



Research Article

A Success and Risk Factor Framework for Public Private Partnership Programmes in the Electricity Generation Sector of South Africa

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Abstract

This study investigates the factors influencing project delivery success in South Africa's formal reverse-auction Public Private Partnership (PPP) programmes in the electricity generation sector. Using a qualitative deductive-inductive design, twenty-one expert interviews were analysed through a five-phase thematic analysis to identify Critical Success Factors (CSFs), Critical Success Criteria (CSCs), Interlink Factors (IFs), and Critical Risk Factors (CRFs) associated with the progression of projects from Preferred Bidder status to Financial Close. The study develops an integrated Success and Risk Factor Framework comprising thirty-two CSFs, seven CSCs, four IFs, and seventeen CRFs. The findings indicate that declining Financial Close performance since 2020 is driven primarily by structural rather than political factors. Grid connection constraints emerged as the dominant success factor, functioning as a binding limitation that cannot be overcome through tariff adjustments alone. The study finds that price-dominant evaluation of bids assessed for compliance rather than deliverability can incentivize unsustainable bidding behaviour. Three enabling factors emerged inductively from the data: project readiness, continuous re-evaluation of programme market fit, and adjustment for material changes in market conditions. The study contributes to PPP literature by integrating success, measurement, and risk constructs into a single framework tailored to reverse-auction electricity procurement. It concludes that greater emphasis on project readiness, bankability, and grid availability is required if South Africa's electricity procurement programmes are to improve Financial Close outcomes and deliver sustainable infrastructure investment.

Keywords: *critical success factor, critical success criteria, critical risk factor, public private partnership, independent power producers, South Africa electricity generation*

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1 Introduction

Global electricity access improved from 1.4 billion people without access in 2010 to 750 million in 2024 (IEA,2024). Sub-Saharan Africa, however, accounted for 597 million of those people which equates to close to eighty percent of the global total (IEA, 2024). South Africa's position within the continent is distinctive as the country is one of the leaders on the continent in terms of electricity access at over eighty-six percent, which is more than double the sub-Saharan average (Byaro & Mmbaga,2022). The country, however, struggles with supply reliability and has experienced a sustained generation shortfall which contributed to the loadshedding experienced starting in 2007 and progressively getting worse throughout up until 2023 (Eskom, 2024). Although loadshedding has stabilized since 2024, the need to increase electricity generation infrastructure remains a pressing challenge. The country has met this growing need of new generation capacity mostly through private investment procured under formal reverse-auction Public Private Partnership (PPP) models.

The formal reverse-auction PPP programmes that were investigated in this study include: The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) which has procured wind, solar photovoltaic, concentrated solar, small hydro, landfill gas and biomass in discrete competitive rounds called Bid Windows (BW) since its inception in 2011. The Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) which was a single emergency round launched in 2020 to procure dispatchable capacity and the Energy Storage Independent Power Procurement Programme (ESIPPPP) which began procuring battery storage in 2023.

All three of these reverse-auction PPP programmes operated under a common mechanism in which the Independent Power Producer Office (IPPO), a procurement office established jointly by the National Treasury, the Development Bank of Southern Africa and the Department of Mineral Resources and Energy (DMRE), now the Department of Energy and Electricity (DEE), releases a Request for Proposal allocating a fixed capacity in megawatts for a defined technology. Only RMIPPPP was technology agnostic. Private consortia bid a tariff, together with commitments on local content and economic development criteria. Bids are screened for compliance on land, legal, environmental, technical and financial criteria, and compliant bids are then evaluated comparatively on a weighted scale heavily favoring price. The successful consortia are announced as Preferred Bidders.

Preferred Bidder status is an announcement, not a contract. The consortium must then reach Financial Close. Which is the point at which every project agreement, financing contract and lender condition has been fulfilled or waived (Yescombe,2002). Preferred Bidders are liable upon accepting their preferred bidder status to endeavor to progress the project to Financial Close within the timeframes as stipulated in the RFP documents. The gap between Preferred Bidder announcement and Financial Close therefore represents the critical

implementation phase of these programmes and forms the central phenomenon under investigation in this study.

1.1 The problems from 2020 – 2023

Table 1 sets out the record. Between 2011 and 2014 from REIPPPP BW1 to BW4 the programme converted Preferred Bidder Announcements into Financial Close almost perfectly. With ninety-one (91) of the ninety-two (92) projects announced as Preferred Bidder reaching Financial Close respectively. However, following a pause in the programme caused by disputes with signing new PPA's there was a drastic drop in conversion from 2020. RMIPPPP converted seven of eleven Preferred Bidder projects to Financial Close. REIPPPP BW5 converted eleven of twenty-five. Bid Window 6 converted two of the six projects preferred bidder projects to financial close, with the four others currently working towards financial close. No wind projects were awarded due to grid constraints in REIPPPP BW6. When measured under the total MW capacity allocation in the programme vs the total MW procured under that programme as a percentage, the deterioration in the delivery intent of the programme is plain to see.

Table 1: Progression of projects through South Africa's formal reverse-auction PPP programmes in the electricity generation sector of South Africa from 2011 - 2023.

Year	Programme	PB	FC	COD	MW at FC	MW allocated	% of allocation
2011	REIPPPP BW 1	28	28	28	1,415	1,416	99.93%
2012	REIPPPP BW 2	19	19	19	1,033	1,044	98.92%
2013	REIPPPP BW 3	17	16	16	1,428	1,456	98.08%
2014	REIPPPP BW 3.5	2	2	2	200	200	100.00%
2014	REIPPPP BW 4	26	26	26	2,205	2,130	103.52%
2020	RMIPPPP	11	7	3 (4) ^a	578	2,000	28.90%
2021	REIPPPP BW 5	25	11	(11) ^a	1,159	2,600	44.58%
2022	REIPPPP BW 6	6	2 (4) ^b	(2) ^a	1,000	5,200	19.23%
2023	ESIPPPP BW 1	5	5	(5) ^a	513	513	100%

PB = number of projects announced as Preferred Bidders; FC = number of those projects reaching Financial Close; COD = number reaching Commercial Operation Date. Figures in parentheses denote projects not yet at the stated milestone at the date of the source data.^a Currently in construction. ^b Currently working toward financial close, with achievement of financial close is assumed for the purpose of capacity calculation. Compiled by the author from IPPO (2024).

ESIPPPP BW1 is an exception in which all five-utility scale energy storage projects which were selected as preferred bidder were able to achieve financial close. This resulted in a materially different outcome from the previous programmes that preceded it.

The research problem is therefore specific, recent formal reverse-auction PPP programmes in South Africa's electricity generation sector have not converted Preferred Bidder projects into Financial Close at the rates their predecessors achieved, which warrants careful analysis to explore possible explanations.

1.2 Research questions

Four questions structure the study.

1. What are the Critical Success Factors enabling PPP project delivery success in the formal reverse-auction electricity generation sector of South Africa?
2. What are the Critical Success Criteria that could be used in measuring that success?
3. How do Critical Success Factors and Critical Success Criteria overlap, and what are these Interlink Factors?
4. What are the Critical Risk Factors that must be managed to drive that success?

1.3 Purpose and contribution of this paper

The paper offers a South Africa specific synthesis of success factors, success criteria and risk factors for formal reverse-auction PPPs in the electricity generation sector. The established Critical Success Factor literature in PPPs is dominated by concession models in transport, water and social infrastructure, in which the private party constructs an asset and recovers investment from user charges over a long operating period. Reverse-auction electricity procurement differs structurally. Firstly, competition occurs on a single price variable before any bilateral negotiation, Secondly the offtaker is a single state-linked purchaser, and thirdly the binding constraint is a financing milestone rather than a construction or demand milestone. Findings derived under concession assumptions do not transfer verbatim without keen examination and hence this paper seeks to contribute to Critical Success Factor literature in PPPs focused on formal reverse-auction PPP in the electricity generation sector of South Africa.

The paper also seeks to integrate the three constructs (Critical Success Factors, Critical Success Criteria and Critical Risk Factors) into a single structure as they have been studied as largely separate literatures. The small body of work bridging any two factors has not extended to all three (Frefer et al., 2018; Lamprou & Vagiona, 2022). The framework derived in this study holds them together and identifies the factors that function as both enabler and measurement factors.

Furthermore, the paper's deductive-inductive design tentatively unearthed three enabling factors, from the empirical evidence as opposed to the literature. These are namely: (1) project readiness, (2) continuous re-evaluation of the programme's market fit, (3) adjustment for changing market conditions, and on the measurement factor.

2 Literature and Theoretical Framework

2.1 Definitions

Critical Success Factors (CSF) are the few areas of activity in which favourable results are necessary for an organization or project to achieve its goals (Daniel, 1961; Rockart, 1979). They are enablers. They are not, in general, directly measurable.

