Perceptions of Senior Bankers on the Role of South African Banks in Large-Scale Renewable Energy Projects

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A Dissertation presented in partial fulfilment for the Degree of Master of Management: Energy Leadership to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

Oct 2025

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DECLARATION

I Kabo J Nkoana declare that this research report entitled ‘Perceptions of Senior Bankers on the Role of South African Banks in Large-Scale Renewable Energy Projects” is my own unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Management: Energy Leadership at the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.

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Signed at Johannesburg on 28 October 2025

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the almighty God for instilling a sense of desire to embark on this masters journey. Thank you to my husband, Zwelihle Mkhize, for his unwavering support and encouragement throughout my research journey. Your belief in me has been a constant source of motivation, and your patience and understanding has been invaluable. To my mother, Evelyn and late father, Matome, thank you for teaching me the value of hard work and perseverance. To my siblings, thank you for always being there to cheer me on and for your endless support.

I am also grateful to my supervisor, Prof. David Coldwell, and Dr Bruce Young, the Programme Director: Master of Management in the field of Energy Leadership at the Africa Energy Leadership Centre ('AELC'), for their guidance, mentorship, and insightful feedback. Your expertise and dedication have been instrumental in shaping this research. Thank you for your patience, for challenging me to think critically, and for providing me with the tools and opportunities to grow as a researcher.
Lastly, thank you to the energy finance professionals who took the time out of their busy schedules to participate in this study. Your expert insights have certainly added to the body of knowledge in the energy financing field.

This work would not have been possible without the support and encouragement of my family, supervisor and energy finance professionals who participated in the study. Thank you for believing in me and for being a part of this journey.

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ABSTRACT

South Africa's urgent need to address its energy crisis and meet climate goals is heavily dependent on private capital for large-scale renewable energy projects. However, the perspectives of commercial banks - the key financiers - are not fully understood. This study explores the perceptions of senior bankers on the role of South African commercial banks in financing large-scale renewable energy projects. The study was motivated by South Africa's ongoing electricity crisis, Eskom's financial constraints, and the urgent need for private capital to enable renewable energy expansion.

Using a qualitative, phenomenological design, semi-structured interviews were conducted with purposively selected senior bankers involved in renewable energy financing. The study adopted Green Finance Theory and Institutional Theory as conceptual lenses. The data were analyzed using thematic analysis. The findings reveal that clear and stable government policy, such as the Integrated Resource Plan (IRP) and Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), is perceived as the most critical enabler for investment. Banks mitigate risk through established project finance structures, while Environmental, Social, and Governance (ESG) criteria are being progressively integrated into their investment decisions. However, significant barriers, particularly grid capacity constraints and regulatory ambiguity, are identified as major impediments to accelerating the energy transition. In summary, commercial banks view themselves as important actors in financing; thus, influencing policy, regulatory compliance, and project bankability remain critical barriers.

This study contributes a nuanced understanding of the commercial banking sector's role, providing a framework of the drivers, criteria, and challenges that shape the financing of renewable energy in South Africa. The research offers valuable insights for policymakers, project sponsors, and financial institutions aiming to close the country's energy funding gap.

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Dissertation title: Perceptions of Senior Bankers on the Role of South African Banks in Large-Scale Renewable Energy Projects

Johannesburg, 25 October 2025

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Abbreviations/Acronyms

Bn	Billion
CCS	Carbon Capture Systems
DBSA	Development Bank of South Africa
DFI	Domestic Financial Institutions
GF	Green Finance
GHG	Green House Gasses
IFI	International Financial Institutions
IMF	International Monetary Fund
IPP	Independent Power Producer
ISMO	Independent System and Market Operator Bill
IRP	Integrated Resource Plan
JET	Just Energy Transition
JI	Joint Implementation
LCOE	Levelized Cost of Electricity
LS-REP	Large-scale Renewable Energy Project
MDG	Millenium Development Goals
MW	Megawatts
NDC	Nationally Determined Contribution
PF	Project Finance
PPA	Power Purchase Agreement
RE	Renewable Energy
REIPPP	Renewable Energy Independent Power Producer Procurement Programme
SA	South Africa
SSA	Sub-Saharan Africa
UNFCCC	United Nations Framework Convention on Climate Change

