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Integrated Resource Planning and Independent Power Producer Investment in South Africa's Evolving Electricity Market

Mvumikazi Vimbani

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Energy Leadership

Johannesburg, 2025

ABSTRACT

This research examined the relevance of integrated resource plans (IRP) in South Africa's electricity market, particularly its role in attracting investment from Independent Power Producers (IPPs) after the removal of the 100 MW licensing exemption threshold announced on 17 January 2023.

The White Paper on Energy Policy,1998 mandated IRP-based decisions for large investments, with new generation capacity licenses granted only if compliant with the IRP. Similarly, procurement by the IPP Office relied on IRP-derived technology and capacity needs.

However, recent developments challenge the IRP's role. Technological advancements, electricity crises, grid limitations, and legislative changes are transforming the South African electricity market. Notably, the removal of the 100 MW licensing threshold through the Licensing Exemption & Registration Notice, 2023 weakens the link between IRPs and investment decisions.

This research investigated stakeholder perspectives on the continued relevance of IRP in this evolving landscape, where IPP investment may no longer dependent on IRP-backed procurement with government guarantees. The goal was to determine whether the role of an IRP may require adaptation or replacement, and whether successful IPP investment in the new market structure can be facilitated in the absence of a guaranteed off-taker and government guarantees.

A qualitative research approach was adopted using interviews for primary data collection and document analysis for secondary data collection.

Interviews targeted stakeholders involved in or impacted by IRP and generation investment (government, regulators, utilities, etc.) – 14 respondents.

Document analysis focused on public records and data related to IPP projects exceeding 100 MW, with public pronouncements, and completed registration with the National Energy Regulator of South Africa (NERSA). The study suggests that while the IRP program has merits, it needs modifications. It also highlights those factors often assumed to be crucial in influencing IPP investment decisions (like

guaranteed off-takers and avoiding social obligations) may not be as decisive in the evolving South African market than conventionally understood in the broader literature.

KEY WORDS – **Integrated resource planning, independent power producer investment, 100 MW licensing exemption threshold, power sector reform, South Africa**

DECLARATION

I, Mvumikazi Vimbani, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Energy Leadership at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name:Mvumikazi Vimbani Signature: 

Signed at Pretoria

On the 16th day of February 2025

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LIST OF ACRONYMS and ABBREVIATIONS

Put these into alphabetical order

COD	Commercial Operation Date
DFFE	Department of Forestry, Fisheries & Environment
DMRE	Department of Mineral Resources & Energy
DSM	Demand Side Management
DTIC	Department of Trade, Industry & Competition
EAF	Energy Availability Factor
EE	Energy Efficiency
EIA	Environmental Impact Assessment
ERA[1]	Electricity Regulation Act, 5 July 2006 (Government Notice No. 660, Government Gazette No. 28992)
ERA Bill, 2022[2]	Electricity Regulation Amendment Bill, 10 February 2022 (Government Notice No. 1746, Government Gazette No. 45898)
ERA Bill,2023[3]	Electricity Regulation Amendment Bill [B23B-2023]
Amendment Act[4]	Electricity Regulation Amendment Act (Act No.38 of 2024), 20 August 2024 (Government Notice No. 5139, Government Gazette No. 51100)

[1] The Electricity Regulation Act (Act 4 of 2006) as amended by Act 28 of 2007
[2] The Electricity Regulation Amendment Bill, 2022 published by the Minister of Mineral Resources & Energy for public comments on 10 February 2022
[3] The Electricity Regulation Amendment Bill as passed by the National Council of Provinces for assent on 16 May 2024.
[4] Electricity Regulation Amendment Act,2024 assented into law on 20 August 2024 effective from 1 January 2025. This Amendment Act, amends the Electricity Regulation Act, 2006.

Eskom Roadmap	Roadmap for Eskom in a Reformed Electricity Supply Industry, 2019
ESI	Electricity Supply Industry
GAU	Grid Access Unit
IEP	Integrated Energy Plan
IPP	Independent Power Producer
IPPPP	Independent Power Producer Procurement Programme
IPPO	Independent Power Producer Office
IRP	Integrated Resource Plan
ISMO Bill	Independent System Market Operator Bill [B09-2012]
MW	Megawatt
NERSA	National Energy Regulator of South Africa
NTCSA	National Transmission Company of South Africa
PPA	Power purchase agreement
PUC	Public Utilities Commission
RE	Renewable energy
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
Schedule 2	Schedule 2 of the Electricity Regulation Act, 2006

Schedule 2, 2017 Licensing Exemption and Registration Notice, 10 November 2017 (Government Notice No. 1231, Government Gazette No. 41237)

Schedule 2, 2020 Licensing Exemption and Registration Notice, 26 March 2020 (Government Notice 402, Government Gazette 43151)

Schedule 2, 2021 Licensing Exemption and Registration Notice, 05 October 2021(Government Notice No. 1000, Government Gazette No. 45266)

Schedule 2, 2022 Licensing Exemption and Registration Notice, 15 December 2022 (Government Notice No. 2875, Government Gazette No. 47757)

Schedule 2, 2023 Licensing Exemption and Registration Notice, 17 January 2023 (Government Notice No. 2935, Government Gazette No. 47877)

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

This research investigated stakeholder perspectives on the relevance of integrated resource planning as a policy instrument to facilitate independent power producer investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators on 17 January 2023. The study identified key challenges and opportunities presented by this policy change and provides recommendations for optimizing policy frameworks to support sustainable energy.

1.2 Context of the study

The context of the study was based on the post democratic South African electricity supply industry (ESI) and its associated policies and legislation. The ESI is mainly comprised of generation, transmission, and distribution activities. The electricity generation market is underpinned by a single-buyer model with some facets of the wholesale market, such as the bilateral contracting market. Eskom, the state-owned utility is a dominant player and coexists with Independent Power Producers (IPPs) which hold a minor market share and therefore South Africa's electricity generation market is an example of a hybrid electricity market (Baker & Phillips, 2019).

The hybrid electricity generation market is an outcome of ongoing reform of the electricity sector where it is being transformed from a monopolistic electricity market where Eskom was the sole supplier of the generation and transmission activities mentioned above.

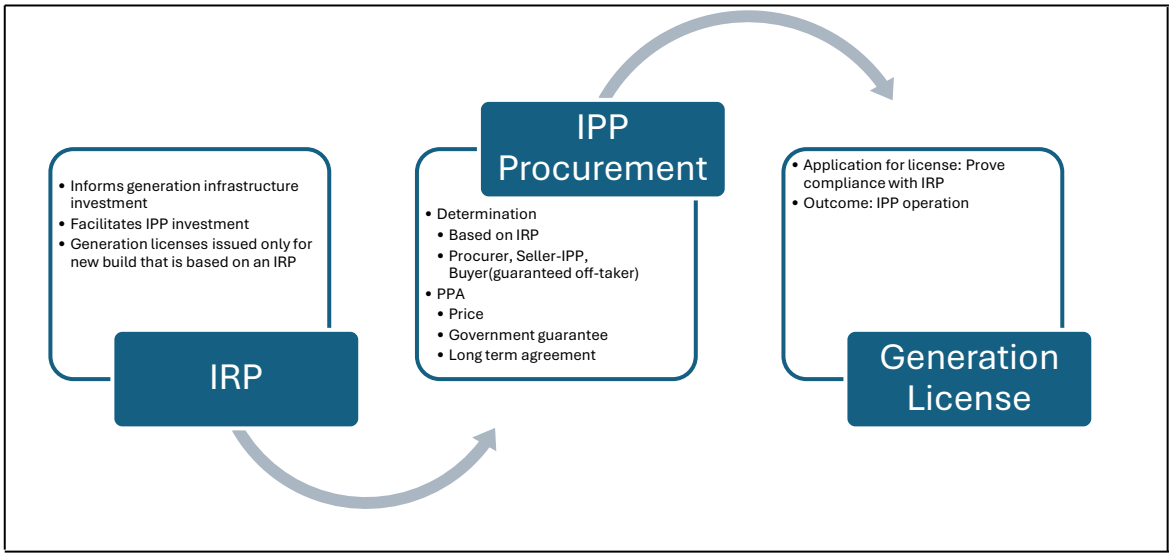
Key players in the ESI include policy makers, regulators, utilities (Eskom and municipalities), IPPs, consumers, traders, resellers, and financial institutions.

1.2.1 Investment related developments in the ESI

The initial facilitation of private sector participation in electricity generation was by design. However, due to disruptive developments in the electricity supply industry, this sub-section illustrates a shift in approach towards private sector investment. An Integrated Resource Plan (IRP), which is a framework that outlines the scheduling of supply and demand-side options to meet the forecasted electricity demand (Department of Energy, 2011b), plays a role in facilitating private sector participation in electricity generation in South Africa.

This is implemented through the Independent Power Producer Procurement Programme (IPPPP). The IPPPP is initiated through Ministerial Determinations, which specify the technology and quantity of new generation capacity to be procured, the procurer, and the buyer of the power, if the power procured is from an independent power producer (IPP) (Department of Energy, 2011a). Once NERSA concurs on a Determination issued by the Minister of Mineral Resources & Energy (the Minister), the Independent Power Producer Office issues a Request for Proposals (RfP) to the market to procure power. The RfP sets in motion a competitive tendering process, commonly referred to as bid windows or reverse auctions, inviting developers and investors to bid for long-term power purchase agreements. Successful bidders are announced as Preferred Bidders, and are eligible to proceed to financial close, construction, and generate power as an IPP (IPPO, 2023). Furthermore, municipalities have been empowered to seek determinations from the Minister to procure power from IPPs; or build their own generators; or engage in Public-Private Partnerships (PPPs) with private entities (Department of Mineral Resource & Energy, 2020). IPPs that emanate from the IPPPP and those that provide power to municipalities or any other organ of state must be licensed by NERSA. Licensing necessitates compliance with the IRP unless deviations are permitted by the Minister (Republic of South Africa, 2006) (Department of Mineral Resource & Energy, 2020). That in turn, necessitates an IRP for procurement of power by government and organs of state. The result of this process through the IPPP programme, has been long-term power purchase agreements of 20 years with an inflation indexed price backed by government guarantees effected by the Government Framework

Support Agreement, and concomitant local content and social policy obligations (Eberhard & Naude, 2017). This process is summarised in figure 1.



Source: Authors depiction

Figure 1: A pro-active approach to facilitating IPP investment - Policy driven

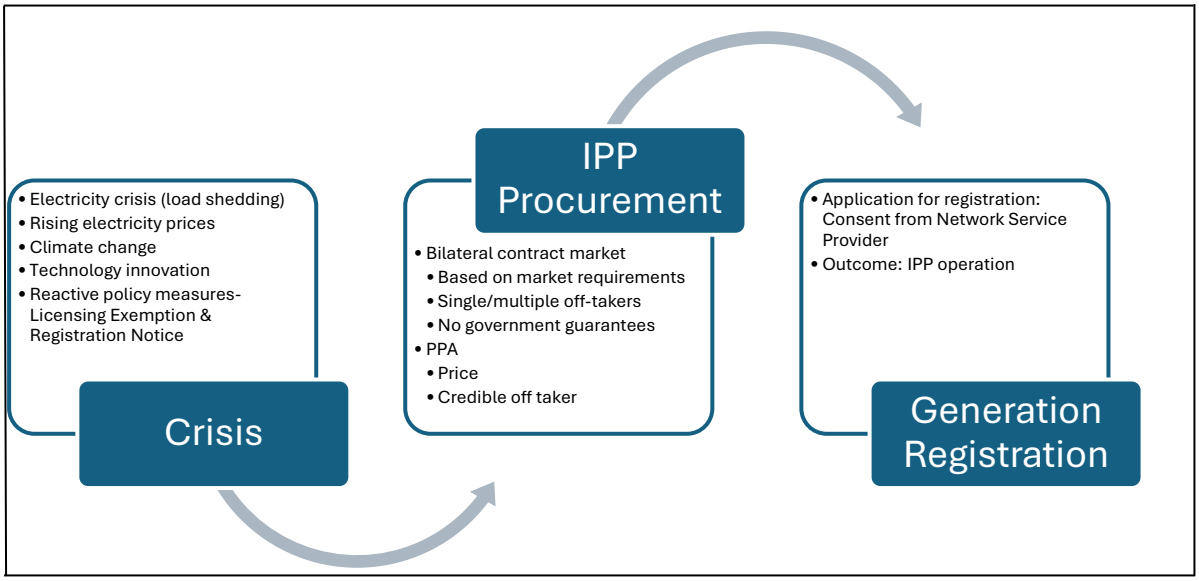
National Treasury's status in relation to government guarantees is stated by the following quote; "As at 31 March 2024, government's commitment in relation to the Renewable Energy Independent Power Producer Procurement Programme is expected to increase to R277,9 billion. The value of signed projects, which represents government's exposure, is expected to amount to R207,1 billion by 31 March 2024. The exposure will increase to R208,6 billion by 2024/25 before declining to R184,7 billion by 2025/26 and R162,6 billion by 2026/27." (National Treasury, 2024, p. 81). These government guarantee figures are seen as a low risk to the fiscus (National Treasury, 2024),however the fiscus has been at a deficit for over a decade with very high debt levels (National Treasury, 2023) and hence government has commissioned a study exploring alternative support to the REIPPP so that government guarantee requirements are eliminated or reduced (National Treasury, 2022). However, the National Treasury has been explicit that no government guarantees will be issued for municipal IPP procurement (National Treasury, 2022).

The REIPPP programme has not been without challenges. For example, for Bid Window 6, an unprecedented challenge occurred, out of 4116 MW of bids

received for onshore wind projects, 3200 MW of project capacity could not be awarded due to the unavailability of grid capacity in the Western Cape and Eastern Cape areas of supply. (Department of Mineral Resources & Energy, 2022). Whilst the South African Wind Energy Association was shocked at this dynamic, the association quickly looked at other avenues it could explore such as the possibilities promised by the ERA Amendment Bill 2023, including negotiated bilateral PPAs of more than 3000 MW, and pushing forward near-ready projects, in line with the Interim Grid Capacity Allocation Rules (IGCAR) which allocate grid capacity to almost connection-ready projects (South African Wind Energy Association , 2023). This initiative shows an investor willingness to take a path that foregoes government procured PPAs backed by government guarantees and relieves them of the costly social policy obligations imposed in return for such guarantees.

Investors have shown willingness in other areas to invest in power generation without government guarantees. For example, IPPs are also keen on the Eskom land lease programme, another investment opportunity that has no government guarantees. (The Presidency, 2022). In this programme Eskom auctions off the lease of its land that has transmission infrastructure access for IPPs to build new generation capacity projects for wheeling onto the grid for transportation to their off takers. This saves the IPP investing in grid connection infrastructure and avoids the delays in gaining Eskom approval for grid connections. The first bidding round in April 2022 was set to deliver 1800 MW. The programme reflected so much enthusiasm from investors that, in December 2022 a second bidding round set to deliver 500 MW was launched (Eskom, 2023).

A recent amendment to Schedule 2 of the Electricity Regulation Act, 2006, i.e. Schedule 2, 2023 perpetuated this direction further as it enabled other IPPs to enter bilateral contracts with consumers without requiring a license (but they must still register with NERSA), irrespective of their generation capacity (Department of Mineral Resources & Energy, 2023a). This exemption from licensing also exempted these IPPs from demonstrating compliance with the IRP or seeking Ministerial deviations.



Source: Authors depiction

Figure 2: A reactive approach to facilitating IPP investment - Crisis driven

These developments, the Eskom land lease programme, and Schedule 2, 2023, facilitated private sector investment in electricity generation with non-governmental off-takers where procurement decisions are made bilaterally without a Ministerial Determination and compliance with an IRP. They laid a foundation for an open market as envisaged by the ERA Amendment Act, 2024. Programmes such as the Eskom Land Lease, the IGCAR initiatives, and growing numbers of generation facility registrations with NERSA are demonstrating investor willingness to build new generation capacity and foregoing government guarantee backed PPAs. Considering these developments which provide an alternative to the initial methodology for facilitating private sector participation in generation, the emerging question is: To what extent does the removal of the 100 MW licensing exemption threshold affect the IRP's role in promoting private sector involvement in power generation?

1.3 Research problem

The White Paper on Energy Policy,1998 (Energy White Paper), still remains the official energy policy. It states that decisions for large investments will be based on integrated resource planning (Department of Minerals and Energy, 1998). It further articulated that licensing of new facilities by the regulator can only be licensed "upon the satisfactory completion of an integrated resource plan." (Department of Minerals and Energy, 1998, p. 83). To that effect the Electricity Regulation Act (2006) requires license applicants to prove that they are compliant with the applicable integrated resource plan at the time of making a license application (Republic of South Africa, 2006).This means that the project to be licensed has to be aligned with the technology and capacity set in the IRP. Furthermore, procurement by the IPP Office is initiated by a Ministerial Determination which draws its technology and capacity contents from an IRP (Baker, Burton, Godinho, & Trollip, 2015), and has been backed by government guarantees and off-take agreements (Eberhard & Naude, 2017).

However, technological innovation, an electricity crisis, grid constraints, and legislative developments have brought about a significant transformation in the South African electricity market. The electricity market is moving away from a reliance on an integrated resource plan for making new generation capacity project investment decisions, and with the removal of the 100 MW licensing exemption threshold and the evolving market structure and therein lies the research problem. Critical to the research problem is the tension between the effectiveness of the historical role of an IRP in South Africa in attracting investment in IPPs, and the evolving market dynamics. With respect to competition in the ESI the Energy White Paper states that "IRP policies will be adjusted to be consistent with the new market system." (Department of Minerals and Energy, 1998, p. 54), and hence this research seeks to investigate the stakeholder perspectives on the relevance of integrated resource planning particularly in a landscape where investment in new generation capacity is no longer dependent on an IRP backed procurement with government guarantees and guaranteed off-take agreements. The findings will help to determine whether integrated resource planning needs to be adapted to the new circumstances or

replaced with alternative mechanisms to facilitate investment in new generation capacity in the IPP market in South Africa.

1.4 Research questions

This research investigated stakeholder perspectives on the relevance of integrated resource planning as a policy instrument to facilitate independent power producer (IPP) investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators. Furthermore, the willingness to invest in IPPs without a guaranteed off-taker and government guarantees was studied. The following research questions are therefore posed:

1. What are the recommended alternatives or amendments to the role of integrated resource planning given the removal of the 100 MW licensing threshold?

2. What is the impact of the absence of a government guaranteed off-taker and government guarantees, as well as the avoidance of local content and social policy obligations on investor willingness to invest in Independent Power Producers (IPPs)?

1.5 Significance of the study

This study investigated the role of Integrated Resource Planning (IRP) amid a crucial transition period where South Africa is transitioning from government-controlled procurement of power generating capacity to market forces being responsible for introducing additional generating capacity. At the time of writing (January 2025) the IRP is facilitating Independent Power Producer (IPP) investment after the removal of the 100 MW licensing exemption threshold that is allowing market forces to introduce additional generating capacity, which is

changing the South African electricity market dynamics and is therefore a matter of considerable public interest. This study was founded upon the tension between the concepts of integrated resource planning and the introduction of market forces, that is a move to competition *for* the market as has been managed by the IPP office to date.

This section examines South Africa's integrated resource planning, building upon existing research such as Montmasson-Clair & Ryan (2014), Mqadi, Musango, & Brent (2018), and McCall et al. (2019), which have analyzed the IRP's objectives, identified obstacles, and explored the role of renewable energy, but have largely focused on its role in centralized planning. South Africa's Integrated Resource Plan (IRP 2010) has been analysed through a comprehensive 10-point analytical structure by Montmasson-Clair & Ryan (2014). Their analysis focuses on how well the IRP met its objectives and suggests ways for enhancement. Mqadi, Musango, & Brent (2018) scrutinized the obstacles present in South Africa's Integrated Resources Plan (IRP) and suggest an integrated and sustainable framework for transitioning to more environmentally friendly electricity systems. The discrepancies between the IRP and other national strategic plans are highlighted and a more coordinated approach to sustainability transitions is advocated by Mqadi, Musango, & Brent (2018). In exploring the least-expensive integrated resource planning strategy and the significance of renewable energy within South Africa's energy industry, McCall, et al. (2019) acknowledged the value of incorporating renewable energy options into the IRP, especially in competitive markets where cost efficiency is crucial. Whilst these studies on integrated resource planning in South Africa are beneficial to improve IRP development, the significance of the IRP in a reformed market is not discussed, concentrating instead on its conventional function in central planning.

This study therefore contributes to the South African pool of studies on integrated resource planning focusing on the unique aspects of how it is perceived by stakeholders in a policy landscape that is reforming towards a competitive market. Potential beneficiaries of this study include policy makers, and investors.

1.6 Delimitations of the study

This study examined the relevance of Integrated Resource Planning (IRP) for Independent Power Producer (IPP) investment in new generation capacity in South Africa's electricity market, particularly after the removal of the 100 MW licensing exemption threshold for IPPs. Stakeholder theory served as a valuable lens through which this topic was analysed because it emphasized the importance of understanding the perspectives of various groups (Babajide , et al., 2023) impacted by a policy change. The delimitations of this study were as follows:

I. The study was confined to the South African hybrid electricity market.

II. The focus was on the electricity market fostered by the Licensing Exemption and Registration Notice, 2023 from 17 January 2023 to December 2024.

III. The study focussed on IPP new generation capacity that was built for the purposes of electricity generation for trading purposes. IPPs built for the ancillary services market were excluded from this study.

IV. The study tracked only the developments relating to the bilateral contract market which emerged after the removal of the 100 MW licensing exemption threshold (private procurement), in comparison with IPPPP (public procurement). Developments related to the draft South African Wholesale Electricity Market (SAWEM) market code published for comments on 18 April 2024 by the National Transmission Company of South Africa (NTCSA) and the Electricity Regulation Amendment Act, 2024 were not studied.

V. The study primarily assessed stakeholder perspectives on the continued relevance of IRP as a planning tool for attracting IPPs, and not to comprehensively evaluate the technical aspects of IRP itself.

VI. The analysis was limited to a qualitative analysis involving a case study with no economic modelling of future IPP investment trends.

VII. The role of politics was excluded limiting the study to a technocratic framing of integrated resource planning.

VIII. The focus was on specific sets of stakeholder groups such as government; government agency; regulators; utilities; consultants; an offtaker; academia; and industry associations.

1.7 Definition of terms

This study used several key terms with specific meanings within the context of electricity markets and the South African landscape. To ensure clarity, consistency, and a shared understanding throughout this research, this section provides definitions for all key terms used.

Electricity tariff: An electricity tariff generally refers to the rate imposed by a regulated utility for the supply and retail sale of electricity. This rate is set by regulatory authorities and usually comprises elements such as energy charges, demand charges, and fixed fees. It is typically applied to a wide range of customers (Department of Minerals & Energy, 2008), (NERSA, 2018).

Electricity Supply Industry: The generation, transmission, distribution, trading, and reselling activities in the electricity industry (African Development Bank , 2018).

Energy Availability Factor (EAF): The maximum available energy in percentage value, which a generation plant can supply to the power system when not on an outage (Department of Mineral Resources & Energy, 2024).

Financial transmission rights: Financial transmission rights are a financial instrument that “enable transmission customers – whether load serving entities

(LSEs) or generators – to enter into long-term contracts at a fixed price and hedge the risk of congestion.” (Hausman, Hornby, & Smith , 2008, p. 26)

Integrated Energy Plan: National Energy Act (No. 34 of 2008) defines it as:

"Integrated Energy Plan" means the national energy plan contemplated in section 6, approved by Cabinet and published in the Gazette by the Minister (Republic of South Africa, 2008, p. 5) annually. The plan is intended to guide investments into energy infrastructure required for supply options to meet demand (Republic of South Africa, 2008). Section 6 was only brought into effect on 1 April 2024 (Republic of South Africa, 2023b).

Integrated resource planning: Integrated resource planning is a modern electricity resource planning process which projects an anticipated future electricity demand and how it can be met through supply capacity expansion at a least cost (Swisher, de Martino Jannuzzi, & Redlinger, 1997). The least cost consideration includes social and environmental costs when selecting supply alternatives whilst incorporating energy efficiency technologies, demand-side management, and non-utility generators as inputs into the process (Swisher, de Martino Jannuzzi, & Redlinger, 1997). South Africa does not follow this orthodox approach. Instead, in South Africa, an integrated resource plan is defined as “ a resource plan established by the national sphere of government to give effect to national policy” (Republic of South Africa, 2006, p. 2) It is developed by the Minister in consultation with the regulator (NERSA), and published in the government gazette (Department of Energy, 2011a). The regulator is also mandated to develop rules for the implementation of the integrated resource plan and to issue licenses based on the IRP (Republic of South Africa, 2006).

Independent Power Producer: It is a privately owned electricity generation facility (U.S. Department of Energy, 2015).

Licensing exemption threshold: The Capacity in megawatts (MW) at which generation facilities or activities are exempt from requiring a license as per Licensing Exemption & Registration notice, which is an update of Schedule 2 of

the Electricity Regulation Act, 2006 (Department of Mineral Resources & Energy, 2020).

Ministerial Determination: It is an instrument issued under section 34 of the Electricity Regulation Act (Act No. 4 of 2006) that facilitates the procurement of electricity generation capacity required, detailing technology options and capacity as per integrated resource plan. It identifies the procurer, buyer, seller, and establisher of new generation capacity (Department of Energy, 2011a), (Baker, Burton, Godinho, & Trollip, 2015), (Department of Mineral Resources & Energy, 2019).

Power purchase agreement: A power purchase agreement is a legally binding contract between the electricity seller (IPP) and the buyer (off-taker), typically established on a bilateral basis (Badissy, et al., 2020) (Gabrielli , Aboutalebi, & Sansavini, 2022).

Power purchase agreement price: The price in a power purchase agreement pertains to the set rate for electricity as outlined in the contract. This price is determined through negotiations between the electricity producer and the purchaser or a competitive auction bid. It can be arranged in different formats, such as fixed, indexed, or floating rates. Typically, it is customized to suit the requirements and risk profiles of both parties (Badissy, et al., 2020), (Future Energy, 2023).

Power sector reform: A process which includes the establishment of an independent regulator free from political influence; restructuring of the state-owned monopoly utility; introduction of the private sector to participate in the power sector; and to introduce competition among generators and eventually the

option for customers to choose their own retailers (Foster, Witte, Banerjee, & Moreno, 2017).

Market Restructuring: The vertical separation of generation, transmission, and distribution activities; as well as the horizontal separation of generation activities (Urpelainen & Yang, 2019).

Stakeholders: Stakeholders are interested organisations, individuals and groups that can sway or guide the direction of policy, projects, or organizations. They can be categorized into, international agencies; donors; politicians; public sector; private sector; investors, labour unions; non-profit/governmental organizations; civil society, and consumers/users (Brugha & Varvasovszky, 2000), (Schmeer, 2000).

1.8 Assumptions

Table 1: Assumptions

Assumption	Reasonableness	Sensitivity to data collection
1. Stakeholders have a basic understanding of IRP and its historical role in South Africa's electricity market.	Reasonable	Medium
2. Stakeholders have an understanding of South Africa's current electricity market structure.	Less Reasonable	High
3. Stakeholders are aware of the recent removal of the 100 MW licensing exemption threshold for IPPs.	Likely Reasonable	Medium
4. Stakeholders may hold varying opinions on the continued relevance of IRP in a reformed market.	Very Reasonable	High
5. Stakeholders hold informed opinions on the continued relevance of IRP in a reformed market.	Less Reasonable	High

Assumption	Reasonableness	Sensitivity to data collection
6. Stakeholders are interested in a stable and efficient electricity market in South Africa.	Very Reasonable	Low

- Assumption 1: Stakeholders have a basic understanding of IRP and its historical role in South Africa's electricity market. This assumption is reasonable, as an IRP has been central to power planning, but understanding may vary by stakeholder group (Montmasson-Clair & Ryan, 2014). Medium sensitivity is allocated to this assumption as it varies depending on the stakeholder.

- Assumption 2: Stakeholders have an understanding of South Africa's current electricity market structure. This assumption is less reasonable, as the electricity market is complex, and in-depth knowledge may be limited outside of industry professionals. Allocated sensitivity is high as lack of understanding may have an impact on the stakeholder perspective.

- Assumption 3: Stakeholders are aware of the recent removal of the 100 MW licensing exemption threshold for IPPs. This assumption is likely reasonable, as the 100 MW licensing change is recent and has received industry attention, considerable media coverage, but some stakeholders may be unaware of it (Terblanche, Botha, Louw, & Radmore, 2024), hence the sensitivity allocation is medium.

- Assumption 4: Stakeholders may hold varying opinions on the continued relevance of IRP in a reformed market. This assumption is very reasonable, as the role of an IRP in a reformed market is an ongoing public debate. Different viewpoints are crucial for understanding (Montmasson-Clair & Ryan, 2014). Since this is one of the important aspects the study seeks to investigate, the sensitivity is high as different viewpoints are crucial for understanding.

- Assumption 5: Stakeholders hold informed opinions on the continued relevance of IRP in a reformed market. This assumption is less reasonable, as stakeholders may not have investigated this topic beyond their interests. Allocated sensitivity is high as lack of uninformed opinions may have an impact on the stakeholder perspective.
- Assumption 6: Stakeholders are interested in a stable electricity supply in South Africa. This assumption is very reasonable with low sensitivity allocation, as a stable electricity supply benefits all stakeholders.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Integrated resource planning and independent power producer (IPP) investment in the electricity supply industry (ESI) were the underpinning concepts of this study. In this section, the South African ESI is outlined, the legislative frameworks which govern the industry are highlighted, and the history of the industry in the legislative context is summarised so as to give perspective. The following sections introduce the conceptual framework of integrated resource planning and IPPs; the alternative roles of IRP in certain jurisdictions; and the incentives for IPP investments. This chapter is then concluded by two propositions derived from this literature review.

2.1 Conceptual Framework

2.1.1 History of Integrated Resource Planning

Integrated resource planning was preceded by traditional planning or least cost utility planning (Bauer & Eto, 1992), both traditional planning and integrated resource planning aim to ensure that forecasted electricity demand is served with reliable electricity over the forecasted period in a cost-effective manner (De Almeida, Fonseca, & Saraiva, 1998). Traditional planning was an internal utility exercise which focused on generators and resources owned by a utility; with the objective of maintaining the reliability of the system and keeping electricity prices at a minimum. Comparing an IRP to traditional planning, integrated resource planning is a more thorough, inclusive, and forward-thinking approach with an emphasis on sustainability, stakeholder participation, and long-term cost effectiveness (Hirst, 1992). Other key differences between the two planning methods are that traditional planning only considered supply side options, whilst integrated resource planning in addition to supply side options considers demand side options for serving the future electricity demand; and accounts for reduction

of negative impact to the environment. The consideration of demand side options in integrated resource planning is attributed to have saved consumers and utilities in the United States of America billions of US dollars by implementing energy efficiency and demand side measures instead of investing in new generators (De Almeida, Fonseca, & Saraiva, 1998).

The origins of integrated resource planning date back to the 1970s in the United States of America (Turner & Fane), and its implementation benefits led to it being legally mandated in some states. The legal requirement in developed countries to practise integrated resource planning was found by D'Sa (2005) to be the main driver of conducting integrated resource planning exercises in the 1990s as was the case in the United States of America and Europe. In Europe compared to the USA, integrated resource planning practise was uncommon and only Denmark had legal framework, promulgated in 1994, which obligated IRP practice. During the same period of the 1990s, the findings were that developing countries neither practiced integrated resource planning nor had mentioned it in their energy legislative frameworks or policies. During the power sector reforms, the findings yielded that the developing countries continued without the practice of integrated resource planning or its incorporation in their energy legislative frameworks except for South Africa which within its White Paper on Energy Policy,1998 recommended the adoption of the integrated resource planning methodology as a tool for electricity planning. For the developed countries during their power sector reforms, as they transitioned to competitive markets, integrated resource planning was no longer mandatory. The USA saw a decline in integrated resource planning practices whilst Europe received a directive in the late 1990s from the European Commission requiring member states of the European Union conduct integrated resource planning exercises (although not binding) to complement the introduction of wholesale competition and partial retail competition by the year 2000 (D'Sa, 2005).