Critical Success Criteria (CSC) are the parameters against which the successful outcome of a project can be measured (Chan et al., 2002; Frefer et al., 2018). They are measures. The distinction matters because the two (CSF and CSC) are routinely conflated, and because the conflation obscures a genuine finding - some factors are both CSFs and CSCs. These factors that are both measures and enablers are expressly described as Interlink Factors (IF).

Critical Risk Factors (CRF) are the systematic and project specific aspects that increase the likelihood of an unfavourable outcome (Xu et al., 2015; Babatunde et al., 2018).

PPP Project Delivery Success is defined for this study as a project that has been successfully constructed, commissioned and has been operational for two (2) years post Commercial Operation Date (Adapted from Helmy et al., 2020).

2.2 Prior research on critical success and risk factors in PPPs

The Critical Success Factor method originates with Daniel (1961), however the method gained theoretical traction with the seminal work of Rockart (1979), who used the method to capture key success factors in an organization with inputs from the management and executives. The versatility of Rockart's original Critical Success Factor method has become the basis from which all other adaptations have since developed.

The method has been applied extensively to PPPs. Osei-Kyei and Chan (2015) reviewed empirical PPP success factor studies published between 1990 and 2013 and found the field consolidating around a recurring set of factors, namely: (1) a favourable legal framework, (2) appropriate risk allocation, (3) a strong private consortium, (4) government support and political stability, and (5) transparent procurement. Subsequent studies have largely confirmed and localized this set. Helmy et al. (2020) identified success factors for PPPs in the Egyptian education sector using a comparable qualitative expert design with thirteen participants. Fernando and Nanayakkara (2020) derived six thematic success factors for electricity generation expansion at the Ceylon Electricity Board in Sri Lanka. Berisha et al. (2022) derived six for Albania's restructuring toward European Union accession. Awuku et al. (2022) drew lessons for Ghana's solar industry explicitly from the South African and Moroccan experience.

The Critical Success Factor literature is established, however attempts to move from identification of factors to ranking has produced mixed results. Nguyen et al. (2020) ranked success factors in Vietnam's PPP market, placing land acquisition, private sector financial strength, effective project management, effective regulatory frameworks and PPP feasibility in the top five. Maqbool et al. (2018) attempted causal inference using structural equation modelling. However, in Thurman et al. (2015) famous critique it was stated that such attempts to operationalize and rank these factors systematically under-represented soft factors. Davis (1979), in an early critique of Rockart, raised a related problem of bounded rationality, which highlighted that executives asked to name critical factors retrieve what memory makes available, and settle on satisfactory rather than optimal answers.

The measurement and ranking challenge stimulated the development of a parallel stream of literature. Many success factors are enablers rather than measures, researchers developed Critical Success Criteria to bridge the gap between enabling conditions and observable outcomes (Okudan & Budayan, 2021; Osei-Kyei et al., 2017; Osei-Kyei & Chan, 2018). These however have their own limits. Magalhaes et al. (2020) observed that project measurement has historically relied on budget, time and scope, which in and of themselves are uni-

dimensional measures ill-suited to multi-stakeholder infrastructure projects/programmes. Penyalver (2022) argued that such measures alone are no longer sufficient for modern infrastructure, and that environmental and sustainable development objectives (often soft factors) must be incorporated if all parties are to perceive their expectations as met. Wegrzyn and Wojewnik-Filipkowska (2022) linked this to reduced stakeholder friction and improved project support.

A smaller body of work examined the two constructs together. Frefer et al. (2018) and Lamprou and Vagona (2022) found that some factors operate as both enabler and measures. Therefore, they cannot be easily separated into CSFs to CSCs.

Risk in PPPs has been treated largely separately. Babatunde et al. (2018) identified critical risk factors for PPPs in developing economies; Xu et al. (2015) did so for waste-to-energy PPPs in China; Rybníček et al. (2020) built a conceptual model organizing risk by project phase and stakeholder. Yescombe (2007) identified a more structural problem, which was irrespective of how well success factors, criteria and their interlinks are understood, a gap persists between contractual and actual risk transfer. Private consortia finance electricity PPPs through Special Purpose Vehicles under project finance structures (Sainati et al., 2020), private liability is capped contractually, while the public authority retains the ultimate obligation to provide the service.

Therefore, three limitations in this body of work motivate the present study. First, its empirical base is dominated by concession models. Second, success factors, success criteria and risk factors are typically studied in isolation or in pairs, so the question of how they interact is rarely investigated. Third, and most directly, the South African reverse-auction programmes have been studied extensively as a policy phenomenon (Eberhard et al., 2014; Eberhard & Naude, 2016; Kruger & Eberhard, 2023; Lawrence, 2020) but not through a success and risk factor lens, especially since the conversion failures of the post 2020 bid window rounds.

2.3 Theoretical framework

The study consists of a dispersed but interlinked theoretical base. Three key theories form the basis of the framework, these are namely:

Transaction cost theory, which explains bidder behaviour under uncertainty. Private consortia commit to projects when expected financial benefit exceeds the transaction costs and risks of pursuing them, and they price residual uncertainty into the cost of finance through project and country risk premia (Fleta-Asin & Munoz, 2021; Odhiambo et al., 2020). The mechanism this implies for reverse-auction procurement is unforgiving. An auction that competes on tariff alone, under high uncertainty, will systematically select the bidder who has assumed the most and verified the least, leading to that bidder pricing the lowest. The theory therefore predicts that price-dominant evaluation under uncertainty produces winners who cannot close. This grounds the study's findings on tariff sustainability, project readiness and concentration risk.

Project finance theory explains the Financial Close constraint itself. A project-financed asset is serviced solely from its own cash flows, with recourse to sponsors limited by contract (Sainati et al., 2020; Yescombe, 2002). Lenders will therefore not commit capital until every material risk is either allocated to a creditworthy party or eliminated. The mechanism this implies is that Financial Close is not an administrative step, but a solvency test

administered by third parties who did not participate in the adjudication of the formal reverse-auction PPP programmes and are therefore not bound by its assumptions. Meaning that lender consortia ultimately decide the bankability (and hence Finance Close capability) of a project or programme and not the IPPO or any other government entity. This disconnect between administrative and procedural decision makers (such as the IPPO) and senior lender, who make decisions on bankability ties very closely to the major theory on New public governance and the need for very close collaboration amongst all key stakeholder groups.

New public governance explains the relational and measurement findings. Casady et al. (2019) redefine PPPs in the new public governance paradigm as arrangements depending on sustained shared authority and commitment across institutionally mature actors rather than on contractual specification alone; Krogh and Triantafillou (2024) develop the paradigm further. The mechanism this implies is twofold, (1) delivery depends on continuing relational investment beyond contract signature, and (2) legitimate performance measurements extend beyond the typical measurements of time, cost and scope - to include environmental and social outcomes.

The theoretical framework is coherent as a sequence as opposed to a set of theories, given the time dependent nature of PPP Project Delivery Success. Transaction cost theory explains what bidders do under uncertainty; project finance theory explains what lenders require before capital will move; new public governance explains what must be sustained, and measured, for the arrangement to hold once capital has moved. The framework derived in Section 5 follows that sequence, enablers act on what bidders and lenders can do, criteria measure what the arrangement delivers and risks are the conditions under which the sequence breaks.

3 Methodology

3.1 Approach and Design

The study employed a qualitative, deductive-inductive design within an interpretivist paradigm. Qualitative inquiry suits the collection and analysis of non-numerical information about context-specific phenomena (Ravitch & Carl, 2016). This approach has been used to consolidate expert opinion across public and private sectors in comparable PPP success factor research (Al-Saadi & Abdou, 2016). The interpretivist stance was chosen because knowledge here is created through interaction between interviewer and participant (Thanh & Thanh, 2015).

The design was deductive in that a conceptual framework and four research questions derived from the literature review guided the interview instrument and the initial coding structure (Pearse, 2019). It was simultaneously inductive in that the analysis permitted factors not present in the initial structure to emerge from the transcripts of the semi-structured interviews (Fife & Gossner, 2024). This combination was deliberate to ensure that emergent enabling factors could be identified empirically whilst simultaneously anchoring the framework on an established theoretical base.

3.2 Population and sampling

3.2.1 Population

The population was divided into three groups.

- Group one: comprised private sector professionals with experience at Independent Power Producers, private equity and BBBEE investors, financial institutions, service providers and consultants, and debt providers including commercial banks and development finance institutions.
- Group two: comprised public sector professionals from the IPPPO, the DMRE, the National Energy Regulator of South Africa (NERSA) and Eskom.
- Group three: comprised professionals with substantive experience in both, included specifically strengthening triangulation, since expert interviews are susceptible to positional bias (Natow, 2019).

3.2.2 Sample type and sample size

3.2.2.1 Type

Purposive sampling combined with snowball sampling was used for this study. Purposive sampling permits selection of information-rich participants against defined criteria (Patton, 2002); snowball sampling was used alongside it to reach participants through professional networks (Naderifar et al., 2017).

