher likelihood of follow-through. A programme like Scaling Solar also provides us with greater certainty that key elements required to make a project bankable... have already been thought about and structured in a way to make the arrangements bankable” (Interview 41) “We had very good consultants. Dan and his team and Linklaters. The beauty of this was we could assign responsibility for something and be comfortable that they will do it 100%.” (Interview 32)
Support to awarded projects	Limited evidence of this positively impacting project realisation. Scaling Solar projects were facing an IDC in turmoil/transition post-award, while the IFC had stepped away; they were therefore largely having to “fend for themselves”. The GETFIT political counterparties appear to have limited power and appetite for getting these projects realised. “IDC is influential, but the issue was capacity... there was advisory support up to procurement. Then it decreased a lot. We did not have (IFC supported) advisors post-award. We lacked an honest broker in the middle. There was lots of complexity. The utility had never handled solar. They needed advisors on the government’s side. We tried to act as honest brokers ourselves.” (Interview 16) “Everyone was fired at IDC! At least all political appointments. The CEO, the CFO... Scaling Solar lost everyone. This is a massive issue.” (Interview 29)

	“The Department of Energy is the principal counterparty of GETFIT. It is not very empowered, and has lots of competing priorities... there was lots of frustration. The programme lacked a Zambian progressive champion.” (Interview 31) “The framework is important as well because processes with evident track records (like REI4P) or designed by reputable entities (like Scaling Solar, GETFIT, PROLER) which are afterwards involved in the financial close process provides additional reliability for the investor. It is also true that sometimes such level of support doesn’t ensure that the financial close is finally achieved in reasonable time (i.e. GETFIT, Ethiopian solar tender), mainly when political choices prevail and they contribute to jeopardise the process.” (Interview 26)
PROJECT	
Favourable equity partners	Both programmes awarded projects to international, experienced, financially capable bidders that were able to use their scale, networks and negotiation positions to reduce costs and prices as much as possible. In the case of Scaling Solar, these investors, alongside the IDC shareholding, helped get projects over the line. See sections 4.2.2.8. and 4.3.4.4.
Favourable debt arrangement	Debt for all awarded projects was provided by DFIs and export credit agencies – often at very concessionary rates. There is strong evidence that this impacted prices, but limited evidence of this impacting project realisation. “No commercial banks had any interest. AfDB offered an 18 year, sub-10% loan package. All the other DFIs bid beneath it, even in a worsening economic situation.” (Interview 31) “AfDB used global climate finance funding for GETFIT” (Interview 1) “IFC debt was blended. OPIC debt was provided with a longer tenor.” (Interview 29) See also Table 4.3.
Secure and adequate revenue stream: off-taker, contracts, risk mitigation	Both programmes provided what was judged at that time to be bankable contracts, including risk mitigation – though there was no multilateral cover in place for GETFIT. This proved to be particularly important due to the severe financial problems with ZESCO, which necessitated increasing levels of risk cover. There is evidence that this impacted price levels by increasing competition levels and reducing the cost of capital. The “belts and braces” approach to risk mitigation in Scaling Solar played an important role in getting projects to financial close and commercial operation. ZESCO’s deteriorating financial position, the government’s seeming inability or willingness to deal with this and the resultant inability to get additional risk cover made it impossible to close the GETFIT projects. “Zambia’s government assured all lenders that they would restructure ZESCO, which they didn’t do...World Bank support disappeared... there was acknowledgement that ZESCO was not bankable. Nothing was done to shore them up. Things just kept getting worse...” (Interview 31)

	“Where a lot of projects fail is how you package the security. Because of the World Bank guarantee, there is some belief in the market that the World Bank will talk to the government in a manner that many others can’t. Credibility and risk containment are the two elements that made this (Scaling Solar) a success” (Interview 14)
Strategic management & relationship building	Scaling Solar projects featured mandated minority shareholding from IDC (at full cost), which did not appear to impact prices. GETFIT projects did not feature local shareholders as a rule (except for two projects with CEC shareholding). There is limited evidence of IDC shareholding helping the projects reach financial close and commercial operation. “Scaling Solar was put through with the presidential whip.” (Interview 1) “IDC would have ownership and drive it to completion...Scaling Solar was powerful. We could use our mandate, with the president as chair (of the IDC board). With the cabinet secretary on board, we could land the programme.” (Interview 32) “We launched the tender rules, but they were not popular. There was no carve-out for Zambian representation. The Zambian government said: ‘ just get the lowest tariff’”. (Interview 31)