1. CHAPTER 1: INTRODUCTION

1.1. Introduction

The research report examines the contribution of South African commercial banks to financing large-scale renewable energy projects in the backdrop of the current electricity crisis, fiscal limitations, and the motivation for the low-carbon development pathway in the country. The report assesses the personal views of the top banking executives on their organizational and strategic role in implementing renewable energy sources, and the characteristics that facilitate and drive successful involvement in this industry. The report analyses these perceptions using the qualitative research design based on semi-structured interviews and contextualizes the results within the existing theoretical and policy framework. The subsequent chapters are used to state the research problem, conduct a literature review, define the methodology, provide the results, and construct the conclusions and recommendations on the basis of the empirical evidence.

1.2. Purpose of the Study

The proposed study has explored the subject of renewable energy finance, as it pertains to large-scale renewable energy projects in South Africa. For this study, a “large-scale” renewable energy project is considered as a government or commercial project with a generating capacity equal to or above 100 MW (Vidaurre, 2017).

The objective of the study the researcher pursued was:

> *To identify the key elements of the role of commercial banks in the delivery of large-scale renewable energy projects in South Africa.*

These key elements were identified by examining the perceptions of selected employees from two South African commercial banks. Given their roles within the banks concerned, the selected employees were expected to provide a knowledgeable viewpoint. Accordingly, this study is expected to have immediate practical implications for renewable energy financing in South Africa and possibly the Sub-Saharan Africa region. It is also expected that there would be lessons that could be drawn from the perspective of renewable energy financing in developing economies.

Considering the research problem, which is stated in the sections following, as well as the literature that has been reviewed, the qualitative research paradigm was adopted. Evidence was collected via semi-structured interviews, and participants were sourced from a group of employees in the South African commercial banks(Yin, 2014). The respondents were selected in a focused and purposeful manner in line with the nature of the research.

The data collected from the interviews were analysed and presented thematically, with reference to attributes that were key to the research. These attributes are discussed in further detail in the literature review below. The research approach was exploratory, designed to highlight some key and initial considerations into the topic being studied. Therefore, any further questions that may be deemed necessary to be investigated beyond the initial presentation of the bankers' perceptions have been left for future research.

1.3. Context of the Study

Whilst South Africa is a developing country, it has a highly developed financial market and an energy-driven economy (Bekun et al., 2019; International Monetary Fund, 2022). It is also considered the most industrialized economy in Africa (International Energy Agency, 2022). These attributes have, however, not been attained without causing harm to the environment due to the country being one of the main emitters of greenhouse gases (GHG) in the world (Bekun et al., 2019). Notwithstanding its seemingly unique attributes relative to the rest of the African continent, South Africa also shares some similarities with its African counterparts. Among these is an urgent need for investment in renewable energy (International Energy Agency, 2022).

The characteristics highlighted above, alongside the country's sustainable development objectives, present South Africa as an ideal case to study, to gain insights into how the financial sector is equipping itself to meet the needs of the green energy economy (Department of Energy: Republic of South Africa, 2019b). Such a study presents an opportunity to extract lessons and identify opportunities for improvement. Financing a green economy in a country such as South Africa is a delicate balancing act between the pursuit of green energy and socioeconomic developmental targets. As responsible corporate citizens, South African banks are important role players in this balancing act.

The green economy has generally been understood as an alternative means for advancing a society's growth and development while strengthening commitments to long-term environmental sustainability (Talberth, 2011). Moreover, financial development has an impact in advancing a country's green economy (Ji & Zhang, 2019). Given the increasing importance of renewable energy in enhancing sustainable development goals, it is critically important that financial development be pursued as a means of achieving the renewable aspirations of nations(Kaluba, 2018).

1.4. Renewable Energy Finance

Renewable energy finance is emerging as a distinct and rapidly developing field in project finance (Krupa et al., 2019). Given the increasing significance of renewable energy in the global economy, as well as the ongoing discourse on climate change, it is imperative that the role of financial institutions be strengthened so that they can play a meaningful role in sustainable energy transitions. Finance is one of the important enablers of renewable energy projects (Geddes et al., 2018). As stated above, South Africa's unique mix of developmental challenges, energy requirements, and globally integrated financial markets position the country as a useful subject of study, from which lessons can be extracted for application in other regions, regarding the role of finance in energy transitions.