Eligibility required both of the following:

- at least three years (> 3) of working experience in formal reverse-auction PPP programmes in the South African electricity generation sector; and
- current or prior service in a mid-management, senior management or executive role, following Rockart's (1979) original specification that Critical Success Factors are elicited from those holding the integrated view.

3.2.2.2 Size

Twenty-one participants met these criteria and were interviewed. Eleven with private sector experience only, five with public sector experience only, and five with both private and public sector experience. From Table 2, institutional experience categories are not mutually exclusive; participants with careers spanning multiple institutions are counted in each.

Table 2: Composition of the interview sample

Dimension	Category	Participants (n)
Sector experience	Private sector only	11
	Public sector only	5
	Both public and private sector	5
Seniority	Executive	8
	Senior management	6
	Mid-level management	7
Institutional experience	Independent Power Producer	13
	Development finance institution	4
	Consulting	4
	Eskom	3
	Independent Power Producer Office	3
	Commercial bank / senior lender	2
	Department of Mineral Resources and Energy	2
	National Energy Regulator of South Africa	1
	National Treasury	1
Programme tenure	Involved since REIPPPP BW 1 (2011)	6

Six participants had been involved since REIPPPP Bid Window 1 in 2011, spanning the full history of the programmes. Eight were executives, six senior managers and seven mid-level managers. Across the sample, thirteen had Independent Power Producer experience, four development finance institution experience, four consulting experience, three Eskom experience, three IPPO experience, two commercial bank and senior lender experience, two DMRE experience, one NERSA experience and one National Treasury experience. Participants are identified throughout by the codes P1 to P27, assigned by interview sequence; the codes are non-contiguous because not all approached individuals proceeded to interview.

3.3 Instrument and data collection

The instrument was a semi-structured interview guide developed through the five-step procedure of Kallio et al. (2016). Step one confirmed that semi-structured interviewing suited the research problem. Step two established the prior knowledge base through the literature review. Step three formulated the questions, with care taken to keep them non-leading so that participants expanded on their own experience rather than confirming the researcher's own (Ruslin et al., 2022). Step four pilot-tested the guide on 17 October 2024. The pilot participant proposed minor adjustments, which were incorporated (Majid et al., 2017). Step five consolidates the final guide.

The guide opened with descriptive items forming attribute codes and confirming eligibility, proceeded to a common set of substantive questions asked of every participant, and closed with open-ended questions inviting insights the guide had not anticipated. This section was to ensure that emergent factors could emerge from the empirical data.

Interviews were conducted between October and December 2024, one-to-one, in person or via Microsoft Teams, and were recorded and transcribed. Interviews averaged approximately one hour. Each participant was given the opportunity to read and amend their transcript before analysis, a member-checking procedure was incorporated into the study design that strengthens credibility (Stahl & King, 2020).

3.4 Analytical procedure: Bingham's five phase inductive-deductive approach

Transcripts were analysed in MAXQDA using the five-phase deductive-inductive procedure described by Bingham (2023) and Bingham and Witkowsky (2022). The phases were applied as follows.

Phase 1: Organising the data.

Transcripts were imported into MAXQDA and attribute codes applied for years of experience, sector, seniority, interview medium and participant identifier. These attribute codes were developed deductively before interviewing began, and are what allow for the sectoral disaggregation of participants in Table 2.

Phase 2: Sorting the data.

Interview data were sorted into seven themes developed deductively from the literature review: These themes were namely: (1) macro political and regulatory factors, (2) effective procurement factors, (3) financial and economic factors, (4) project feasibility factors, (5) organizational factors, (6) social factors, and (7) PPP measurement-specific factors.

Phase 3: Understanding the data.

Within each theme, open coding proceeded using the constant comparative method (Glaser, 1965), in which codes are developed, defined, redefined and reapplied iteratively across every transcript. The codebook was maintained as a live document recording each open code with its definition and its inclusion and exclusion criteria, following Bingham (2023).

Phase 4: Interpreting the data.

Pattern coding grouped open codes into higher-order findings, combining and summarising codes and discarding material not relevant to the research aims (Elliott, 2018). This is the phase at which the thirty-two Critical Success Factors, seven Critical Success Criteria, four Interlink Factors and seventeen Critical Risk Factors were consolidated, and at which the emergent factors were identified as such, a code was treated as emergent when it recurred across multiple participants at Phase 3 but had no corresponding construct in the deductive structure established at Phase 2.

Phase 5: Explaining the data.

Findings were interpreted against the conceptual framework and the main theoretical lenses, permitting confirmation, deviation and context-specific extension to be distinguished from one another. Section 4 (Findings and discussions) report on this phase.

3.5 Saturation

Sample size was determined by saturation rather than fixed in advance. Guest et al. (2006) demonstrated that saturation can occur as early as six interviews and typically within twelve; Cobern and Adams (2020) argue that in the absence of consensus on numbers, researchers should attend to whether new and differing perspectives are still appearing.

The operational criterion adopted here was code saturation, which is the point at which additional transcripts produced no new open codes at Phase 3 and no new pattern codes at Phase 4 in the analytical procedure. For this study new findings began slowing down from the fifteenth (15th) interview, with saturation occurring after the eighteenth semi-structured interview, in which no new open or pattern codes emerging from the empirical data thereafter. Meaning saturation, the point at which no new dimensions of an existing code appeared for this study was a distinct and robust measure (Hennink et al., 2017) and not a number set before the semi-structured interviews began.

3.6 Trustworthiness

Four criteria were applied.

Credibility was pursued through triangulation across three participant groups, across multiple programmes and bid windows, and across two interview media. Furthermore, through member checking of transcripts and through a reflexivity journal maintained across the study (Stahl & King, 2020).

Transferability is limited by the non-probabilistic sampling and the single-sector, single-country setting. The deductive element strengthens transferability to the extent that findings align with the prior literature, but the design does not support generalisation.

Dependability was pursued through a documented audit trail recording the evolution of codes and themes (Nassaji, 2020).

Confirmability is constrained by interpretivist design. The researcher's own position in the sector is part of the findings rather than external to them (Junjie & Yingxin, 2022), and reflexive journaling and member checking mitigate rather than remove this.

All coding was performed by a single analyst. No inter-coder reliability statistics are reported, and none should be inferred. The codebook, the constant comparative procedure and the audit trail are offered as the basis for assessing consistency, thus they are not a substitute for independent coding. This has been captured as a limitation in Section 6.

3.7 Ethics

Ethics clearance was granted by the Wits Business School Ethics Committee, constituted under the University of the Witwatersrand Human Research Ethics Committee (Non-Medical) under the protocol number: WBS/EL454688/100. Participation was voluntary and confidential. Participants gave written informed consent before interviews commenced. Names appear in neither the codebook nor any output; participants are identified by code only. Recordings and transcripts are held in encrypted cloud storage for a maximum of five years, after which they will be destroyed. Two verbal prompts were embedded in the interview guide asking participants whether they remained comfortable to continue; one of the twenty-one participants (P27) ended an interview at such a prompt, and that request

was honoured. The interview data up to that prompt was included in the analysis as the participant needed to drop off due to another engagement and was not available to finish off the rest of the interview.

One ethical consideration warrants a specific statement. The researcher is an active professional in the sector and was known personally to several participants. This created a potential power dynamic in which participants approached purposively may have felt obliged to participate (Allmark et al., 2009). Interview questions were framed to be participant-oriented and neutral, and interviews were scheduled at times and locations of the participant's choosing. The residual risk however could not be eliminated and this is recorded as a limitation of this study in Section 6.

4 Findings and Discussions

4.1 CSF: The binding constraint is physical and administrative, not political

The most widely raised enabling factor in the study was grid connection, named by twenty of the twenty-one participants. Political will and support was raised by seventeen participants and sound energy policy by nineteen; grid connection exceeded both.

Participants were clear that the programme can proceed under political instability, at a cost expressed in the country risk premium and therefore in the tariff, aligning with the transaction cost theory. However, the programme in its current design cannot proceed without grid capacity at any price. Political will is a condition of the programme existing; grid connection on the other hand is a condition of individual projects closing and therefore uncertainty on grid creates a risk dynamic that cannot be managed and ultimately cannot be banked.

Participants disaggregated grid connection into four components that must operate together, namely grid expansion, grid modernisation and grid code compliance, the grid connection process and its associated costs, and the streamlining of grid access rules.

The literature emphasizes the first (Ayamolowo et al., 2022). Participants emphasized that expansion alone is insufficient. Modernisation and grid code compliance for key equipment, reduced uncertainty between the Cost Estimate Letter and the Budget Quote, and clearer allocation rules under the Interim Grid Capacity Allocation Rules (IGCAR, 2023) were each raised as independently binding.

“There is a discrepancy between the cost of connection that you get when you apply for the CEL [Cost estimate letter] versus what you get when you’re in BQ [Budget Quote] stage” [P6, Executive, Private]

This consequence was made plainly visible in Bid Window 6 where the department received 4,116 MW of onshore wind bids against an allocation of 3,200 MW and selected none on the stated grounds that no grid capacity was available for connection in the Eastern and Western Cape (DMRE, 2022). What participants criticized was less the constraint itself but rather the urgency and pace of response to it.