The State and Local Energy Efficiency Network (2011), a federal government facilitated initiative which assists local stakeholders, utilities, and states to escalate energy efficiency practices, echoes the assessment by D'Sa (2005), in asserting that integrated resource planning processes are most often found

where it is required by law or a regulator or where retail competition has not yet been achieved. Hughes (1994) instead refers to the usefulness of resource planning in retail markets, and states that retail competition enhances the planning function to adapt it to customer needs rather than disregarding it altogether. He further emphasizes that least cost resource mix in retail competition is determined by the markets because they allow only the most efficient generators to produce. Therefore, planning in retail competition mitigates against the construction of new generation capacity that is not preferred by customers which will ultimately be paid for by the same customers. In Arizona, the IRP rules were therefore modified to align with retail competition rules (Wilson & Biewald, 2013). Regardless, Li, Zhang, & Feng (2021) reason that competitive electricity markets replace integrated resource planning because the market tariff determines generation investment decisions such as technology, location, and commercial operation date. The companies in the retail market can bid to reduce demand whilst the generators can bid to increase supply. The utility can then opt for the most cost effective between the two for implementation. Where the integrated resource planning process is required by law or regulator, Carvallo, et.al (2016) qualifies it by saying it is often for the purposes of fulfilling the objectives of government policy.

While traditional planning focused solely on utility-owned generation at minimal cost, integrated resource planning emerged as a more comprehensive approach considering both supply and demand options, with an emphasis on sustainability and long-term benefits. While its legal mandate drove early adoption, IRP's role in competitive markets remains a topic of debate.

2.1.2 Definitions of integrated resource planning

The literature provides various definitions of integrated resource planning, and a few are reviewed to highlight key defining factors to compare with the definition used in the South African context.

Bauer & Eto (1992) define integrated resource planning as a “process for integrating supply and demand-side options is consistently planned, implemented, and evaluated to provide energy services at a cost that

appropriately balances the interests of all stakeholders." (p. 8.1) Integrated resource planning according to Swisher, et. al (1997) is a modern electricity resource planning process which projects an anticipated future electricity demand and how it can be met through supply capacity expansion at least cost. The least cost consideration includes social and environmental costs when selecting supply alternatives whilst incorporating energy efficiency technologies, demand-side management, and non-utility generators as inputs into the process. These two definitions are similar and yet have different perspectives on the cost aspect of integrated resource planning. The definition by Swisher, et. al indicates that the cost must be least cost, whereas the definition by Bauer & Eto (1992) indicates that the cost must be one that balances the interests of stakeholders. A definition by the Regulatory Assistance Project (1994) describes integrated resource planning to be a planning process which has the outcome of an energy mix that is intended to deliver reliable energy services at the "lowest practical cost" (p. 7). Reddy & Sumithra (1997 as cited in D'Sa, 2005) specify that the energy mix identified by an IRP must comprise of renewable energy and energy efficiency measures with the objective of reducing environmental impact. In the United States of America, various states have different definitions of integrated resource planning (D'Sa, 2005), based on the objectives of the state and local context.

In 1993, when the British Colombia Utilities Commission made it mandatory for utilities to develop IRPs, it required that the initial step would be for them to undertake an exercise to identify the objectives of their IRP. This undertaking involved soliciting views and perspectives of internal and external stakeholders in a public consultation process. The outcomes of the exercise were a list of prioritised objectives and associated trade-offs. It was also realised that these trade-offs come in handy during iterations of the IRP due to changes in circumstances over time (Keeney & McDaniels,, 1999). In summarizing the IRP process for the power sector, D'Sa (2005) concurs that defining the objectives of an IRP is the first step in IRP development. It is further emphasized by Bauer & Eto (1992) that IRP objectives are not static, and they evolve as energy environment changes.

Whilst the definition of an IRP may be contextualised, the evolving objectives may differ based on stakeholder views and perspectives, and therefore best practise that is applicable for IRP development regardless of context is to consult a diverse group of stakeholders for a broader perspective from all affected by the plan (Greacen, Greacen, von Hippel, & Bill, 2013) . Based on the definitions above; an IRP definition includes at least the following key characteristics:

- Reliable and adequate supply & demand side options;
- an energy mix with least cost;
- an energy mix with least impact to the environment; and
- stakeholder perspectives

In so far as the South African definition of integrated resource plan is concerned, the definition has variations depending on the legal framework it is defined in. Integrated resource planning is defined in the White Paper on Energy Policy (1998) as "… a decision-making process concerned with the acquisition of least-cost energy resources, which takes into account the need to maintain adequate, reliable, safe, and environmentally sound energy services for all customers." (Department of Minerals and Energy, 1998, p. 53) The definition of the IRP provided by the Electricity Regulation Act, 2006 (ERA) highlights that national government is responsible for its establishment and that the plan is intended to carry out national policy (Republic of South Africa, 2006). The Integrated Resource Plan, 2010 refers to an IRP as a "living plan" intended for regular revision as triggered by a change in circumstances (Department of Energy, 2011). In the Integrated Resource Plan, 2019 it is referred to as "… the co-ordinated schedule for generation expansion and demand-side intervention programmes, taking into consideration multiple criteria to meet electricity demand" (Department of Mineral Resources & Energy, 2019, p. 6). The Electricity Regulation Amendment Act, 2024 defines an IRP as

> "an indicative, forward-looking plan for electricity generation, which reflects national policy on electricity planning, which plan specifies the types of energy sources and technologies from which electricity may be

generated and indicates the amount of electricity that is to be generated from each of such sources or technologies ” (Republic of South Africa, 2024b, p. 4) Although these definitions vary, when looked at collectively, the key characteristics of an IRP definition are present according to the literature with the exception of stakeholder participation which is not mentioned. However, broader stakeholder participation is Government policy according to the Energy White Paper in the development of integrated resource plans (Department of Minerals and Energy, 1998).

2.1.3 Stakeholder participation

Stakeholder participation is one of the characteristics that set apart integrated resource planning from traditional planning (Hirst, 1992). Stakeholders are interested organisations, individuals and groups that can sway or guide the direction of policy, projects, or organizations (Brugha & Varvasovszky, 2000), (Schmeer, 2000). Stakeholders in their different aspects, offer varying contributions at different stages of policy making which make their inputs or perspectives quite helpful in the decision-making as a society (OECD, 2015). They can be categorized into, international agencies; donors; politicians; public sector; private sector; labour unions; non-profit/governmental organizations; civil society, and consumers/users (Schmeer, 2000). As already highlighted in sub-sections above, stakeholders are a key factor in integrated resource planning.

Stakeholders involved in integrated resource planning include but are not limited to government ministries ; an independent regulator ; research institutions; electricity service providers; non-governmental organizations; advocacy groups (D’Sa, 2005), (Greacen, Greacen, von Hippel, & Bill, 2013); and investors. The ministry of energy is an important stakeholder in IRP development for its role in policy development, to give guidance for resource planning, and issue legislation or directives to implement policies (Greacen, Greacen, von Hippel, & Bill, 2013) , (D’Sa, 2005). Other government ministries with an interest in the IRP are those involved in economic planning and environmental protection (Greacen, Greacen, von Hippel, & Bill, 2013), such as the National Treasury and Department of Forestry, Fisheries and Environment in South Africa. The independent regulator

plays the role of periodic monitoring of IRP implementation to ensure that an increase in demand is matched by the projected supply increase, enable the collection of data (D'Sa, 2005). Due to the technical nature of the IRP development process, another critical stakeholder is research institutions who are a skill source for technical expertise in IRP development (D'Sa, 2005). The electricity producers are invested stakeholders as implementers of an IRP. The customer sector as a stakeholder can be categorized into industrial customers; commercial customers; and residential customers which may organize themselves into non-governmental organizations and customer associations. Both producers and consumers of electricity may be represented by advocacy groups which represent another stakeholder category.

In procuring the power contemplated in an IRP, the same stakeholders mentioned above are involved taking on a different role, or the same role, there are also other stakeholders which have not been mentioned yet. For instance, the ministry that deals with energy, or a designated entity may be the procurer. In cases where the IRP is developed by a utility, the utility may have both IRP development and off taker roles. An electricity Regulator may develop IRPs or oversee the development of IRPs and or approve them, and issue licenses to IPPs as part of the power procurement process. Investors view an IRP as a policy signal for investment, and in power procurement they are active participants as developers along with development finance institutions (Badissy, et al., 2020).

In countries with democratic governance, stakeholder contribution towards policy making or simply stakeholder participation occurs within a policy context (Brugha & Varvasovszky, 2000). The White Paper on Energy Policy, 1998 which in reference to electricity sector governance, integrated resource planning, and electricity infrastructure investment decisions puts emphasis on broad stakeholder involvement and public participation (Department of Minerals and Energy, 1998). This democratic prescript is outlined in the South African democratic context and by law requires stakeholder participation to engage and solicit the views of stakeholders in policy making and country developments (Legislative Sector South Africa, 2013). The IRP1 gazette for implementation promised stakeholder consultation and engagement in the IRP reviews to follow

(Department of Energy, 2010). Consequently, stakeholder engagement was evident in the gazette for public comments on the draft IRP 2010 (Department of Energy, 2010), draft IRP 2018 (Department of Energy, 2018), and draft IRP 2023 (Department of Mineral Resources & Energy, 2024).

Stakeholder participation is not only an important aspect of integrated resource planning generally; in South Africa its importance is mandated through policy and law. Stakeholders are involved in the preparation of an IRP by providing inputs and influencing the planning process. This study, however, focuses on how stakeholders perceive and understand the IRP itself, and provide recommendations on the new role it can potentially take in the future.

2.1.4 Independent Power Producers & Merchant Power Producers

Private sector participation in the electricity generation market is characterised by the presence of Independent Power Producers (IPPs). IPPs are privately owned facilities that generate electricity to sell either directly to consumers, to utilities, or specific companies (U.S. Department of Energy, 2015). In South Africa, an IPP is a private company not controlled by the government or organ of state that builds or plans to build new electricity generation facilities based on a Ministerial Determination (Department of Energy, 2016). In deregulated electricity markets, IPPs can be involved in power pools or exchanges to sell electricity on the market or engaging in bilateral contracts with interested parties for power transactions (Hausman, Hornby, & Smith , 2008). The presence of IPPs in a power system can signify various stages of reform, ranging from fully reformed markets to those still undergoing changes or operating as a mix of IPPs and state-owned utilities, common in developing nations where reform may not follow a standardized process (Eberhard & Gratwick, 2008).

IPPs are often introduced into an electricity market through the single buyer model where IPPs sign a power purchase agreement with the single buyer which is either a vertically integrated utility, or in a vertically and horizontally unbundled market the single buyer is an independent transmission entity (Vagliasindi &

Besant-Jones, 2013). The manner in which IPPs engage in markets, such as through Power Purchase Agreements (PPAs) or spot markets, depends on the reform level and market structure. In the wholesale competition model, IPPs have bilateral contracts (PPAs) with traders, distributors or end user customers, and IPPs also compete to sell power in the market based on market rules (Energy Knowledgebase, n.d.). In the wholesale/retail competition model where competition exists in both the wholesale and retail markets, IPPs can also sell directly to traders or to aggregators or to end use customers or to the spot market in a power exchange or to an independent system operator (Energy Knowledgebase, n.d.). This type of IPP is referred as a merchant power producer (MPP).

Merchant Independent Power Producers or Merchant Power Producers (MPPs) are power plants that operate without long term power purchase agreements and sell the electricity they generate in an open competitive market. The incentive for MPPs to invest comes from the potential for higher profits due to market demand and price fluctuations which potentially achieve greater returns on their investment. However, a greater part of the market risk is borne by the MPP (Siddhartha & Rajan, 2010), (Advanced Engineering Associates International, Inc. (AEAI), 2003). In comparison with an IPP which has a PPA, risks that are borne by the MPP that the PPA mitigates against include energy volumes to be sold, the price of energy, and technology. These are pre-agreed in a PPA, whilst in an open competitive market volumes and price are dependent on the market supply and demand dynamics. The technology aspect is dependent on the economic dispatch order followed by the system operator and the consumers preference (Siddhartha & Rajan, 2010). For MPPs to thrive, they require the support of a conducive policy and regulatory environment that:

- encourages non-discriminatory access to transmission networks;
- has reasonable grid connection costs;
- promotes competition,
- mandates compliance with health, safety and environmental regulations;

- has a licensing and permitting issuing system that is consistent, transparent, timely, with clear requirements (The Regulatory Assistance Project).

This discussion of IPPs and MPPs provides a foundational understanding of the evolving role of private sector participation in the South African electricity market. By exploring the characteristics and market dynamics of different IPP models, including the transition towards MPPs in more competitive markets, allows a better understanding of the implications of the 100MW licensing exemption removal and the potential shift towards a more market-oriented electricity system.

2.1.5 Power Purchase Agreements

2.2.5.1 Power Purchase Agreements

The relationship between an Independent Power Producer (IPP) and an off taker regarding the delivery of electricity and the corresponding payments is detailed within a power purchase agreement (PPA). A PPA is a legally binding contract between the electricity seller (IPP) and the buyer (off-taker), typically established on a bilateral basis (Badissy, et al., 2020) (Gabrielli , Aboutalebi, & Sansavini, 2022). The seller, who can be an electricity generator, utility company, Independent Power Producer (IPP), or electricity reseller, agrees to provide electricity while the buyer, which could be a utility or any other entity, agrees to purchase it (Javadi & Javadinasab , 2011). The PPA outlines details such as the agreed price, energy and capacity quantities, duration of operation, financing terms, performance guarantees, payment terms, penalties, termination conditions, and provisions for unforeseen events like force majeure. It delineates the roles and responsibilities of each party, processes for event management, and any additional agreements necessary for PPA implementation (Badissy, et al., 2020).

PPAs are designed to bring stability in the face of dynamic and uncertain market conditions, often incorporating fixed capacity charges and take-or-pay provisions for certainty. They also enhance project bankability by assuring lenders and investors of predictable cash flows. In cases where the off-taker (such as a state-

owned utility or transmission company) is unable to meet payment obligations to the IPP, the PPA may include clauses for governmental step-in rights as a form of contingent liability, formalized through a separate guarantee agreement (Badissy, et al., 2020), (Lovei, 2000).

The PPA can be the outcome of a competitive auction tender which is intended to encourage investment. Procurement process options include Feed-in-Tariffs, direct negotiations, or competitive bidding. The procurement process choice, however, is influenced by the legal framework of a country (Abrahams, et al., 2019). In developed countries there is a higher percentage of merchant IPPs participating in spot markets due to deregulation compared to developing countries which are still in the process of reform and the IPP market is still not yet sufficiently mature to operate without a PPA (Advanced Engineering Associates International, Inc. (AEAI), 2003).

The outcome is a power purchase agreement (PPA) with a price, capacity, and energy i.e. a result of competition *in* the market. The PPA price is one of the major aspects in a power purchase agreement in power procurement. It determines the worthiness of the project from both the procurer and investor perspectives. The procurer wants the price to translate to fair and low electricity tariffs, and the investor wants to make a return on investment. The price can be determined through a negotiation between the investor and procurer/off-taker in a vertically integrated model, and in a single buyer model it will be determined through a competitive auction bid process aimed at lowering the energy and capacity prices (Badissy, et al., 2020).

Competitive Auctions: This procurement process is meant to reap the fruits of competition by translating to cheaper price and other criteria that is beneficial to the customer. The competitive bidding process can be restricted or open. In restricted bids, only bidders that receive an invite from the procurer may participate. However, in open bids any bidder who meets the criteria may bid in response to a request for proposals. The bidders are then shortlisted to pre-qualified bidders and eventually selected as the preferred bidder (Abrahams, et al., 2019). Best practise is for hybrid markets to procure power using competitive

auction bidding which is effective in lowering the energy and capacity prices to be registered in the PPA (Badissy, et al., 2020).

Direct Negotiations: Direct negotiations are common in both vertically integrated and deregulated markets. In vertically integrated markets, the initiator of the project in this procurement process can either be the procurer or the investor. In deregulated markets, direct negotiations are applicable in wholesale and retail markets in the form of bilateral contracts between a seller and a buyer of electricity. The transaction can be between generators and consumers, generators and traders, traders and consumers, etc (Badissy, et al., 2020). Amidst the market changes of the spot market, bilateral contracts offer an element of stability for both parties where the negotiated price is fixed. However, this is not the case if the price is indexed to some relevant market indices (Hausman, Hornby, & Smith , 2008). Emergency power is another instance that may require negotiated tariff PPA when because of some unfortunate event, there is no time for competitive bidding and power must be restored as soon as possible (Badissy, et al., 2020). With some existing projects, the procurer may wish to expand it because they have access to spare facilities which may make available more capacity to the grid within a short space of time. The procurer may decide between a negotiated PPA or competitive procurement (Abrahams, et al., 2019).

Bilateral contracts: Bilateral contracts are a type of PPA between a seller and a buyer of electricity. The contract duration varies between short term periods, i.e. up to three years, and long-term periods of five years or more. The bilateral contracts offer price stability to both the buyer and the seller. The buyer can shield its customers or end user from volatile spot market prices, and the seller can make provision for long term planning in terms of capacity expansion or new generation capacity especially under long term contracts (Hausman, Hornby, & Smith , 2008). There exists however the risk of the contracting price to be a disadvantage to either the seller or buyer when compared to the spot price. To mitigate this risk, the contract for differences bilateral contract can be used where the seller and buyer are guaranteed the difference between the spot market price and the contract price. This form of contracting is not always a physical contract, where the power generated at a specific location is consumed at that location. It

can be financial in the sense that the power may be delivered by another entity and not necessarily the seller that the buyer has contracted with (Khatib & Galiana, 2007).

Feed-in-Tariffs: Feed-in-Tariff (FiT) usually incentivise investment in certain types of IPP projects, notably small projects, where the government or regulator will set a PPA price and project development timeframe beforehand. The bidders are left to compete on other procurement criteria such as socio-economic benefits, speed, etc (Abrahams, et al., 2019).

In the preceding section, the central role PPAs play in facilitating IPP investment and shaping the electricity market landscape. In the context of the 100MW exemption removal and the potential shift towards a more market-oriented system, this discussion brought an understanding the different types of PPAs, their implications for investment risk and project bankability, and the role of various procurement mechanisms (such as competitive auctions, direct negotiations, and FiTs).

2.2 Overview of the Electricity Supply Industry

2.2.1 Outline of the South African Electricity Supply Industry

The Department of Mineral Resources & Energy has been the policy maker and custodian of the legislative framework which governs the electricity sector in SA. However, there is various other legislation that is applicable to the sector under the custodianship of other government departments such as National Treasury; Department of Trade, Industry & Competition; Department of Public Enterprises; Department of Fisheries, Forestry, and Environment (Morris & Martin, 2015).

The electricity industry is regulated by a statutory body, the National Energy Regulator of South Africa (NERSA) an independent regulator (Forlee, 2008), which also regulates the petroleum pipelines and piped-gas industries (Republic of South Africa, 2004). NERSA is mandated to issue licenses for electricity

generation, transmission, distribution, trading, importing, and exporting activities; and enforce electricity regulations (Republic of South Africa, 2006). The Koeberg Nuclear Power Plant, an electricity generator, is also regulated by the National Nuclear Regulator (Republic of South Africa, 1999).

Electricity generation is comprised of state-owned generators under Eskom Holdings, privately owned generators more commonly referred to as independent power producers (IPPs), small scale embedded generators (Baker & Phillips, 2019), and cross border generation imports such as power from the Cahora Bassa hydro-electric station from Mozambique (Eberhard, 2004). The IPPs can be categorized into government procured IPPs (hence forth referred to as 'Single buyer IPPs'), business initiative IPPs (hence forth referred to as 'Schedule 2 IPPs'), and municipal procured IPPs. The Single buyer IPPs were procured through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), and Eskom is the single buyer of the power they produce. The Schedule 2 IPPs must seek their own off takers and are eligible to enter into bilateral contracts with private customers. The municipal procured IPPs are procured through a municipal procurement process, for IPPs to sell power to the municipality, or for the municipality to build its own generation plant or enter a public private partnership to build a generation plant (Department of Mineral Resources & Energy, 2020). Small scale embedded generators (SSEG) are installations of 1MW and less (Baker & Phillips, 2019), located at the place of consumption with a limited number feeding into the grid (Department of Mineral Resources & Energy, 2024).

Transmission of electricity is still a monopoly, owned and operated by the National Transmission Company of South Africa (a wholly owned subsidiary of Eskom) and licensed to provide the functions of a network service provider, system operator, transmission system planner, and grid code secretariat (NERSA, 2023).

Electricity distribution in South Africa is shared between Eskom Distribution and municipalities. Out of the total of 237 municipalities, 184 hold distribution licenses (Sustainable Energy Africa, 2014). Eskom Distribution serves the remaining 44 municipalities. The licensed municipalities on-sell the power that they buy from

Eskom at a mark up to consumers which constitutes approximately 60% of the South African consumer base (Baker & Phillips, 2019). The remaining customers buy directly from Eskom distribution (Baker & Phillips, 2019). The consumers can be categorized into industrial, commercial, and residential users. Other players in the electricity sector are traders and resellers. Traders buy electricity to sell to customers in the wholesale or retail market (Republic of South Africa, 2023), and resellers buy electricity from a trader or municipality or Eskom to sell to customers (Department of Mineral Resources & Energy, 2023a).

Primary energy for electricity generation includes coal, nuclear, diesel, hydro, solar, wind, biomass, and landfill gas. This energy mix is indicative of the current power plants, which have a nominal capacity of 53 810 MW connected to the grid (Eskom, 2019).

2.2.2 Legislative Context of the Electricity Supply Industry

The policies and legislation governing the ESI were crucial to enabling the ongoing reform through a winding route of legislative development and amendments which provide the legislative context of the electricity supply industry as reviewed in this sub-section.

All legislative frameworks in South Africa are derived from the principles embedded within the Constitution, the supreme law of the land which outlines the mandates and functions of the levels of government, and entities of state, and hence policy making is a government mandate (Republic of South Africa, 1996).

The White Paper on Energy Policy, 1998 (Energy White Paper) provides the overarching vision for the energy sector. In setting out goals for the electricity sector the Energy White Paper expressed government objectives with regards to the use of integrated energy planning and integrated resource planning for electricity planning; the introduction of the private sector into the power generation market; the energy mix; providing non-discriminatory access to transmission networks; and public participation in the decision making of the sector (Department of Minerals and Energy, 1998). These objectives have

gradually found expression in the legislative frameworks applicable to the electricity industry.

National Energy Regulator of South Africa (NERSA) is established by the National Energy Regulator Act, 2004 (Republic of South Africa, 2004).

The Electricity Regulation Act, 2006 (ERA) is administered by NERSA and provides for the licensing of generation, transmission, distribution, trading, import and export activities. This Act makes it the duty of transmission network service providers to give third parties non-discriminatory access to their networks to the extent provided for in their licence (Section 21(3)).

It further articulates the duties of municipalities and the framework applicable to them entering into a service delivery agreement with another institution to provide certain services on their behalf. This Act mandates the National Energy Regulator to be the enforcer of the electricity regulatory framework (Republic of South Africa, 2006).

National Energy Act, 2008 is administered by the DMRE and has the objective to ensure energy security through the use of diverse energy resources to support the growth of the economy, improve the way of life, whilst considering the environment. The Act provides for integrated energy planning (IEP), investment in energy infrastructure, collection of energy data, and the promotion of energy related research. Significantly, it does not mention integrated resource plans, which presumably are subordinate to IEPs. It also establishes the South African National Energy Development Institute responsible for energy efficiency, energy research & development, and funding of research (Republic of South Africa, 2008).

Electricity Pricing Policy, 2008 provides direction and principles in the formulation of electricity prices (Department of Minerals & Energy, 2008).

The Electricity Regulations on New Generation Capacity, 2011 (Regulation No.399, dated 04 May 2011) are regulations provided for in the ERA and are made by the Minister of Mineral Resources & Energy. They were developed with the objective of planning for new generation capacity, providing a framework for

the implementation of the IPP programme (Department of Energy, 2011a), and a framework applicable to organs of state in the energy sector and municipalities for the procurement and building of new generation capacity (Department of Mineral Resource & Energy, 2020). These regulations also address the conditions for cross border generation projects.

Licensing Exemption & Registration Notice (Schedule 2 of the Electricity Regulation Act, 2006) details the activities which are exempt from licensing but require registration instead. The notice gives a criterion to be applied to generation and reselling activities for licensing exemption and registration requirement (Department of Mineral Resources & Energy, 2023a).

These policies and legislative framework reflect the status quo of the ESI from 17 January 2023 to 31 December 2024 as outlined in sub-section 2.2.1. from a legal perspective in terms of permissible activities.

2.2.3 Historical Context of the Electricity Supply Industry

The historical context of the ESI sheds light on the evolution of the energy policy and legislation, explaining the winding route that shaped the current legal landscape of the electricity supply industry.

2.2.3.1 Period: 1998 – 2004: Early Steps Towards Reform

The White Paper on Energy Policy, 1998, published during the early years of the South African democracy, set out the policy framework for South Africa's power sector reforms. It outlined the significance of private sector investment and the introduction of competition in the electricity sector to achieve operational efficiencies (Vagliasindi & Besant-Jones, 2013). The Energy White Paper also advocated the adoption of the integrated resource planning methodology for the evaluation of required investments in electricity supply infrastructure, and the use of renewable energy technologies for electricity generation (Department of Minerals and Energy, 1998). Following this important step of the development of an overarching policy framework for power sector reforms, "the standard model for the reform process generally incorporates the following sequence of events:

primary enabling legislation; establishment of the regulatory framework; creation of the first independent power producers (IPPs); restructuring and privatization; competition." (Nagayama, 2007, p. 3441). The National Energy Regulator Act, 2004; and the Electricity Regulation Act, 2006 were consequently developed as enabling legislation which made some provision for the power sector reforms within a regulatory framework. This regulatory dispensation was intended to transition the South African electricity market from a vertically integrated monopoly model to a single buyer model. In accordance with the Energy White Paper, integrated resource planning was conducted resulting in National Integrated Resource Plans (NIRP), with NIRP1 published in 2001, and NIRP2 published in 2004 (Baker, Burton, Godinho, & Trollip, 2015).

2.2.3.2 Period: 2004 – 2011: Navigating Crisis and Enabling Private Investment

During this period, South Africa's electricity crisis would begin, that is, the country started to experience frequent power outages due to load shedding from 2007 onwards. Load shedding was followed by increasing electricity prices from 2008 (Blignaut, Inglesi-Lotz , & Weideman, 2015). This crisis later contributed to rising unemployment , economic decline (Ngwane & Bond, 2020) , increasing electricity prices, and a state-owned utility (Eskom) that was drowning in debt and faced a risk of not being a going concern, (Crompton & Matsika, 2021).

This was followed by the development of the next IRP, which was published in the Government Gazette in January 2010, in terms of the requirement of the Electricity Regulations on New Generation Capacity (Regulation No. 9116, dated 05 August 2009) and was referred to as IRP1. Included in the IRP1 gazette was a Ministerial Determination for new generation capacity in accordance with Section 34 of the Electricity Regulation Act, 2006 (Department of Energy, 2010). The gazette of IRP1 marked the beginning of an era of legally mandated IRPs. The first comprehensive integrated resource plan was Integrated Resource Plan, 2010 published in the government gazette in 2011 (Montmasson-Clair & Ryan, 2014). The implementation of the IRP 2010 led to the establishment of the IPPO and the Renewable Independent Power Producer Procurement programme (REIPPPP). These developments enabled private sector investment in electricity generation, and a new renewable energy (RE) industry Baker, et.al (2015). This

point marked the realisation of some aspects of the Energy White Paper vision, and the literal transformation of the ESI from the vertically integrated model to a single buyer model.

2.2.3.3 Period: 2012 -2017: The Era of Resistance and Challenges to Reform

The Energy White Paper identified the distribution industry as the part of the ESI that was most in crisis and consequently government's first reform efforts focussed on that sector. This led to the development of the Independent System Market Operator Bill, 2011 (ISMO Bill) to usher in the next phase of power sector reform process, i.e., restructuring. This restructuring was intended to reform distribution into a limited number of economically viable distributors termed Regional Electricity Distributors (REDs). The ISMO Bill was introduced into parliament and was adopted in the Portfolio Committee on Energy as Independent System Market Operator Bill [B9-2012]. However, this aspect of the restructuring of the power sector was not realised due to the withdrawal of the Independent System Market Operator Bill [B9-2012] from parliament in 2014 (Parliamentary Monitoring Group, 2014), Baker, et.al (2015).

Whilst the ISMO Bill was going through the legislative process, the IRP 2010 was also reviewed for the purposes of updating assumptions due to new data culminating into the IRP 2013. This iteration was not an overhaul of the IRP 2010 but a review (Department of Energy, 2013). The IRP 2010 and REIPPPP sent a strong signal on South Africa's commitment to climate change which was followed by the signing of the Paris Agreement in 2016 (South African Government, 2016). The roll out of the IRP 2010 was not without challenges. Most notable were the court cases which challenged the implementation of coal and nuclear determinations; and the prolonged signing of power purchase agreements (PPAs) Baker,et.al (2015); (IPP Office, 2021). The affected projects were announced as preferred bidders in April 2015 and would have reached financial close by the following year. Whilst the outright refusal to sign the PPAs was declared by Eskom in 2016, the utility had initially employed resistance tactics by not giving IPPs budget quotes which provide the cost of their grid connection and are essential for projects to reach financial close (Baker L. , 2017). Eskom argued that RE technologies were more expensive than coal generation despite the

continued decline of RE costs and that there was surplus supply on the grid (Lawrence, 2020) thus defying its legally binding obligation as the buyer (Department of Energy, 2011a). Ting & Byrne (2020) identified this behaviour by Eskom as a "regime resistance" (p. 5) strategy whereby a regime incumbent employs tactics to resist rule changes such as policies, to maintain the *status quo*. In this instance, Eskom's refusal to sign PPAs was found by Ting & Bryne (2020) to be a strategy to challenge the implementation of power sector reforms which posed a threat to its dominance in the market. The delayed signing of PPA's by Eskom delayed the REIPPP programme by almost three years and Eskom conceded to signing after changes in political and utility leadership (Ting & Byrne, 2020). The resulting consequences was unpredictability of the REIPPPP; reduced investor confidence and erosion of the beginnings of an RE manufacturing sector (Baker L. , 2017). The regime-resistance strategy was later reported by Paton (2019), Bartenstein & Oyamada (2019) , Hartley & Mills (2019) that was encouraged by the President's statements such as "Eskom is too big to fail" (Paton, 2019), (Bartenstein & Oyamada, 2019); "just too important to fail" (Hartley & Mills, 2019).