The definition of "renewable energy finance" is subtle and should not be used interchangeably with "climate change finance" without the necessary qualifications. Climate change finance may be understood as the financing of climate change adaptation or mitigation efforts (Mungai et al., 2022). Climate change adaptation refers to measures taken by communities to contend with the effects of climate change that are already ongoing, while climate change mitigation refers to the measures that are adopted to reduce the effects of climate change (Laukkonen et al., 2009). For example, the planting of mangrove trees along a coastal area, to protect communities from sea level rise, is an example of a climate change adaptation project (Chow, 2018).

Depending on the context, the adoption of renewable energy may either be a climate change mitigation or an adaptation strategy which is something that should be explained and clarified whenever renewable finance is being discussed. Renewable energy sources including solar, wind, hydro, biomass and geothermal energy offer an alternative to conventional thermal energy and are a crucial adaptation strategy in curbing GHG. This is particularly true in economies that rely on fossil fuels for their energy needs (Suman, 2021).

1.5. Sub-Saharan Africa and Renewable Energy

While the global world economy continues its recovery following the economic devastation caused by the COVID-19 pandemic, the IMF predicts that global economic growth will be muted at 3.3% in 2025 and 2026 respectively (2024: 3.1%) which is below the 3.8% historical average (2000-2019). Growth in emerging or developing market economies is expected to be 4.2% in 2025 while advanced economies are predicated to see lower growth rates of 1.9% for 2025 (IMF, 2023a).

A significant proportion of the world's fastest growing economies are in Sub-Saharan Africa (African Development Bank Group, 2014). The conspicuous exception is South Africa, whose economic growth is stifled by the current account deficit, delays in implementing structural economic reforms to promote growth, corruption, inefficiencies in state organizations, and weak governance (Thakoor, 2020). Notwithstanding its recent ascension to the top position on the list of the largest economies in Africa by GDP, South Africa's economic growth in 2025 is not expected to exceed 1.5% (Bloomberg, 2024; IMF, 2023a).

Notwithstanding the encouraging progress that the continent has made, it remains far from realizing its full potential and has much work to do when it comes to societal progress. Many of the world's heavily indebted poor countries (HIPCs) are in Sub-Saharan Africa, and struggle with crippling debt and debilitating interest payments and penalties (Akam et al., 2021; World Bank Group, 2018).

Debt relief initiatives by the World Bank's HIPC debt relief initiative had past success, however, post the 2020 context, it has offered limited relief for low-income qualifying countries. Debt levels after being restructured are rising again, limiting these countries' ability to finance growth and development (Essers & Cassimon, 2023). For the most part, Africa is not on course to meet the United Nations Millennium Development Goals ('MDGs') by 2030 (Adenle, 2020). It should nonetheless be noted that the debate as to how to measure the success of failure of MDGs is ongoing. In particular, the impact of renewable energy, especially solar energy technologies, have not been quantified, and the low penetration of solar energy projects in developing nations, particularly those in Africa, may have contributed to the absence of performance evaluation (Adenle, 2020).

Among other things, the MDGs include the promotion of environmental sustainability and the eradication of extreme poverty and hunger. Despite Africa's natural endowment, the continent has been unable to maximize the consumption of its own oil, uranium and other fossil fuel resources (Adenle, 2020). The consequent lack of energy, security and access to energy has been one of the many challenges that stand in the way of Africa's ability to meet its MDG targets. At the 2023 Africa Energy Forum which was attended by Energy Ministers, policymakers, exhibitors, and energy experts from around the world, discussions highlighted that Africa has the potential for large scale deployment of renewable energy. Nevertheless, such deployment would require political will, the presence of financially viable projects, and the backing of supportive regulatory frameworks, which all would work together to propel a sustainable energy transition (Mwirigi, 2023). Therefore, the absence of the political will, financially viable projects, and supportive regulatory frameworks may threaten the very survival of the continent, as well as its economic development (Mwirigi, 2023).