“I know that the IPP office is working on a pilot project to procure grid [Independent Transmission Programme], but that’s already two years in the making. They’re too slow. They’re not moving with the times. We need grid now.” (P12, mid management, public sector)

Political will nonetheless remains a real enabler, and participants located its effect at the level of programme continuity rather than project delivery. P9 traced the programmes existence to a policy decision:

“So, for the IRP 2010, the technical modelling outcomes [Base Case 0.0 scenario] were giving coal and no renewables none whatsoever... there was a policy adjustment for renewable energy to be part of the outcomes of the IRP.” (P9, mid management, public sector)

Participants were unanimous that the withdrawal of political support between 2014 and 2018, when Eskom declined to sign Power Purchase Agreements for Bid Window 3.5 and Bid Window 4 projects, halted the programme entirely. Lawrence (2019) records investment falling from R170 billion in 2011 to R50 million in 2017.

“I mean it was exemplified from 2014 to 2018. Everything stopped.” (P15, executive, private sector)

4.2 CSF: Price dominant evaluation incentivizes for bidders who cannot close

Eighteen of twenty-one participants raised sustainability of the tariff, and all agreed it was a key enabler. Their disagreement was concerned with whether the current evaluation methodology encourages bidders to submit sustainable tariffs, and that disagreement fell along sectoral lines in a way that is itself a finding.

The public sector position is that the evaluation is robust by construction. Compliance on land, legal, environmental, technical and financial criteria is assessed before any comparative evaluation on tariff occurs. The public sector position is only compliant bids reach the comparative stage where projects are evaluated on a heavily price weighted score. On that reading the public sector position was that a compliant bidder is by definition ready, and the lowest compliant price should win.

Private sector participants disputed the premise rather than the logic.

“I don’t think the lowest price should always be awarded Preferred Bidder (status)... I mean the lowest tariff can win but can these projects also last?” (P4, mid management, private sector)

“The lowest tariff is not a winning tariff. It can be low but if it’s not able to reach Financial Close, then it’s meaningless.” (P5, mid management, private sector)

The substance of the dispute is what compliance verifies. Participants noted that bids are not required to include binding offers from principal contractors at submission, and that the

financial model audit, which is a bid compliance requirement, examines the logic integrity and internal consistency of the model's formulae rather than confirming that the project can be built at the modelled cost. A bid may therefore be fully compliant and still rest on unverified assumptions.

“If someone bids on fiction...and they still need to go and negotiate, it makes it more difficult. So, project readiness is key.” (P5, mid management, private sector)

This illuminates the transaction cost theory operating exactly as predicted. Where uncertainty is high and evaluation rewards price, the bidder who has assumed most and verified least can price lowest and will win. The Bid Window 5 outcome, in which fourteen of twenty-five Preferred Bidder projects failed to close and the IPPO called their bid bonds in the fourth quarter of 2024, is the mechanism's visible result. From Figure 1 and Figure 2, the projects that failed to close all had amongst the lowest tariffs bid into Bid Window 5.

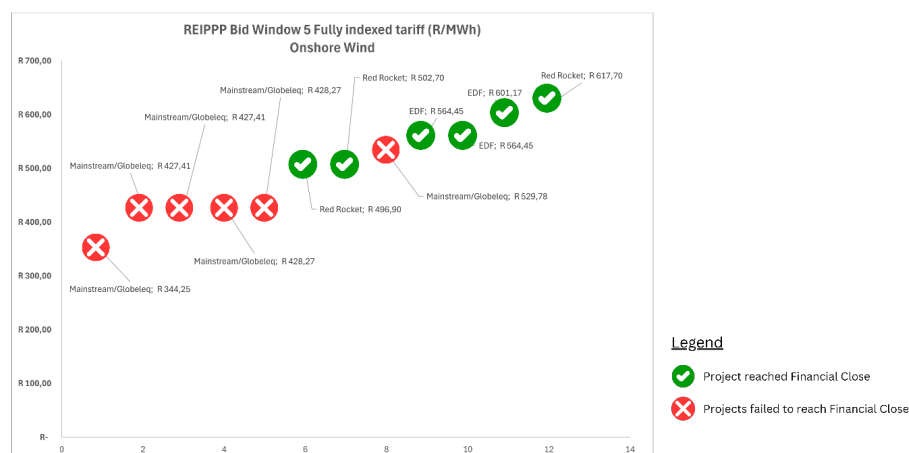


Figure 1: Onshore wind fully indexed tariffs (R/MWh) bid into REIPPPP BW5

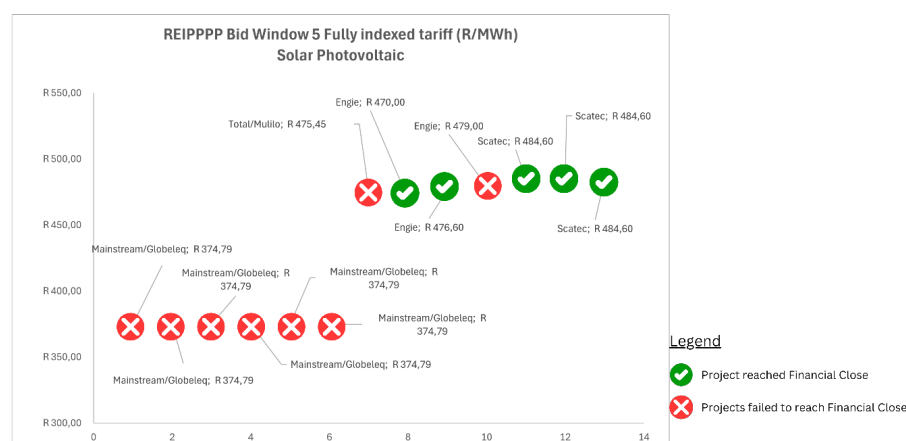


Figure 2: Solar photovoltaic fully indexed tariffs (R/MWh) bid into REIPPPP BW5

The account in Figure 1 and Figure 2 should not be read as a general indictment. Participants were consistent that the programmes revenue architecture is its strongest feature acting as a double-edged sword – driving competitive pricing whilst simultaneously incentivizing risky bidding practices and institutionalizing unsustainable tariffs.

“That’s why this program is so successful. It’s that it’s very easy for people to see what this program is going to pay you.” (P4, mid management, private sector)

“Every single invoice I have ever sent since I came here to Eskom for power has been paid on time. It has never been late, not once.” (P15, executive, private sector)

Revenue certainty of this kind reduces contingency pricing and raises transaction efficiency, exactly as transaction cost theory predicts (Fleta-Asin & Munoz, 2021). It also underwrites a recommendation participants themselves advanced, which is that the government guarantees which currently sit at eighty percent, may have room to reduce even further.

Local content policy attracted the opposite assessment. Participants supported localisation in principle and criticized its current targeting, arguing that prescripts should follow comparative advantage rather than equipment categories.

“If you want to do local content in terms of PV and battery, there’s no way South Africa can compete. Because the technology advances so quickly.” (P24, executive, both sectors)

“Local content is important, but I think we need to really do a deep dive on the value chain of the procurement process and really hone in on what can be truly localized and can be sustained beyond that particular program.” (P6, executive, private sector)

Therefore, the combination of revenue certainty from actual invoices being successfully paid from previous bid windows coupled with strong government guarantees, incentivized bidders to bid prices that were very low on the premise of making up for them once selected as preferred bidder.

4.3 CSF: Co-ordination failure across government departments, illustrated by RMIPPPP

Thirteen of twenty-one participants raised the IPPO’s coordinating role, and the assessment was two-sided: the office was credited with the programmes existence and criticized for the limits of its authority over other departments.

“If it wasn’t for that office, then none of this would be here.” (P14, senior management, both sectors)

The RMIPPPP round of 2020 is the clearest illustration of what happens when coordination fails. Table 3 sets out its eleven Preferred Bidder projects. Four failed to reach Financial Close, and all four were the gas technology projects as shown in Table 3.

Table 3: The impacts of no gas supply on RMIPPPP projects

Project name	Evaluation price (R/MWh, 2021)	Capacity (MW)	Technology		Reached financial close
Scatec Kenhardt 1	1,884.64	50	Solar	PV, battery	Yes
Scatec Kenhardt 2	1,884.61	50	Solar	PV, battery	Yes
Scatec Kenhardt 3	1,884.56	50	Solar	PV, battery	Yes
Oya Energy Hybrid Facility	1,550.34	128	Solar	PV, wind, battery	Yes
ACWA Power Project DAO	1,462.00	150	Solar	PV, battery	Yes
Umoyilanga Energy	1,721.64	75	Solar	PV, wind, storage	Yes
Mulilo Total Hydra Storage	1,515.97	75	Solar	PV, battery	Yes
Karpowership SA Coega	1,468.87	450	Gas		No
Karpowership SA Richards Bay	1,496.03	450	Gas		No
Karpowership SA Saldanha	1,686.48	320	Gas		No
Mulilo Total Coega – Gemsbok PV	1,885.37	197.76	Solar	PV, Gas	No

Participant 12 captures the same phenomenon of poor co-ordination failures across government departments.