Appendix G: Namibia analytical framework with evidence

Element	Status and impact on price and project realisation
COUNTRY	
Economic & legal stability	Namibia is characterised by relative levels of economic and political stability, although the country slipped below an investment-grade credit rating (a rarity in the region) in 2019/20. Judicial independence and quality is rated highly, as measured by the World Governance Indicators. There is some, albeit limited evidence of these conditions directly impacting price levels and project realisation, although it did create a stable investment context that in part supported projects' ability to be financed and built without any sovereign guarantee (or other risk mitigation) cover or political force majeure provisions. "We are looking for new opportunities in Namibia. For finance, it is a good place. It is a good investment destination. It is a very stable country, safe." (Interview 9)
Supportive energy policy framework	Namibia's energy policy encourages IPP investments, and recent new policy changes and regulatory amendments have opened up the market even more. Support for renewable energy specifically was limited and necessitated the creation of an intergovernmental RE steering committee, which supported the development of the sector while new policy was being created and specifically initiated the first 3x10MW procurement. The powerful finance ministry is also supportive of the private sector's role in electricity generation. Beyond creating the general enabling environment that importantly allows private power projects to be realised, there is no evidence of these having a direct impact on project prices or realisation. "The Renewable Energy Steering Committee...was mainly there to facilitate the roll-out of renewable energy. Almost everything was at that stage still based on the 1998 energy white paper. It was created to fast-track renewable energy development, because there was not sufficient policy support for renewable energy." (Interview 10) "The 3x10MW tender came from the RE steering committee" (interview 5) "The finance ministry is very vocal... the minister fully believes in IPPs and the private sector." (Interview 6)
Regulatory transparency, consistency and fairness	Namibia's regulator is rated as one of the top performing in Africa and has consistently ensured the sector's financial health by setting cost-reflective tariffs. The result is that NamPower was one of a handful investment-grade rated utilities in Africa. This impacted prices – by increasing competition levels for a contract with NamPower – as well as allowed projects to be realised without any risk mitigation cover. Licensing procedures (incl. PPA tariff approval) for new generation facilities were also "built into" the procurement processes, which supported the timely realisation of the Hardap project. "Before going to market, NamPower had to make sure: what are the licensing requirements? We made sure the process would be quick. In January 2017, the (Hardap project) was awarded. In February, the license application process started. In May, ECB issued the license." (Interview 4)

	“The financial model used (for bidding) was ECB’s... it had to be used to approve the tariff” (Interview 42)
Coherent sectoral planning	Namibia’s electricity generation expansion plan - the NIRP - was not officially approved, and so the Hardap PV project was slightly bigger than what was provided for in the unofficial plan. At that stage the plan did not provide much certainty on future market development. A version of the NIRP (2016) has been officially adopted, and was the basis on which ministerial determinations were made that included the Khan project. No evidence of this directly impacting price or realisation rates. “The 2016 NIRP was approved in 2017. It set out three plans: plan A was approved, which had a stronger focus on renewable energy... the minister made determinations in 2018 for NamPower to procure 150 MW, which included 50MW wind and 20MW solar PV from IPPs.” (Interview 10)
Competitive bidding practices	Significant evidence that competitive bidding resulted in superior price outcomes, as tendered project prices were much lower than FIT levels or prices for directly negotiated projects. The competitively bid Hardap project reached financial close and COD in record time – but it was still broadly in line with timelines for the FIT solar projects in the country. The Khan project is facing significant delays in reaching financial close and commercial operation. “We got lots of responses!... we want to move away from this (FiT and DN projects) to competitive bidding” (Interview 4) “The competitive procurement process yielded a significantly lower tariff vs. the REFIT projects” (interview 5) See sections 5.3.3. and 5.5.1.
PROGRAMME	
Auction design	
Competition-inducing, scale-friendly auction volume	Auction volumes were modest – between 20MW and 37MW. Despite these modest volumes, the market reacted strongly, with high levels of competition for each bidding process/round. There is strong evidence that these lower volumes induced competition – driving down prices. No evidence of a direct impact on project realisation. “Namibia’s government can’t provide a sovereign guarantee, therefore we went for smaller plants that can be built without this. But it was also about spreading them (projects) to increase grid stability” (Interview 10) See sections 5.3.3. and 5.5.1.
Scale-friendly project size limits	Project sizes were limited to 10MW, then 37MW (Hardap) and 20MW (Khan). All indications are that these smaller project volumes – while limiting economies of scale – still resulted in competitive price outcomes. Larger projects would likely have resulted in lower prices through economies of scale and increased competition, with