With the needs of poor Africans remaining unmet across the continent, it has been proposed that renewable energy be used to support Africa's development by promoting energy security, economic growth and an improved quality of life (Nsafon et al., 2023). So strong is the importance of renewable energy that the Forum for Energy Ministers in Africa resolved upon a set of targets, which include accelerating the adoption of clean energy and improving access to energy for productive activity (Nsafon et al., 2023).

Despite its significance, the transition towards modern energy is but one of several energy transition paths that African countries could follow, based on their needs and specific circumstances (Department of Energy: Republic of South Africa, 2019b). These energy transition paths are not necessarily mutually exclusive. Also, while they go by different names, several of them in fact are quite similar, if not the same. Examples of other energy transition paths include the just energy transition; sustainable energy transition; and others (Heffron & McCauley, 2018; Steg et al., 2018). Africa remains open not only to the modern energy transition path but also the just energy clean energy and sustainable energy transition paths (Dominković et al., 2018). Renewable energy remains a feature of more than one of these paths.

Developmental objectives are multi-dimensional in nature and incorporate economic, social, local and global sustainability dimensions (Ruggerio, 2021). Mutezo and Mulopo (2021) argue further that improving electricity access needs to be done in tandem with protecting the environment and taking climate change into account. Africa's search for "clean energy" and "green growth" is now underway, and Africa is currently going through an unprecedented energy transition (Gu et al., 2018).

1.6. Africa's role in mitigating climate change

Africa can play a significant role in decreasing the negative consequences of climate change on achieving the SDGs. Moreover, implementing effective mitigation strategies across the continent is imperative, given their critical importance for several reasons. Firstly, the inclusion of Africa would promote international cooperation. Secondly, Africa would not become dependent on high-carbon-emitting energy sources. Thirdly, without mitigation measures, Africa would become a significant source of carbon emissions by the turn of the century (Schwerhoff & Sy, 2017).

1.7. Renewable Energy and the Challenge of Unreliable Electricity Supply in South Africa

South Africa not only looks to renewable energy as a potential solution to some of its current electricity challenges (Department of Energy: Republic of South Africa, 2019b); but it also views renewable energy as an important part of its envisioned energy future (Department of Energy: Republic of South Africa, 2019b). South Africa has an electrification rate of approximately 85%, with over 90% of the population having access to electricity (Niselow, 2019a; Oji et al., 2016). Despite this, the country's energy supply is inadequate to drive economic growth and development. South Africa's state power utility, Eskom, supplies 95% of the country's electricity consumed (EE Publishers, 2019).

Nonetheless, it has struggled to meet South Africa's energy demand for years, and the country's crippling power shortages are well documented (Kessides, 2020).

These challenges are attributable to a number of factors, including inadequate generating capacity (EAF of below 60% in recent years); and the de-rating of the Medupi and Kusile power plants below their name-plate rating (Department of Energy: Republic of South Africa, 2019b). Moreover, aging plants are prone to breakdowns (Kessides, 2020); and significant financial and operational shortcomings. Eskom's unsustainable debt of ~R440bn and ballooning municipal debt exceeds ~R70bn as at 30 September 2024, added to this is deeply rooted corruption and policy uncertainty (Eskom, 2023). As a result, South Africans have had to contend with severe frequent load-shedding since it was first experienced in 2008 (Niselow, 2019a).

The adverse impact of a complex global economic landscape cannot be ignored. In addition to complex global economic factors impacting the country, the South African power crisis has exacerbated the nation's economic challenges in various ways (National Treasury: Republic of South Africa, 2019). The power utility remained the biggest threat to the South African economy for several years (Kruger, 2019). This is not only because Eskom cannot support the economy's electricity demands, as stated above, but it is also because it cannot support its own operational finance and debt repayment requirements (Eskom, 2019; Kruger, 2019). To further highlight the seriousness of the situation, South Africa's credit rating has been downgraded and continues to be threatened by Eskom's burgeoning debt. This is due to the guarantees the state has provided to financial markets to enable Eskom to borrow funds and also because of the direct financial support that Eskom requires from the state to stay afloat (Kruger, 2019). The World Bank believes that South Africa's economy would not be able to survive the failure of Eskom (Niselow, 2019b). This places national government in a difficult position where it cannot free itself of the obligation to support the power utility.