“You will note that there were three power ships from RMIPPPP and then one project from Mulilo Total. All four of them did not reach Financial Close. And there’s a very good reason for that. It was the gas supply because none of the ports had the infrastructure in place to get the gas supply into the ports... There should have been better coordination from the IPP office side together with the other role players.” (P12, mid management, public sector).

The pattern in Table 3 is clear projects that failed used gas, and every project that closed did not. This is the project finance mechanism again, operating on an input rather than an offtake constraint. Lenders would not fund vessels that could not be supplied, and no party to the procurement held authority over the port infrastructure on which supply depended. The failure was neither commercial nor technical - it was jurisdictional.

“So, I think the IPP office hasn’t grown with the market and the times we had Minister Radebe, he always said we need to be agile.” (P27, executive, both sectors)

4.4 CSF: Emergent enabling factors

4.4.1 Project readiness

Definition of Project readiness (author’s own): a mechanism to be incorporated into the adjudication process ensuring that projects submitted at bid are able to reach Financial Close and begin

construction within the programme's stipulated timeframes.

Eight of twenty-one participants raised project readiness as a major enabler. It serves as one of the key enabling factors to emerge from the empirical evidence.

"So, project readiness is key. . . . If the lowest tariff is not a winning tariff, if it's not able to reach Financial Close, then it's meaningless. I think it's time we weighed other aspects such as ability and readiness to reach Financial Close." (P5, mid management, private sector)

Furthermore, Project readiness is not costless. Higher certainty at bid requires longer and more expensive development before Preferred Bidder status is known, which is inefficient for bidders who will not be selected. The factor therefore poses a genuine design trade-off rather than an obvious improvement, and participants who raised it acknowledged as much.

The underlying issue is that the public entity retains responsibility for service provision irrespective of the private party's default (Awuku et al., 2022). Remedies available to the public entity after failure on behalf of the private party is calling of bid bonds, which may recoup some of the financial losses and discourage future bidders from submitting non-compliant bids, however the remedies will not be able to recover the country's loss of opportunity in procuring electricity generation.

4.4.2 Continuous re-evaluation of the programme's market fit

Definition (author's own): recurrent multi-stakeholder engagement to review the programme and identify what is working and what could be improved.

Five of twenty-one participants raised the need for the programme to be reviewed continuously against a rapidly changing procurement environment.

"So, we need to think about changing with the time and making sure the program stays relevant." (P27, executive, both sectors)

"From the IPPPO side, I think that they need to look at retrospective learning to see what is working instead of just continuing the process." (P23, executive, private sector)

Participants noted that engagement currently occurs through briefing notes when an active Request for Proposal is in the market, which was regarded as useful but insufficient. The need for this continuous re-evaluation is best read through the lense of new public governance theory which highlights sustained relational engagement between public and private actors as a key delivery input, and not a courtesy to enable long term PPP Project delivery success.

4.4.3 Adjustment for changing market conditions (Interlink Factor)

Definition (author's own): an adjustment to tariff for material, unforeseeable changes in macro conditions that adversely affect project economics.

Eleven of twenty-one participants raised the absence of any mechanism to adjust tariff after bid submission or Preferred Bidder announcement.

“There should be mechanisms to allow for adjustments in things like the tariff itself if there are external factors outside of the control of the country.” (P8, mid management, private sector)

The asymmetry participants identified is structural. Regulation Nine of the Electricity Regulations on New Generation Capacity prevents a public buyer from entering a Power Purchase Agreement unless it represents Value for Money (Electricity Regulation Act, 2011). That mechanism protects the public party against cost-unreflective tariffs.

Participants from both sectors observed that no equivalent mechanism protects the private party against material adverse change. The instances cited were the COVID-19 pandemic and the ten percent import duty on solar photovoltaic modules gazette in August 2023 and signed into law in June 2024, neither of which met the threshold for force majeure but both of which materially altered project economics after bids were priced.

Contreras (2022) discusses tariff adjustment in PPPs following technological breakthrough that is, adjustment downward, consistent with Value for Money. The finding here concerns the reciprocal case, for which participants proposed a financial equilibrium clause of the kind used in other PPP jurisdictions.

This factor is classified as an Interlink Factor rather than a pure enabler, because participants treated the presence of such a mechanism as both something that enables Financial Close and something against which programme fairness can be measured.

Table 4 sets out the enabling factors with their salience. A factor raised by all twenty-one participants is one that experts had consistently named, it is not thereby shown to explain variation in financial close outcome but rather to show what was commonly raised as enabling factor amongst all participants to enable projects achieving Financial Close. Emergent factors are those identified at Phase 4 of Bingham (2023) five-phase deductive-inductive procedure, with no corresponding construct in the deductive structure established in Phase 2.

Table 4: Critical Success Factors by theme, with salience among the interview sample

Theme	Critical Success Factor	Participants (n = 21)
Macro political and regulatory	Sound energy policy	19
	Strong political will and support	17
	Country-level political stability	11
	Stable regulatory and statutory bodies	3
Project feasibility	Grid connection	20
	Project technical viability	11
	Total project lifecycle cost analysis	6
	Use of the latest and most efficient technology	5
Effective procurement	Rolling or staged bids	15
	Transparency in procurement	14
	Efficient approval of permits	12
	Standardized PPA and project documents	9
	Project readiness (emergent)	8
	Competitive tender	6
	Continuous re-evaluation of programme market fit (emergent)	5
Financial and economic	Government-backed guarantees	18
	Sustainability in the tariff	18
	Programme is self-sustaining	12
	Strong liquidity in local currency	11
	Project capable of servicing debt over its tenor	9
	Defined revenue stream	6
	Stable economic conditions	4
Organizational	Coordination between intergovernmental departments	14
	Central PPP unit	13
	Strong and experienced private consortium	9
	Balanced power dynamics in the Special Purpose Vehicle	5
	Risk transfer to private consortia	5
	Reduction in public sector administration costs	4
Social	Community buy-in	16
	Technical upskilling of local communities	7

4.5 Critical Success Criteria: Both project management and ESG factors must be measured

Seven Critical Success Criteria were identified, falling into two groups.

The first group comprises conventional project management measures with established quantitative definitions, namely adherence to schedule, adherence to budget, health and safety performance, and the project meeting its output specifications.

The second group comprises qualitative measures, namely environmental performance, relationship governance between Independent Power Producers, government and communities, and social impact, a criterion that emerged from the data.

Mapped against the environmental, social and governance framework, the second group

is complete: environmental performance corresponds to E, social impact to S, and relationship governance to G. The finding is that participants treated ESG measures as constitutive of PPP Project delivery success rather than adjacent to it, which is consistent with Penyalver (2022) and Wegrzyn and Wojewnik-Filipkowska (2022) and with the new public governance prediction that legitimate measurement extends beyond the conventional and established project management measures.

The neglect participants identified was specific. Relationship governance and community engagement were widely acknowledged in principle and weakly specified in practice. Economic development obligations are contracted and reported, but participants distinguished between spend and effect.

“How do we leave these places better than how we found them.” (P14, senior management, both sectors)

“In my experience that I had is that I always called it fiscal dumping. A project with no measurable outcomes.” (P16, senior management, private sector)

Social impact was accordingly defined for this study as a significant positive change addressing a pressing social challenge and identified as requiring tangible measurable outcomes rather than expenditure records. Therefore, the PPP measurement specific factors that align with CSC are a combination of ESG factors and project management factors as captured in Figure 3 below.

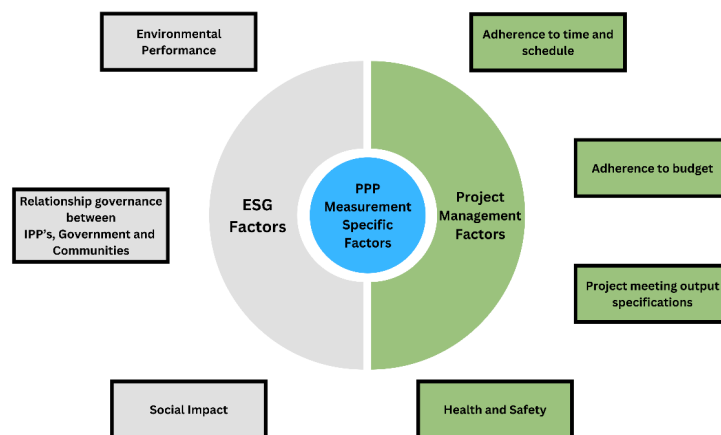


Figure 3: PPP measurement specific factors

4.6 IF: Four factors operate as both enablers and measurement factors

Four factors function simultaneously as Critical Success Factors and Critical Success Criteria, these are namely (1) low political interference, (2) shared authority and commitment, and (3) energy yield and the (4) adjustment for changing market conditions as per Section 4.4.3.