	some of the bigger bidders deciding to not submit bids for Khan because it was deemed too small. No indications of the project sizes directly impacting realisation, apart from the fact that modestly-sized projects generally tend to have shorter realisation timelines (see Kitzing et al, 2021). “(Our decision to not submit a bid for Khan) was mostly to do with the size of the plant being too small, and the lack of a bid guarantee and no prequalification criteria also deterred us as NamPower can end up with unrealistic offers which they’ll accept.” (Interview 8) “We did not submit a bid for Khan since we are targeting larger projects at present” (Interview 2) “When Hardap was being tendered the team was focusing on 50MW plus deals (e.g. Scaling Solar Zambia) and at the time it was considered too small. Since, the direction has changed and RE MWs are appreciated anywhere in Africa based on the merits of the opportunity. And our minimum project size has dropped to 10MW with consideration on deal flow, strategic importance etc.” (Interview 39)
Technology choice: specific vs. neutral	Namibia chose to only auction solar PV capacity, based on the technology’s relative simplicity, the country’s excellent solar resources and the utility’s desire to understand the technology better. There is no evidence of this directly impacting price levels or realisation rates, beyond the fact that the technology is exceptionally well suited to Namibia’s solar resources and is relatively simple to build.
Bid award limits	Since only single projects were being awarded, bid awards did not really come into play for the Hardap and Khan projects. For the 3x10MW tender, there were no bid award limits, and Alten was awarded all three projects based on bidding the lowest price – which supports the price reducing impact of not setting such limits. No evidence of a direct impact on project realisation.
Bidding rounds	When the Hardap project was announced and later awarded, there was no schedule announced for next tender rounds (or indeed clarity on whether there would be more auctions). Khan effectively functioned as a second round, and it seems clear that the price levels established by Hardap set expectations for Khan’s pricing, and that more certainty on bidding windows would increase competition. No evidence of bidding rounds having a direct impact on realisation. “Is it really worth the effort? This is really important...it helps if you can get a bit of a runway: a prospect of multiple rounds, multiple projects. Like, Khan was a once-off thing. If there were 4-5 projects that you can do as part of a programme, everything would be standardised, so you can get used to it, you have a shot at another and re-use your familiarity and try again.” (Interview 16)
Winner selection	The Hardap project was awarded on a 70:30 Price:Technical basis. It seems clear that the technical criteria had no additional impact on pricing since bidders were already optimising the project’s technical parameters to maximise revenues and achieve a competitive tariff, but at least one “cheaper” project was not