During this period, the restructuring efforts were unsuccessful, the IPP program had been delayed, and load shedding persisted due to an electricity demand that could not be matched by electricity supply (Wiese & van der Westhuizen, 2024). Simultaneously, the costs of renewable energy had been falling at a fast pace, with non-utility solar PV systems costs dropping over the years to a cumulative 64% from 2008 to 2014 (IRENA, 2015). The combination of persistent load shedding, steeply rising prices and reducing solar PV cost, induced some industrial, commercial sector and well-off consumers to seek alternative sources of electricity supply. This gave a rise to rooftop solar PV installation amidst the absence of a legal framework to regulate this market Mqadi, et.al (2018). Following a consultation paper by NERSA on the integration of small-scale embedded generation onto the grid Baker, et.al (2015), government gazetted the Licensing Exemption and Registration Notice (Schedule 2, 2017) which amended Schedule 2 of the ERA in 2017. This notice exempted generation facilities below 1MW from having a license but required them to be registered with NERSA. These generators were limited to generate electricity for own use and /or for

related users (Department of Mineral Resources & Energy, 2017). This would allow for consumers to generate their own electricity to reduce the load from the grid and to self-mitigate against load shedding.

2.2.3.4 Period: 2019 – 2022: Reforming in Response to Crisis

In 2019, the long-awaited IRP update was published. Six years had lapsed between the IRP 2013 review and the IRP 2019 update, which can be considered an unreasonable a delay (for a document that is deemed to be a 'living plan' in a period of rapid technological change) to be updated and revised. The Department of Energy expected this to happen as and when circumstances change or at least every two years (Department of Energy, 2011b). The IRP 2019 which had a ten-year planning horizon up to 2030 with an anticipated 31 488 MW of new capacity (IPP Office, 2021), is the current plan, it also has faced implementation challenges. These include delays experienced in procurement due to the environmental impact assessment (EIA) process; projects not reaching financial close; and grid capacity constraints (IPPO, 2023).

During the same year, there was a Presidential pronouncement during the 2019 State of the Nation Address to unbundle Eskom into separate generation, transmission, and distribution entities (SONA) (Republic of South Africa, 2019). This pronouncement led to the development and publishing of the *"Roadmap for Eskom in a Reformed Electricity Supply Industry"* (Eskom Roadmap) by the Department of Public Enterprises (DPE) in 2019, Eskom's then shareholder department. This publication outlined the future electricity supply industry structure based, to some extent, on the principles enshrined in the Energy White Paper and provided the framework that would guide the unbundling of Eskom. Critical to the unbundling of Eskom would be the establishment of a separate transmission entity, and transmission system operator which would enable competition to the ESI through its market operation function (Department of Public Enterprises, 2019). The Eskom Roadmap resuscitated South Africa's power sector reform aspiration which had collapsed with the withdrawal of the ISMO Bill [B9-2012]. This time it was the DPE nudging the reforms instead of the policy department, the Department of Mineral Resources & Energy (DMRE). Subsequently, the DMRE introduced a series of regulatory amendments which

pointed towards power sector reform. These included the amendment to the Electricity Regulations on New Generation Capacity, 2020 (Regulation No.1093, dated 16 October 2020) which enabled municipalities to procure from IPPs or construct their own new generation capacity. The Licensing Exemption and Registration Notice, 2017 was further amended in 2020 to exempt off-grid generation facilities from both licensing and registration regardless of the capacity (Department of Mineral Resources & Energy, 2020).

In 2021, President Cyril Ramaphosa announced that the licensing exemption threshold for embedded generation projects would be increased from 1MW to 100MW to lessen the impact of load shedding, enable investment in new generation capacity within the larger picture of power sector reforms (The Presidency, 2021). This announcement was followed by the Licensing Exemption & Registration Notice published on 12 August 2021, after which two amendments were published on 20 August 2021, and 05 October 2021 amending a few definitions and reinserting clauses which were erroneously deleted (NERSA, 2021).

Whilst these legislative amendments were shifting the ESI closer towards the next phase of power sector reform, they were a response to load shedding rather than a planned reform.

The move to rooftop solar PV together with load shedding translated to reduced revenues for Eskom, approximately a 1 % p.a. reduction in the volume of sales since 2012 (Eskom, 2022). This decline in sales volumes resulted in higher electricity prices which forced some customers to seek alternative sources of electricity, and other customers to reduce their consumption. Consequently, Eskom increased electricity prices again to increase revenues and is thus caught in a classic utility death spiral (Crompton & Matsika, 2021).

Eskom as a utility argued for cost reflective tariffs as per Electricity Pricing Policy,1998, which states that tariffs must recover for the different customer categories; energy costs, network usage costs; and associated service costs (Department of Minerals & Energy, 2008). Cost reflective tariffs from a business perspective encourages efficient use of electricity by consumers they cover the

cost of supply, maintenance, and development of electricity infrastructure, and to some extent avoid new infrastructure investments due to changed consumer behaviour which in turn would eventually reduce costs. Therefore, Eskom's argument for cost reflective tariffs is an effort to achieve sustainable business operations. However, with the past Eskom tariff applications to NERSA as part of the multi-year price determination process (MYPD), NERSA has approved tariffs that were lower than Eskom applied for (Maphosa & Mabuza, 2016), due to the identification of some non-prudent costs in the tariff applications (National Energy Regulator of South Africa, 2020), (National Energy Regulator of South Africa, 2022). (Maphosa & Mabuza, 2016).

These NERSA decisions have resulted in Eskom taking NERSA to court several times and NERSA has lost all the cases to date. In MYPD4 submitted to NERSA on 14 September 2018 (Eskom, 2019) for instance, Eskom had applied for a 15% tariff increase for each financial year of the MYPD period, and NERSA granted it a 9.41% increase for 2019/20; 8.1% for 2020/21; and 5.22% for 2021/22. The point of contention in this court case was that Eskom argued that NERSA mistakenly accounted for government bail outs as a subsidy for consumers of electricity, whereas the bail outs were intended to service Eskom's debt which became necessary because of NERSA not awarding Eskom cost-reflective tariffs in the past and this increased the risk of Eskom not meeting its Going Concern obligation (High Court of South Africa, 2020). After that court judgement, the electricity prices increased by 13.41% for 2019/20; 8.76% for 2020/21; and 15.06% for 2021/22 (Department of Mineral Resources & Energy, 2023), yet there still remains no visible improvement to Eskom's financial situation and provision of electricity supply despite the government bail outs and some movement towards cost reflective tariffs. For the year 2023 the utility's net loss before tax doubled, from R15.1 billion in 2022 to R31.6 billion in 2023, and load shedding was experienced for 280 days in 2022 compared to the 65 days experience in 2021 (Eskom, 2023).

The electricity price increases in general have a negative impact not only on some customers which cross-subsidize other customers but is felt the most by indigent consumers who may have physical access to electricity but may not

actually have access due to affordability (National Energy Regulator of South Africa, 2022). Moreover, the impact of increasing prices coupled with load shedding has had a detrimental impact on the economy, perpetuating unemployment, and creating a breeding ground for the rampant electricity theft, and other contributors to non-technical losses such as infrastructure theft, damage, poor service delivery, fraud, and corruption (Louw, 2019). The mitigation response to load shedding, i.e., adoption of small-scale embedded generation, inadvertently exacerbated the electricity price hike problem, worsened the crisis and accelerated the utility death spiral. The ESI proved to be fertile for competition, and the benefits which come with it, i.e., price reduction, and improved efficiencies (Department of Public Enterprises, 2019), and hence the 2022 Bill to amend the Electricity Regulation Act, 2006 (Department of Mineral Resources & Energy, 2022) in response to the Eskom Roadmap, 2019 (Republic of South Africa, 2023c) which finally commenced operation in January 2025.

2.2.3.5. Period: 2022 – 2024: Policy Shifts Towards a New Market

A proposal to amend the Electricity Regulation Act, 2006 was made to make provision for the developments outlined in the Eskom Roadmap through the Electricity Regulation Amendment Bill, 2022 (ERA Bill, 2022) that was gazetted for public comments on 10 February 2022 (Department of Mineral Resources & Energy, 2022). Additionally, in his address to the nation on the energy crisis on 25 July 2022, President Cyril Ramaphosa announced that it was imperative to greatly increase investment from the private sector in new generation capacity, this was based on the 6000 MW of projects that the private sector confirmed to build post the increase in the licensing exemption threshold to 100 MW. To that effect, the licensing exemption threshold would be removed to allow investment levels in generation capacity to increase (South African Government, 2022) and thereby reduce loadshedding. Consequently, the Licensing Exemption & Registration Notice of 15 December 2022 followed by a correction notice on 17 January 2023 (which was correcting of a drafting error) was published in the government gazette. In addition to removing the licensing exemption threshold, this notice enabled the registered generation facilities to sell electricity to one or more customers thus entrenching a bilateral electricity market. This led to a

cumulative capacity of 7240 MW registered projects between the period 22 February 2019 to 1 April 2024, mostly from renewable energy sources (SAPVIA, 2024). Once again, driven by load shedding, more avenues for private sector investment and the beginnings of a market were enabled through legislative amendments whilst the ERA Bill,2022 was going through the policy making process.

Considering global developments, with regards to climate change mitigation, the South African electricity generation sector has been identified as the area where the country can rapidly reduce most of its emissions. Secondly, the European Union (EU) has adopted a carbon border adjustment mechanism (CBAM) which penalizes certain products imported into Europe from countries with lower carbon taxes than apply in the EU. To remain competitive and avoid this penalty, South African producers aim to use electricity generated from renewable energy to reduce their reliance on coal generated power. This is believed to have contributed to an increase in the number of NERSA registered power generation projects (Terblanche, Botha, Louw, & Radmore, 2024). The draft Integrated Resource Plan, 2023 in this respect identified capacity of up to 10 436 MW of committed RE projects to be built through private sector initiatives for the period up to 2030 (Department of Mineral Resources & Energy, 2024). This is an example of international pressure indirectly contributing to a move away from a state owned centralised near monopoly towards increased private ownership and competition.

The Draft Integrated Resource Plan, 2023 (Draft IRP 2023), published for public comments on 04 January 2024, breaks up its study period into two horizons, horizon 1 being the period up to 2030, and horizon 2 being the period from 2031 to 2050. In horizon 1, the study analyses 5 scenarios of which 3 do not solve security of supply due to the presence of unserved energy. One only achieves security of supply in 2028, and the remaining one achieves security of supply in 2024. These last two scenarios achieve security of supply due to improvement of Eskom’s energy availability factor (EAF) as put forward by the Eskom Generation Recovery plan, and the deployment of natural gas in large measure. The emerging plan then depicts that in addition to the private sector initiatives, the

capacity under procurement from the IRP 2019 bid windows, government may need to procure an additional capacity of 13 878 MW from gas, solar PV, wind, and battery energy storage system technologies. For developers this signals an opportunity for investment, however there can be opportunity for more investment as the emerging plan continues to show levels of unserved energy. The draft IRP 2023 attributes this to limited grid capacity and remains unclear on gas sources and infrastructure to deploy the quantities of gas-fired power that the system requires. However, should the proposed intervention to improve Eskom's EAF be implemented, the opportunity for new IPP investment may be reduced. That scenario and intervention only considers those projects that are already underway. Whilst the plan states that all scenarios studied under horizon one are within the Nationally Determined Contribution target limits, the compliance with the Minimum Emission Standards by the coal fired power station fleet is flagged as a risk, and thus raises an issue of misalignment between government policies and objectives and conflict of interests within government (Department of Mineral Resources & Energy, 2024). This illustrates the difficult transition between a generation capacity plan like an IRP and the introduction of a competitive market. In one sense IPP investors are taking a bet on Eskom's ability to improve its EAF, or not, unless they have their own non-Eskom guaranteed off take, in which case it is their customers that are taking the bet. Public comments from some stakeholders on the Draft IRP 2023 highlighted that once again, and IRP was published before an IEP, arguing that the IRP is intended to align with an IEP which should be developed prior to an IRP (Krause, 2024), (Just Share, 2024). The nature of the IEP and IRP is detailed in the conceptual framework section of this chapter.

As the ERA Bill, 2022 was progressing in its own right, it received approval in the National Assembly on 14 March 2024. It was approved by the National Council of Provinces on 16 May 2024 (Parliament of the Republic of South Africa, n.d.) and was assented into law on 20 August 2024 (Republic of South Africa, 2024b) for partial commencement on 1 January 2025 (Republic of South Africa, 2024c) – key provisions relating to municipal powers and rights were not brought into operation by the President's decision. The objects of this amendment Act regarding electricity market reforms state that the Bill is amended to "provide for

an open market platform that allows for competitive electricity trading; to assign the duties, powers and functions of the Transmission System Operator to the National Transmission Company South Africa SOC Ltd" (Republic of South Africa, 2024a, p. 2). If this amendment Act is implemented in conjunction with the Eskom Roadmap, South Africa's electricity market will transition to a wholesale competition model, within 5 years according to the timelines stipulated in the Amendment Act. This will facilitate an anticipated increase in private sector investment and advance the restructuring phase of the power sector reforms and if the envisaged electricity market materialises, further call into question the role of IRPs.

This historical overview of South Africa's power sector reforms from 1998 to 2024 reveals a complex narrative of policy evolution characterised by a crisis-driven winding route. Several key factors contributed to this pattern:

- Erratic attempts to implement policy (White Paper on Energy Policy 1998).
- Opposition to reform by vested interests.
- Challenges in IRP implementation led to missed opportunities for a smoother transition.
- An inconsistent regulatory environment created uncertainty for investors and stakeholders.
- Resistance from the incumbent Eskom disrupted the reform process.
- The electricity loadshedding crisis itself had a negative impact on economic growth and energy security. This brought about urgent policy responses, which led to reactive rather than proactive measures.
- Balancing national objectives with international commitments while addressing local challenges further complicated the reform journey.

These factors illuminate some of the key reasons behind the winding route that shaped the legal landscape of the ESI, demonstrating the challenges of

navigating power sector reform without a well-defined and structured approach and without consistent political will.

2.3 The Alternative Roles of Integrated Resource Planning

South Africa's reform process is at the stage where independent power producers can make investment decisions without regard to an IRP. To inform the development of potential alternative or amended IRP functions, alternative roles of integrated resource planning are reviewed. In this section, the role of the IRP in different countries that have undergone power sector reforms is looked at. The United States of America is selected for its similarity with South Africa from the perspective of having initially mandated the practice of integrated resource planning through legal instruments. China and the United Kingdom are selected based on the similarity with South Africa for government-led planning. Finally, Australia is selected based on its stark difference from South Africa.

2.3.1 Integrated Resource Planning (IRP) in the United States of America

In the United States of America (USA), the Clean Air Act as amended in 1990 and the US Energy Policy Act, 1992 were the primary legislation driving the mandatory adoption of IRP practises. The provisions in the Clean Air Act Amendments of 1990 were intended to encourage state commissioners (economic regulators) in the United States to establish regulations mandating utility participation in IRP; and the US Energy Policy, 1992 required all electric utilities to conduct an IRP and submit their plans for approval to the state Public Utility Commissions (PUC). IRPs demonstrated that DSM could prevent the need to construct unpopular and polluting generating units while also yielding significant economic and environmental benefits. Hence, the introduction of IRPs was primarily motivated by environmental concerns as well as the rising costs of producing electricity and the ensuing need for more energy efficiency (D'Sa, 2011). Additionally, IRP adoption was to make utilities accountable to the public

and to facilitate an environment conducive for sharing ideas and innovation in electricity planning (Byrne & MUN, 2003).

In 1992, out of the 50 states in the United States of America, 32 had frameworks for regulating IRP implementation, and nine other states were starting to probe IRP practises (D'Sa, 2005). For the remaining states that did not practice IRP, over capacity; the absence of regulatory requirements to develop an IRP or regulatory capture were some of the reasons observed as to why those utilities did not practice IRP (Bauer & Eto, 1992).

During the power sector reforms, in the middle of the 1990s, the USA saw a decline in IRP practices in states that had restructured to the level of retail competition due to regulation relegating IRP to an optional practise rather than mandatory as was previously the case. The laws requiring integrated resource planning were either repealed or disregarded (D'Sa, 2005), (Wilson & Biewald, 2013) . The reason for this was that in retail markets the utility responsibility was limited and hence an IRP process would not be suitable. Moreover, it was difficult for PUCS to require an IRP from competitive suppliers as they were not under PUC regulation. (State and Local Energy Efficiency Action Network, 2011).

By 2011, the number of states obliging utilities to undergo an IRP process had increased to 34. However, the role of PUC and that of the IRP varied from state to state. In some states the PUC received and recognized IRPs from utilities; in other states for the utility developed IRP to be valid it required PUC approval. The PUC in some states may facilitate stakeholder engagements to solicit public inputs prior to making an approval decision. PUCs in other states took a more active role, in that they were responsible for the IRP development and required utilities to provide data (State and Local Energy Efficiency Action Network, 2011).

The advent of a deregulated market brought about a decline in the requirement for an IRP because there was an expectation that the deregulated market would take care of planning for investments in new generation capacity (Swisher, de Martino Jannuzzi, & Redlinger, 1997), (HU , WEN , & TAN , 2009). Secondly, proponents of deregulation believed that the competitive market would determine the choice of resources with which demand must be met. This was at loggerheads

with the IRP principle that demand must be met with cost effective sources outlined in the plan. This was viewed as a form of regulation and would not be acceptable in a deregulated market (York & Narum, 1994). Thirdly, there was no longer incentive for utilities to do integrated resource planning as there wasn't any shared planning between the utilities business due to unbundling, and therefore it would be difficult to facilitate integrated resource planning (Hu, et al., 2010). The IRP therefore in some states became more of an information document for reference purposes rather than a plan (State and Local Energy Efficiency Action Network, 2011).

California's electricity market is an example of an electricity market that had also opted for deregulation and relinquished IRP practices. Energy efficiency measures for buildings were abandoned and there was a reliance on investors from the unregulated market for future new generation capacity with no measures in place to sensitize policy makers of the market status with regards to the additional new generation capacity (D'Sa, 2005). The electricity market experienced a crisis in 2001 (D'Sa, 2005) which led to increased prices and insufficient power supply. To resolve the crisis, California went back to the use of an IRP, termed the Long-Term Procurement Plan (LTPP) (Wilson & Biewald, 2013) for decision making, resulting in reduced prices and a balance in the supply and demand of power (Byrne & MUN, 2003). The use of the IRP enabled the California regulatory commission set quantifiable annual minimum efficiency and renewable energy goals for each investor-owned utility (Bradford, 2005). California has since been consistent with IRP practises and uses the IRP as a tool for procurement of additional power and to achieve greenhouse gas emissions targets (California Public Utilities Commission, 2024).

Other states with deregulated markets, such as Arizona and Connecticut, when returning to integrated resource planning in the early 2000s, either went back to the IRP rules that were in use prior to deregulation or updated the rules so that they may be applicable to the competitive market structure or replaced them with resource procurement plan rules. Resource procurement plans assessed capacity and energy purchase requirements for utilities without generation assets. The resource procurement plans took on the principles of integrated

resource planning however they differed from integrated resource plans in that they had shorter planning periods and required annual update (Wilson & Biewald, 2013).

Different states approached integrated resource planning in different ways due to differing public goals. Some states, for instance Michigan, used the traditional IRP approach whilst other states adopted different approaches resulting in different names such as Long-Term Procurement Planning (LTPP) (e.g. Massachusetts, Illinois and California); or Site Plans (e.g. Florida); or Discrete Resource Approvals Through a Certificate of Public Convenience and Necessity (CPCN) (e.g. Georgia, Minnesota, Indiana, Wisconsin, and Maryland) (U.S Environmental Protection Agency, 2022). The table below gives an overview of each IRP type plan. It is evident from this overview that integrated resource planning had evolved to take different forms with varying legal status. States went back to planning because they realized that short-term energy market approaches were insufficient for long-term planning, as demonstrated by crises like the California electricity crisis (D'Sa, 2005). They also learnt that plans must be adaptable to changing market conditions and technological advancements. South Africa can learn from this history how to develop adaptable plans that can respond to changing circumstances.

Table 2: Variations of integrated resource planning approaches in the USA

Process	Overview	Applicability	Legal Status
Integrated Resource Planning or Integrated Resource Plan (IRP)	IRP considers forecasted demand, supply- and demand-side resources, financial and environmental costs and risks, and stakeholder input in a plan to reliably meet customer load. IRP planning horizons are typically 10–30 years, and the frequency of IRP updates are commonly 2–3 years.	With some exceptions, IRP rules typically apply to vertically integrated utilities in regulated states.	IRPs are commonly required by state legislation or regulation and reviewed by utility regulators. Approved IRPs are generally not legally binding.

Process	Overview	Applicability	Legal Status
Discrete Resource Approvals Through a Certificate of Public Convenience and Necessity (CPCN)	A CPCN is considered through a docketed proceeding before a state utility commission in which a utility provides justification for a large capital investment in generation, transmission, and some distribution infrastructure.	A CPCN is required for owners of generation, transmission, and some distribution projects. It occurs in both regulated and restructured states, as required by state law.	A CPCN hearing is a litigated process. An approval gives permission, but does not require, a utility to take the requested action.
Default Service—also known as Standard Offer Service (SOS)	Default service provisions ensure that load-serving utilities procure electricity for those customers who are ineligible (e.g., due to size) or have not elected to choose a competitive energy provider.	Default service applies to distribution-only utilities operating in restructured markets with retail competition. In some restructured states, retail choice is available only to large industrial consumers.	Procurement of electricity for default service customers is required by law in applicable states.
Long-Term Procurement Planning	Long-term procurement planning refers to utility plans that consider medium- to long-term (e.g., 3- to 10-year horizon) system and local resource needs and solicit market-based supply offers. The update cycle may occur over a shorter period (e.g., every year) than IRPs.	Long-term procurement planning generally applies to distribution-only utilities operating in restructured states.	In states where it occurs, long-term procurement planning is required by law.

Source: (U.S Environmental Protection Agency, 2022)

Regional resource adequacy programs or regional IRPs are also developed in some parts of the USA where the focus is on ensuring regional resource adequacy and coordinating capacity obligations across utilities in a specific region. The regional IRP provides insights to regional capacity needs and sets

targets and obligations for the utilities to consider in developing the utility IRP (Carvallo, et al., 2021). The Pacific Northwest region of the USA which is made up of four states; Idaho, Montana, Oregon and Washington conduct integrated resource planning at regional level as mandated by the Pacific Northwest Electric Power Planning and Conservation Act,1980. The Act established the Northwest Power and Conservation Council which is required to develop an IRP over a 20-year planning horizon which must be reviewed every five years. Each state still requires their regulated utilities to do IRP's which become useful in the development of the regional IRP. For instance, in estimating the contributions of renewable energy in the region, the Council relies on the goals set out in the utility IRPs (Bradford, 2005).

While an IRP was originally intended to guide resource planning, deregulation led to the expectation that the market would handle this function, and this resulted in a decline in IRP use. California's experience left a lesson that the transition to a deregulated electricity market, is not a simple switch and requires careful management, and that there is a need for some form of planning even in deregulated markets to ensure sufficient and reliable electricity supplies (Byrne & MUN, 2003), (Wilson & Biewald, 2013).

The shift to various forms of resource planning reflects how integrated resource planning has evolved to take on different forms depending on the regulatory environment. For example, some USA states use IRPs for informational purposes only, while others integrate them with setting goals for renewables and efficiency. A significant distinction lies in the scope of IRPs: in the USA, they often focus on a specific utility's planning needs, whereas in South Africa, they typically encompass an entire country's electricity system. Even in instances of regional IRPs in the USA, individual utilities are still required to develop their own IRPs that contribute to the broader regional plan.

2.3.2 Integrated Resource Planning in China

In China, energy planning was based on the "Plan for the National Economy and Social Development," a five-year plan developed by the National Development and Reform Commission (NDRC) for adoption by the National People's

Congress. This plan is at the top level of a pyramid of plans which include industry and sector plans such as the energy plan. The energy plans had distinct plans for the conservation of energy and renewable energy adoption. The five-year plan integrated and synchronized China's social and economic growth strategies with energy planning to set goals and targets for the energy industry and was prescriptive in pronouncements pertaining to investments. However, Bradford (2005) found that the plan had short comings as cost, environmental considerations, and demand side options were not prioritised in its development. The plan was also not updated as rapidly as conditions that impacted the plan changed (Bradford, 2005). Consequently, China adopted integrated resource planning which was developed by utilities. After the third phase of electricity market restructuring (competitive generation market that is unbundled from a regulated transmission and distribution market) in 2002 (Yeoh & Rajaraman, 2004) , government took on the role of doing IRP for the expansion of the power system (Hu, et al., 2010). Instead of choosing between central planning and market forces, both central planning and market mechanisms co-exist (Davidson & Pérez-Arriaga, 2020). To assist national government in this role, Hu, et al (2010) proposed an integrated resource strategic plan (ISRP) which is an extension of integrated resource planning. The ISRP considers a balance between supply side power plants, energy efficient power plants (energy efficient appliances & motors), and government policy. Under normal circumstances, if energy planners find that the costs to build new generation capacity are high in comparison to energy efficiency, optimization will lead to aggressive energy efficiency measures. However, if there was a government policy to encourage investment in new generation capacity, then a policy adjusted IRP would sway the plan in the direction of new generation capacity. An ISRP aims to strike a balance between energy efficiency, new generation capacity, and government policy for social benefit.

The ISRP allows for adjustments based on policy priorities, ensuring that energy planning aligns with national objectives. This approach allows China to adapt its energy strategy based on economic realities and social priorities. The ISRP serves as a flexible framework where policy plays a crucial role in shaping China's energy future.

2.3.3 Integrated Resource Planning in Australia

The Australian electricity market is deregulated, comprising of competition in both generation and distribution industries. The transmission grid is private investor owned, and the Australian Energy Market Operator (AEMO) is responsible for market operations, dispatch grid planning, and forecasting of future supply and demand over the long term. In terms of resource planning, generators in the market make their own plans for building new generators based on the AEMO forecast (Li, Zhang, & Feng, 2021). The AEMO forecast is part the Integrated System Plan (ISP) which has a planning horizon of 20 years and is reviewed every two years as assumptions change. Its purpose is to transition the electricity sector from fossil fuels to renewable energy whilst considering the reliability and security of supply through grid modernization and expansion, and investment in utility scale energy storage (Australian Energy Market Operator, 2022).

2.3.4 Integrated Resource Planning in the United Kingdom

In the United Kingdom, the electricity market is also deregulated with competition in generation. The transmission grid is state-owned and is responsible for system operations and dispatch. Energy trading is provided by two trading centres (the wholesale electricity market), and the customers interact with the retail electricity market. The government develops an energy plan, referred to as the national energy development goal, an electricity plan, which serves as a guideline for generators in the market when they develop their own resource plans. Generators are required to submit their resource plans to government for approval (Li, Zhang, & Feng, 2021), (NESO, n.d.).

Both Australia and the UK utilize integrated resource planning to navigate the energy transition. While both share similarities in their long-term goals, the key difference lies in the level of government control. Australia leans towards a market-driven approach with the ISP acting as a guide, while the UK utilizes a more prescriptive national plan with government approval for resource plans.

2.3.5 Integrated Resource Planning in South Africa

During the years when South Africa's ESI was a monopoly, prior to 2006, planning was done at a utility level. Eskom produced an internal Integrated Strategic Electricity Plan which informed generation capacity expansion (Baker, Burton, Godinho, & Trollip, 2015). This occurred even though the planning responsibility had been assigned to the Department of Minerals & Energy (DME) in 1998 by the Energy White Paper (Department of Minerals and Energy, 1998) which delegated the planning responsibility to NERSA. NERSA consequently developed the NIRP1 and NIRP2 (Baker, Burton, Godinho, & Trollip, 2015). The Electricity Regulation Act, 2006 then shifted it away from the national regulator to legally mandate the responsibility of integrated resource planning to be at national Government level (Republic of South Africa, 2006). The Electricity Regulations on New Generation Capacity, 2011 (Regulation No.399, dated 04 May 2011) therefore enabled the Minister of Energy to be the developer of the integrated resource plan (Department of Energy, 2011a), hence Montmasson-Clair & Ryan, (2014) state that the IRP was institutionalized in the Department of Energy. Following the merger of the Department of Energy and the Department of Mineral Resources in 2019, these regulations were transferred to the Minister of Mineral Resources and Energy. After the May 2024 general election, the regulations were transferred to the Minister of Electricity and Energy (Republic of South Africa, 2024).

In South Africa, integrated resource planning is located within the integrated energy planning framework. The White Paper on Energy Policy, 1998 recognizes integrated energy planning as the foundation for energy sector planning (Department of Minerals and Energy, 1998). The National Energy Act, 2008 therefore makes provision for the development and annual review of integrated energy plans which inform and guide energy infrastructure plans, one of which is the electricity plan, but does not explicitly use the term integrated resource plan (Republic of South Africa, 2008). Instead, the term is to be found in the Electricity

Regulation Act, 2006 and 2024, which allocates the duty to the Minister. The current practice has seen two promulgated integrated resource plans, IRP 2010 and IRP 2019, and a draft IRP 2023 gazetted, before the development of a comprehensive integrated energy plan which is deemed to provide their overall context (Baker, Burton, Godinho, & Trollip, 2015), (Montmasson-Clair & Ryan, 2014). However, the National Energy Act is silent on the IRP's supposed subordination to the IEP. Instead, it says that an "Integrated Energy Plan must inform and be informed by plans from all supply, production and demand sectors whose plans impact on or are impacted by the Integrated Energy Plan" (Republic of South Africa, 2008, p. 10).

On 28 April 2023, the President of South Africa issued a proclamation for section 6 of the National Energy Act (which deals with integrated energy planning) to commence operation (Republic of South Africa, 2023b)) some 15 years after the balance of the Act commenced. This proclamation was the outcome of legal action initiated by an NGO, a stakeholder in the energy sector , which based its court case on the notion that the lack of integrated energy planning is the root cause of South Africa's energy crisis (The Green Connection, 2023) (The Green Connection, 2024).

The IRP is used as a tool for administering the pursuit of national policy objectives (Republic of South Africa, 2006) such as energy objectives; economic objectives; industrial objectives; developmental objectives; social objectives; financial objectives; and environmental objectives. The energy objectives have security of supply at its core and is reflected as the primary objective of the IRP (Montmasson-Clair & Ryan, 2014). In implementing the IRP a procurement process is conducted by the IPP Office to facilitate IPP investment, and these objectives are embedded within the power procurement process.

Table 3: IRP iterations over the years

Year published	IRP Iteration
2001	National Integrated Resource Plan 1 (NIRP1)
2004	National Integrated Resource Plan 2 (NIRP2)
2009	Integrated Resource Plan 1 (IRP1)
2011	Integrated Resource Plan 2010 (IRP 2010)
2013	Integrated Resource Plan 2013 (IRP 2013)
2019	Integrated Resource Plan 2019 (IRP2019)
2024	Draft Integrated Resource Plan 2023 (Draft IRP 2023)

Source: (Baker, Burton, Godinho, & Trollip, 2015), (DMRE, n.d.)

In comparing all the countries presented in this chapter, long term planning for electricity is over a horizon of 10 – 30 years is deemed important. The IRP goal in the above-mentioned countries is achieving security of supply while considering factors like affordability, environmental impact, and efficiency. Differences however do exist in the market structure in which integrated resource planning exists; the level of government control; and in integration with broader energy plans. In South Africa and China, state-owned generation plays a significant role, supplemented by private participation. In contrast, the USA, Australia, and the UK have deregulated markets where competition exists in both generation and retail sectors. Each country's approach to IRP varies. In South Africa the national government leads with procurement based on the IRP. The USA has a mix of mandatory utility-driven integrated resource planning in some states and market-driven approaches in others. In some regions, the USA has regional IRPs which are sets of goals and targets for utility consideration. China

transitioned from utility-led IRP to government-led planning influenced by policy priorities; and Australia and the UK operate in deregulated markets where generators develop plans guided by government directives (Australia) or national energy plans (UK). Quite distinct to the other countries reviewed here, is that in South Africa, government plays a central role in the development and implementation of an IRP; it is not for informative purposes, the IRP has a national focus, it applies to the whole country; and it has preceded a broader integrated energy plan.