Energy yield illustrates the category clearly. It enables delivery, because a project whose yield is credibly forecast can be financed. It measures delivery, because the programme scrutinizes realized yield against forecast and applies variance penalties.

“So, you now have the 10% variation penalty in your forecasts” (P12, mid management, private sector)

Shared authority and commitment are the second clear case and is the most direct empirical expression of the new public governance paradigm in the study. It is an enabler because the arrangement depends on it, and a measure because participants proposed it as something the programme should track, rather than rely only on contractual specifications between public and private sector actors.

4.7 Critical Risk Factors: seventeen factors, four of them are context specific

Seventeen Critical Risk Factors were identified. Thirteen align with the established literature, namely (1) design risk, (2) site-specific physical risk, (3) land and permitting risk, (4) government and political risk, (5) supply chain risk, (6) legal risk, (7) change management risk, (8) financial risk, (9) public opposition risk, (10) construction risk, (11) commissioning risk, (12) operations risk and (13) environmental risks.

Four emerged from the data as context-specific, these are climate change risk, concentration risk, extortion risk and skilled labour shortage risk. These context specific findings are described in more detail in the following subsections, with a summary of CRFs by theme in Table 5.

Table 5: Critical Risk Factors by theme and salience from the interview sample

Risk factor	Theme	Participants (n = 21)	Status
Financial risk	Financial and economic	16	Consistent with literature
Land and permitting risk	Project feasibility	12	Consistent with literature
Site-specific physical risk	Project feasibility	11	Consistent with literature
Legal risk	Effective procurement	11	Consistent with literature
Public opposition risk	Social	11	Consistent with literature
Supply chain risk	Macro political and regulatory	10	Consistent with literature
Design risk	Project feasibility	6	Consistent with literature
Government and political risk	Macro political and regulatory	6	Consistent with literature
Change management risk	Organizational	3	Consistent with literature
Construction risk	PPP measurement-specific	13	Consistent with literature
Commissioning risk	PPP measurement-specific	11	Consistent with literature
Operations risk	PPP measurement-specific	9	Consistent with literature
Environmental risk	PPP measurement-specific	2	Consistent with literature
Concentration risk	Effective procurement	2	Emergent
Climate change risk	Project feasibility	3	Emergent
Extortion risk	Social	2	Emergent
Skilled labour shortage risk	Social	2	Emergent

4.7.1 Concentration risk

Concentration risk is the most consequential and is defined here as the risk of a single Independent Power Producer or consortium being selected for a large majority of the capacity allocated in a bidding window.

“I’m going to use Round five as an example where again, by the design of the rules, it did not limit one company being awarded 50% of their allocation” (P6, executive, private sector)

The Bid Window 5 outcome is the illustration. Of the fourteen Preferred Bidder projects that failed to reach Financial Close, twelve belonged to a single consortium (Ikamva Consortium). Participants observed that concentration correlates with tariff. The consortium concerned had bid substantially below competitors across the round. Concentration risk is therefore not independent of the price-dominant evaluation described in Section 4.2, it is that mechanism’s portfolio-level consequence. Participants further noted that concentration risk exists on the BBBEE partner side as well as the developer side.

4.7.2 Climate change risk

Climate change risk was found to operate on construction as well as on yield. Participants raised extreme weather events at project sites during construction alongside the more familiar seasonality and forecasting effects, consistent with Gernaat et al. (2021).

4.7.3 Extortion risk

Definition (author’s own): The risk of money or property being obtained by force, intimidation or undue illegal power (Merriam-Webster, 2025).

Participants highlighted a growing trend of organized criminal syndicates infiltrating the South African construction industry. One participant referred to this group as the “construction mafia”. Nyangiwe, Amoah and Mukumba (2023) study aligns with the empirical findings of the risks associated to construction mafia.

“Especially with the projects moving away from the Cape region and moving more to Mpumalanga and KZN, we’re going to be dealing a whole lot more with construction mafia issues.” [P14, Senior Management, Both]

It was further noted that this is an ever-increasing risk as projects, due to grid constraints, move closer towards populated load centers such as Limpopo, Mpumalanga and Kwazulu-Natal.

4.7.4 Skilled labour shortage risk

Participants mentioned that skilled resources within the industry are limited, and the impact of the shortage is foreseen to increase in the coming years as more and more skilled people leave the country. This phenomenon of brain drain is not unique to South Africa and has been observed in other African countries as well (Tuj-Zohura & Bhowmik, 2024).

“For me, the biggest risk that we did not really touch on is skilled resource which are very few in the country and the brain drainage will occur in the years to come. That’s definite.” (P21, senior management, private sector)

5 Success and Risk Factor Framework

The framework in Figure 4 integrates the four constructs into a single structure. Keeping the four constructs in one structure is not just a presentation choice. Each answers a different question and cannot answer the others. Success factors say what must go right but not whether it did, success criteria say what to measure but not what causes it, and risks say what can go wrong but not which enabler they break. Because all four sit under the same six themes, risks, enablers and measures can be grasped in an integrated manner. As an example concentration risk illuminates the benefits of an integrated framework, on its own concentration risk may look like bad luck, but placed in the Effective Procurement Factors theme it is visible as the portfolio-level result of the price-dominant evaluation described in Section 4.2, which is a design problem on the programme rather than an accident. The Bid Window 5 outcome, where twelve of the fourteen failed Preferred Bidder projects came from a single consortium, is legible in the integrated structure and largely invisible in three separate lists. The Interlink Factors exist only because two constructs are held together: kept apart, energy yield as an example would be recorded either as an enabler, because a credible forecast can be financed, or as a measure, because realised yield is checked against forecast under a variance penalty. However never as both, and the lesson that the programme must enable and track the construct at the same time would be lost. This extends the two-construct bridging work of Frefer et al. (2018) and Lamprou and Vagiona (2022) to include risk, and it preserves the sequence set out in Section 2.3. To use the framework practically, a bidder could apply the enabling factors as a pre-bid readiness check that separates what has been verified from what has been assumed, and the risk factors as a bid-stage register. A lender could apply it in due diligence to separate risks that can be allocated to a creditworthy party from those that can be neither priced nor allocated, of which grid connection is the clearest of those items. The IPPO could apply it before a round as a design checklist for the Request for Proposal and after a round to attribute retrospectively any conversion failures to a theme rather than a project. The contribution of the framework is therefore threefold (1) the framework allows for an integration of all four constructs for reverse-auction electricity procurement in South Africa, (2) the identification of four interlink factors and three emergent enablers, and (3) a programme-level diagnostic tool for South Africa, noting that the framework in its current form provides value as a diagnostic tool and does not predict for reasons given in Section 6 and 8.