	awarded because of the use of the 30% technical scores. Had NamPower thus used price-only scoring, it would have awarded a lower-priced project. The use of a “project schedule to COD” score (as part of the 30%) also seems to have had a limited impact on project realisation since the deadlines set in the bidding documents were already extremely tight, and turned out to have been optimistic. The Khan tender scored bids on an 80:20 Price:socio-economic development basis. It also allowed bidders to state their own escalation rate. The very competitive price outcomes seem to indicate that there was a limited impact on pricing, although there is some evidence of this creating upward pressure (or at least more risk) on pricing. There is also some evidence of the self-selected escalation rate lowering competition levels. “The evaluation has been split into 80% price and 20% economic development whilst the Previous IPP Project was split into 70% financial and 30% technical. ED has three key pillars, socioeconomic development undertaking(% of annual electricity sales spends toward developmental initiative which ranges between 1 -1.8%), Previously Disadvantaged Namibian(PDN) in executive management and second tier contracting with PDN owned entities. The technical criteria are still used to prequalify bidders however the strength of the technical proposal will not be evaluated as the risk allocation for non-performance is borne by the IPP. The current IPP is purely owned by private developers as opposed to previous project where NamPower has some shareholding(10%) and inherently bear some risk for poor plant performance during operation. NamPower wanted to create incentives for IPP to have a positive socioeconomic impact in the communities in which they operate and increase participation of Namibians in construction, operation and maintenance of Solar PV plants.” (Interview 38) “Local equity participation where they don’t have competitive capital is a drag on IRR. Local content requirements drive up EPC prices. And any socio-economic development usually gets a percentage of revenue” (Interview 43) “SED criteria did influence the pricing somewhat but it was not specific enough, with enough time to really interrogate it properly. I think everyone took some risk.” (Interview 19) “One objection (to the Hardap award) was received during the licensing process. NamPower responded, saying that the tariff was only one component of bid scoring. We rejected the objection” (Interview 4) “You could choose your own escalation (for Khan). They were vague about how they would evaluate it. It was really quite messy... we felt they haven’t properly thought this through.” (Interview 16) See sections 5.2.3.3.7. and 5.4.1.2.3.
Price caps	No price caps set. There is no evidence of this impacting price levels (since competition levels were already so high, though the intention of not setting price caps was to reduce prices) or project realisation.

	“The ceiling price/price cap was not set for both projects to avoid signaling to prospective bidders on expected prices. This follows precedent set by the REI4P programme in which the caps were abandoned.” (Interview 38)
Physical (project/bid preparation) qualification criteria	Physical (project preparation) qualification criteria for both the Hardap and Khan projects were relatively relaxed, limited to signed term sheets from investors since the sites, environmental permits and grid connections were being provided by NamPower. This combination of site provision and preparation with financial commitment helped to ensure that bids were mature without imposing substantial preparation costs. This lowered the risks and costs of bidding – increasing competition levels (though some bidders avoided the tender for this reason) – and supported the timely realization of the Hardap project. The bungling of the sites for the 3x10MW tender however rendered this initial tender process moot. “There was a well-arranged site visit, and lots of predevelopment work done. It was done to a good standard. We prefer to do this ourselves, but if it is done properly, it lowers the risks” (Interview 2) “We required bank confirmation (of lending) and that there are funds for equity” (Interview 38) “The site development was well done” (Interview 3) “The site, substation, environmental impact assessment: everything was straightforward” (Interview 8) “NamPower’s position was that you can’t leave everything, mainly land and grid connection, to the IPP as this would end up in a price war about connection points. NamPower wanted to de-risk the process so IPPs would only compete on technology...land issues take the longest in Namibia and are hampered by draconian, bureaucratic laws that don’t speak to each other” (Interview 42) “The (Khan) site was being provided, which is good, but for us (not sure this holds for every developer), we like to do site origination all the way to construction. We feel we have a chance to differentiate ourselves from the competition by getting a good site... it allows you to de-risk the site yourself. You are obviously responsible for everything on the site! You have to take all the risk. If the government is providing the site – which has its own advantages – you get more competition, but there is more interface risk and discussion about this...so site is one thing that held us back on Khan” (Interview 16)
Financial qualification criteria (bid bonds)	The Hardap tender required a modest bid bond, while Khan required none. There is some evidence of the lack of a bid bond lowering competition levels, and this decision also appears to have negatively impacted the realisation of the Khan project. “The public procurement act does not allow for bid bonds. We want to eliminate bidders who gamble, but we think there are other ways to achieve the same objectives as with a bid bond. We therefore look at project references, letters of support from investors, and place the onus on the lender. The lower costs should lead to more participation and competition.” (Interview 38)