While long-term planning is essential for all countries, the centralized and prescriptive nature of South Africa's IRP, compared to the more flexible and market-oriented approaches of other nations, may hinder the country's ability to adapt to rapid changes in the energy landscape.

2.3.6 Proposition 1

Integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market.

2.4 Independent Power Producer Investments

South Africa’s reform process is at the stage where independent power producers can make investment decisions without reference to an IRP and government guaranteed off-takers. By outlining the role of government guarantees and PPAs in attracting IPP investments, this section provides a basis for investigating how the removal of these incentives would impact investment decisions.

2.4.1 Independent Power Producers with Power Purchase Agreements

PPAs have been found useful in enabling investment for independent power producers globally because they transfer a lot of the risk away from the investor and socialise it instead. The objective of IPP investors is to make a profit and reduce any risk that may challenge profit making (Badissy, et al., 2020). Additionally, IPP projects are often funded through project finance which requires a bankable PPA, that is, one that has clauses which guarantee the project a revenue stream to repay the loans taken to develop the project. Such clauses include minimum operating capacity of the plant, the energy price contract duration, whether the capacity charges over the duration of the contract are fixed or variable, fuel price fluctuations, and take or pay. These clauses make it attractive for IPPs to invest in new generation capacity (Advanced Engineering Associates International, Inc. (AEAI), 2003).

In a study conducted by AEAI (2003) in comparing the wholesale electricity prices charged by IPPs in South Asian countries, it was found that developers preferred IPP projects with PPAs. These PPA's have a tenure ranging from 20-30 years, have been obtained either through a competitive tender or a negotiated agreement, and power generated is sold to a state-owned single buyer vertically integrated utility. The take or pay clauses within the PPA incentivize IPPs to invest as they require the buyer to pay for a specified amount of electricity regardless of usage. This guarantees revenue for the IPP and reduces financial risk for it (Advanced Engineering Associates International, Inc. (AEAI), 2003). However, an important aspect to this is the ability of the off-taker to make payments, and hence the credit status of the off-taker is vitally important (in the case of a private PPA) or clauses regarding government guarantees are present (in the case of a government PPA). Investors prefer a PPA which transfers risk to the off taker.

Badissy, et al (2020) found that PPA prices resulting from a direct negotiation are higher compared to those obtained from a competitive auction bidding. In another study evaluating the effectiveness policy in adopting renewable energy, it was found that amongst the East Asia summit countries, the use of competitive auction bids towards or direct negotiation towards a PPA to incentivise

investment in renewable energy IPP projects resulted in a lower PPA price compared to the use of Feed-in-Tariffs (Chang, Fang , & Li, 2016). For the successful development of projects under either of the procurement processes above, it is crucial that the necessary regulatory dispensation is available to create an environment conducive to competition, access to transmission infrastructure through physical availability and financial transmission rights (Hausman, Hornby, & Smith , 2008).

2.4.1.1 Government Guarantees

Government guarantees play a significant role in IPP investment, as they provide guarantees for the performance of the power purchaser and, in some cases, the fuel supplier if it is government-owned (Advanced Engineering Associates International, Inc. (AEAI), 2003). They are commonly offered in developing countries where the off taker of the power to be generated by the IPP is a state-owned utility (Aslan & Irwin, 2020). Government guarantees, also referred to as sovereign guarantee or support is a separate agreement that accompanies the PPA, it ensures that the IPP is paid when the off-taker defaults on a payment for power received and also ensures that the IPP is paid compensation upon PPA early termination. The inclusion of government guarantees for the investor increases the bankability of a project and mitigates the risk of non-payment by the off taker (Badissy, et al., 2020). This type of government guarantee is classified as a financial guarantee, where government makes payment on behalf of the off taker thus impacting the fiscus as a contingent liability. This type of guarantee cannot be reversed and must be honoured timeously should the need arise (Lu , Chao, & Sheppard, 2019). Government guarantees may also come in the form of protection from political and regulatory risks, fuel price variations, and recovery of fixed costs, as in the cases of Bangladesh, Pakistan, and Bhuthan (Advanced Engineering Associates International, Inc. (AEAI), 2003). This type of guarantee differs from the financial guarantee and is termed a performance guarantee. A government, under a performance guarantee, fulfils a role that it agreed to beforehand under specified circumstances. The performance guarantee is more prevalent in public-private partnership contracts (Lu , Chao, & Sheppard, 2019).

While government guarantees reduce risk for investors, they can pose a potential risk to the government's fiscal health (Lu , Chao, & Sheppard, 2019). Therefore, Aslan & Irwin (2020) emphasize that the government must estimate the cost of these guarantees to make informed decisions about whether to provide them. They propose a method that uses the credit ratings of the state-owned utility to estimate the probability of a default and therefore determine the expected government payments under the guarantee. In the case of the Chinese power plant Sha Jia B, government lost billions of Hong Kong dollars and Chinese Yen in exchange rate and cost escalation losses whilst the investor enjoyed an internal rate of return of up to 38,8% during the concession period ((Xu et al. 2014.) as cited in (Lu , Chao, & Sheppard, 2019)).

In Pakistan, to incentivize foreign IPP investment, the government provided performance guarantees which guaranteed foreign currency repatriation and foreign exchange rate indexation. This resulted in an annual outflow of up to $800 million, and in hindsight there was a realisation that only high priority projects should have received such a guarantee (Lu , Chao, & Sheppard, 2019).

The provision of government guarantees was key for attracting private investment into the Turkish electricity market (Atiyas & Dutz , 2004), however as the fiscal situation worsened, there was a realisation that government guarantees would be unsustainable. Therefore, the Turkish government opted to further reform their electricity market through restructuring and designing a new market to include privatization, competition, and independent regulation (Erdogdu, 2007).

South Africa, similarly, to Turkey, incentivised IPP investment with PPAs backed with government guarantees where the IPP and government sign a Government Framework Support Agreement (GFSA) and an Implementation Agreement (IA). The GFSA ensures that the IPP payment is accounted for in the tariff to be ringfenced for that sole purpose. The IA is a sovereign guarantee that government will step in if the off taker fails to pay and is applicable if the GFSA fails (Eberhard & Naude, 2017). The National Treasury has indicated that they seek to eliminate government guarantees (National Treasury, 2022) and the ERA amendment Act,2024 makes provision for competition (Republic of South Africa, 2024b).

Not all PPAs make provision for government guarantees as with the case of Nepal and India (Advanced Engineering Associates International, Inc. (AEAI), 2003), and to solve for bankability of projects in the absence of government guarantees, Atiyas & Dutz, (2004) recommends that distribution companies be first privatized to ensure that they are managed commercially and viable financially.

2.4.2 Independent Power Producers without Power Purchase Agreements (Merchant Power Producers)

Merchant power producers (MPPs) exist to close the generation capacity gap, meet the needs of their consumers, and to make a profit. To make profits, MPP investors find markets where a capacity gaps persists, there is high demand and strong consumer purchasing power to be attractive (Siddhartha & Rajan, 2010), (Banu Power, 2022). Capacity gaps and high demand, particularly an inelastic demand, potentially drive market prices up thus making MPP investment profitable. However, price cap regulation is one of the mechanisms used to mitigate against market exploitation by MPPs (Banu Power, 2022), (The Regulatory Assistance Project). In the United States of America, during the period between 1997 – 2005, at the onset of deregulation the MPP market boomed with project financed MPPs and the USA electricity market was flooded with new entrants. There was a similar trend in Australia and the United Kingdom. Whilst this was good for resource adequacy, the oversupply lowered electricity prices extensively and resulted in financially distressed MPPs which could not recover their costs and did not receive adequate equity returns. Out of the 230 GW MPPs in the USA, 123 GW were in financial distress by 2005. Drax Power station in Europe went bankrupt, the Australian MPP industry experienced losses of almost $6 billion AUD over 10 years. Based on this trend, MPPs face a challenge in accessing project finance without a long term PPA. It was therefore recommended that policy makers and regulators should assist in ensuring that policy and regulatory environment in the regulation of tariffs considers long term investment decisions and not just based on the short run market dynamics (Nelson & Simshauser, 2013).

While Power Purchase Agreements (PPAs) with government guarantees have historically been crucial for attracting investment in Independent Power Producers (IPPs), global trends reveal that bankability can be achieved without them. However, this depends on reformed electricity markets that emphasize an environment conducive to competition, with strong creditworthy off-takers and a well-designed regulatory framework to avoid pitfalls experienced in deregulated markets elsewhere.

2.4.3 Proposition 2

In the absence of a government guaranteed off-taker and government guarantees, investor willingness to invest in Independent Power Producers (IPPs) in South Africa will decrease.

2.5 Conclusion of Literature Review

This literature review emphasizes that an IRP is a comprehensive and forward-thinking approach to electricity resource planning. It highlights the importance of stakeholder participation, considering both supply and demand options, and achieving a sustainable energy mix. The review also highlights the evolution of integrated resource planning in different contexts and the importance of long-term planning for electricity supply. While each country's approach varies, the common goal remains achieving security of supply while considering factors like affordability, environmental impact, and efficiency. Government policies and market structures greatly impact the implementation of IRP.

The review concludes that while there's a trend showing that bankability can be achieved without PPAs in reformed electricity markets conducive to competition, creditworthy off-takers, and a well-designed regulatory framework, historically PPAs and government guarantees have been vital for IPP investments.

Based on the findings presented in this literature review, two key propositions emerge that will guide this research:

2.5.1 Proposition 1

Integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market.

2.5.2 Proposition 2

In the absence of government guaranteed off-taker and government guarantees, investor willingness to invest in Independent Power Producers (IPPs) in South Africa will decrease.

Table 4: Consistency table: research questions and propositions

RQ #	State Research Question or Objective	Prop / hyp #	State Proposition or Hypothesis
1	What are the recommended alternatives or amendments to the role of integrated resource planning given the removal of the 100 MW licensing threshold?	1	Integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market.
2	What is the impact of the absence of a government guaranteed off-taker and government guarantees, as well as the avoidance of local content and social policy obligations, on investor willingness to invest in Independent Power Producers (IPPs)?	2	In the absence of government guaranteed off-taker and government guarantees, investor willingness to invest in Independent Power Producers (IPPs) in South Africa will decrease.

3 RESEARCH METHODOLOGY

This research investigated the relevance of integrated resource planning as a policy instrument to facilitate independent power producer investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators. The proposition One formulated in the previous chapter with respect to the relevance of integrated resource planning is that it requires adaptation to a more flexible and market-oriented approach, to better suit the evolving electricity market. The second proposition formulated was that investor willingness to invest in independent power producers (IPPs) will decrease in the absence of a guaranteed off-taker and government guarantees. This chapter aims to outline the methodology that was used to guide how the formulated propositions were addressed and tested.

3.1 Research approach

A qualitative research methodology was used. It is a research approach that focuses on obtaining comprehensive understanding of different perspectives, meanings, and gives insight to social behaviour and practises, experiences of human beings within a specific context, and how problems are addressed (Yin, 2016), (Kielmann, Cataldo, & Seeley, 2012) (Creswell, 2013). In the context of the South African electricity supply industry, integrated resource planning; and the removal of the 100MW licensing threshold for generators has attracted keen interest among the stakeholders. To unveil the import or significance of these developments with respect to the relevance of integrated resource planning and IPP investment, a qualitative research approach was the most appropriate. It allowed for the understanding of the complexities and nuances of the issue, from the different points of view, settings, and interests of the stakeholders, and how IPP investment policy and the broader electricity sector is potentially impacted.

3.2 Research design

Research design can be considered as a method employed to accomplish the objectives of a research study. It connects theoretical concepts, research questions, the generalization of findings, and how the research outcomes are presented, with the specific methods employed and resources accessible, all within the context of achieving the research goals (Flick, 2004).

The licensing exemption notice had been applicable to the ESI in different formats previously over different time periods. The 1 MW licensing exemption threshold was applicable from 2017 to 2021. The 100 MW licensing exemption was applicable from 2021 to 2022. The removal of the 100 MW licensing exemption threshold was applicable since 2022. This study focused on the latter period.

To study the impact of the removal of the 100 MW licensing threshold on IPP investment a case study was employed. A case study is a research design that delves into real-world situations (single or multiple) over time. Researchers in conducting case studies use a variety of methods to gather rich data (observations, interviews, videos, documents) to understand the case(s) in detail and identify recurring themes (Creswell, 2013). Snapshots, i.e. an analysis of state and process at the time of the research, is concerned with expert perceptions in a specific field at the time the research is conducted. Data in a snapshot analysis is often collected in the form of interviews and is compared to understand the perceptions presented (Flick, 2004). To investigate the role integrated resource planning can take given the removal of the 100MW licensing threshold, expert perceptions in the ESI were solicited. Case study and snapshot were therefore the most relevant research designs to employ. A case study helped to understand the impact of removal of the licensing threshold on IPP investment, and the snapshot revealed expert perceptions from the stakeholders in this regard.

This case study conducted a comparative analysis of investment processes employed by Independent Power Producers (IPPs) in South Africa's Electricity Supply Industry (ESI). The focus was to identify the impact of the removal of the 100 MW licensing threshold, which enabled private procurement of IPP projects.

The case study compared two distinct IPP development models: government-led and private-led initiatives. Key areas of investigation included:

- Project financial close rate: An analysis of the number of projects reaching financial close since the removal of the 100 MW licensing threshold (January 2023) compared to the most recent government-led bid window (Bid Window 6) under similar conditions.
- Time to financial close: A comparative analysis of the duration required for projects under both models to reach financial close.
- Process efficiency: An assessment of the efficiency of each investment process, considering factors such as regulatory approvals, permitting, and financial closure timelines.
- Project success rate: A comparative analysis of the number of projects reaching financial close since the removal of the 100 MW licensing threshold in January 2023 until 31 December 2024 compared to the most recent government-led bid window (Bid Window 6) under similar conditions
- Investor sentiment: An evaluation of the impact of each investment process on investor willingness to participate in IPP development in South Africa.

To ensure a robust comparison, the study focussed on projects exceeding 100 MW, under similar economic and political conditions, with a preference for similar technology types. By examining these factors, the case study aimed to identify the strengths and weaknesses of each investment model and provide insights into optimizing the South African ESI for future IPP development.

3.3 Data collection methods

Data collection is a process that is intended to get information that will assist in answering the research question/s. The process involves determining the sources of information, gaining access to such sources, source sampling, collection of the data, information recording, resolution of arising issues (if any), and data storage (Creswell, 2013).

Yin (2016) states that interviewing and conversing is the most relevant method of data collection in circumstances where the researcher is looking for explanations of actions or viewpoints. He further breaks down interviewing into two types, i.e., structured interviews, and qualitative interviews. Fowler & Cosenza (2009) as cited by Yin (2016) conceded that data obtained from structured interviews is often associated with accuracy, yielding to a conclusive analysis due to the use of predefined responses to questions, often referred to as closed-ended questions. However, structured interviews limit the interviewee to only the questions asked, hence Creswell (2013) finds interviews with open-ended questions more advantageous if the researcher wishes to obtain in-depth information, rich with contextual insights and knowledge. These kinds of interviews are referred to as qualitative interviews, and they take on a conversational approach where the interviewee expresses themselves authentically (Yin, 2016). The qualitative interview was therefore adopted as the data collection method for the first research question which explored the alternative roles of integrated resource planning through interviews with stakeholders to obtain their expert views.

Case studies are distinguished by the use various information sources, such as databases, documents, and interviews (Creswell, 2013). Data for the second research question was therefore collected from secondary data such as documents and websites relating to IPP investment process. An interview was also conducted to seek clarity from the secondary data.

Table 5: Secondary data to be collected

Data Description	Data Source
▪ Number of projects registered post 100 MW threshold removal	NERSA, SAPVIA
▪ Regulatory frameworks and guidelines for IPP licensing and registration ▪ IPP registration and licensing process approval timelines	NERSA, DMRE
▪ Energy One Stop Shop IPP project process	DTIC
▪ EIA guidelines and procedures, approval timelines for IPP projects	DFFE
▪ Grid connection procedures, and timelines for IPP projects	Eskom
▪ Procurement process documentation for government-led IPP programme ▪ Evaluation criteria, and contract terms for IPPs	IPP Office
▪ Investor reports, statements on investment decisions in South African energy sector	Public Domain (news articles, industry reports, academic publications)

The data collection process explored the use of primary data through interviews, and secondary data from existing databases and available public information. Whilst secondary data provided useful information, more detail was required to supplement the secondary data, and an interview was employed.

3.4 Population and sample

3.4.1 Population

The population in this study consisted of stakeholder groupings that are involved in; affected by; and have an interest; in integrated resource planning and generation infrastructure investment in South Africa. These included government representatives as it is responsible for integrated resource planning; regulators, utilities and investors as affected stakeholders as well as academics as interested stakeholders.

Stake (1995) as cited by Creswell (2013) states that the case in a case study can be a process. The case in this study was a comparison between the process in place followed by an IPP because of the licensing threshold exemption, and the process of a government-led procurement. The population therefore consisted of documentation from the different institutions involved in the process such as the regulator, network service providers, and government departments.

3.4.2 Sample and sampling method

To enrich the quality of the research the type of sampling to be used is important, and therefore researchers ought to be intentional or purposeful in selecting the participants and the number of participants as a data sample (Creswell, 2013).

For this study, the type of sampling used was the purposeful sampling, and the maximum variation sampling strategy was employed. This strategy consisted of selecting a variation of participants knowledgeable about the subject matter, in advance that have different perspectives. This benefited the study in terms of leveraging on the differences, limiting bias, and gaining insight into the area studied (Creswell, 2013), (Yin, 2016). This aspect was particularly important for this study as the identified population consisted of stakeholders with differing and possibly contesting perspectives on a policy instrument that has a national impact.

The number of respondents that were interviewed was 14 and represented the various stakeholders from junior management to senior management level, with a minimum of five years of experience from government, government agencies, regulators, utilities, consultants, an offtaker, academic institutions, and industry associations. The high-level profile of respondents is shown in Table 6 below.

The participating government officials were at rank of middle to senior management. The government agency was selected for its role on IRP implementation. The regulator official was selected for their role in administering electricity regulation in particular through the concurrence of determinations, registration and licensing of generators. The regulator official was from the Electricity Regulation department. Utility employees were selected are for their role as operators of generation facilities. Targeted employees from the state-owned utility were from energy planning and electricity markets. Employees from IPPs were also interviewed. Consultants often take on various roles in the preparation of IPP investments, and they were selected as participants on that basis. An employee from an off taker was also interviewed for insights into private procurement. A local academic institution that does extensive research on integrated resource planning, power system studies, and IPP investments responded as suitable participants. Industry associations representatives often represent investor perspectives and are selected for such reasons. Participating industry associations were representative of business interests in energy, advocacy of a renewable energy technology, and advocacy of free competitive markets,

Respondents were invited to participate formally with an invitation letter (Appendix A) which explained what the research was about. Upon agreement to participate in the study, the participant was then requested to complete the consent form (Appendix B). A meeting appointment was then set up by the researcher or the participant's personal assistant for a time convenient to the participant. The medium of communication was primarily emails and

communication by phone was also used as secondary communication as and when it was necessary.

Table 6: Profile of respondents

Description of respondent type	Job Title/Description	Number sampled
1. Government officials	Research & Analysis for Climate Change Mitigation	1
2. Government agency	Infrastructure Project Development	1
3. Regulator official	Regulation Specialist	1
4. Utility employees	IPP Technical Development	2
	Energy planning: Market Reforms	
5. Consultants/Developers	Energy Modelling	3
	IPP Project Development	
	IPP Development & Procurement	
6. Off taker	RE Procurer	1
7. Academics	Research Group Director	2
	Energy Systems Modelling	

Description of respondent type	Job Title/Description	Number sampled
8. Industry association representatives	Research, Technology & Innovation	3
	Advocate for Free Competitive Markets	
	Advocate for Solar PV	
Total No. of Respondents		**14**

Case studies use document analysis as a method of gathering data, which proves valuable in obtaining empirical data for monitoring development, validating findings from various sources, and formulating interview questions (Bowen, 2009). The type of documents employed in data analysis include public records, personal documents and physical evidence. (Indeed, 2023). Public records range from public databases to newspaper articles and website entries (Sage Publication), (Bowen, 2009). For the second research question of this study, there was a reliance on public records, documents, and data for document analysis. In addition to the tracking the process as the case study, projects that the following criteria were identified, which was the basis for analysis as part of the data collection process:

- IPP projects with a capacity above 100 MW
- IPP projects with public pronouncements
- IPP projects that completed the registration process with NERSA

- IPP projects that participated in bid window 6
- IPP projects that have reached financial close

3.5 The research instrument

Interview guides are useful for achieving focus in an interview as they provide key questions that cover certain themes or topics to warrant that the objectives of the research are met. Interview guides are often used in structured interviews, however they are also appropriate in qualitative interviews, in particular semi-structured interviews where the researcher uses an interview guide but is also at liberty to ask follow up questions and change the order of the questions based on the trajectory of the interview at any given point (Monday, 2020). Whilst semi-structured interviews provide flexibility, it is still important for the semi-structured interview guide to be properly developed to produce an effective and genuine data source. The literature review is therefore identified as a pre-requisite for developing a good semi-structured interview guide (Naz, Gulab, & Aslam, 2022). This study therefore used a semi-structured interview guide (attached as Appendix C) as the research instrument used to conduct one-on-one interviews. The interview guide was used during the interview.

3.6 Procedure for data collection

Respondents were in some instances approached directly to invite them to the interview (via email or LinkedIn), whereas in some instances they were approached via a liaison person (an organisation's Human Resources department and/or email helpdesk / an industry colleague), which was then followed by direct invite. The interview invite entailed the objectives of the research study, the participation criteria, the consent form which detailed the rights of the participants and consent for recording. See Appendix A and Appendix B for the interview invite and consent form respectively.

The interviews were conducted online and in-person. Online interviews were conducted via the Microsoft Teams platform and WhatsApp call. The Microsoft Teams platform can both record and transcribe the interview which was beneficial to the process. For the WhatsApp call and in-person interviews, a phone sound recorder was used to record and transcribed separately. For the in-person interviews an online application was used for recording and transcription purposes. Permission to record was requested from the interviewees prior to the start of the interview. The duration of the interview was approximately 45-60 minutes.

Secondary data for the case study data was collected through websites and articles on the internet. The data options were news articles, media statements/ press releases, published reports, and databases on projects procured or developed as a result of the removal of the 100 MW licensing threshold removal, and REIPPPP Bid Window 6.

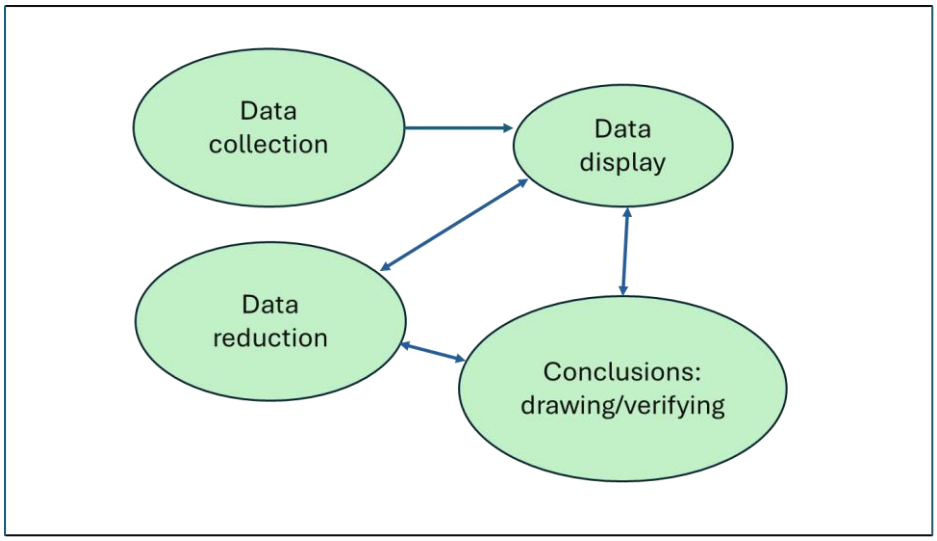
3.7 Data analysis and interpretation

Data gathered in qualitative studies requires an analysis to make sense of what it reveals, and this process is known as qualitative data analysis (Caudle, 2004). Qualitative data analysis occurs post data collection and is characterized by an interaction between data display; data reduction; conclusions (see

Source:

Figure 3). Data display is the process of organizing and presenting qualitative data in a visual format to provide an overview of the current research status. It also builds a foundation for further analysis and interpretation. The responses of the participants to the interview questions were organized onto an excel spreadsheet, where each sheet represented each question asked. This was how the raw data was displayed in this study. Data reduction is the process of condensing and simplifying qualitative data while preserving its core meaning and context. It's an ongoing process throughout the analysis. Based on the final interpretation and

explanation drawn from the analysed data, conclusions are developed (Mayer, 2016).



Source: (Mayer, 2016)

Figure 3: Data analysis process

A thematic analysis is one method of conducting a qualitative analysis that is useful for its flexibility as its use cuts across different areas of study, and is applicable to different kinds of data sets of various sizes (Lester, Cho, & Lochmiller, 2020).Through thematic analysis, researchers uncover in-depth meaning in their data by identifying recurring patterns (themes), which are then interpreted to draw conclusions that address the research questions (Castleberrya & Nolen, 2018). In this study, the data was analysed using thematic analysis, following the Braun & Clark thematic analysis framework (see **Table 7** below) as referenced by (Maguire & Delahunt, 2017). Codes were generated by condensing extensive information into concise units of meaning. Similar codes were then grouped and refined into broader themes.

Table 7: Steps in implementing the thematic analysis framework

Step 1: Become familiar with the data, Step 2: Generate initial codes, Step 3: Search for themes,	Step 4: Review themes, Step 5: Define themes, Step 6: Write up.

Source: (Maguire & Delahunt, 2017)

Step 1: The transcriptions of the interviews were studied, and displayed on excel for visualization.

Step 2: The responses received by participants in answering interview questions were used to generate initial codes. This was the outcome of data reduction.

Step 3, 4, & 5: The themes were a conclusion of the message carried by the codes in response to a particular research question.

Step 6: The write up was a narrative based on the emerging themes in response to the research questions.

3.8 Limitations of the study

- The use of snapshot design in the methodology only captures perceptions at a single point in time. In this study the perceptions were applicable for the electricity market reform in which generation facilities are exempt from licensing and can have bilateral contracts with off takers without government intervention for the period from 17 January 2023 – 31 December 2024. The viewpoints of the stakeholders may change under a different electricity market structure.

- The sample size is a determinant of achieving theme saturation in a thematic analysis study, and the number of interviews for a sample to reach saturation varies from study to study (Aguboshim, 2021). More participants may be required if necessary.

- The Schedule 2, 2023 is a recent amendment and there may not be a number of comparable projects that have reached financial close with publicly available data.

3.9 Trustworthiness

Trustworthiness is an important aspect of qualitative research, ensuring the validity and reliability of the findings. According to Lincoln and Guba's framework (1985), there are four primary criteria to establish trustworthiness: credibility, transferability, dependability, and confirmability (Shenton, 2004).

3.9.1 Transferability

Transferability refers to the applicability of a qualitative study's findings to similar contexts or situations. This is possible through comprehensive and detailed descriptions of the research context, participants, data collection methods, and setting (Stahl & King, 2020). This research has given a broad narrative of the research context in terms of the electricity market status the research is based on, the legislative framework, and the historical context for perspective. The research context and setting were adequately described with timeframes clearly stipulated. The data collection methods shared are sufficient in terms of the instrument used and how participants were reached. The participant criteria and information were given with as much detail as possible without compromising anonymity. To further ensure transferability for researchers under a similar context, the findings were transcribed with detail and clarity. However, given the very particular circumstance of this research, transferability is expected to be very limited.

3.9.2 Credibility

Credibility refers to the trustworthiness and believability of the findings in qualitative research. It ensures that the research accurately reflects the participants' experiences and perspectives. This was achieved through pilot interviews to refine the interview questions; prolonged engagement with the data to develop in-depth understanding; and by sharing the findings with the participants to confirm resonance (Korstjens & Moser, 2018).

3.9.3 Dependability

Dependability refers to the consistency and reliability of the research findings and interpretations. It ensures that if another researcher followed the same methods, they would likely reach similar conclusions. This was achieved by keeping an audit trail that recorded the method used, steps taken, and decisions taken to ensure the research can be repeated (Korstjens & Moser, 2018), (Stahl & King, 2020).

3.9.4 Confirmability

Confirmability refers to the degree to which the research findings are objective and reflect the participants' views rather than the researcher's biases or interpretations. Similarly, to credibility the transcribed notes were confirmed with a third party for accuracy (Stahl & King, 2020).

3.10 Ethical considerations

3.10.1 Data Collection

Primary data was collected through individual interviews from knowledgeable experts with an interest in integrated resource planning. Participants were be contacted by email or telephonically to request their participation in the study. The interviews were recorded with an audio recorder on the Microsoft Teams platform and a phone sound recorder as most of the interviews were conducted online (Teams and WhatsApp call) with the exception of one. Secondary data was be sourced from publicly available websites and databases.

3.10.2 Risk to the Research Participants

The number of research participants were 14 from government, government agency, regulator, utilities, consultants/developers, an off taker, academia, and industry associations. The participants were experts in their fields, and questions

asked during the interview were not intended to pose discomfort to the participants. Therefore, the risk allocation for the research participants was deemed minimal.

3.10.3 Confidentiality & Anonymity

Whilst the individual identities of participants and the organizations they are affiliated to is be known by the researcher, the individual participants and organizations will not be identifiable in the raw data and report. The participants were therefore informed that 100% confidentiality and anonymity cannot be guaranteed, however the researcher ensured that data in the report was attributable to any individual and/or organization.

3.10.4 Protection of Data

The anonymised data was stored on a password protected laptop for a period of 5 years, after which it will be destroyed.

3.11 Consistency table

Table 8: Consistency table: research questions, propositions, data collection and data analysis

RQ #	State Research Question or Objective	Prop / hyp #	State Proposition or Hypothesis	Data collection detail	Data analysis method
1	What are the recommended alternatives or amendments to the role of integrated resource planning given the removal of the 100 MW licensing threshold?	1	Integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market.	Interview guide questions 1, 2, 3, 4, 5,7	Thematic analysis
2	What is the impact of the absence of a government guaranteed off-taker government guarantees, avoidance of local content and social policy obligations on investor willingness to invest in Independent Power Producers (IPPs)?	2	In the absence of a government guaranteed off-taker and government guarantees, investor willingness to invest in Independent Power Producers (IPPs) in South Africa will decrease.	Interview guide questions 1, 2, 3, 6, 7 NERSA Registered generation facilities database NERSA website for registration process ESKOM website for grid connection process Energy One Stop Shop database SAPVIA registered plants dashboard	Thematic analysis

4 PRESENTATION OF FINDINGS & DISCUSSION

4.1 Introduction

In this chapter, the findings of this study are presented and discussed. The aim of the study was to investigate the relevance of integrated resource planning as a policy instrument to facilitate independent power producer (IPP) investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators. The findings presented address the following research questions:

Research question 1: What are the recommended alternatives or amendments to the role of integrated resource planning given the removal of the 100 MW licensing threshold?

Research question 2: What is the impact of the absence of a government guaranteed off-taker and government guarantees, as well as the avoidance of local content and social policy obligations, on investor willingness to invest in Independent Power Producers (IPPs)?