The South African economy experienced the longest downward cycle in the country's history in the period leading to March 2020 (Naidoo & Goko, 2019). The last time South Africa grew at a rate higher than 4% was in 2007 (The World Bank, 2019). The South African economy remains stagnant, having narrowly escaped a recession in Q4 of 2023 and closing in on year-on year GDP growth of 0.8% for 2024 (Statistics SA, 2024). The

National Treasury expects that the country's economic growth rate will be an estimated at 1.6% over the next three years. This is modest compared to global economic recovery which has been forecast 3.3% for 2025. However, by putting renewable energy at the core of the economic recovery plan, South Africa has an opportunity to accelerate its energy transition.

In August 2021, Eskom made a commitment to spend R106 billion on renewable energy projects (Sguazzin, 2021). This investment plan comes as a bold step to support South Africa's SDG goals of diversifying away from the GHG-emitting coal as the main energy source, and as the power utility looks to repurpose its ageing coal power plants (Sguazzin, 2021). Securing support from financial institutions could be one of the biggest barriers to Eskom achieving this, considering Eskom's heavily indebted balance sheet (R440 billion).

1.8. The Envisioned Future of Reduced Carbon Emissions

As one of the high-energy consumption countries on the continent, the electrification and development of South Africa came at the expense of high carbon emissions (Bekun et al., 2019) (Nsafon et al., 2023). The country's industrialization has been driven by cheap and abundant coal, which remains a significant component of the energy mix, providing approximately 77 per cent of primary energy needs (Department of Energy: Republic of South Africa, 2019a). Menyah and Wolde-Rufael ((Buchanan & Jones)) found a correlation between South Africa's economic growth during the period between 1965 and 2006 and high carbon emissions. Their evidence also showed that that the country, which has high energy carbon emissions relative to the size of its economy, may have to choose between economic growth or lower carbon emissions.

Despite a stated objective to transition towards a low-carbon economy, South Africa's Integrated Resource Plan remains tied to coal to a significant degree, least of all due to practical, timing and Just Energy Transition ('JET') considerations (Department of Energy: Republic of South Africa, 2019b). Despite this coal burden, the IRP does recognize the world's pivot towards renewable energy (Department of Energy: Republic of South Africa, 2019b). While coal remains dominant as an energy source in the medium term, potential renewable energy solutions such as wind, solar PV and gas are considered for the period leading up to 2030, while the associated infrastructure costs remain a key factor

(Department of Energy: Republic of South Africa, 2019b). Renewable energy is seen as not only a pathway towards a low-carbon economy, but also as a potential solution to Eskom's challenges as discussed above (Department of Energy: Republic of South Africa, 2019b).

1.9. Renewable Energy and Financial Markets

Renewable energy projects may be categorized as falling under environmental infrastructure projects, which means that financiers involved with such projects would use funding mechanisms to finance such projects (Lalon, 2015). Finance is one of the important enablers in the implementation of renewable energy projects, taking into account the high costs to set up renewable energy plants and the high level of technical skills required (Mungai et al., 2022). Green finance, as the specialized area of finance focusing on renewable energy, is known to be crucial in supporting development and therefore needs to be given sufficient attention as an enabler of renewable energy projects(Mungai et al., 2022). Ji and Zhang (2019) highlight the importance of finance in enabling economic development, while (Michaelowa et al., 2021) concludes that finance is important in advancing renewable energy. Renewable energy projects are therefore paramount in sustainable development and would be a key enabler to unlocking and turning the tide of South Africa's energy transition and economic growth.

SSA and the rest of the world are still grappling with the financial, institutional and legal mechanisms of green finance and the role that it will play in the sustainable economies of the future (Choudhury et al., 2023). By and large, countries are still experimenting with various mechanisms and structures for financing renewable energy projects. For example, OECD countries are known to have experimented with special repayment terms for renewable energy borrowers. Chirambo (2018) argues that SSA still needs to develop and implement similar financing and delivery strategies to support renewable energy projects. This need may be seen on the reading of South Africa's IRP, in which it is clear that the implementation of new energy solutions is to be considered on a “least cost basis” and which also recognizes the high cost of renewable energy infrastructure (Department of Energy: Republic of South Africa, 2019b).