	“(Our decision to not submit a bid for Khan) was mostly to do with the size of the plant being too small, and the lack of a bid guarantee and no prequalification criteria also deterred us as NamPower can end up with unrealistic offers which they’ll accept...South Africa has high bid and preferred bidder bond requirements, which has deterred unattainable tariffs” (Interview 8) “With a bid bond, it’s interesting. Sometimes it can be more onerous. You have to lock up your own money, working capital. Put it up for a year or longer. But on the other hand, as a developer and participant we feel it is good to keep bidders honest. It creates additional pressure on bidders to be more realistic. It balances against unrealistic bids. If you really do something stupid, you can say that your bid bond is gone... it (the lack of a bid bond for Khan) put us off” (interview 16) “Not sure how Access deliver(ed) that tariff. No bid bond is clearly an issue where there is lots of room for fun and games.” (Interview 43)
Auction access requirements (experience and financial standing)	Both Hardap and Khan required evidence of (modest) project development experience (reference projects), but no evaluation of financial strength (turnover/ assets). This relatively low auction access requirements increased competition levels by allowing local companies with REFIT projects to also participate. There is no evidence of the access requirements directly impacting realisation, beyond ensuring that the awarded companies had the technical experience to successfully execute projects. See table 5.7 and 5.10
Penalty regime incentivises timely project realisation	The Hardap tender included a performance bond, several liquidated damages clauses and a PPA length reduction clause (for delays). These appear to have had some upward impact on price levels. The Khan project only included the PPA reduction clause. It appears that none of these were used for the Hardap project, despite it experiencing some realisation delays (mostly due to NamPower) – indicating that they had little impact on project realisation timelines. It also appears that the technical performance-related penalties had no additional impact, and were thus removed for Khan. “We did not specify a minimum capacity factor (for Khan), since we are looking at the whole PPA, where payment is for energy only. Bidders are thus already incentivised to optimise performance. So we don’t want to also penalise them. We also did not include liquidated damages clauses, since these add costs to them that they will pass on to us (through the tariff).” (Interview 38) See section 5.3.2.7.
Staged bidding process	Both tenders used a one-stage bidding process (although bidders had a sense of who was interested based on the number of entities participating in the site visit). There is no evidence of this directly impacting prices or project realisation.

Pricing rule, auction format	Both tenders used pay as bid, sealed bid processes. There is evidence that this contributed to the perceived simplicity and straightforwardness of the programme, which induced competition (reducing bidding risks). There is no evidence of a direct impact on realisation. “Keep it simple” (Interview 5) “I can clearly understand the process and what they want” (Interview 9)
Auction Implementation	
Procuring entity	NamPower suffered reputational losses due to the bungling and consequent court case of the 3x10 MW tender. As a result, at least two major international developers decided not to submit bids for Hardap. Competition levels were nevertheless still high, with many bidders maintaining that NamPower was still seen as competent. The utility’s successful tendering of the Hardap project, as well as some high level governance changes, appear to have improved trust in the procuring entity for the Khan project. “We were originally interested and submitted (a bid for the 3x10 MW projects), but after the (legal) challenge drama we decided that the process lost credibility and didn’t want to participate further (in the Hardap tender)... the passing of time and a new “clean” and unencumbered procurement process (convinced us to submit a bid for Khan). There were also some changes at board level at NamPower.” (Interview 19) “Margaret (Mutschler) ran it (Hardap tender). The quality was at the same level as REI4P. The site, substation, environmental impact assessment: everything was straightforward” (Interview 8) “NamPower is the best to do this (procurement)” (Interview 6) “We would submit in Namibia again. I regard it (disqualification) as more a partner error than a NamPower error. NamPower are one of a few credible and bankable utilities whom don’t require government guarantees.” (Interview 39)
Procurement process regarded as fair, transparent	Trust in the procurement process remained relatively high for Hardap and Khan – based on the simplicity of the procurement process and documentation, the clear rules and good communication during the tender processes. There were nevertheless concerns about the awarding decisions for the Hardap project (also based on the 3x10 MW bungling) – in part due to poor communication about rejected bids and procurement criteria. The fact that everything was being done in-house by NamPower, that there was no auditing of results, and that the 37MW project was awarded to the same firm that had secured the 3x10MW tender (despite lower priced bids being submitted) further tainted the process. In short, the general sentiment was that the Hardap and Khan tenders were professionally run, but that there were also shortcomings – although on balance these were not significant enough to significantly erode trust. “NamPower’s tender is the best, because the documents were really good, there were lots of clarifications. It was a clear package, complete. The timelines were managed