The findings and discussion pertaining to proposition 1 in relation to research question 1 are presented first. The findings are from the data analysis from a snapshot where the perspectives of experts at the time of research are solicited (Flick, 2004). The findings and discussion pertaining to proposition 2 in relation to research question 2 follow. The findings are from the snapshot data analysis and from a case study.

The discussions make reference to the participants; however, their names and any identifying factors are omitted to protect their identity and masked according to Table 9.

Table 9: Masked participant identifier

Description of respondent type	Job Title/Description	Participant Mask
Government officials	Research & Analysis for Climate Change Mitigation	A1
Government agency	Infrastructure Project Development	B1
Regulator official	Regulation Specialist	C1
Utility employees	IPP Technical Development	D1
	Energy planning: Market Reforms	D2
Consultants/Developers	Energy Modelling	E1
	IPP Project Development	E2
	IPP Development & Procurement	E3
Off taker	RE Procurer	F1
Academics	Research Group Director	G1

Description of respondent type	Job Title/Description	Participant Mask
	Energy Systems Modelling	G2
Industry association representatives	Research, Technology & Innovation	H1
	Advocate for Free Competitive Markets	H2
	Advocate for Solar PV	H3
Total No. of Respondents	**14**	

4.2 Findings & Discussion pertaining to Proposition 1 – Alternative Roles of Integrated Resource Planning

The objective of this question was to determine the alternative roles of integrated resource planning given that it is no longer the sole basis upon which decision making for electricity generation infrastructure may be made.

4.2.1 Snapshot Findings

The question was approached through a qualitative interview where participants were asked for:

- Their understanding of the traditional role of IRP in facilitating private sector investment in South African power generation
- Their view with regards to the effectiveness of the current IRP framework in promoting private sector participation in power generation, given the alternative procurement model
- Suggestions on how IRP policies can be adapted to be more consistent with a market-driven approach to generation investment
- Specific changes they would recommend to make the IRP remain effective in the current market context
- Their thoughts regarding any value in utility developed IRPs

The themes emerging from the stakeholders who participated in the study regarding research question 1 have been tabulated in Table 10.

Table 10: Emerging themes from the data collected

Theme 1	Participants have an understanding of the traditional role of IRP
Theme 2	Participants believe that the IRP is still effective in promoting private sector participation
Theme 3	Participant suggestions on adapting IRP policies to be more consistent with a market-driven approach to generation investment
Theme 4	Participant recommendations on IRP adjustments to remain effective in the current electricity market context
Theme 5	Participant thoughts on the value of utility/municipal developed IRPs

Theme 1: Participants have a view of the traditional role of IRP

Table 11:Data codes generated to develop Theme 1

Code	Code Detail
Addressing Energy Security	▪ The IRP addresses the need for a reliable and secure power supply. ▪ Reflects the projected demand, and the supply capacity to meet the demand. ▪ Determines the level of investment required for new generation capacity to ensure a secure power supply.
Outlines South Africa's Preferred Energy Mix	▪ It provides a framework for private sector investment by outlining the government's preferred energy mix, and potential price paths for electricity. ▪ The energy mix further reveals the country's commitment to climate change mitigation through the renewable energy capacity allocation.
Signal to the Market	▪ It acts a signal to the private sector, indicating the types and amounts of power generation capacity the government intends to procure. This is a critical factor for attracting private sector investment and maintaining economic growth. ▪ This allows investors to plan their investments, accordingly, assess risks, and identify potential opportunities.
Facilitating Private Sector Participation	▪ The IRP has been important in facilitating private sector participation through Ministerial Determinations and the IPP programme.

Theme 2: Participants believe that the IRP is still effective in promoting private sector participation

Table 12:Data codes generated to develop Theme 2

Code	Code Detail
Market Guidance	▪ Even when the IRP is no longer mandatory, it still provides valuable guidance to the market by indicating the government's preferred technologies and future energy goals. This can help the private companies understand potential opportunities and align their investments with the government's vision.
Enabling Innovation	▪ The IRP can promote new technologies by allocating them capacity in the IRP.
Grid Stability	▪ The IRP helps with planning the energy mix to ensure grid stability and meet future electricity demand. ▪ To inform future grid development, that is, the Transmission Development Plan.

Theme 3: Participant suggestions on adapting IRP policies to be more consistent with a market-driven approach to generation investment

Table 13: Data codes generated to develop Theme 3

Code	Code Detail
Bold Policy Position Directive	▪ The IRP should move away from a purely least-technology cost approach and consider other factors such as socio-economic interest, social development, exploitation of natural resources for economic growth and environmental impact. ▪ The IRP should be more than just a modelling exercise. It should be a clear policy directive that outlines the desired energy mix for South Africa, including the roles of different technologies like coal, nuclear, and renewables. ▪ The IRP should consider ways to encourage investment in beneficial but not necessarily cost-effective technologies and discourage investment in non-beneficial technologies. ▪ Clear communication of the IRP's objectives and assumptions to all stakeholders, including the private sector, is crucial to build trust and encourage investment. Transparency in the decision-making process is also essential. ▪ The IRP should be used as a tool to drive economic development by facilitating local content development, job creation, and the growth of

Code	Code Detail
	related industries within the South African economy.
Shift Focus from Central Planning to Market Signals	▪ The IRP should be indicative of the direction the country is taking in terms of the energy mix, an indicator to government in terms of procurement requirements and to the market to incentivise it to procure the required generation technology. ▪ The IRP to highlight incentives which will be detailed separately as the market unfolds. ▪ The IRP should be an indicative plan whose objective is to enable some national policies like climate change or localisation, for implementation by the market.
Addressing Market Gaps	▪ The IRP can identify gaps where the market might not be providing sufficient capacity for certain technologies crucial for the energy mix

Theme 4: Participant recommendations on IRP adjustments to remain effective the current electricity market context

Table 14: Data codes generated to develop Theme 4

Code	Code Detail
Climate Change Incorporation	▪ Incorporation of climate change targets when developing the IRP and using the IRP as a tool to achieve the sector emission targets as per Climate Change Act, 2024. ▪ The IRP can be a vehicle to look at ways to achieve net zero
Pricing flexibility	▪ The IRP consider ways to price flexibility into the energy market. This could involve mechanisms to account for the cost of dumping excess renewable energy or incentivize dispatchable sources like gas.
Update Frequency	▪ The IRP needs to be more dynamic and responsive to changing market conditions, such as economic fluctuations, technological advancements, and international events. Regular updates, perhaps every two years, are recommended to ensure the plan remains relevant. ▪ Needs to be a live document however not doing away with the long-term plan which can be published perhaps every 5 years.

Code	Code Detail
	▪ Relook the public participation process as it impacts the update frequency and assumptions used.
Credibility of assumptions & pure modelling exercise	▪ The IRP requires an independent audit to oversee the IRP process and ensure the credibility of its assumptions and modelling approach. ▪ The IRP needs to take into account the sudden increase in embedded generation, and better account for the significant growth of embedded generation, ensuring that the planning process considers the impact of these smaller-scale generation projects on the overall grid. ▪ The IRP should consider the capacity procured by the private sector in its input assumptions. ▪ The IRP should look at learning rates and anticipate future technology costs. ▪ The IRP should be based on sound modelling and data analysis, minimizing political interference that can distort the planning process and lead to suboptimal outcomes.

Theme 5: Participant thoughts on the value of utility/municipal developed IRPs

Table 15: Data codes generated to develop Theme 5

Code	Code Detail
Bottom – Up IRP Approach	▪ A bottom-up approach should be adopted for IRP where the planning starts from the lower levels (municipalities) and progresses to the national level. ▪ Municipalities can utilize IRP-type modelling to procure power to meet customer needs.
Top – Down IRP Approach	▪ IRP should remain a government-owned document ▪ independent IRP modelling platform led by an industry body should be considered ▪ due to the interconnected nature of the SA power system individual municipalities developing IRPs may not be effective ▪ the capability of most municipalities to develop credible IRPs is questioned

4.2.2 Snapshot Discussion

4.2.2.1 The IRP still Required to Inform Investment Decisions

The traditional role of the IRP was understood by participants to be one that addresses energy security, outlines the country's energy mix, a signal to the market, facilitate private sector participation, and an instrument to achieve climate change mitigation objectives. Whilst the private sector procurement exists which need not be compliant with an IRP, participants reckoned that an IRP would still be effective in promoting private sector participation whether through private sector procurement or government-led procurement. In seeking to address energy security, the IRP determines the level of investment (in MW) required for new generation capacity, based on the projected demand (see Table 11, Theme 1). This is conducted on a national level giving a holistic view of investment opportunity and therefore the IRP serves as a signal to the market indicating the capacity and technology required by the power system for adequacy. Investors, financiers, developers look to it to inform their investment plans. In the words of H3, the IRP *"…creates a sense of certainty and security in their plans*" and furthermore indicates "*investment opportunities for the entire value chain*." This therefore maintains the role of the IRP as per Energy White Paper to be a basis for decision-making for infrastructure investment (Department of Minerals and Energy, 1998) as emphasized by H1, and this is important regardless of whether the new generation capacity will be procured privately or by government. Similarly to China and the UK where government develops a plan based on national policy priorities for generators to align with in making their plans (Hu, et al., 2010), (Li, Zhang, & Feng, 2021), participants (see Table 12, theme 2) believed that an IRP even in this evolving electricity market would be valuable in providing market guidance for private sector to align their investments with government vision.

4.2.2.2 Suggestions for IRP Adaptation

Whilst participants still believed in the requirement of an IRP and its effectiveness in promoting private sector investment, they did however point out that it would

require adaption for it to be more consistent with a market-driven approach to generation investment as per theme 3 (see Table 13).

Suggestions offered on IRP Adaptation:

The first suggestion related to IRP adaptation was that the IRP should be a '*Bold Policy Position Directive*' which clearly communicates its objectives to all stakeholders, that outlines the desired energy mix for South Africa, including the roles of different technologies like coal, nuclear, and renewables. In its approach, it should consider other factors such as socio-economic interest, social development, exploitation of natural resources for economic growth and environmental impact and move away from a purely least technology cost approach. This approach would make the IRP a useful tool to drive economic development by facilitating local content development, job creation, and the growth of related industries within the South African economy. China uses this approach as their energy and integrated strategic resource plans are shaped by government policy which allows them to adapt their energy strategy based on economic realities and social priorities (Hu, et al., 2010).

The second suggestion is about how the IRP should shift focus from central planning for government procurement to become a signal to the market. It should be indicative of the direction the country is taking in terms of the energy mix, an indicator to government in terms of procurement requirements and to the market to incentivise it to procure the required generation technology. D2 applauded the Electricity Regulation Amendment Act, 2024 for taking this direction based on how the IRP is defined to be a forward-looking, indicative plan. This participant understood this to mean that not all procurement has to occur according to an IRP and thus the government procurement, and that the plan indicates options the power system requires for the market (private & public generators) to build in the outlined planning horizon of 10-15 years. An indicative plan according to G1 is a plan that markets look to for "*some sort of indication of where we think things are going, and because it's not binding then it's not a problem if it is not 100%*." In essence the IRP should be an indicative plan whose objective is to enable some national policies like climate change or localisation, for implementation by the market.

Participants C1 and D2 cautioned that in competitive markets, market players are not guaranteed to build new generation capacity or to build what the system requires, and therefore they must be incentivised to do so. C1 then highlighted the role of the Regulator in ensuring transparency in tariff setting for both supply and demand sides so that the investor understands from the outset whether there is a business case for investment in a certain technology in the IRP at a certain location. Participants D2 and G2 brought up another reality of the market which requires incentives. For instance, the IRP may encourage the market to build solar PV, however with the plummeting costs of the technology it's a desirable technology for investment but with a lot of them in the market, the price may be driven down so low that investors may not make a return on investment. Then the indicative IRP should then be supported by price incentives for the market to continue to build solar PV. The example provided by G2 is that government could set a threshold for the solar PV market price of R0,50/kWh, and if the market price is R0,20/kWh, government will top it up. The indicative IRP should then be supported by price incentives which are released based on how the market activities are unfolding.

The third suggestion was that the IRP should be adapted to be an enabler of innovation or new technologies and the basis upon which government procures what the market has failed to build. When it comes to nascent technologies or technologies not previously part of the power system, they are usually very costly. In IRP development, learning rates may be applied to these technologies which shows that the technology gets cheaper over time until it gets to a threshold. As per D2, *"… it might be that the market's not going to invest in that technology until you hit the threshold. So maybe to help encourage that, it becomes government policy to go out and procure it to help it get over the threshold. So, then the market will take over from after a certain time...*" This view was also held by E3, who gave the example of how renewable energy was factored into the IRP 2010, "*And then 2010, that was the full IRP, properly modelled, that was referred to as IRP 2010. So that's the first IRP that was introduced, which in a way, it sort of helps in terms of outlining which resources must come into play, and it also helps in terms of introducing policy into the whole planning space. Otherwise, if the policy elements of the IRP were not included, we wouldn't have done the renewables, because*

the renewables were too expensive. So, at that time, 2010, so they were too expensive. So, to introduce renewables in a planning session, it needed to see adjustment, which would then allow you to include renewables with a view that there is a potential of such resources being cheap in the future. And trying to deal with the environmental emissions and all of that. So, it was not that renewables were cheap at that point, when the planning was done. Otherwise, we would have opted for other sources, such as coal and all of that, becoming much cheaper at that point. So, what the plan did, it allowed the department to introduce renewables as a policy adjustment plan… So that's what the IRP did."

As already mentioned above, markets may not necessarily build what is required. However, as per IRP that characteristics of a certain technology may be required by the power system or by policy positions, if incentives don't attract investment in that technology, the government may have to step in and procure it to mitigate against power supply shortages. The example by D2 with regards to a technology required by the power system is : "*So, if the IRP says we need gas as an option or more batteries or something to back up the grid and the market's not doing that, then the idea is that the IRP can trigger a procurement that the Minister would then go and say, right I see a gap in the next five years, we need to run a procurement to make sure we have that capacity*." With regards to contentious technologies like new coal or new nuclear, which may be required by policy, B1 indicated the need for government procurement with a 100% government guarantee due to the risk as these technologies are always challenged by the environmentalists.

The suggested adaptations for the IRP centred on two key areas. Firstly, the IRP should serve as a bold policy directive, guiding investment decisions in accordance with government objectives. Secondly, it should act as a catalyst for the adoption of new technologies. The subsequent section delves into specific recommendations for refining the IRP's implementation and considerations for its future development.

4.2.2.3 Recommendations for IRP Adjustments

Recommendations made by participants on some IRP adjustments for the current market context as per theme 4 (see Table 14) are discussed. When the private sector procures its own power from other generators and not Eskom, those generators are called 'embedded generation'. Embedded generation should be considered when planning how much electricity the country needs to produce (the IRP) as it has an impact on the overall demand and the performance of the grid– if they are grid connected. In terms of the actual modelling exercise and outcomes, there was a difference in perspectives when it comes to approach. The one perspective advocated for a pure technical model solution claiming that anything beyond that is political interference and leads to suboptimal outcomes. The other perspective embraced the policy adjustment of the IRP by politicians as it helps to address socio-economic priorities. An independent audit of the IRP was also recommended to oversee the IRP process and to ensure the credibility of its assumptions and modelling approach.

The frequency of IRP updates was another issue that was highlighted for adjustment. One perspective deemed that the update process to takes too long, and D1 attributed the update delays to the public consultations. He admitted that they are an integral part of integrated resource planning but maintained that they do need to be managed. G2 was also of this view further expressing that the longer it takes to update and adopt the IRP, the assumptions change during the process, and by the time it is adopted, the plan is outdated. The recurring word across those that spoke to the issue of frequency update was 'dynamic', the IRP needed to be a dynamic plan that adjusts to changing circumstances. H3, whilst supporting the idea of a dynamic IRP, did not discard the need for what she referred to as a '*Foundational IRP revision*' which will have to undergo the public consultation processes and be reviewed every 5 years. The dynamic IRP she referred to as a '*Live IRP*' which can be updated perhaps every 2 years to quantify the supply and demand balance as was done by Horizon 1 of the Draft IRP 2023. G2 took this idea of a '*Live IRP*' and '*Foundational IRP'* a step further by elaborating on how it should be done. For the Live IRP he recommended a dedicated team that is just updating the IRP 100% of the time as assumptions change, meaning that the frequency could be faster than the 2 years proposed

by H3. On the '*Foundational IRP'*, G2 referred to it as the '*Policy IRP'* which would set the direction for the next 2 or 3 years.

The recommendations made by participants on adjustments to the IRP for the current electricity market focused on several key areas. Participants emphasized the need to account for embedded generation procured by the private sector within the IRP model, as this significantly impacts overall demand and grid stability. Conflicting views emerged regarding the appropriate modelling approach. One perspective advocated for a purely technical model, while another emphasized the importance of incorporating policy adjustments to address socio-economic priorities. Participants strongly advocated for increased flexibility in IRP updates to keep pace with rapidly evolving market dynamics. The issue of who should serve as the custodian of the IRP arose frequently during discussions on update frequency, particularly in relation to the value of utility-developed IRPs. This topic is explored further in the following subsection.

4.2.2.4 Custodian of the IRP

The literature review presented the IRP approaches used in the USA, Australia, China, the UK and South Africa, and the custodian of IRPs depended on the electricity market of the country. In the USA IRPs were developed by either the utilities as generation expansion plans for approval or noting by the Regulator referred to as the Public Utilities Commission (D'Sa, 2011), in other instances the PUCCs developed IRPs and utilities were required to submit data (State and Local Energy Efficiency Action Network, 2011). It was on this basis that participants were asked if there is any value in utility developed IRPs in South Africa. E3 in this regard recalled that a utility developed IRP was no strange thing to South Africa, as Eskom used to develop what was then termed the Integrated Strategic Electricity Plan (ISEP). The purpose of the ISEP was to inform Eskom's generation capacity expansion (Baker, Burton, Godinho, & Trollip, 2015). This kind of planning, or IRP by utilities according to (U.S Environmental Protection Agency, 2022) is applicable to vertically integrated utilities.

Municipal utilities also came up, and there were two conflicting views. Those that were pro utility developed IRPs saw it as necessary if municipalities want to procure their own power, they need to understand their demand. This was important in an era where the consumer is concerned about sustainable supply. The example given by D2 was that of Austin, Texas: "*They're in a market environment, they can buy and sell on the market, but they do IRP type modelling to look at what kind of portfolio they need for their customers. So, they have an objective, so the City Council would tell them we want 15% wind, or you know 20% from PV in the future. So they'll go and do a model to look at what that looks like, what does it do in terms of their demand and how do they fill the gap and then they can go out and procure it. They can do long term contracts or they can just participate in the market. But that IRP gives them the sort of the vision as to how they go around doing their procurement… But it's kind of trying to get a bit of sense of where you're getting your power to meet customer needs*."

Secondly, municipal developed IRPs were viewed as beneficial to the national process as those plans could be aggregated to feed into the national plan as input assumptions. E3's view was that based on these municipal utility plans, which are essentially demand plans, the national plan must ensure that their supply needs are met, and he gave an example from Brazil *"…In the Brazilian scenario, so they normally, allow people to plan for themselves, which in our case is the municipality. So, they can go and plan and then say we're gonna need so much power from national, you need to move it five years ahead, and then national would plan and procure that power that you're gonna need in five years' time. And then you can do your own things there if you want to, but you should make a commitment that in five years' time I'm gonna take so much power from national, then you must take that power. If you decide that you're gonna come back, let's say you say the next five years I don't need the power, in five years' time I will need so much power from you, or I will not need so much power from you, because I'm gonna be on hold. Should you decide you want to come back, and I will get power from the Grid, they don't allow you. They say no, no, no, you can't get it because you said you didn't need it. So now you need to give us another notice that in the next five years you won't come back, then so that we can go on. So, they've got that kind of arrangement. So, what that does, if they*

say if there isn't enough power, or should I say if there's enough power in the system, they will give it to you, because anyway it's made, but they are not obliged to give it to you, because you said you didn't want it. So, but if it's there, they will give it to you, but if it's not there, they will say you off first, because you said you're going to have yours, so you didn't have it, so you can't, then you can't penalize those who indicated that." This Brazilian example brings in another factor raised by interviewees which was municipalities can conduct the demand forecasts of their areas and submit them for aggregation in the national plan. This approach is like that of some USA states where the utilities provide the PUC with data for the IRP (State and Local Energy Efficiency Action Network, 2011).

Those who were anti- utility IRPs simply pointed out that municipalities are incapacitated to do this kind of planning, and that due to the interconnected nature of the SA power system individual municipalities developing IRPs may not be effective.

On the custodianship of the IRP, some preferred government to do it as it has a broader perspective but must be audited by an independent body. This approach is similar to the UK and Chinese approach. Others proposed an independent custodian led by an industry body. Those who were for municipal IRPs also recognised lack of skill in municipalities to do this work and proposed that they procure the services of consultants to perform the work.

Considering the diverse perspectives on IRP custodianship, a balanced approach may involve government oversight with independent auditing, coupled with municipal participation in demand forecasting and planning, leveraging consultant expertise where necessary for municipalities, to inform nationally coordinated IRP.

4.2.3 Conclusion pertaining to Proposition 1

The proposition that integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market is supported by the findings.

The analysis indicates that South Africa's Integrated Resource Plan (IRP) remains a critical tool for managing the intricacies of the changing electricity market. While its core role in ensuring energy security and guiding investment decisions is still necessary, significant changes are required. The IRP should shift from a centralized, top-down approach to a more adaptable, market-driven model. This means evolving it into a "*Bold Policy Position Directive*" that clearly outlines goals while integrating socio-economic factors alongside technical aspects. Additionally, the IRP should act as a market signal, influencing investment decisions while allowing the government to step in strategically to address market failures and support emerging technologies. To keep the IRP relevant, a more flexible and dynamic updating process is necessary, possibly combining both "*policy*" and "*live*" updates. In terms of oversight, a balanced approach is needed, incorporating government alongside valuable input from utility-generated IRPs and municipal demand projections. By implementing these changes, South Africa can use the IRP to effectively manage its evolving electricity market, ensure energy security, and promote economic growth.

4.3 Findings & Discussion pertaining to Research Question 2 – IPP Investment with No Government Guarantees

The objective of this question was to understand the willingness of investors to invest in IPPs in the absence of a government guaranteed off-taker and government guarantees. The aim was to assess the effectiveness of the licensing threshold exemption in establishing a private procurement model for increasing private sector participation in electricity generation as per Energy White Paper. The question was approached through a qualitative interview for a snapshot analysis, and a case study.

4.3.1 Snapshot Findings

In the interview, participants were asked for:

- Their understanding of the changes in South African electricity market in the recent years, particularly regarding private sector participation in generation, and how the changes affect the dynamics of the electricity market for IPPs.
- Their view on IPP investment in the absence of government guarantees
- Suggestions for encouraging IPP investment

The themes emerging from the stakeholders who participated in the study regarding research question 2 have been tabulated in Table 16.

Table 16: Themes emerging from the data collected

Theme 1	Participants understand the changes in the South African electricity market
Theme 2	Participants believe that the changes in the South African electricity market are positive
Theme 3	Participants highlight that the changes in the South African electricity market come with some challenges
Theme 4	Participants are of the view that investment in IPPs will increase in the absence of government guarantees.
Theme 5	Participants caution that investment in IPPs in the absence of government guarantees comes with some risks.
Theme 6	Participants believe the current legal dispensation is sufficient to encourage IPP investment, however some issues still need to be addressed.
Theme 7	Participants believe that IPP investors are not deterred by social obligations in the IPP programme

Theme 1: Participants understand the changes in the South African electricity market

Table 17: Data codes generated to develop Theme 1

Code	Code Detail
Drivers for change	▪ Electricity supply constraints, climate change & sustainability practices, and RE technology maturity were the main drivers that led to the changes in the electricity market.
Changes in the electricity market	▪ IPPs enabled to have multiple off takers, necessitating power wheeling.

Theme 2: Participants believe that the changes in the South African electricity market are positive

Table 18: Data codes generated to develop Theme 2

Code	Code Detail
Shared Responsibility	▪ The lifting of the licensing threshold has shifted the responsibility for developing new generation capacity from solely resting on the government to a shared responsibility between the public and private sectors. The shared responsibility for new generation capacity development helps mitigate past challenges faced by the Renewable Energy Independent Power Producer Procurement Program (REIPPPP), which experienced a significant halt for approximately three years. This shared approach helps with continuity in the IPP industry.
Expanded Market Opportunities for Developers & IPPs	▪ The shift has led to an increase in the potential capacity to be procured, expanding the market for developers and Independent Power Producers (IPPs). They can now participate in both government-led and private procurement processes and resulting in both public and private PPAs.
Multiple Off takers for IPPs	▪ Private procurement allows IPPs to have multiple off takers, unlike government-led procurement where Eskom typically acts as the sole buyer. This diversification of off takers significantly reduces the risk of non-payment for IPPs, as their revenue stream is not solely dependent on a single entity.

Code	Code Detail
Significant Role of Traders	▪ The presence of multiple off takers facilitates the active involvement of traders in the market. Traders play a crucial role in making Power Purchase Agreements (PPAs) more bankable for IPPs, particularly for projects with shorter-term PPAs (3-5 years)
Power Wheeling	▪ Power wheeling enables off takers to access renewable energy from off-site plants without the need to invest in their own renewable energy infrastructure. This allows them to benefit from renewable power while reducing their carbon footprint. Power wheeling not only facilitates the access to renewable energy but also enhances trading opportunities within the electricity market, increasing market liquidity and flexibility.

Theme 3: Participants highlight that the changes in the South African electricity market come with some challenges

Table 19:Data codes generated to develop Theme 3

Code	Code Detail
Eskom Dominance	▪ Eskom's significant market share across the value chain gives it considerable influence.
“Cherry-Picking” of Customers by Traders	▪ Eskom's opposition to the presence of electricity traders stems from concerns that traders may selectively choose the most profitable customers, disrupt the market and potentially raising concerns about supply security in certain areas.
Wheeling Cost Disputes	▪ Disagreements between Independent Power Producers (IPPs) and Eskom regarding wheeling costs (charges for using Eskom's grid) create uncertainty and hinder market development.
Grid Reservation	▪ Private players can reserve grid capacity quickly, potentially blocking public projects that are still undergoing evaluation (awaiting preferred bidder status). This "grid-grabbing" by private entities puts public renewable energy projects (REIPPPP) at risk of not securing necessary grid connections[5].

[5] Eskom approached NERSA in this regard in an application to reserve the grid for public procurement citing that it is in the interest of the public that the public procurement succeeds. Whilst Eskom has implemented the IGCAR rules to mitigate against grid grabbing, they indicated that they are bound by the principle of “open and non-discriminatory access” to be applied for connection ready projects. NERSA denied their application on grounds of Eskom not clearly identifying the customers which must be discriminated against (Daniels, 2024).

Code	Code Detail
Project Viability & Feasibility	▪ Private PPA projects have less stringent feasibility requirements compared to public ones. This can lead to situations where private projects reserve grid capacity based on preliminary agreements, but may not proceed, hindering the progress of more rigorously vetted public projects
Project Development & Financing	▪ The practice of developers selling projects to international IPPs before reaching financial close can hinder the growth of the domestic EPC industry and result in a significant outflow of capital from the country.
Industry Reputation	▪ The entry of poorly prepared players into the market can damage the industry's reputation and negatively impact overall quality.

Theme 4: Participants are of the view that investment in IPPs will increase in the absence of government guarantees.

Table 20: Data codes generated to develop Theme 4

Code	Code Detail
Eskom Has Been a Good Payer	▪ The successful track record of the REIPPPP, with Eskom as a good payer demonstrates that, without government guarantees ever being called upon, demonstrates that IPPs can operate effectively without the guarantees.
Reduced Guarantee in Bid Window 7	▪ Bidders participated in Bid Window 7 with reduced government guarantees (from 100% to 80%).
Private Sector Success	▪ The successful implementation of private sector PPAs without government guarantees proves the viability of this approach
International Models	▪ The success of IPP investments in countries like Namibia, Botswana, and Kenya, where government guarantees are not prevalent, provides a compelling case for a similar approach in South Africa. In these countries, the financial health of off takers plays a crucial role in ensuring the viability of IPP projects.
Competitive market	▪ The Electricity Regulation Amendment Act of 2024 presents a significant opportunity for South Africa to transition towards a more competitive electricity market. In a market-driven environment, project bankability will become the paramount factor for attracting investment. IPPs will need to demonstrate the financial viability of their projects, secure convincing offtake

Code	Code Detail
	agreements with creditworthy buyers, and effectively manage project risks.
Financier Confidence in the Sector	▪ The significant participation of South African banks and Development Finance Institutions (DFIs) in financing IPP projects indicates a growing confidence in the sector and a reduced risk perception among investors.

Theme 5: Participants caution that investment in IPPs in the absence of government guarantees comes with some risks.

Table 21:Data codes generated to develop Theme 5

Code	Code Detail
Off taker Default Risk	▪ The potential for off takers to default on their payment obligations under the Power Purchase Agreements (PPAs). This could significantly impact the financial viability of IPP projects.
Financing Risk	▪ The absence of government guarantees could increase the perceived risk for lenders and investors. This may lead to higher borrowing costs for IPPs and potentially limit access to financing.
Increase in Electricity Price	▪ The absence of government guarantees may slightly increase the cost of electricity. IPPs will need to incorporate the risk of non-payment into their project financing, potentially leading to higher electricity prices for off takers.
Country Risk Premium	▪ Investors may demand a higher return on equity and debt to compensate for the increased risk associated with operating in South Africa without the explicit backing of a government guarantee. This "country risk premium" will ultimately impact the overall cost of capital for IPP projects.

Theme 6: Participants believe the current legal dispensation is sufficient to encourage IPP investment, however some issues still need to be addressed.

Table 22: Data codes generated to develop Theme 6

Code	Code Detail
Split PPAs in Public Procurement	▪ Introduce the concept of "split PPAs" within the public procurement framework. This would allow IPPs to sell a portion of their generated power to Eskom while simultaneously selling to other off takers in the market. This diversification of revenue streams would significantly reduce reliance on government guarantees and incentivize the development of larger-scale projects.
Regional Power Sales	▪ Enable IPPs to sell power to the Southern African Power Pool (SAPP), mirroring the successful approach adopted by Zambia. This regional market access would expand potential customer bases and reduce reliance on the domestic market.
Enforce Mandatory Carbon Budgets	▪ Enforcement of mandatory carbon budgets, as outlined in the Climate Change Act, will compel industries to decarbonize their operations by increasing their reliance on renewable energy sources.
Carbon Tax Exemptions	▪ Leverage carbon tax exemptions for businesses utilizing renewable energy to incentivize the adoption of clean energy solutions.
Carbon Border Adjustment Mechanisms (CBAM)	▪ Proactively address the implications of the EU's Carbon Border Adjustment Mechanism (CBAM) to ensure South African exporters remain competitive in global markets. This may involve supporting the development of renewable energy projects to reduce reliance on carbon-intensive energy sources.
Equity Investment	▪ Encourage increased equity participation by South African Development Finance Institutions (DFIs) like the Industrial Development Corporation (IDC) and local banks in IPP projects. This would demonstrate a strong commitment to the sector and reduce reliance on foreign capital.
Government Support	▪ While direct financial guarantees may be phased out, the government can provide indirect support through measures such as tax incentives,

Code	Code Detail
	reduced corporate taxes, and streamlined regulatory processes. ▪ Emphasize South Africa's competitive advantages, such as lower labour costs compared to developed economies, to attract international investors. This could involve quantifying these advantages and showcasing them to potential investors.
Targeted Procurement Programs	▪ Implement targeted procurement programs in areas with high grid connection costs. This will incentivize investment in regions where grid infrastructure development is challenging, ensuring equitable access to renewable energy resources across the country.
Encourage Shorter-Term PPAs	▪ Encourage financial institutions to accept shorter-term PPAs, increasing flexibility for both IPPs and off takers.
Establish Independent Market Platforms	▪ Establish market platforms independent of Eskom Holdings that connect generators with off takers, facilitating the discovery of mutually beneficial agreements.
Develop a Market Code	▪ Ensure a level playing field for all market participants, including Eskom, by allowing it to compete fairly with other IPPs in the open market.
Grid Constraints & Wheeling	▪ Addressing grid constraints at both transmission and distribution levels and establishing a reliable wheeling framework.
Cost reflective tariffs	▪ Transparent, cost-reflective tariffs, achieved through cost unbundling, are provide accurate market signals that guide investment towards certain regions.