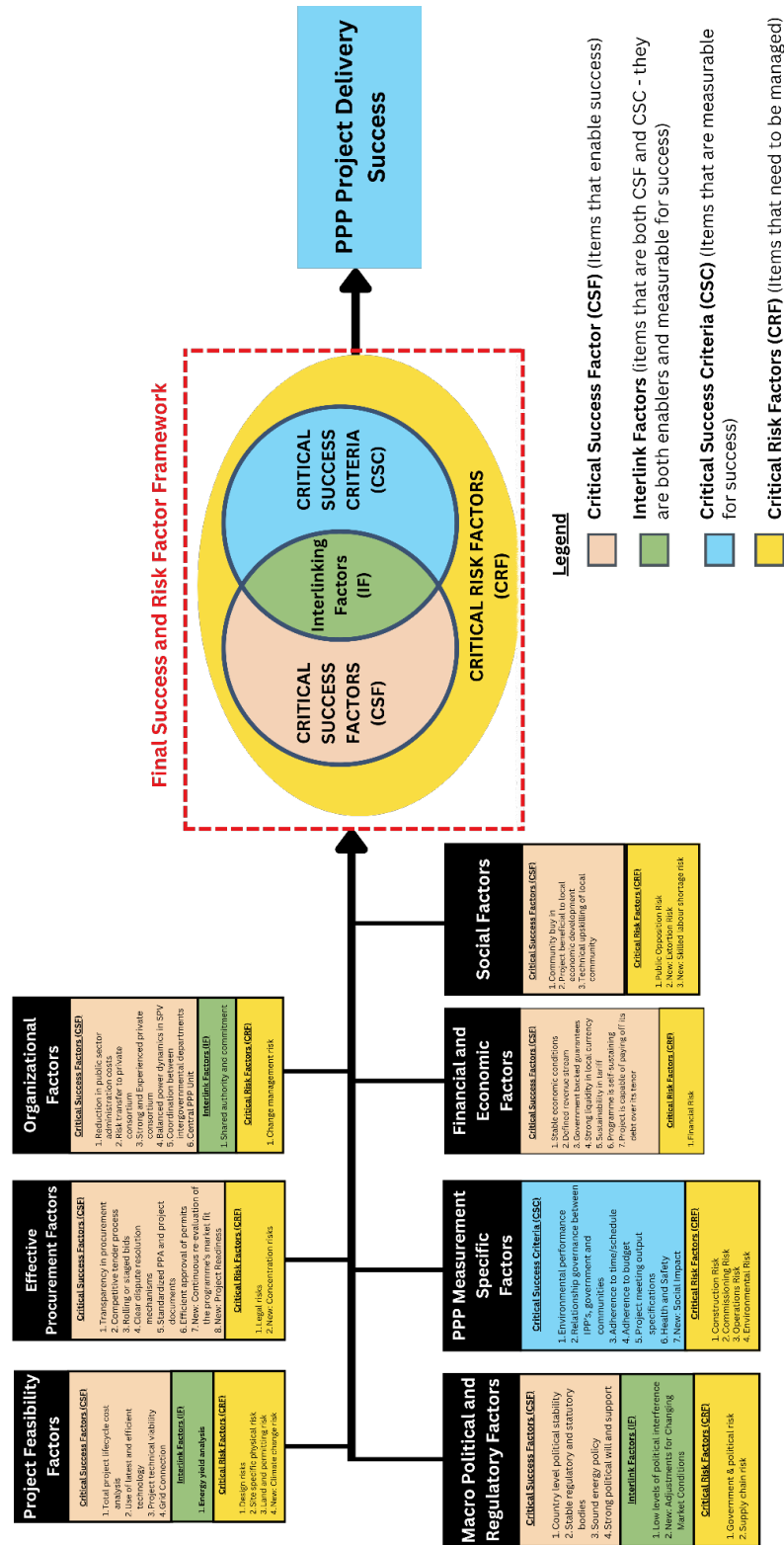


Figure 4: Final Success and Risk Factor Framework

6 Limitations

Based on the overall study design - limitations are captured in this section.

The study analyses what twenty-one experts believe drives success. It does not test those beliefs against project-level outcome data. A factor may be universally believed to matter and not matter, and the nature of the study's qualitative design cannot detect that.

Salience is not causal effect. The participant counts reported throughout indicate how widely a factor was raised. They must not be read as weights. The specific failure mode and limitation therefore is this, a factor that every participant regards as essential and that is in fact reliably satisfied in every round would record maximum salience while explaining none of the variation in Financial Close rates. Conversely a factor raised by few participants may be decisive in the rounds where it binds. Establishing weights requires outcome data and quantitative methods such as fuzzy synthetic modelling and structural equation models that this study does not employ.

The researcher is an active professional in the energy sector and was personally known to several participants. This raises three risks, (1) selection bias in who was approached, (2) guarded responses where commercially sensitive matters were involved, and (3) a power dynamic in which participants may have felt obliged to participate. Reflexive journaling, member checking and triangulation across sectoral groups mitigate these, however the residual risk remains a limitation of the study.

All coding was performed by one analyst, and no inter-coder reliability statistics are available. The codebook and audit trail support assessment of consistency but are not equivalent to independent verification.

Findings are specific to South African reverse-auction electricity generation procurement between 2011 and 2024, hence the cross sectional and qualitative design do not support generalisation.

Lastly, interviews were constrained to approximately one hour by participants' availability. This limited deeper probing on specific items, particularly in the closing open-ended sections where the emergent factors surfaced.

7 Recommendations for policy and practice

7.1 For policy makers

The following recommendations follow the findings.

It is recommended that release of rolling bid windows be fixed to ensure predictability. This is important as participants identified predictable Request for Proposal release dates as the lowest hanging fruit and least cost improvement available, requiring no structural change to the programme design. RFP releases should be predetermined at annual intervals and be predictable to within a specified month. This communicated in advance would remove uncertainty that is currently priced into bids and would enable market participants and government actors to plan far in advance optimizing cost allocation and resources.

There is also a need to consolidate all the permits and the processes under one entity. Participants raised that the one-stop shop established under NECOM be a vehicle to co-ordinate permits across the various departments. NECOM stands for the National Energy

Crisis Committee, which was established by the Presidency to co-ordinate and oversee the implementation of South Africa's Energy Action Plan, which was announced in July 2022 to address the electricity crisis and load shedding. Furthermore, to avoid the issues that arose when Eskom refused to sign PPAs for REIPPPP BW3.5 and BW4, the central purchasing function should be moved to the National Transmission Company of South Africa (NTCSA) which is an entity already being unbundled from Eskom.

There should be a focus on evaluating readiness to reach Financial Close and not only price. Introduce a readiness dimension into comparative adjudication and limit the capacity that a single consortium may be awarded in one round. The Bid Window 5 outcome is the case for both.

It is recommended that a financial equilibrium mechanism be introduced for the private sector as a reciprocal protection against material adverse events that fall short of force majeure, alongside the existing Value for Money protection for the public party.

The government guarantee, currently at eighty percent, may have room for phased reduction, given no history of default within the programmes. This should be tested incrementally with review after each round for effects on competitiveness, tariff and contingent liability.

It is also recommended that the local content strategy be rebuilt around comparative advantage. Localization design should target the segments of the value chain in which South Africa holds a genuine advantage rather than equipment categories in which it does not. The South African Renewable Energy Masterplan (SAREM, 2023) should be reviewed annually as part of the statutory Integrated Energy Plan.

Lastly, there remains an urgent need to address the sector's skills gap in a structured and coordinated manner. A national database of the semi-skilled technical and construction skills required by energy infrastructure projects should be established to provide clear visibility of available talent and workforce demand. TVET colleges should be aligned to this database, ensuring that their curricula and training programmes are tailored to the skills needs of the electricity generation sector. In parallel, institutions such as the Energy and Water SETA should be mobilized to support targeted training, accreditation, and skills development initiatives. Developers should also be incentivized to recruit from this qualified talent pool, creating a direct link between skills development efforts and employment opportunities while strengthening local participation in the energy sector.

7.2 For private sector professionals

Private sector professionals should undertake a comprehensive investigation of their proposed project sites, including surface and subsurface risk assessments and energy yield verification before finalizing site selection. They should appoint dedicated Community Liaison Officers as projects progress, which reduces extortion and public opposition risk while improving the conversion of economic development spend into social impact. Furthermore ESG functions should be adequately capacitated as this is an often overlooked but equally important measurement criteria. Private sector bidders should avoid also knowingly submitting unsustainably low bids in the hope of being awarded preferred bidder at all costs, the study has shown that a tariff that cannot reach Financial Close has no value to the bidder and negative value to the programme at large, even if selected as Preferred Bidder.

7.3 For public sector professionals

For the public sector the IPPO has a major integration role to play to ensure that the programme can achieve its objectives. Policy makers should operationalize a one-stop shop for all major permits, between Preferred Bidder and Financial Close. The IPPO should ensure that there are continuous intergovernmental workshops even between different bids to identify dependencies and bottlenecks. Also to remove any duplication. Lastly the IPPO should also constantly engage with the private sector community of lenders, IPPs and stakeholders collecting data and providing responses to programme design over and above specific responses during formal briefing notes.

8 Future research

The framework derived here is qualitative and its components are ordered by salience. The framework may evolve into an index with quantitative analysis based on project specific failure modes. Therefore, a correlation study using structural equation modelling to establish which thematic groups carry the greatest weight in driving Financial Close may be developed to add predictive elements to the weighting. This requires project-level outcome data across bid windows and expert perception.

Once empirically derived weights have been established, Fuzzy Synthetic Evaluation (FSE) offers a means of aggregating the framework's multiple qualitative dimensions into a single composite index. FSE is particularly suited to infrastructure and PPP research because it accommodates uncertainty, linguistic assessments, and partial membership of success conditions. This would enable comparative assessment of project readiness and Financial Close prospects across procurement rounds. However, FSE should not be applied until the relative importance of the framework's thematic groups has been established through empirical weighting methods, such as structural equation modelling based on project outcome data and expert judgement.

Further research should seek to validate the framework using a larger dataset and by testing it in other jurisdictions that utilize reverse-auction electricity procurement programmes. Cross-jurisdictional application would help determine the framework's external validity, transferability, and ability to explain Financial Close outcomes under different institutional and market conditions.

The findings also give rise to four substantive avenues for future research: the optimal calibration of government guarantees that preserves competitive funding terms; the impact of competition between corporate PPAs and publicly procured programmes on grid expansion; the extent to which ESG outcomes differ across wind, solar and battery technologies; and the most effective mechanisms for closing technical skills gaps in host communities.

9 Conclusion

This study set out to explain why South Africa's reverse-auction PPP programmes in electricity generation have converted Preferred Bidder projects into Financial Close at declining rates since 2020. Drawing on twenty-one expert interviews, it derives an integrated Suc-

cess and Risk Factor Framework holding thirty-two Critical Success Factors, seven Critical Success Criteria, four Interlink Factors and seventeen Critical Risk Factors in one structure.