	well. We are happy with the process. I am one of the first people that has to read the documentation. When I read it, I check whether I can clearly understand the process and what they want. This is clear in Namibia. The frequency that NamPower used with communications was also great. They responded quickly. Sometimes, with other tender programmes, they (auctioneers) take too long.” (Interview 9) “The process was run pretty well. There was a well-arranged site visit, and lots of predevelopment work done. It was done to a good standard. We prefer to do this ourselves, but if it is done properly, it lowers the risks... we decided not to submit a bid for Khan because it was too small, not because we had concerns about the integrity of the process” (interview 2) “Integrity due diligence is a central risk. There was a lot of noise about the project (Hardap) in Namibia. Our due diligence team found it to be clean though. We conduct pre-investment and ongoing due diligence. Any problems here is an immediate event of default” (Interview 3) “Our bid was 15% cheaper (for Hardap)!.. their financial model couldn’t deal with a debt reserve facility. It was too basic. So they threw out our bid. Procedurally, they couldn’t do it!¹⁷⁹ You were also going to be scored on time to COD, but look at how late Alten is! They just don’t have the financial experience. It was really frustrating... we chose not to submit a bid for Khan because it is too small, not because of concerns about the Hardap awarding procedure” (Interview 8) “We were originally interested and submitted (a bid for the 3x10 MW projects), but after the (legal) challenge drama we decided that the process lost credibility and didn’t want to participate further (in the Hardap tender)... the passing of time and a new “clean” and unencumbered procurement process (convinced us to submit a bid for Khan). There was also some changes at board level at NamPower.” (Interview 19) “We can confirm, that a tenderer has provided an objection to the respective generation license application advertised by the ECB and Alten Consortium. This objection was investigated by the ECB and ECB board have pronounced itself in this regard.” (Interview 5) “An evaluation room was set aside. We had CCTV monitoring. People had to sign a code of conduct, which included confidentiality clauses. No pens were allowed in and no one was allowed to leave. It was carried out in accordance with NamPower tender and procurement policy...no external auditors were used to validate the results... what can be stated is that the financial model was evaluated in strict accordance with the ITT. With regard to one tenderer, the financial model was materially changed (and provided different results) by the tenderer, which rendered the model invalid” (Interview 5) “The financial model used was ECB’s. It was very elementary and had one or two problems. But this model had to be used for ECB to approve the tariff. NamPower had its own financial models used to stress-test the financial bids. Bidders had to submitted audited, bankable models. We ran multiple sensitivities. We checked if the DSCR held. We also checked if the IRR fell below 10%. The worry was that if the IRR was too low, the bidder would cut corners or want to reopen price negotiations... projects that

¹⁷⁹ During an exchange between NamPower and this bidder during a short course at the UCT GSB, it was clarified that the bidder had not used an updated financial model provided by NamPower, which was the main reason that their model was deemed unresponsive.