Theme 7: Participants believe that IPP investors are not deterred by social obligations in the IPP programme

Table 23:Data codes generated to develop Theme 7

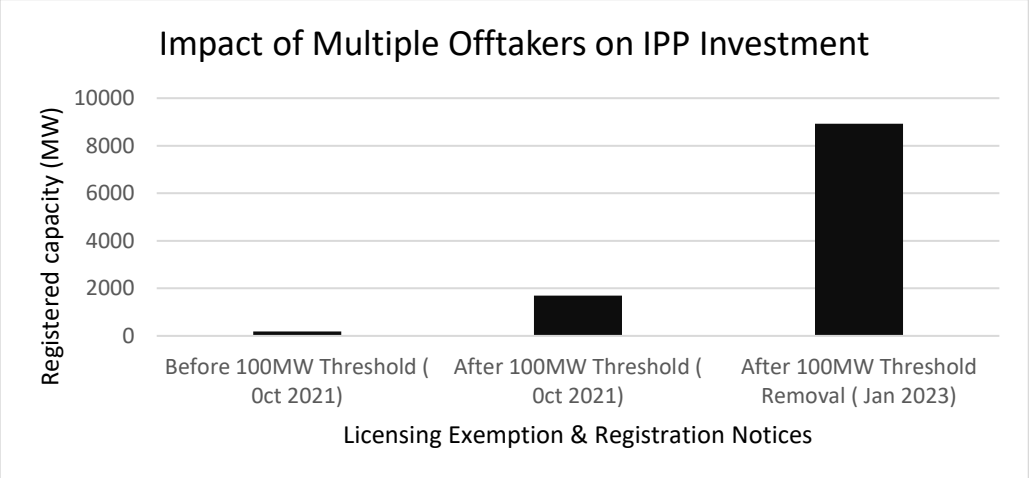
Code	Code Detail
Social Obligations	▪ Social obligations or economic development is evaluated at the bidding stage and penalties may be imposed if not fulfilled. IPPs either do it or pay the fine if they were not able to do it as they are more focused on the business. Either way they don't mind. ▪ In government procurement, the cost of social contribution activities is incorporated into the procurement price, so it factored into the cost and does not necessarily affect profits. ▪ In private procurement, there is no commitment to social contribution, so the return to local communities may be limited.
Local content	▪ The amount of money that IPPs have spent on local content so far is not very high. ▪ Local content is preferable when it is cost effective.

4.3.2 Snapshot Discussion

The first theme as per Table 17 was that participants generally had a good understanding of the developments in South Africa's evolving electricity market. Drivers of the changes in the electricity market were attributed to climate change & sustainability aspirations, technology maturity, electricity prices, and electricity supply constraints. To emphasize the point of electricity supply constraints being a driver of more investment in IPPs, E1 said, *"…So we had these bouts of load shedding that were pretty aggressive in 2022, 2023. However, since we've gotten back to some of the issues on level of normalcy, we no longer have that load shedding being a driver of increased embedded generation. What we have seen is that the rate at which new embedded generation is happening, that is also decreased. So, if we look at imports coming into the country, if we compare 2022, 2023, and 2024, we've literally gone back to the 2020 levels of solar imports into the country. Meaning that there was a driver, which was load shedding, but we've*

moved to a time now where load shedding is not a main driver of embedded generation, especially from a private sector perspective."

Theme 2 as shown in Table 12 highlighted that participants believed that the changes in the South African electricity market were positive. Beginning with the responsibility for developing new generation capacity where it is shared between public and private sectors. This is particularly important for IPP industry continuity and acts as a mitigation measure if challenges in the past where the REIPPPP experienced a halt. This change also brings about expanded opportunities for developers and IPPs. The IPPs can participate in both government-led and private-led procurement whereas previously they were limited to only the public procurement. Additionally, in the private-led procurement they have been enabled to have multiple off takers and therefore an IPP can have multiple PPAs with these different off takers. From the time when the Licensing Exemption & Registration Notice, 2021 came into effect (20 August 2021), enabling for multiple off takers, there was significant increase in the number of registered projects with capacity of 100 MW. This number further increased with the removal of the licensing threshold from January 2023 shown in Figure 4. These are projects which are most likely to be developed for multiple PPAs as E3 indicated that when there is a potential for multiple off takers IPPs are inclined to build bigger facilities. The behaviour of IPPs is in alignment with (Badissy, et al., 2020) in that PPAs useful in enabling IPP investment.



Source: (NERSA, 2024)

Figure 4: Impact of increasing/removal of licensing threshold and enabling of multiple off takers on IPP investment

Due to project financing, PPAs play an important role in proving project bankability as PPAs assist with cashflow projection over the agreed upon PPA duration (Advanced Engineering Associates International, Inc. (AEAI), 2003), (Badissy, et al., 2020). AEAI (2003) further pointed out that investors preferred PPAs with a tenure of 20 – 30 years when the power generated is sold to a state-owned utility. According to Hausman,Hornby & Smith (2008) for bilateral contracts, i.e. PPAs between an IPP and a private off taker, the PPA duration varies between short term periods of up to three years to long term periods from five years and beyond. D1 in his observations of the evolving electricity market in South Africa pointed out the reluctance of private off takers to sign long term PPAs and how they instead prefer shorter term PPAs of three years or at most five years. The preference of long term PPAs by IPPs, can be demonstrated by the case study findings on investor willingness when comparing the government-led procurement (BW6) to the private-led procurement (NERSA registration). The number of received bids for BW6, a government-led procurement with long term PPAs, was 56 (9666,4 MW), and for the NERSA registration, 26 projects were registered (see Source:

Figure 12 & Source:

Figure 13).

The off-taker preference for shorter term PPAs also led to the significance of the role of traders where they help solve for bankable shorter term PPAs for IPPs. Bankability is achieved through multiple off takers which bring about diversification. The diversification of the off takers significantly reduces the risk of non-payment for IPPs, as their revenue stream is not solely dependent on a single entity (see theme 2 on Table 18). However, there is an emphasis by AEAI (2003) for every off taker signing a PPA with an IPP, it must be of good credit status as that is what demonstrates the ability of the off taker to make payments, and therefore bankable. In government procurement, in the absence of a good credit status by the off taker (a state-owned utility), a government guarantee is often acceptable. The government guarantee ensures that the IPP is paid, therefore increases bankability of the PPA and reduces risk for the IPP (Aslan & Irwin, 2020) (Badissy, et al., 2020). AEAI (2003) however argues that even PPAs

with state-owned entities do not require a government guarantee as in the cases of Nepal and India. G1 mentioned Botswana, Namibia, and Kenya as examples of developing countries who did not have provision for government guarantees in the PPAs their state-owned utilities they signed with IPPs as off takers. The reason there wasn't a requirement for government guarantees was that the utilities were well run and their ability to pay IPPs was not questionable. He further mentioned that in the case of Zambia, no government guarantees were provided, because the IPPs were not restricted only to sell to the state-owned utility but could also sell power to the Southern African Power Pool (SAPP). Whilst the South African government-led procurement leads to a PPA with provisions for a government guarantee should Eskom fail to pay IPPs (Eberhard & Naude, The South African Renewable Energy IPP Procurement Program: Reviews, Lessons learnt & Proposals to reduce Transaction Costs, 2017), both participants B1 and G1 concur with each other that Eskom has been a good payer regardless of its financial status and questionable credibility, and further point out that government guarantees have never been invoked. B1 further pointed out that in line with National Treasury's intent to reduce and eventually eliminate government guarantees (National Treasury, 2022), Bid Window 7 of the REIPPPP had reduced the government guarantees from 100% to 80%. The successful implementation of private sector PPAs without government guarantees together with the BW7 response from the market was deemed by participants to be proof that IPP investment in the absence of government guarantees is feasible. Participants however cautioned that this is not without risks to the IPPs. These risks include the off-taker default risk, financing risk, country risk premium, and electricity price increase as expressed in Table 21. To manage the financing risk, mitigate the off-taker default risk by demonstrating the financial viability of their projects by securing PPAs with credit worthy buyers. The second layer of mitigation would be for the IPPs to incorporate the risk of non-payment by IPPs into their project cost potentially leading to higher electricity prices. Additionally, the incorporation of this risk due to absence of a government guarantee in the case of government-led procurement, investors may demand a higher return on equity to compensate for this risk. The country risk premium would then impact the overall cost of capital for IPP projects in South Africa.

Even though the South African electricity market was viewed as relatively mature for IPP investment without government guarantees in both government-led and private-led procurement, participants highlighted that there are circumstances where government guarantees are required. These circumstances include:

- "*the current public PPA prohibits IPPs from selling the power they generate to other off takers other than Eskom*" E3
- "*a bankrupt off taker*" G1
- "*expropriation and nationalisation of IPP infrastructure*" B1
- a technology has "*high upfront investment, no off taker, and potential for declining costs as in a very competitive energy trading market*" G2
- the case of new technologies or the incentivisation for the establishment of a new market for an existing technology, "*for an example gas or storage in South Africa/ transmission infrastructure projects. Or coal/nuclear investments which are typically contested by environmentalists, there would be an expectation from the market to provide government guarantees. This is purely because the risks are so high*." B1

Government guarantees, participants pointed out, could come in different ways, and this view is aligned with that of AEAI (2003) in this regard. The example provided by G2 to make the point was in reference to bullet 4 where he said that the "*guarantee can come in the form of policy that will ensure that the plant will have return on investment*.". E2 also gave an example of government providing a guarantee to support private-led procurement by means of affirming South Africa's competitive advantages such as lower labour costs compared to developed economies to attract private investors to partner with local investors. Other guarantees or government support to encourage IPP investment in the absence of financial government guarantees include tax incentives, reduced corporate taxes, and streamlined regulatory processes.

Turkey turned to restructuring of the electricity market as an alternative to government guarantees (Erdogdu, 2007). Similar recommendations were given by participants emphasizing the need:

- to implement a competitive multi-market as per Electricity Regulation Amendment Act,2024
- for NERSA to develop and be the custodian of the market code as an independent regulator to ensure a level playing field for all market

participants, including Eskom, by allowing it to compete fairly with other IPPs in the open market.

- to establish a market platform independent of Eskom Holdings
- for financial institutions to accept shorter-term PPAs, increasing flexibility for both IPPs and off takers
- introduce split PPAs for government-led procurement to allow for IPPs to sell a portion of their generated power to Eskom while selling to other off takers in the market. The market may be extended to the Southern African Power Pool.
- Address grid challenges at both transmission and distribution levels and establish a reliable wheeling framework
- Set transparent, unbundled and cost reflective tariffs to guide investment.

The above recommendations were in line with Hausman, Hornby, & Smith (2008) in that market restructuring for IPP investment requires a clear regulatory dispensation to create an environment conducive to competition. In providing regulation, the challenges raised by participants as currently existing in the electricity market as shown in theme 3 on Table 19 may be addressed.

In the South African context, a PPA with a government guarantee is accompanied by an Implementation Agreement (IA) between government and the IPP which effects the government guarantees. Additionally, the IA imposes penalties on IPPs should they not fulfil their social obligations as per economic development criteria during the bidding process (Eberhard & Naude, 2017). As per theme 7 in Table 23, participants reckoned that IPPs are not really deterred by these social obligations and do not necessarily view them as burdensome. D2 attributed this thinking by IPPs to them factoring in the cost of social obligations in the bid price. B1 further elaborated on this thinking with the following:

"…*I think they make these commitments over a 20-year period, … it might sound like a big amount, but if you actually take that amount over, so for example, we currently have spent, so the IPPs have currently spent, …, R3.8 billion in socio-economic development and enterprise development. That's the actual contribution made to date by the IPPs. Now, R3.8 billion in the grand scheme of things is not a lot of money, and there's a lot of need at a community level. I mean,*

we all know that, and so I think there's also this misconception that the IPPs come in and they have a lot of money and they're contributing a lot of money, or they have a lot of money to contribute, but actually the amounts are small. It's not, and if you have to spend that over a 20-year period, you know, that might give you maybe a million, two million rand to spend in a community in a year, which is not a lot of money. It doesn't go a very long way". This view that there is actually a lot to be done was also supported by E2 and H3 in saying that the communities actually are losers in this whole process even with the social benefits from the IPP programme, it is still insufficient. In fairness, B1 said, we have to recognise that IPPs are not in the business of socio-economic development and so it will potentially lag and hence the IPPs even at times would prefer to pay the fine as per penalty. However, the fine goes to government, and not the community, where it would be preferred that it goes to the community. Participants D2 and E2 highlighted that the private sector procurement is without these social obligations and cautioned that this could backfire for IPPs because it causes a big social divide and that could be a risk for the business. D2 further provided an alternative view that as much as the social obligations can be thought to be just that at face value, they mitigate the risk of a community seeing beautiful RE infrastructure and getting nothing from it. Hence the local content aspect is also important, using localised labour in construction etc. E2 in terms of equipment for solar PV for example pointed out that local content is not feasible when competing with China which has massive production. He gave an example where his company bid for a solar PV project in a private procurement. The bid requirements stated local content, they obliged but did not win the bid, only to find out the procurer chose a company that had lower bid prices and used Chinese components and equipment thus not obliging to the local content requirement.

Social obligations may not necessarily be a deciding factor for IPP investors to choose private PPAs over the public PPAs as they factor social obligations into their bid pricing.

Participants acknowledged the feasibility of IPP investment without government guarantees, particularly driven by market developments like private-led procurement and multiple off-takers, they also emphasized the need for a robust and competitive electricity market, with a clear regulatory dispensation and a level

playing field for all market participants, to minimize risks and ensure investor confidence. They also highlighted that social obligations are not determinants in deciding whether to pursue government-led or private procurement. The following sub-section examines the case study findings to assess whether they support the participant perceptions regarding investor willingness to invest in IPPs without government guarantees.

4.3.3 Case Study Findings

This case study compared two existing procurement models in the South African electricity market: the government-led and the private-led models. The objective was to assess investor preference between government-led procurement with guaranteed offtake and government guarantees, and private-led procurement without government guarantees.

- Government-led procurement: Represented by Bid Window 6, chosen as it was ongoing when the 100 MW licensing threshold was removed. Only projects with public pronouncements and financial close exceeding 100 MW were included.
- Private-led procurement:
  - Represented by projects registered with the National Energy Regulator of South Africa (NERSA) after January 17, 2023, with a capacity exceeding 100 MW. This assessed project success rates and investor sentiment.
  - Also represented by the Sasol-Air Liquide procurement program, chosen for its public pronouncements and availability of information on the procurement process, timelines, and efficiency. All projects, except one (Mainstream, at 100 MW), exceeded 100 MW and reached financial close.

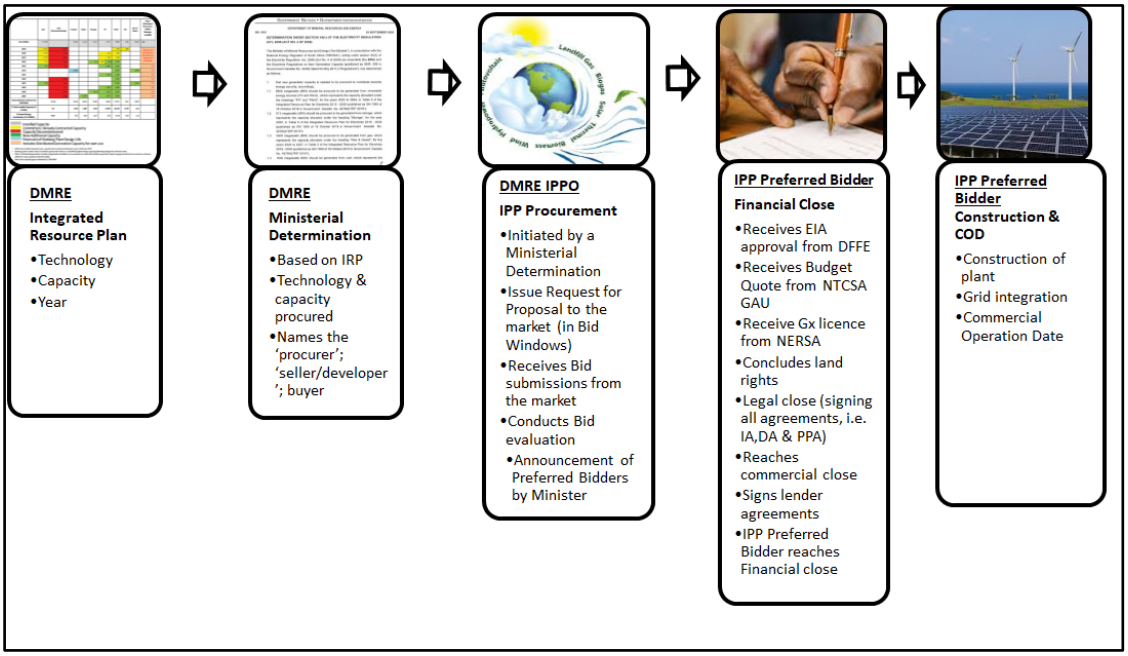
All selected projects (Bid Window 6, NERSA registered, and Sasol-Air Liquide) met the eligibility criteria and were suitable for comparison as they progressed

during the same period, subject to the same macroeconomic and political environment.

The comparative analysis of key components in each procurement model aims to determine whether the South African context aligns with Proposition 2, as suggested by reviewed literature. The findings of this case study are presented in the following sub-section.

4.3.3.1 Process

a. Government-led Procurement Process



Source: Authors depiction

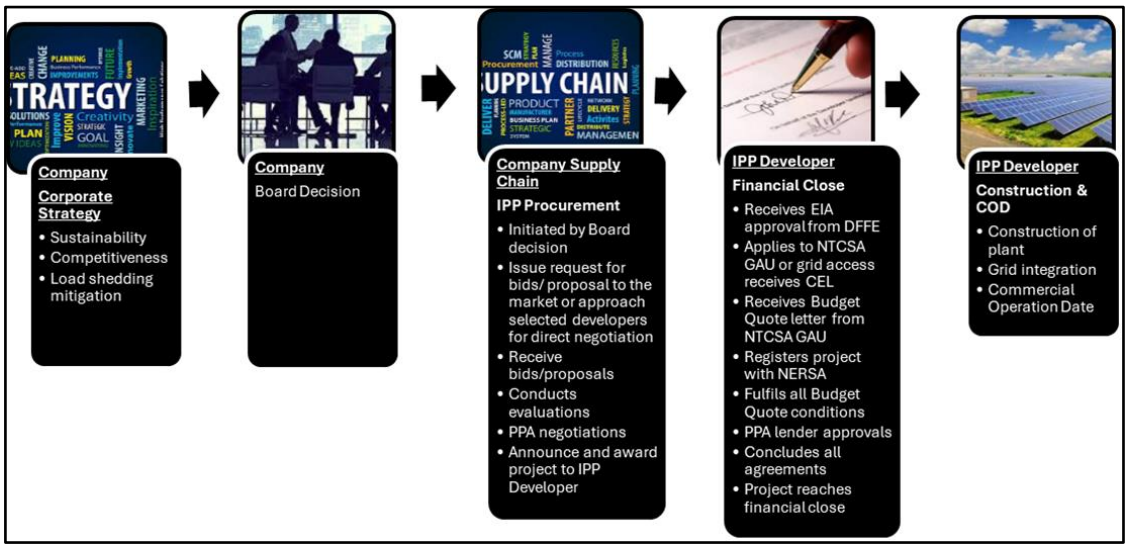
Figure 5: Government-led procurement process

The government led procurement process (as shown in Source: Authors depiction

Figure 5) is based on an integrated resource plan which summarizes the annual new generation capacity from different technologies required by the power system to meet annual demand in a table. The Minister then exercises his discretionary power to make a determination based on the IRP, on the technologies and capacity to be procured, and to determine the procurer, buyer,

and seller/developer of the new generation capacity. Once the Ministerial Determination has been concurred to by the Regulator, it is gazetted in the government gazette, and it signals to the market an upcoming procurement programme through bid windows (Department of Mineral Resources & Energy, 2020). The IPP Office initiates a bid window by issuing a request for proposals to the market for bidders to bid. After bid submission closing date, the bids are evaluated and preferred bidders are announced by the Minister. The preferred bidders must work towards financial close which requires them to have received EIA approval from DFFE, Budget Quote from the National Transmission Company of South Africa's Grid Access Unit (GAU), generation license from NERSA, concluded land rights, and sign lender agreements. After reaching financial close, the preferred bidder may commence with construction, after which the plant will be integrated into the grid leading to commercial operation. The power generated is sold to the guaranteed off taker (DMRE IPP Office, 2024).

b. Private led Procurement Process



Source: Authors depiction

Figure 6: Private-led procurement process

A private led procurement process (as shown in Source: Authors depiction

Figure 6) is based on corporate strategy. This strategy may include alignment to the United Nations Sustainable Development Goals (Jimenez, Franco, & Smith, 2021), remaining competitive by reducing electricity costs and the carbon footprint through renewable energy which has negligible marginal costs and zero carbon emissions. Additionally, private procurement may be done to rely less on the grid and mitigate against load shedding (ERERO, 2023). Based on their corporate strategy, the Board of a company will approve projects that meet the corporate strategy objectives. The company's supply chain will commence with procurement, issue a request for proposals or bids to the market, or approach selected developers for direct negotiations. Once proposals are received, evaluations are conducted and announcements of preferred bidder or developer or partnerships are made. For the projects to reach financial close, they must receive EIA approval from DFFE, a Budget Quote from NTCSA GAU, register with NERSA, conclude land rights, and sign lender agreements. After reaching financial close, the preferred bidder may commence with construction, after which the plant will be integrated into the grid leading to commercial operation (DTIC, 2023). The power generated is sold to a single or multiple off takers (Department of Mineral Resources & Energy, 2023a).

4.3.3.2 Project Timelines

The project timelines examined the duration required for projects under both models to reach financial close. Specifically tracking Bid Window 6 (BW 6) procurement projects under the government-led programme and the Sasol & Air Liquide procurement projects as a proxy for the private-led programme. The starting line to track both procurement models was the date when the request for proposals was issued, and the finish line is the date the projects reach financial close.

a. Government-led Procurement Timelines

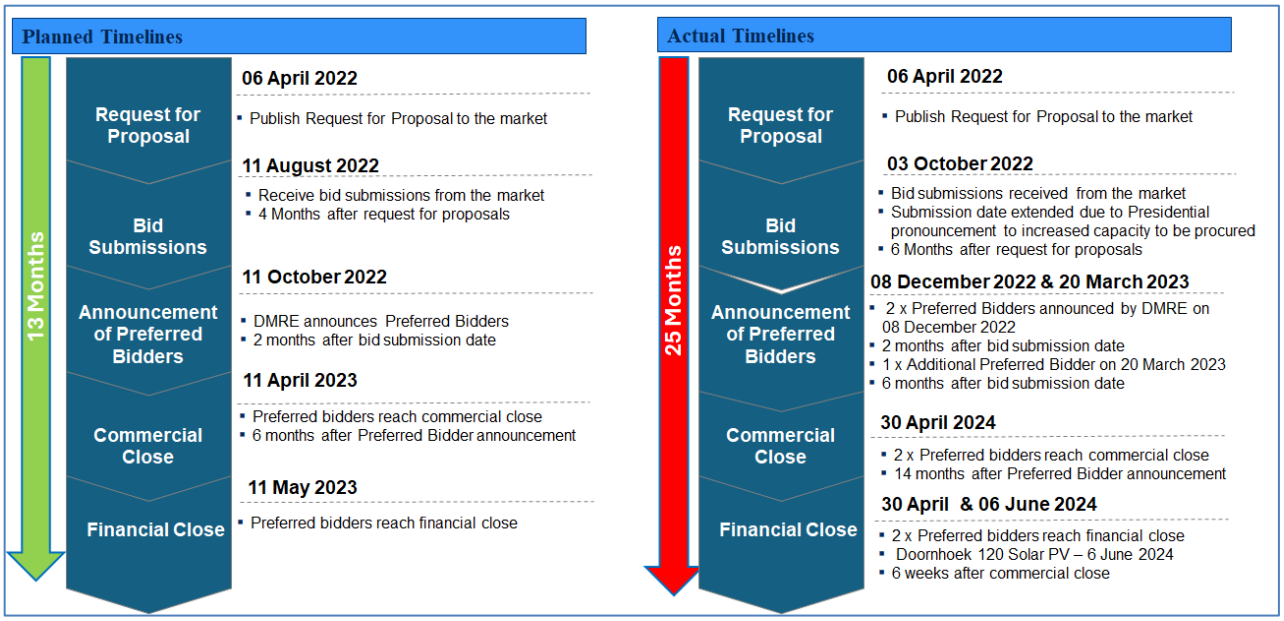


Figure 7: Comparison between the planned & actual timelines for Bid Window 6

Source: Author's depiction

For the government led procurement process, the timelines tracked are those of Bid Window 6 based on the DMRE Section 34 Determination (2020 Determination) gazette on 25 September 2020. The 2020 Determination was based on the IRP 2019 to signal the initiation of an IPP procurement process to the market. The 2020 Determination stated that:

- 6800MW of solar PV and wind should procured for the years 2022 to 2024;
- The procurer should be the DMRE;

- The buyer should be Eskom Holdings SOC Ltd
- The seller must be IPPs (Department of Mineral Resources & Energy, 2020).

The DMRE's IPP Office invited the market to respond to a request for proposal under Bid Window 6 (BW6) of the REIPPPP on 6 April 2022 (Tender no: DMRE/001/2022/23) based on the Section 34 Determination gazetted on 25 September 2020.

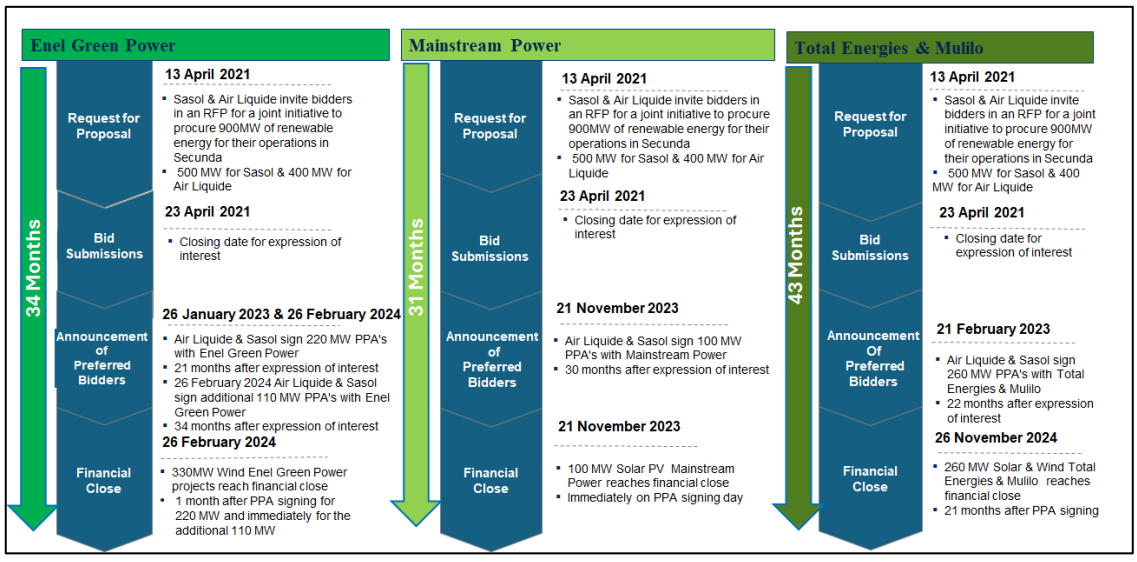
- The allocated capacity to be procured for this bid window was 2600 MW made up of 1600 MW of onshore wind, and 1000 MW of solar PV. The closing date for bid submission was 11 August 2022 and the planned duration of BW6 was expected to be 13 months as shown in Figure 3 above (Department of Mineral Resources & Energy, 2022).
- Changes to BW6 procurement capacity and submission date were announced on 3 August 2022 based on a Presidential announcement made on 25 July 2022 in his address on the measures to be employed to curb the energy crisis. The capacity to be procured for this BW was communicated to increase from 2600MW to 5200MW and the new closing date would be 22 September 2022. The technology allocation of the 5200MW of capacity was not given at this point (Department of Mineral Resources & Energy, 2022).
- Another amendment to BW6 was announced on 8 September 2022 with the capacity to be procured stated to be 4200MW made up of 3200MW wind energy and 1000 MW Solar PV. The bid submission was extended to 3 October 2022 (Department of Mineral Resources & Energy, 2022).

The IPP Office received 56 bid submissions for BW6, totalling a capacity of 9666.4 MW (Department of Mineral Resources & Energy, 2022) out of which 1000 MW of solar PV projects were announced as preferred bidders, 860 MW on 8 December 2022 (Department of Mineral Resources & Energy, 2022) and 140 MW on 23 March 2023 (DMRE IPP Office, 2024). The first two projects to reach commercial close under BW 6, namely Virginia Solar Park in (240 MW) in the Free State and Doornhoek PV (Pty) Ltd (120 MW) in Northwest, achieved this

milestone on 30 April 2024 (DMRE IPPO, 2024). The Ngonyama Solar PV project (140 MW) is yet to reach financial close (Illidge, 2024).

The Bid Window 6 process was planned to take a period of 13 months, i.e. from RfP to financial close, instead the process took 25 months almost double the planned time as shown in Figure 7 above. The first delay can be attributed to the Presidential pronouncement to increase the capacity to be procured in this BW which extended the bid submission date by 2 months. The announcement of the first 2 preferred bidders (Virginia Solar Park & Doornhoek PV) was on time, and the 3rd preferred bidder (Ngonyama Solar PV) announcement was announced 6 months after bid submission date, but this only impacts the overall timeline as this project has not yet received financial close. The biggest delay in this process is on reaching commercial close. Financial close as per planned timelines should take 6 months to achieve, and in reality, it took 14 months which is more than double the time (see Figure 7).

b. Private-led Procurement Timelines



Source: Authors depiction

Figure 8: Timelines for the different projects as per Sasol & Air Liquide procurement

With regards to the private procurement, the Sasol & Air Liquide renewable energy procurement program was tracked. Sasol, based on its corporate

strategy, set a target to reduce greenhouse gas emissions by 10% by 2030 using their 2017 emissions as a baseline. The incorporation of renewable energy into Sasol's operation was identified as a medium for the company's decarbonisation efforts (Sasol, 2021). Air Liquide had committed in 2018 to reducing its carbon dioxide emissions by 33% by 2035. The use of electricity from renewable energy was identified as an indirect means of achieving its decarbonization goals and achieving carbon neutrality by 2050 (Air Liquide, n.d.). Following a business purchase agreement between Sasol and Air Liquide, where Air Liquide would operate and supply gases to Sasol on the Secunda site, both companies agreed to jointly procure 900 MW of renewable energy towards their decarbonization targets with a 500 MW allocation to Sasol and 400 MW allocation to Air Liquide (Air Liquide, 2020), (Sasol, 2021). The request for proposals for this renewable energy procurement was issued on 13 April 2021 with 23 April 2021 as the closing date for submission of expression (Sasol, 2021), (African Development Bank, 2021).