The study finds that the deterioration in Financial Close outcomes is driven principally by structural rather than political factors. Grid connection constraints emerged as the dominant concern, cited by twenty of the twenty-one participants. These constraints operate as a hard system limit that no tariff adjustment can overcome, as they constitute a risk that cannot be efficiently allocated to or absorbed by any contractual counterparty. The findings further suggest that price-dominant evaluation, applied to bids assessed for compliance rather than deliverability, can incentivize unsustainable bidding. This systematically creates an imbalance that favours bidders with the most aggressive assumptions and the least verified execution capability. The resulting concentration risk is evident in Bid Window 5, where twelve of the fourteen failed projects were held by a single consortium.

Three enabling factors emerged from the data rather than the literature: project readiness, continuous re-evaluation of the programme's market fit, and adjustment for material unforeseeable changes short of force majeure. All three sit within effective procurement, which suggests that the locus of remediable failure is the procurement mechanism itself rather than the policy environment surrounding it.

The framework is derived, not validated. Its components are ordered by how widely experts raised them, which is salience and not causal weight. Establishing weights, and with them a genuine index, requires outcome data and quantitative methods this study sets up but does not perform. What the study offers in the meantime is a structured, evidenced and internally consistent account of what these programmes require, what they should measure, and ultimately where they break.

10 Declarations

10.1 Ethics Approval

Granted by the Wits Business School Ethics Committee under the University of the Witwatersrand Human Research Ethics Committee (Non-Medical), protocol number: WBS/EL454688/100. All participants gave written informed consent.

10.2 Conflicts of Interest

The author is an active professional in the South African renewable energy sector and was employed by an Independent Power Producer active in the programmes studied during the conduct of this research. Several participants were known to the author professionally. This is disclosed and treated as a limitation in Section 6. The author declares no financial interest in the outcome of this research.

10.3 Financial Support

The author's employer during the study period provided financial support for study fees and time.

10.4 Interview Guide and programme information

Interview transcripts contain commercially sensitive information and were collected under confidentiality undertakings; they cannot be made publicly available. The interview guide, the codebook structure and the ethics documentation are available from the author on reasonable request. Programme progression data in Table 1 are publicly available from IPPO (2024).

10.5 AI Tools

The author used Microsoft Copilot and Anthropic Claude during the preparation of this manuscript to assist with language refinement, editing, summarization, and review of draft text. All substantive intellectual contributions, including the research design, data collection, analysis, interpretation of findings, and final content, were undertaken and verified by the author. The author reviewed, edited, and accepted full responsibility for the final manuscript.

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10.7 Author biography

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Appendix

Appendix A – Research Instrument

No	Interview Question (<i>Text Italics – Follow up questions</i>)	Purpose/ Research Question (RQ)
1	How many years of work experience do you have in total?	Background info (qualifier)
2	From REIPPPP, RMIPPPP and the BESIPPPP. How many of these programmes do you have work experience?	Background info (qualifier)
3	How many years since you started working on matters related to the government's renewable energy programmes as mentioned above?	Background info (qualifier)
4	Is most of your experience in public or private sector?	Background info (qualifier)
5	Would you say you hold a management, senior management or executive position in your current role?	Background info (qualifier)
6	In your experience, what are the big macro level factors that are required to enable government's formal renewable energy tender programmes to be successful? <i>(a) How do you think these can be improved?</i>	RQ3: How do the Critical Success Factor and Critical Success Criteria's overlap (Interlink Factors) in driving PPP project/programme success in electricity generation sector in South Africa. RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
7	What are the macro level risks that you have identified in your experience which need to be monitored to enable government's formal renewable energy tender programmes to be successful?	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.

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No	Interview Question (<i>Text Italics – Follow up questions</i>)	Purpose/ Research Question (RQ)
8	What are the important factors From a procurement perspective with respect to the structure of the government's formal renewable energy tender programmes?? Is it optimal? <i>(a) What is your views on the pace of new tender rounds being released? [Please elaborate more], is it a good way on getting MW onto the grid?</i> <i>(b) Is transparency in the adjudication process important?</i> <i>(c) What are the benefits of standardized PPA and project documents? (IA, DA)</i> <i>(d) In what ways is competition important for the success of the programmes?</i>	RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
9	What are the risks during the procurement phase that need to be managed?	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.
10	What are the site specific technical factors you focus on in your work that are important to consider <i>(a) Do these differ depending on technology or are they similar?</i> <i>(b) What is your view on the process of independently verifying the energy yield? Is it sufficient – do you think anything else should be independently verified?</i>	RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
11	What are the site specific technical risks that need to be mitigated for throughout up until the end of construction. <i>(a) What are some interesting cases you have come across in your experience?</i>	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.

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Table 6 continued from previous page

No	Interview Question (<i>Text Italics – Follow up questions</i>)	Purpose/ Research Question (RQ)
12	What are the financial and economic factors that impact Preferred Bidder projects within the various programmes being able to reach financial close and commercial operation? <i>(a) How important are government backed guarantees to the programme?</i> <i>(b) How important is it for local banks to be able to provide debt in local currency?</i> <i>(c) How important are defined revenues and tariffs over the PPA term to the project's success</i> <i>(d) What are some of the key financial indicators and ratios that are used in sizing capital structure? Why are these important?</i> <i>(e) Should projects with the lowest price always be awarded Preferred Bidder status? Why?</i>	RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
13	Are there any financial and economic risks that need to be managed throughout the process to ensure preferred bidder projects reach financial close? And 2 years post commercial operation period.	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.
14	We are about half way through, are you still comfortable to carry on?	[Yes/No] for continued Informed Consent
15	What are main factors that influence the interfaces between IPPs and government entities (IPPO, Eskom, DFFE, NERSA) and are these working? <i>(a) How important is the role of the Independent Power Producer Office (IPPO)?</i> <i>(b) How important are the interfaces between intergovernmental departments (NERSA interface with Eskom, interface with IPPO) in making the programmes work?</i> <i>(c) How important is to that government tenders reduce reduces public sector administration costs?</i>	RQ3: How do the Critical Success Factor and Critical Success Criteria's overlap (Interlink Factors) in driving PPP project/programme success in electricity generation sector in South Africa. RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
16	What are the key organizational interface risks between public and private sector that can have an impact on project being successful.	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.

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No	Interview Question (<i>Text Italics – Follow up questions</i>)	Purpose/ Research Question (RQ)
17	What are the social factors that need to be incorporated into a project to ensure success until end of construction COD? [why only until then? Why not end of useful life?] (a) <i>What is your view, local community buy in, on the projects and the programme?</i> (b) <i>Is it important that local communities benefit from the project?</i> (c) <i>From your experience, how can technology and skills transfer be or more beneficial to the local community? What's your view on technology and skills transfer to the local community? [wont everyone just say it's a good thing. Rephrase?]</i>	RQ3: How do the Critical Success Factor and Critical Success Criteria's overlap (Interlink Factors) in driving PPP project/programme success in electricity generation sector in South Africa. RQ1: What are the Critical Success Factors in enabling PPP project/programme success in electricity generation sector in South Africa.
18	What are the key social risks that need to be monitored throughout the tender programme?	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.
19	What are items that need to be measured throughout the project that will best facilitate success?	RQ2: What are the Critical Success Criteria in measuring PPP project/programme success in electricity generation sector in South Africa.
20	What are the risk of not having correct or accurate measures of progress throughout the project? (a) <i>What's your view on project management throughout the entire process?</i>	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.
21	What would you consider to be the overall measures of success for a project? (a) <i>How important is time and schedule?</i> (b) <i>How important is it that projects are built within budget?</i> (c) <i>How important is it that the project are commissioned in accordance with contracted performance requirement?</i> (d) <i>What is your view on the importance of environmental measurement and tracking from Financial Close into the operations period</i> (e) <i>How important is it to keep good working relationship between project company and public entities?</i>	RQ2: What are the Critical Success Criteria in measuring PPP project/programme success in electricity generation sector in South Africa.

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Table 6 continued from previous page

No	Interview Question (<i>Text Italics – Follow up questions</i>)	Purpose/ Research Question (RQ)
22	What are the key risks that need to be managed for a project from throughout from RFP release right into operations What are the key operational risks, especially in the first two years of operation.	RQ4: What are the Critical Risk Factors that contribute to the Success Index in relation to PPP project/programme Success in electricity generation sector in South Africa.
23	There are a few more questions, we are almost done, are you still comfortable to carry on?	[Yes/No] for continued Informed Consent
24	Any other factors that could impact projects from being delivered successfully? <i>(a) What's your view on the overall design of the tender, anything you think needs to be improved?</i>	Open Ended Questions
25	What are some key operational risks especially in the first two of a project that need to be managed correctly?	Open Ended Questions