	failed the evaluation stage were never kicked out for only one reasons. We also checked whether we could defend the decision in a court of law.” (Interview 42) “There were a lot of rumours about Hardap... it was a combination of things that led us to decide not to bid, but the trust thing was the most important thing... there was this thing about Alten already being awarded, then ENEL taking them to court. It gives it this nasty taste of being tainted...this process. You sense there must be some battle involved here. Maybe political stuff. And we know Alten was going to participate in this tender (Hardap). We weren’t sure we would be given a fair chance.” (Interview 16) “We felt the process wasn’t properly set up and you would get in loads of discussions down the line... they could have done this more professionally. It was professionally done, but it wasn’t completely thought through.” (Interview 16)
Support to awarded projects	NamPower was deeply involved in the post-award process as a project shareholder for the Hardap project, which appears to have supported its timely realisation. While NamPower was not a shareholder of the Khan project, there is no indication that its supporting role has been diminished, or that this is the reason for the project’s delays. “They (Khan project awarded bidders) are progressing toward achieving financial close albeit delayed due to restrictions introduced as a result of the Covid-19 pandemic.” (Interview 38) “NamPower’s shareholding provided insight into the project workings and provided an early warning sign for issues; but also meant that it was difficult to implement liquidated damages.” (Interview 5) “It (Hardap post-award process) was a tight schedule. There was a government directive that this was about security of supply.” (Interview 4)
PROJECT	
Favourable equity partners	Both projects were awarded to international, purely commercial developers. While these are not the biggest developers, they appear to have the ability (or willingness) to squeeze margins along the value chain to reduce costs – impacting prices. The Hardap developers reached financial close and commercial operation in good time – despite this being their first African project; while the Khan developers (with African experience) appear to be struggling to reach this milestone. “We (equity fund managers) created a platform (with Alten) for multiple investments. We will exit earlier than Alten, once project operations are naturalised. Solar PV usually takes about 16 to 18 months to reach this. Basically, once cashflows match the financial model... Alten is a tier 1 developer. They have a good track record, multiple projects, high capital efficiency, and a strong team. They had banked enough projects to allow them to grow into tier 1... they have cash and can fund their portion.” (interview 3) “Access does not require as high a return as other companies. It may even be lower than NamPower’s.” (Interview 37)
Favourable debt arrangement	Both Hardap and Khan had debt provided by a local bank (Standard Bank), supported by a DFI (Proparco) to extend the loan tenor to 15 years (from an initial 8 years). This was a significant reason for these projects being able to reach their price levels.

	The requirements for banks to provide signed term sheets as part of the bid also seems to have supported bid realisation by improving due diligence and shortening the financial close process for the Hardap project. In the case of the Khan project – which was awarded just before the COVID-19 pandemic hit – the impact of this lender commitment on project realisation timelines appears to have been diluted – despite the lender remaining committed to its terms. “The margins (for financing PDN shareholding in the Hardap project) were too low for us (local DFI), because the tariffs were so low” (Interview 44) See section 5.3.2.6.
Secure and adequate revenue stream: off-taker, contracts, risk mitigation	For both projects, bidders were provided with bank-tested (bankable) contracts. NamPower’s financial health negated the need for additional sovereign risk cover. Concerns about long-term political risks (not covered in the PPA) were taken care of by a loan cover arrangement between Standard Bank and Proparco. The opportunity to sign an off-take agreement with an investment-grade utility appears to have increased competition levels, while the standardised, bankable suite of documents ensured that the financial close process was relatively quick. “There was no government support. We had to accept this, and were comfortable with this risk” (Interview 2) “We had lots of responses. Most said they are happy to go without a sovereign guarantee” (Interview 4) “Namibia’s government can’t provide a sovereign guarantee, therefore we went for smaller plants that can be built without this.” (Interview 10)
Strategic management & relationship building	The Hardap project included mandated shareholding by NamPower as well as empowerment investors (PDN). While the NamPower shareholding requirement was discarded for Khan, the tender did include incentives for more PDN ownership, as well as local investments. There is no evidence of the Hardap requirements substantially increasing project prices, although the new Khan requirements increased some risks for bidders. The shareholding in Hardap turned out to have been strategic for the project, helping it achieve timely realisation. The local shareholding and investment commitments of the Khan project do not appear to have helped it move towards financial close. “Local equity participation where they don’t have competitive capital is a drag on IRR. Local content requirements drive up EPC prices. And any socio-economic development usually get a percentage of revenue” (Interview 43) “SED criteria did influence the pricing somewhat but it was not specific enough, with enough time to really interrogate it properly. I think everyone took some risk.” (Interview 19) “The socio-economic development agreement creates a fair and transparent mechanism for enforcing IPP obligations. There is no flexibility for IPPs to divert funds to other initiatives that are not necessarily developmental in nature. The funding

	provided by the IPP as per SEDA will be spent in line with NamPower Foundation development goals and objectives...we have consulted a few players in RSA's REI4P programme who have indicated that the socio-economic development aspects was not very successful so we chose a different path." (Interview 38) "We (utility) want shareholding. We want to see what is going on in the SPV. The due diligence of the lender is just commercial and legal. We want the project to be reliable" (Interview 5) "NamPower wanted shareholding, but this couldn't impact the price" (Interview 42)