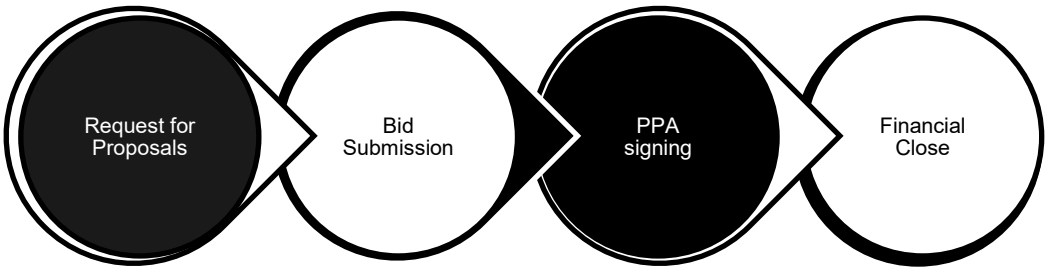
The Sasol & Air Liquide launched a procurement programme on 13 April 2021 to procure 900 MW of capacity by 2030 with 600 MW anticipated to commence commercial operation in 2023. The planned timelines for procurement until commercial operation date (COD) for the 600 MW was approximately 24 months (Sasol, 2021). After selecting three preferred bidders (Enel Green Power, Mainstream Power, and Total Energies & Mulilo) of joint capacity of 690 MW, even reaching financial close for these projects exceeded the planned timelines for COD. On average, based on the timelines in Figure 8 above, financial close was reached in 36 months. This translates to a delay of at least 12 months, not taking into account construction period.

As shown in Figure 8 above, from the closing date for expression of interest to the announcement of the first preferred bidder, Enel Green power, it took approximately 21 months. For the second preferred bidder, Total Energies & Mulilo, it took approximately 22 months. For the third preferred bidder, Mainstream Power, it took approximately 30 months. Whilst the announcement of preferred bidders was timeous, it occurred simultaneously with the signing of PPAs. Financial close was reached on the same day as the PPA was signed for the Mainstream Power project, the same occurred for the additional 110 MW from

Enel Green power. However, the 220 MW capacity from Enel Green Power took a month to reach financial close after PPA signing. Total Energies & Mulilo on the other hand took 21 months to reach financial close after PPA signing.

4.3.2.3 Project Efficiency

An assessment of the efficiency of each procurement process was conducted, considering factors such as regulatory approvals, permitting, and financial closure timelines. The process was broken down into milestones in the figure below. The efficiency was looked at based on the time and requirements for a project to reach the milestones indicated in Figure 9.



Source: Author's depiction

Figure 9: Milestones in the procurement process

To study the efficiency of the government-led process, the planned process timelines were used as shown in Figure 7. For the private-led process, the efficiency was studied based on the timelines of the Sasol & Air Liquide procurement programme as shown in Figure 8.

Table 24: Comparison of stages leading to milestones in the two procurement processes

Stage	Government-led	Private-led
1: Request for Proposal to Bid Submission	▪ RfP is issued with a deadline for bid submission ▪ Planned to take 4 months	▪ RfP is issued with a deadline for expression of interest ▪ Planned to take 10 days ▪ RfP submission date not made public
2: Bid Submission to PPA Signing	▪ Evaluation of bids to PB announcement (2 months) ▪ EIA (147 days/60 days for solar), GAU (6 months), NERSA License (120 days), Land Rights ▪ PPA: Standard & non-negotiable ▪ Sign PPA (8 months after Bid Submission)	▪ Evaluation of proposals, PB notification ▪ EIA (147 days/60 days for solar), GAU (6 months), NERSA Registration (64 days), Land Rights ▪ PPA: Negotiations ▪ Sign PPA
3:PPA signing to Financial Close	▪ After PPA signing during Legal & Commercial Close, lender agreements are signed, and project achieves Financial Close. ▪ It takes 1 month	▪ After PPA signing, lenders approve the PPA, all agreements are concluded, and project achieves financial close

Source: (DMRE IPPO, 2024), (Eberhard & Naude, 2017), (DTIC, 2023)

Stage 1:

Government-led process is more transparent in terms of same submission date for all project proposals; evaluation criteria; and detail required for proposal.

Private-led process makes room for flexibility with just expression of interest for a quicker response.

Stage 2:

Registration takes half the time to do licensing for the private process, however the PPA signing is faster for government process due to standardized non-negotiable PPA whereas PPA negotiations are a prolonged processes for private processes especially when dealing with multi-international corporations operating under various legal jurisdictions.

Stage 3:

Government-led process states it takes 1 month. For BW 6 financial close was reached on same date as commercial close and 6 weeks later for the other project, and therefore the one month is fine.

Private-led process Enel Green Power took 1 month after PPA signing, then Mainstream reached financial close on the same date as PPA signing. However, for TotalEnergies and Mulilo it took 21 months to reach financial close.

4.3.3.4 Project Success Rate

The success project rate is the number of projects reaching financial close since the removal of the 100 MW licensing threshold in January 2023 until 31 December 2024 compared to the most recent government-led bid window (Bid Window 6) under similar conditions.

a. Government-led Project Rate

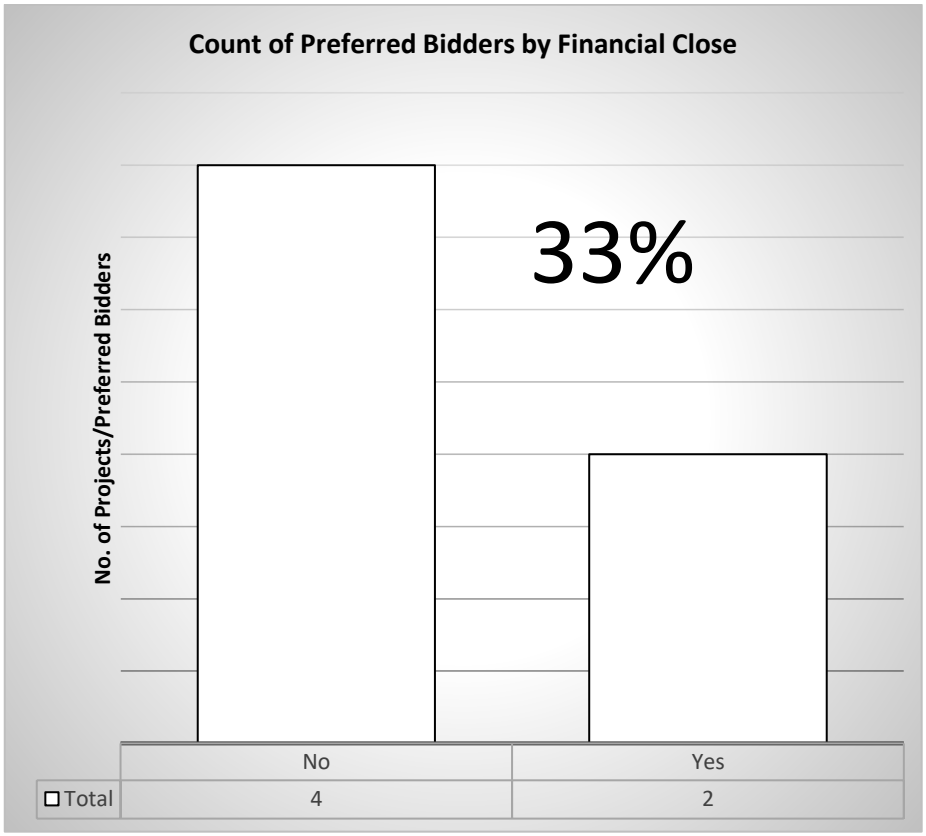
Table 25: Status of preferred bidder projects under Bid Window 6

Project Name	Contracted Capacity (MW)	Price	Province	Financial Close	Status
Kutlwano Solar Power Plant	150	469,5	North **West**	No	Permitting
Boitumelo Solar Power Plant	150	469,5	North **West**	No	Permitting
Virginia Solar Park/URSA Energy (RF)(Pty)(Ltd)	240	486,5	Free State	Yes	
Good Hope Solar Park/ Antlia Energy (RF)(Pty)Ltd	200	498,9	Free State	No	Permitting
Doornhoek PV	120	540	North **West**	Yes	
Ngonyama Solar PV	140	548	Free State	No	

Source: (REIPPPP Bid Window 6 Successful Bidders, 2023), (South African Government, 2024), (Red Rocket, 2024), (AMEA Power, n.d.)

There were six announced preferred bidders for BW 6, and all were solar projects (REIPPPP Bid Window 6 Successful Bidders, 2023). Of the six, only two projects have reached financial close by 31 December 2024, Virginia Solar Park (240 MW) located in the Free State Province, and Doornhoek PV (120 MW) located in the North-West Province (see Table 25). That translates to 33% of the projects to have reached financial close as shown in Figure 10 below. Grid access is cited as one of the challenges hindering financial close for the remaining four projects (South African Government, 2024).

Source:



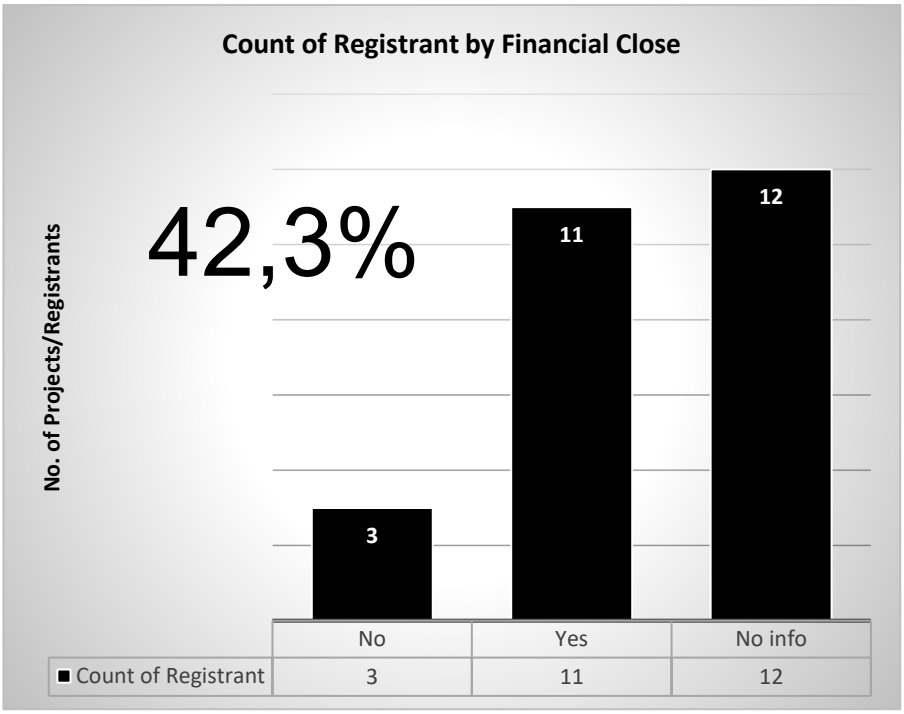
Source: (DMRE IPPO, 2024)

Figure 10: Project rate for projects under Bid Window 6

b. Private led Project Rate

For private-led projects, projects registered with NERSA were equated to those achieving preferred bidder status in the government-led process. This is because both NERSA registration and preferred bidder status involve requesting a budget quote from NTCSA GAU and entail similar stages before reaching financial close. The NERSA registered projects considered were those with a capacity above 100 MW, and they totalled 26 projects as at September 2024 (NERSA, 2024).

Of the 26 projects registered, 11 projects[6] had reached financial close, 3 projects[7] had yet to reach financial close, and information was unavailable for the status of 12 projects[8]. Hence, the project rate to reach financial close for the private sector procurement, this



[6] Mogalakwena Mine Solar Power, Bolobedu Solar Farm, Mooi Plaats Solar Power, Hartebeesthoek Wind Power, Umsobomvu Wind Power, Khangela Emoyeni Wind Farm, Red Cap Impofu East (Eastern Cape), Umsinde Emoyeni Wind Farm, Hendrina South Wind Energy Facility, Red Cap Impofu East (Eastern Cape), Red Cap Impofu East (Western Cape)
[7] FS Orkney, Sutherland 2 Wind Farm, Ishwati Emoyeni Wind Farm
[8] Paarde Valley PV2, Springbok Solar Power Plant, Thakadu Solar Power Plant, Tournee 1 Solar, Lion Thron Solar 145, Major Machines, Mulilo De Aar 2, Ummbila Emoyeni Two, Ummbila Emoyeni Three, Mulilo New Castle Wind Power, Fe Overberg, Notsi PV

translates to 42,3% as depicted in Source:

Figure 11 below.

Source: (NERSA, 2024)

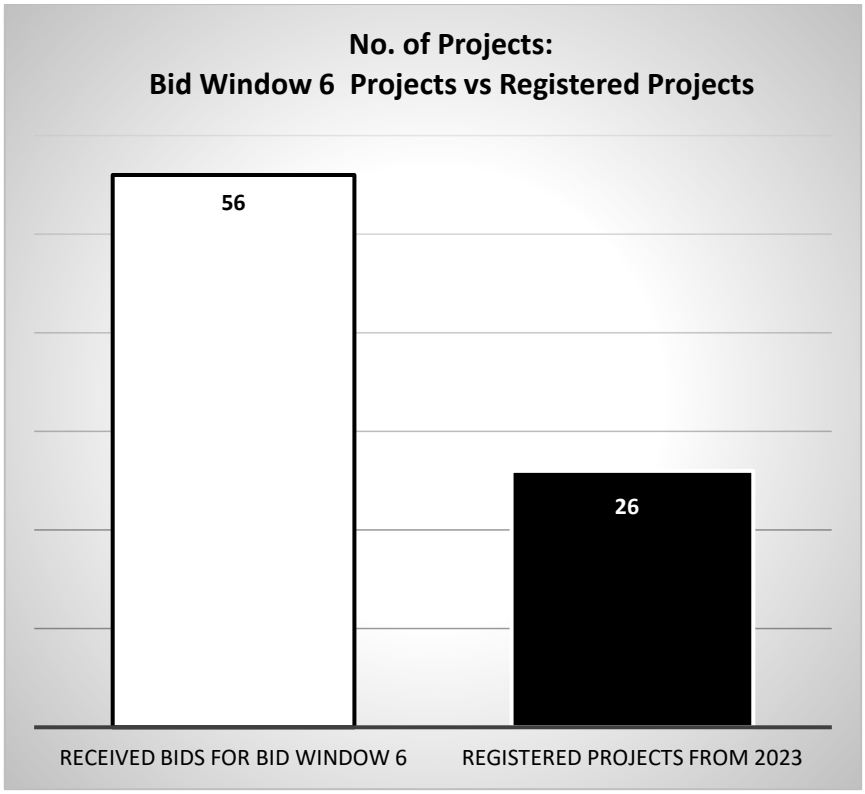
Figure 11: Project success rate for NERSA registered projects

4.3.3.5 Investor Sentiment

Investor sentiment was an evaluation of the impact of each procurement process on investor willingness to participate in IPP development in South Africa. The government-led procurement was represented by Bid Window 6 (BW6) and the NERSA registered projects were a proxy for the private-led procurement. The investor willingness on two procurement processes was evaluated on the following measures:

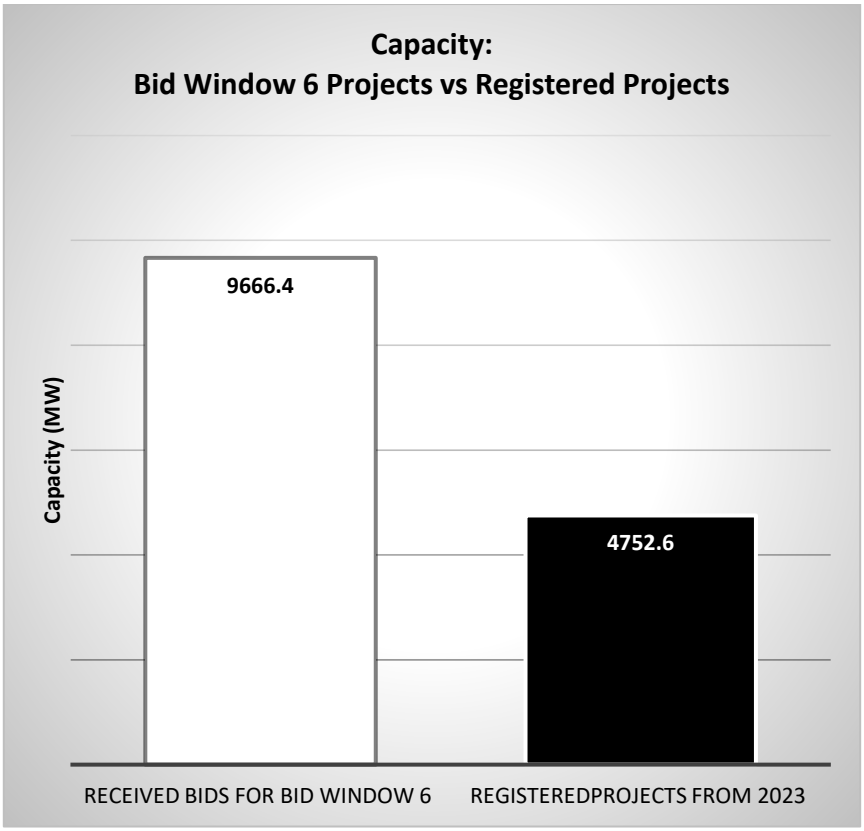
- Number of projects & Capacity
- Technology
- Location

a. Government-led vs Procurement led: No. of Projects & Project Capacity



Source: (Department of Mineral Resources & Energy, 2022) (NERSA, 2024)

Figure 12: Comparison of investor preference between government-led & private-led procurements



Source: (Department of Mineral Resources & Energy, 2022) (NERSA, 2024)

Figure 13: Comparison of investor preference between government-led & private-led procurements

For the government-led process, the number of received bids as a response to the BW6 request for proposals were used as a measure to assess investor sentiment as they reflect investor interest in the programme. Source:

Figure 12 shows that 56 bids were received by the IPP Office, and that equated to 9666,4 MW of capacity as shown in Source:

Figure 13.

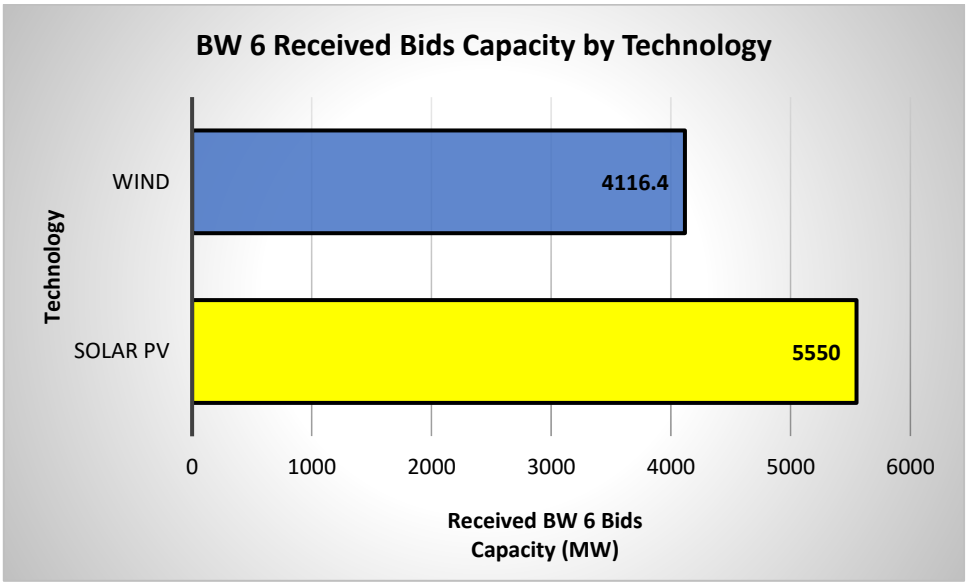
For the private-led process, the NERSA registered projects above 100 MW after the Licensing Exemption & Registration Notice, 2023 were considered as a measure to assess investor sentiment as a reflection of investor interest in the private-led procurement programme. The registered projects considered were

registered with NERSA from January 2023 to September 2024. The number of registered projects during this period were recorded to be 26 as shown in Source:

Figure 12 and equating to 4752,6 MW of capacity as reflected in Source:

Figure 13.

b. Government-led Procurement: Technology



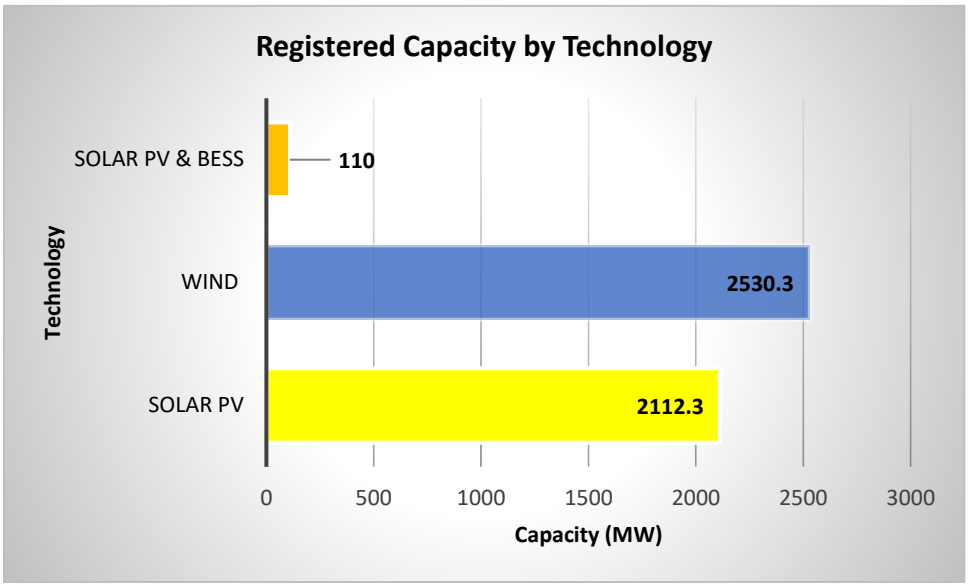
Source: (Department of Mineral Resources & Energy, 2022)

Figure 14: BW6 received bids by technology

Source:

Figure 14 reflects those investors in the government-led procurement, had a preference of solar PV (57.4%) over wind (42.6 %).

c. Private-led Procurement: Technology

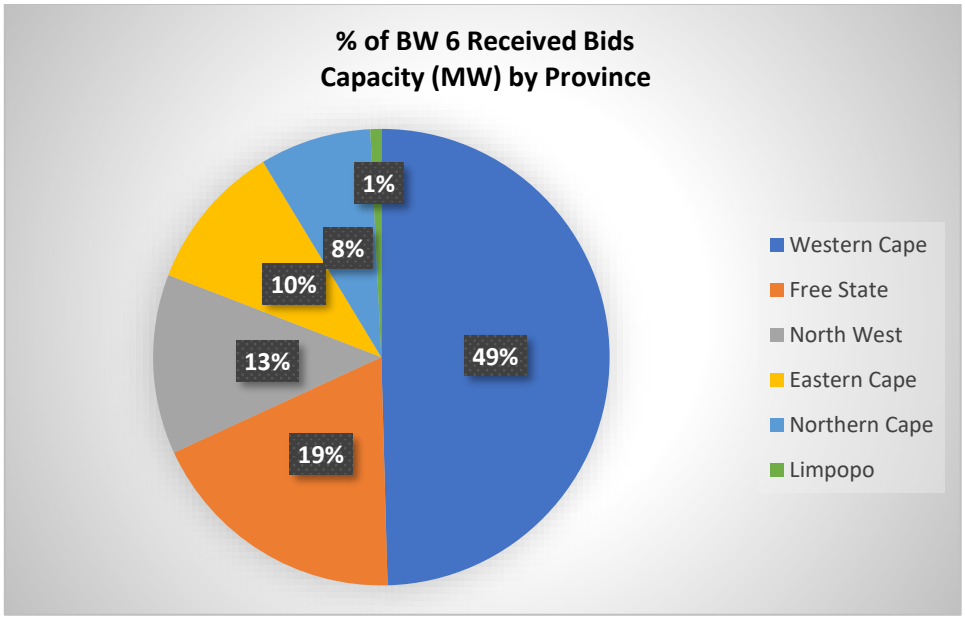


Source: (NERSA, 2024)

Figure 15: NERSA registered projects by technology

Under the private-led procurement process, investors had a preference for wind (53.2%) over solar PV (44.4%) as shown in Figure 15 above.

d. Government-led Procurement: Location



Source: (Department of Mineral Resources & Energy, 2022)

Figure 16: Proportion of BW6 received bid by province

For the government-led procurement as shown in Source:

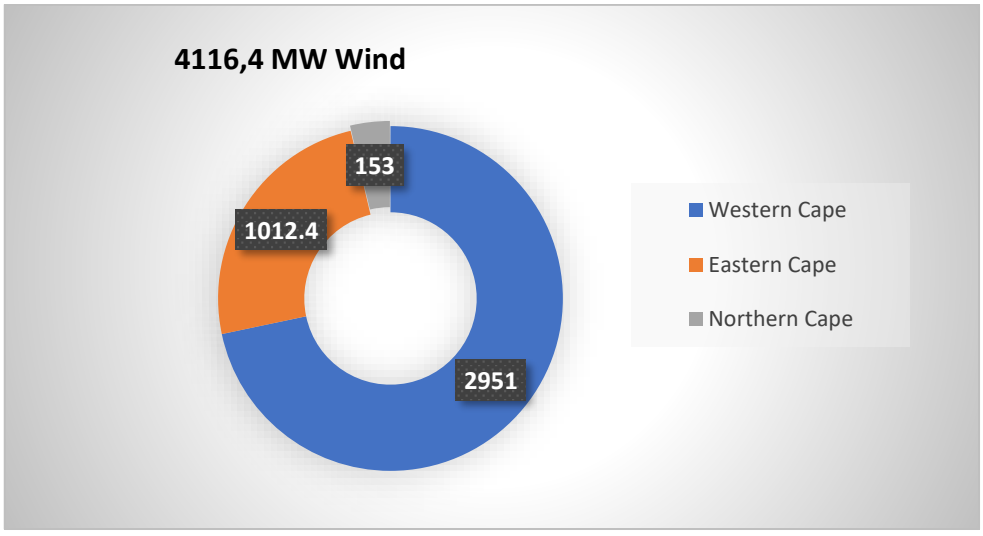
Figure 16 and Table 26, the Western Cape province was the most preferred location by investors in terms of capacity. This capacity was mostly for wind projects as depicted in Source:

Figure 17. All bids for wind projects were located in Western Cape, Eastern Cape and Northern Cape.

Table 26: Distribution of capacity per province for the 56 bids received under BW6

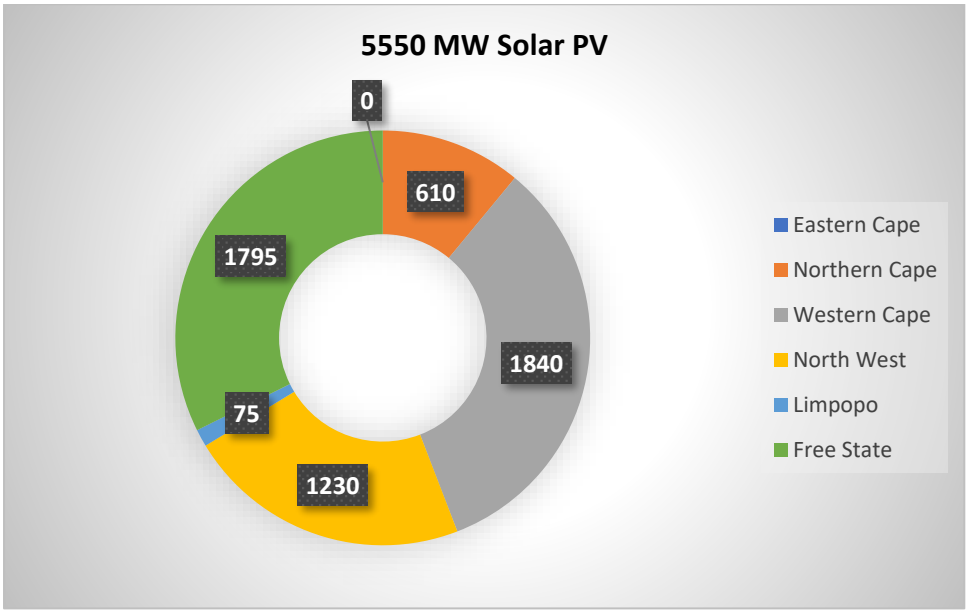
Province	BW6 Received Bids Capacity (MW)
Western Cape	4791
Free State	1795
North-West	1230
Eastern Cape	1012,4
Northern Cape	763
Limpopo	75
Grand Total	**9666,4**

Source: (Department of Mineral Resources & Energy, 2022)



Source: (Department of Mineral Resources & Energy, 2022)

Figure 17: BW 6 received bid capacities for wind projects per province



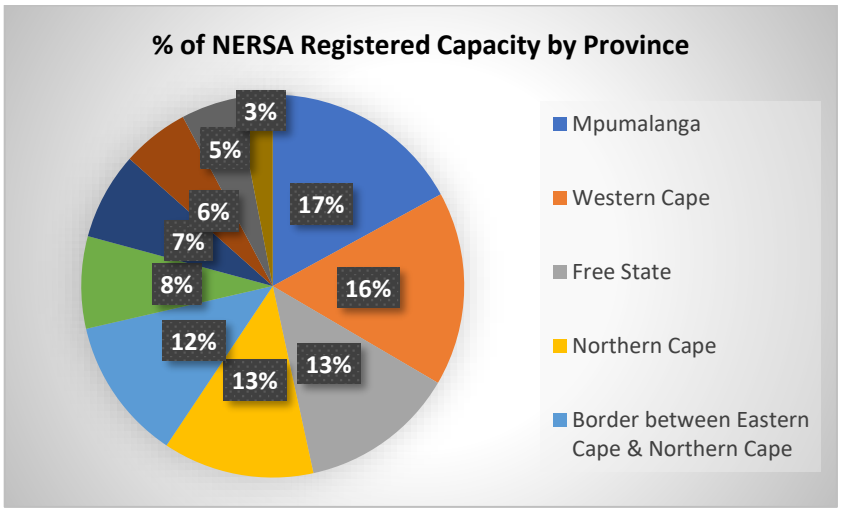
Source: (Department of Mineral Resources & Energy, 2022)

Figure 18: BW 6 received bid capacities for solar PV projects per province

Free State and North – West provinces were gaining momentum as preferred location, for solar PV. However Solar PV projects were widely distributed over 6 provinces: Western Cape, Free State, North-West, Northern Cape, and Eastern Cape as shown in Source:

Figure 18.

e. Private-led Procurement: Location



Source: (NERSA, 2024)

Figure 19: Proportion of NERSA registered projects by province

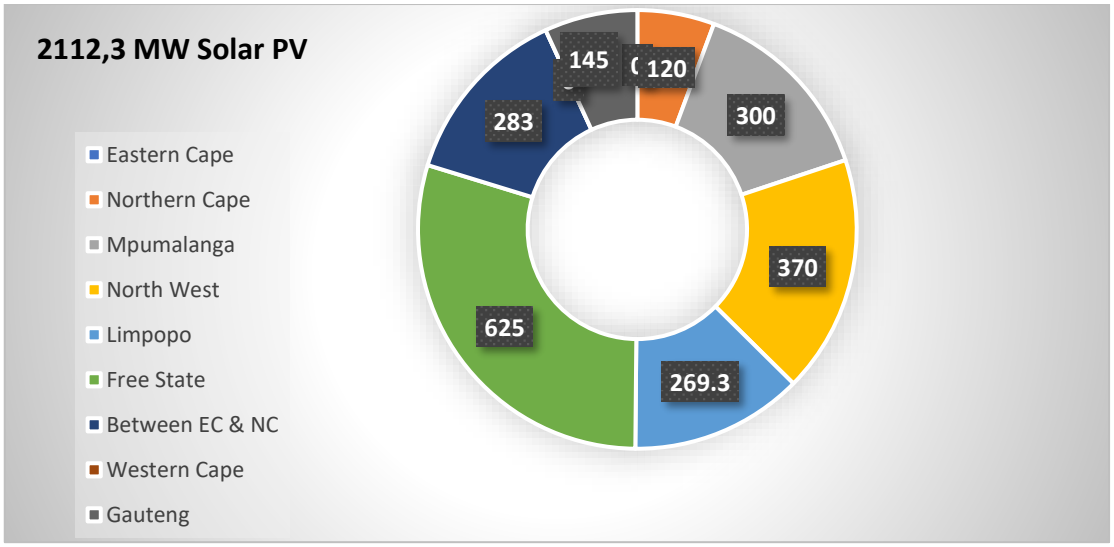
Province	NERSA Registered Capacity (MW)
Mpumalanga	810
Western Cape	779,1
Free State	625
Northern Cape	607
Border between Eastern Cape & Northern Cape	573
North-West	370
Kwa-Zulu Natal	350
Limpopo	269,3
Eastern Cape	224,2
Gauteng	145
Grand Total	**4752,6**

Table 27: Distribution of capacity per province for the 26 NERSA registered projects

Source: (NERSA, 2024)

For the private-led procurement as shown in Source:

Figure 19, Mpumalanga province was the location most preferred by investors in terms of capacity (see Table 27).



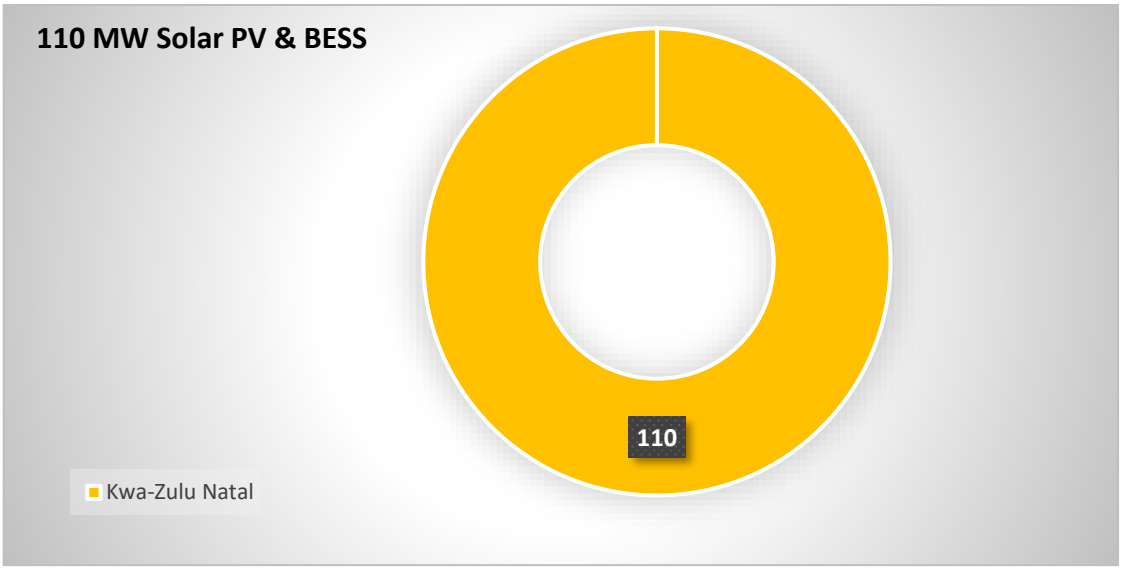
Source: (NERSA, 2024)

Figure 20: NERSA registered capacities for solar projects per province

For solar PV as shown in Source:

Figure 20, the biggest capacity was in the Free State, (625 MW) followed by the North-West (370 MW), and Mpumalanga (300 MW). Only one project considered the combination of solar PV and BESS (110 MW) in Kwa-Zulu Natal as shown in Source:

Figure 21.

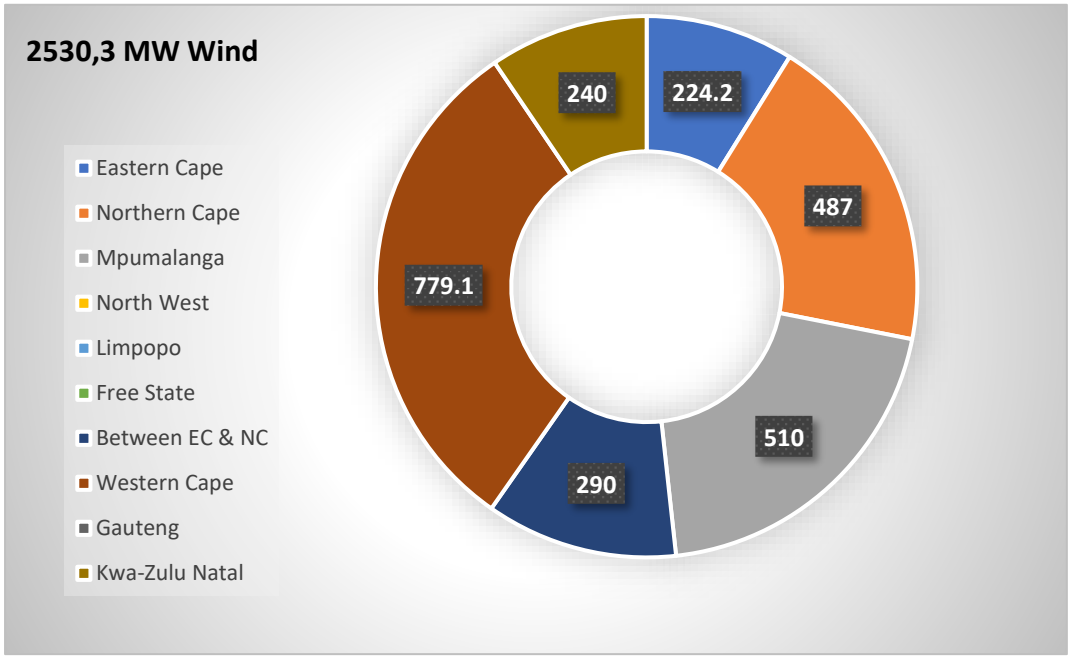


Source: (NERSA, 2024)

Figure 21:NERSA registered capacities for solar PV & BESS projects per province

The biggest capacity for wind projects was in the Westen Cape (779,1 MW), followed by Mpumalanga (510 MW), and the Northern Cape (487 MW) as depicted in Source:

Figure 22.



Source: (NERSA, 2024)

Figure 22: NERSA registered capacities for wind projects per province

4.3.4 Case Study Discussion

In terms of the steps in the process followed in both procurement models, the number of steps are the same (see Source: Authors depiction

Figure 5 and Source: Authors depiction

Figure 6). However, the difference lies in the basis upon which the procurement is conducted. The Government-led procurement is based on an IRP and the RfP is triggered by a Ministerial Determination, whereas the private-led procurement is based upon corporate strategy which may include the sustainability, competitiveness and load shedding mitigation. This is as per theme 1, about the drivers for change in South Africa's electricity market (see Table 17) and theme 6 which includes policy instruments such as carbon tax and CBAM as corporate drivers for procurement of RE new generation capacity (see Table 22).

The other distinct difference between the two procurement models is the approach to PPAs. The PPA in the government-led procurement is standard and non-negotiable (Eberhard & Naude, The South African Renewable Energy IPP Procurement Program: Reviews, Lessons learnt & Proposals to reduce Transaction Costs, 2017), whilst the private-led procurement PPAs are negotiated by the parties involved (F1). The projects under government-led procurement require a licence from NERSA, whilst the projects under private-led procurement only need to register with NERSA (Department of Mineral Resources & Energy, 2023a), (NERSA, 2021).

While the number of steps may be the same, the time it takes to execute them and for a project to reach financial close is crucial for investors. Comparing the BW6 program (government-led procurement) to the Sasol & Air Liquide program in terms of timelines, the two BW6 projects that reached financial close did so 25 months after the RFP date, representing a 14-month delay compared to the planned date. Although delayed in reaching financial close, BW6 preferred bidders still achieved this milestone earlier than the Sasol & Air Liquide program, which on average reached financial close in 36 months. However, it is important to note that within these 36 months, all five projects procured within the Sasol & Air Liquide program reached financial close, whereas only two out of six projects

in BW6 reached financial close. F1 who was privy to the Sasol & Air Liquide programme attributed the delays to reach financial close to PPA negotiations. PPA negotiations can be quite lengthy and onerous due to the fact that in deals like this one involving multiple international companies, operating in different legal jurisdictions, and with the financiers also involved in the negotiations makes it quite complex. Each party scrutinizes every detail to see how they can minimize risk for themselves because it is essentially a long term PPA. This is often the case in direct negotiations (Badissy, et al., 2020).

The timelines of each procurement process are affected by the efficiency of the stages to reach the different milestones. In the Sasol-Air Liquide programme, the first milestone in stage 1 was to identify the bidders, and this milestone was achieved quicker through an expression of interest in 10 days rather than the planned 4 months it takes in the government-led programme which was 6 months for BW6. Due to the necessary transparency required for investor confidence in public procurement, D1 spoke to how the government-led program has limited flexibility, whereas in private-led procurement there is the flexibility to conclude a stage as and when they see it fit. Another perspective in this regard was given by participants E2 and H3 who spoke about the role of developers in preparing projects and pitching unsolicited proposals to potential off takers. This can significantly reduce the time to identify bidders. To get to a PPA signing milestone, stage 2, the government-led procurement is more efficient due to the standardized PPA, even though the licensing process is longer than the registration process for registration. For the financial close milestone, stage 3, the planned duration for government-led procurement is 1 month after signing of PPAs. However, with BW6, for the Virginia Project financial close was reached on the same day as PPA signing, and for the Doornhoek project it was reached 6 weeks after signing PPAs. Similarly, with the Sasol & Air Liquide projects some reached financial close on same day as PPA signing, whilst another a month later, and another 21 months later. For each programme efficiency for this stage varies.

Overall, in terms of the project success rate to reach financial close, the private-led procurement (NERSA registered projects, not the Sasol – Air Liquide

programme) did better than BW6 under the government-led procurement with a 42,3% project success rate compared to the 33% achieved by the private-led procurement. The lag in the project rate in BW6 was attributed to challenges related to grid access (South African Government, 2024), and the lead for NERSA registered projects was attributed by the participants to agility, flexibility, and an unlevel playing field. D1 in referring to agility indicated that government-led procurement operates within strict timelines outlined in the detailed tenders, whilst private-led procurement is driven by agreements between off-takers and Independent Power Producers (IPPs), can proceed at a much faster pace. This disparity has led to instances where private sector projects, in BW6, have secured a substantial portion of grid capacity, especially in the Western and Eastern Cape. Government projects, often constrained by the requirement to first obtain "preferred bidder status," were unable to compete effectively for these grid connections. Whilst referencing agility on the part of private-led procurement, E3's perspective empathized with the government-led procurement insinuating dirty tricks on the part of private projects as per quote: "So if I'm in the private space, I would know that there is a current window being evaluated, I will run and grab that capacity before they announce those bidders. Right? By the time they announce, there's no capacity there, because projects in the space, they know each other. I know who I'm competing with. In my area, if I'm in private generation, and I'm connected to a particular substation, I will know who else is in that area…and it's targeting the government. I will make sure that I get my budget quote before he gets his preferred bidder status, then he is out. So that's one of the complications that they have. And I understand NERSA rejected that preservation of capacity for the government program. So, they can't reserve the capacity. You have to wait until the last day and see if there is capacity, and that nobody has taken it. So that created disturbance. So, the program is at risk, and it doesn't work well, given that problem."

Under theme 3 in Table 19 the project viability and feasibility of the private projects which reserve the grid is even questioned by participants and therefore perceive private procurement to have an unfair advantage due to an unequal playing field.

From the actions of the investors, investor sentiment on the basis of the no. of projects and project capacity, investors were keener on government-led procurement. This finding is concurred to by B1 who observed some players who had previously announced that they would no longer take part in the REIPPPP return to the REIPPPP in Bid Window 7.

While investors bidding for BW 6 in terms of capacity preferred solar PV (5550 MW) over wind (4116,4 MW), only 1000 MW of that solar PV capacity was awarded as Preferred Bidders, all located in the North-West and Free State provinces (see Table 25). Out of the 1000 MW only 360 MW (2 projects) reached financial close, located in North-West & Free State. Reasons cited for the delay of the other 4 Preferred Bidders being grid allocation. In comparison to the private-led procurement, there was less keenness for solar PV (2112,3 MW) than wind (2530,3 MW). The larger share of this solar PV capacity is located in Free State (625 MW), North-West (370 MW), and Mpumalanga (300 MW). Investors are looking into Free State & North-West provinces with increasing interest in terms of capacity compared to previous bid windows (Department of Mineral Resources & Energy, 2022), (DMRE IPP Office, 2024) and this may have led to reduce grid capacity as none of NERSA registered projects have reached financial close in those provinces. The 3 solar PV projects that have reached financial close under the private-led procurement are in Limpopo (2 projects), and border between Eastern Cape & Northern Cape (1 project). This finding therefore substantiates that of the other four BW6 Preferred Bidders who are also struggling to reach financial close in the North-West and Free State provinces.

For wind capacity (4116,4 MW) under BW6, none of it was awarded as Preferred Bidders due to grid constraints in the Cape provinces (Western, Eastern & Northern Cape) as they were all located there. In comparison to the private-led procurement, whilst interest from investors was about 2530,3 MW wind capacity, with a larger part in the Cape provinces, investors also ventured to Mpumalanga, Free State, Gauteng & Kwa-Zulu Natal. Out of that capacity, 8 projects reached financial close, 7 in the Cape provinces and 1 in Mpumalanga. This finding is aligned with the perceptions brought about participants with regards to the agility of private-led procurement to get ahead of government-led procurement.

Both government-led and private-led procurement models presented distinct advantages and disadvantages for investors. Government-led procurement, while aiming for transparency and equitable access, faces challenges with grid constraints, bureaucratic delays, and limited flexibility. This was evident in the BW6 program, where challenges in grid allocation limited the number of preferred bidder projects reaching financial close, and disqualified other from being awarded as preferred bidders. The standardized PPAs in government-led procurement offer some predictability and save time that would be spent with PPA negotiations, but the overall process can be disadvantaged if projects don't reach financial close.

Private-led procurement demonstrated agility and speed in some respects. The PPA negotiation also does slow down the process, but it may not be the case always that there are multi-international corporations negotiating and has a potential to be faster. Interestingly, investor sentiment, as evidenced by project numbers and capacity, initially favoured government-led procurement, with some previously hesitant investors returning to the REIPPPP. However, analysis of project locations and financial close rates reveals a more nuanced picture, as evidenced by the higher project rate for NERSA registered projects and for the Sasol-Air Liquide procurement. In addition, private wind projects, achieved higher success rates, particularly in the Cape provinces and Mpumalanga, due to speed and flexibility.

4.3.5 Conclusion pertaining to Proposition 2

The proposition that investor willingness to invest in IPPs in South Africa will decrease in the absence of government-guaranteed off-takers and government guarantees is partially supported by the findings.

While findings from the snapshot analysis acknowledge the feasibility for IPP investment in the absence of government guarantees, there is an emphasis on a strong and competitive market, clear regulatory dispensation, and a level playing

field highlights the important role of government in mitigating risks and encouraging investor confidence.

The findings from the case study further illustrate that the success of each model depends on various factors, including the specific project characteristics, the availability of grid infrastructure, and the appropriateness of regulatory frameworks. Therefore, while government guarantees may not be entirely necessary, a well-defined and stable policy and regulatory environment, coupled with a competitive and transparent market, is crucial to attract and sustain IPP investment in South Africa's IPP sector. This should include addressing grid constraints and ensuring a level playing field for all market participants.

5 CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

South Africa's power sector reforms are evident through the evolving electricity market shaped by a winding route of policy and legislative amendments for over two decades. Government objectives were to increase private sector participation in electricity generation and use integrated resource planning for decision-making when it comes to investment in new generation capacity infrastructure. The reliance on integrated resource planning for new generation capacity project investment decisions was reduced with the removal of the 100 MW licensing exemption threshold. The aim of this research was to investigate stakeholder perspectives on the relevance of integrated resource planning as a policy instrument to facilitate independent power producer (IPP) investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators. Furthermore, the willingness to invest in IPPs without a guaranteed off-taker and government was studied.

Sections 5.2 and 5.3 render conclusions of the study in relation to the posed research questions. How the findings of this study differ from the literature is explained in section 5.4. Recommendations are presented in section 5.5, followed by suggestions for further research in section 5.6.

5.2 Conclusions regarding research question 1 – Alternative Roles of Integrated Resource Planning

Whilst the removal of the 100 MW licensing threshold and the evolving market dynamics challenged the traditional role of the IRP and brought its relevance into question, stakeholders generally agreed that the IRP still holds value but needs a significant role amendment to remain relevant in the evolving South African electricity market. It was recommended that it take on a more strategic role, guiding long-term policy decisions, encouraging innovation, and influencing

investment decisions rather than its current role of facilitating the government-led procurement, i.e. the IPPPP. In fulfilment of proposition 1, it was recommended that it be adapted to be a flexible and frequently reviewed framework to effectively address the dynamic nature of the electricity market.

5.3 Conclusions regarding research question 2

The study found a multifaceted interplay of factors influencing IPP investment in South Africa.

Government guarantees, while historically important for de-risking IPP investments (especially with Eskom as the off taker), were found to be not always necessary. Eskom's consistent payment record has contributed to investor confidence. However, Eskom’s payment record may be attributable to pressure from National Treasury that keeps a careful eye on SOC conduct that might undesirably trigger government guarantees (all of the Government procured IPPs have government guarantees). Should those guarantees fall away it is not certain that Eskom would maintain its good payment record, given its parlous financial situation.

The success of private-led procurement demonstrates growing investor confidence. While risks like off-taker default and financing challenges exist without guarantees, and specific projects may still require them, alternative solutions like market restructuring and transparent tariffs are key to attracting investment.

Social obligations and local content requirements, while common in government-led IPP procurement, don't generally deter investors, who simply factor the costs into their bids. While concerns exist about the effectiveness of these initiatives and the potential for social division if they're removed in private procurement, the feasibility of local content, especially in sectors like solar, is also questioned due to international competition.

Initially, investors preferred government-led projects, but this analysis showed that private projects, especially wind, reached financial close faster than

government-led projects under BW 6 Therefore, both approaches have pros and cons, and the optimal choice depends on the specific project and context.

The absence of a guaranteed off-taker and government guarantees is not necessarily a determining factor in IPP investor preference for private procurement of power generating capacity. Also, social obligations do not necessarily deter IPP investment in the government-led procurement. The overall market environment plays a crucial role. A well-functioning and competitive market, supported by clear policies, transparent regulations, and efficient grid management, is essential for attracting investment. The shift towards private-led procurement and the increasing number of projects registered with NERSA demonstrates a willingness to invest in the absence of traditional government support, provided that the market offers sufficient stability and opportunity.

5.4 Difference between research findings & literature review

The key differences that emerged between the findings of this study and the reviewed literature on IPP investment were found to be IRP flexibility, government guarantees, and PPA duration. Each of these is discussed in turn.

IRP Flexibility: The reviewed literature acknowledged the need for adaptability (e.g., in the US context), however, the specific emphasis in the current findings, on the need for frequent and agile IRP updates for the short-term, alongside a long-term policy directive plan is a differentiating factor from the literature reviewed.

Government Guarantees: The literature emphasizes the crucial role of government guarantees in mitigating risk and attracting IPP investment, especially in developing countries with state-owned off-takers (AEAI, 2003; Aslan & Irwin, 2020; Badissy et al., 2020). Guarantees were seen as essential for enhancing project bankability and ensuring payment security. This study contradicts the view that government guarantees are essential for South African independent power producers (IPPs). Eskom's reliable payment history, even with its financial struggles, and successful private PPAs without guarantees show growing investor confidence. While guarantees might still be needed in some

cases (e.g., new technology or bankrupt off takers), the market is proving it can operate without them, demonstrating its increasing maturity and acceptance of market risks.

PPA Duration: The referenced literature favoured long-term power PPAs, typically lasting 20-30 years, for IPP projects, especially when selling electricity to state-owned utilities (AEAI, 2003). These extended PPAs offer predictable revenue streams, making it easier for projects to secure financing. This research shows a shift towards shorter PPAs of 3-5 years in the private sector, mainly because off takers prefer them in an evolving market. This preference means energy traders are becoming important players in the South African electricity market.

Table 28: Consistency table: research questions, conclusions and contribution to knowledge

RQ #	State Research Question	State literature-based proposition	State conclusion or answer based on own research	Highlight key differences between your initial propositions / hypotheses and your findings – this is your contribution to knowledge
1	What are the recommended alternatives or amendments to the role of integrated resource planning given the removal of the 100 MW licensing threshold?	Integrated resource planning in South Africa needs to be adapted to a more flexible and market-oriented approach, to better suit the evolving electricity market.	the IRP still holds value but needs a significant role amendment to remain relevant in the evolving South African electricity market. It was recommended that it take on a more strategic role, guiding long-term policy decisions, encouraging innovation, and influencing investment decisions.	The need for frequent and agile IRP updates for the short-term, alongside a long-term policy directive plan.
2	What is the impact of the absence of a government guaranteed off-taker government guarantees, avoidance of local content and social	In the absence of a government guaranteed off-taker and government guarantees, investor willingness to invest in Independent Power Producers (IPPs) in	The absence of a guaranteed off-taker and government guarantees is not necessarily a determining factor in IPP investor preference for the private procurement. Also, social obligations do not necessarily deter IPP	Government guarantees are not essential for South African IPPs save for new technology and bankrupt off takers. Short term PPAs are bankable in the presence of traders.

RQ #	State Research Question	State literature-based proposition	State conclusion or answer based on own research	Highlight key differences between your initial propositions / hypotheses and your findings – this is your contribution to knowledge
	policy obligations on investor willingness to invest in Independent Power Producers (IPPs)?	South Africa will decrease.	investment in the government-led procurement. The overall market environment plays a crucial role. A well-functioning and competitive market, supported by clear policies, transparent regulations, and efficient grid management, is essential for attracting investment. The shift towards private-led procurement and the increasing number of projects registered with NERSA demonstrates a willingness to invest in the absence of traditional government support, provided that the market offers sufficient stability and opportunity.	

5.5 Recommendations

Based on the conclusions of this study, the following recommendations are made for the policymaker, specifically the newly established Department of Electricity & Energy:

5.5.1 Adaptation of the IRP

- The IRP should be categorized into two types: an annual IRP serving as a short-term plan and an indicative Policy Directive IRP functioning as a long-term plan.
- The Medium System Adequacy Outlook, published annually by the NTCSA, should be elevated to the status of a short-term plan. It should be designed to:
    - Inform market participants of the supply and demand gap.
    - Assess market behaviour in terms of the energy mix.
    - Determine the power system requirements.

5.5.2 Expedited Implementation of the Electricity Regulation Amendment Act:

The findings of the second research question emphasized the need for a robust and competitive electricity market characterized by clear regulatory frameworks and a level playing field for all market participants. This is key for minimizing risks, encouraging investor confidence, and ultimately ensuring the success of Independent Power Producers (IPPs) in South Africa. The case study analysis further highlighted that the success of each IPP model is contingent upon various factors, including the specific project characteristics, the availability of grid infrastructure, and the appropriateness of the regulatory environment. While government guarantees may not always be necessary, a well-defined and stable policy and regulatory environment is paramount to attract and sustain private

investment in the IPP sector. This necessitates addressing grid constraints and ensuring fair competition among all market players, and this can be achieved through existing legislation, i.e. the Electricity Regulation Act, 2006 and the Electricity Regulation Amendment Act, 2024

The Electricity Regulation Amendment Act, 2024 was effective from January 1, 2025, making provisions for an open competitive market, the establishment of the Transmission System Operator SOC Ltd, and procurement of transmission infrastructure among others. It is recommended that policymakers expedite implementation of these provisions in the Amendment Act.

Development of Regulations for a Competitive Market: The policy maker is recommended to develop regulations to promote a competitive market by invoking the provisions in Section 35 of the Electricity Regulation Act, 2006. Section 35(4) which empowers the Minister to develop regulations regarding:

- "(m) *the participation of the private sector in new generation activities*;
- (o) *the prohibition of certain practices in the electricity supply industry;*
- (p) *the criteria for or prohibition of cross-ownership or vertical and horizontal integration by licensees in generation, transmission and distribution assets;"* (Republic of South Africa, 2006, p. 17)

The development of the abovementioned regulations will contribute to an enabling regulatory dispensation for a competitive market which would:

- provide clarity on private sector involvement in power generation,
- prohibit anti-competitive practices, and
- restrict cross-ownership or vertical integration to prevent market dominance.

Such measures will create a level playing field, enhance investor confidence, and minimize risks for IPPs.

Establishment of the Transmission System Operator (TSO): The Electricity Regulation Amendment Act, 2024 mandates the creation of the Transmission System Operator (TSO) SOC Ltd. It is recommended that the establishment process commence promptly. It is preferable that TSO SOC Ltd is an independent entity separate from Eskom Holdings, as Eskom generators are market participants. This independence will promote competition and ensure fairness, allowing the market operator to function objectively in fulfilling its responsibilities (Energy Knowledgebase, n.d.). This recommendation is also directly related to encouraging a robust competitive market.

Procurement of transmission infrastructure: Recognizing grid access as a barrier to the development of new generation capacity, and this was flagged as a risk by the Draft IRP 2023 as 14000km of new transmission grid is required by 2032 (Department of Mineral Resources & Energy, 2024). The Amendment Act allows the Minister to procure transmission infrastructure to facilitate private sector participation in building capacity and enhancing grid accessibility. To this effect, the IPPO has issued a request for information for Independent Transmission Projects.

These recommendations aim to enhance the effectiveness and efficiency of the integrated resource plan and IPP investment by fostering a competitive and accessible electricity market.

5.6 Suggestions for further research

This research was conducted to investigate the relevance of integrated resource planning and the willingness to invest in independent power producers in the absence of guaranteed off takers and government guarantees. As such, government-led procurement was compared to private-led procurement to assess investor preference. For government-led procurement, Bid Window 6 was

used, and for private-led procurement, NERSA-registered projects and the Sasol & Air Liquide procurement were used as proxies to understand some elements.

Further research could be conducted using Bid Window 7 for government-led procurement, as it featured reduced government guarantees.

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APPENDIX A: Participant Information Sheet (PIS)



Dear Sir / Madam,

My name is Mvumikazi Vimbani. I am a student doing Masters in Management in the field of Energy Leadership at the University of the Witwatersrand, Johannesburg. My supervisor is Prof. Roderick Crompton. I am conducting a research study about the relevance of integrated resource planning as a policy instrument to facilitate independent power producer investment in South Africa after the removal of the 100 MW licensing exemption threshold for generators. The study title is *Integrated Resource Planning and Independent Power Producer Investment in South Africa's Evolving Electricity Market*.

I am inviting you to take part in an interview. If you decide to take part, your participation in this research study will last about 45-60 minutes. The interview will take place at online at a time convenient to you.

With your permission, I would like to audio record the interview. This data will be stored in a password protected laptop and deleted after 5 years. Only the researcher will have access to the data.

During the research activity, I will need to ask for some personal information about you, including qualifications obtained, and work experience

The interview will be confidential and anonymous. When I share the results of the research study, I will not include your name or anything else that could identify you.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits or rights you would normally have if you decide not to join. Taking part in the research study will not cost you anything. You will not be paid for being in this research study.

The risks for this research study are no more than what happens in everyday life.

This research study will be written up as a research report. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,
Mvumikazi Vimbani

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APPENDIX B: Participant Consent Form

Title of project: Integrated Resource Planning and Independent Power Producer Investment in South Africa's Evolving Electricity Market.

Name of researcher: Mvumikazi Vimbani

I, ……., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that my participation in the study is voluntary.	YES	NO
I understand that I am free to withdraw from this interview at any time.	YES	NO
I agree that the interview may be audio recorded and transcribed.	YES	NO
I agree that direct quotations from my interview may be used by the researcher in their research report.	YES	NO
I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report.	YES	NO
I agree that other researchers may use the information I provide in my interview (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on.	YES	NO

…… (signature)
…… (name of participant)
…… (date)

…… (signature)
…… (name of researcher/person seeking consent)
…… (date)

APPENDIX C Instrument

1. Introduction

1.1. Greetings

1.2. Request permission to record.

1.3. Interview outline: This interview is broken down into 5 segments:

- Introductions and background, where I will formerly introduce myself, highlight the objectives of this research study, and request a formal introduction from yourself.
- South Africa’s Electricity Market
- Integrated Resource Planning
- Recommendations on the role of integrated resource planning
- IPP investment
- Conclusion

2. Introduction and Background

2.1. Researcher introduction

2.2. Research aim: This research aims to understand the role of Integrated Resource Planning (IRP) in South Africa's evolving electricity market.

2.3. Participant introduction:

- Briefly describe your educational background and career experience (including the number of years) in the South African electricity supply industry (ESI).
- In your experience, has your work been impacted by integrated resource planning? Or what kind of encounters have you had with integrated resource planning in your experience?

3. South Africa's Current Electricity Market

3.1. In your view, how has the South African electricity market changed in recent years, particularly regarding private sector participation in generation (also considering the recent removal of the 100 MW licensing exemption threshold for generation facilities)?

3.2. How do you think this change affects the dynamics of the electricity market, particularly for IPPs?

4. Integrated Resource Planning

4.1. Can you explain the traditional role of IRP in facilitating private sector investment in South African power generation?

4.2. Given the recent changes in the market, do you believe the current IRP framework is still effective in promoting private sector participation?

5. Recommendations on the role of integrated resource planning

5.1. Given the evolving market structure and the rise of alternative investment models for IPPs, do you believe the current IRP approach is still relevant for facilitating private sector participation in generation? Why or why not?

5.2. If you believe IRP needs adjustments, what specific changes would you recommend to make it more effective in the current market context?

5.3. Are there alternative mechanisms, besides IRP, that could be explored to promote successful investment in the IPP market? If so, can you elaborate?

5.4. Considering the emphasis on competition in the ESI's Energy White Paper, how can IRP policies be adapted to be more consistent with a market-driven approach to generation investment?

5.5. Do you think there would be any value in utility or IPP developed IRPs?

- If yes, does South Africa have sufficient skills to develop IRPs at such as scale?

6. IPP investment

6.1. What are your thoughts on IPP investment in the absence of government guarantees?

6.2. Do you have any suggestions for encouraging IPP investment in the current legal dispensation?

7. Conclusion

7.1. Do you have any additional comments or insights on the future of IRP in South Africa's electricity market?