1.10. Conclusion

The study context, rationale, aims, and structure have been established in this chapter based on the premise of the research problem, which is the existing electricity and energy financing issues in South Africa. The chapter has shown that South Africa is in urgent need to increase the adoption of renewable energy, but the financial resources of the state (and especially Eskom) are limited, which makes commercial banks the key players in bridging the gap in investment. The paper hence aims at understanding the perceptions of senior bankers regarding their role in funding large-scale renewable energy projects, what factors determine their involvement, and what are the implications of these perceptions on policy and practice. In the following chapters, the literature available in terms of both the theory and empirical evidence is reviewed, the approach to the research is outlined, the results of the study are presented, and conclusions and recommendations are drawn using the evidence obtained.

2. RESEARCH CONCEPTUALISATION

2.1. Problem Statement

South Africa's current electricity supply is unreliable. The power supply is characterized by frequent rolling blackouts, which hinder economic growth and development. Eskom, which supplies much of the electricity in South Africa, undertook a new build programme (Generation) which to date has failed to stabilize the power supply.

Since the new build programme was undertaken, Eskom's financial position has worsened, with its debt and monies owed by municipalities to Eskom escalating to ~R440bn and R70bn respectively, thus putting pressure on the utility's solvency, liquidity and ability to honour debt repayments. The utility remains operationally inefficient, cash flows generated from operations are insufficient to service the debt obligations, and it continues to struggle with generation capacity (Eskom, 2023). Eskom's Energy Availability Factor (EAF) has continuously failed to operate at the 70% target, with load shedding intensifying to higher stages (Eskom, 2023).

In an effort to address the unsustainable debt levels, the National Treasury extended a debt relief of R254bn over three years (National Treasury: Republic of South Africa, 2023).

This was expected to provide much needed liquidity to Eskom and cover Eskom's debt repayment over the next three years. The support was in the form of a subordinated loan (ranks behind other lenders) (Eskom, 2023). Upon compliance with the related conditions, the loan may be converted to equity (Eskom, 2023). Below are some of the conditions of the loan which are measured quarterly (National Treasury: Republic of South Africa, 2023):

- Eskom's capital expenditure being restricted to transmission and distribution - no greenfield generation capital projects allowed.
- Proceeds from sale of non-core assets for capital are prohibited from being used for capital and operating needs.
- No new borrowings are permitted without the written consent of the finance minister. Eskom reported that it is permitted to drawdown on available existing facilities.
- Eskom's guarantee for the R350bn facility will reduce in line with National Treasury recommendations.
- Positive equity balances in Eskom's derivative contracts cannot be used to structure new loan agreements; and
- Remuneration adjustments that may negatively impact Eskom's financial position and sustainability are prohibited.

According to the National Treasury, this debt relief is being undertaken in the context of broader electricity reform which has been in implementation, albeit at an extremely slow pace since the Energy White Paper was first published in 1998 (National Treasury: Republic of South Africa, 2023).

However, the government-initiated efforts to reform the electricity supply industry (ESI) have been futile. The Department of Minerals and Energy in 2003 established the Electricity Distribution Industry Holdings, the sole purpose which was to enable the reform of the ESI in accordance with the Energy White Paper and subsequent cabinet endorsements (Tsenoli L, 2010).

In 2012, the government published the Independent Systems and Market Operator Bill. The Bill sought to end Eskom's monopoly by introducing an Independent Systems and Market Operator (ISMO). This was to assume ownership over the national electricity grid and act as the main purchaser and distributor of electricity from producers (Mazzone N, 2019). Though well intended, both these efforts were abandoned due to policy indecision and misalignment within the ruling party further delaying much needed reform of the ESI to the detriment of economic growth and development of the nation.

Notwithstanding the pending and numerous bills to reform the ESI, Eskom remains a monopoly. In addition to the utility's financial woes, it continues to grapple with:

- Skills shortage, where highly experienced staff who either retire or resign from Eskom have been replaced by less experienced staff leading to ineffective operation and longer downtime at power plants as critical skills must be outsourced,
- High incidents of vandalism and theft to key distribution infrastructure which often leaves communities with extended power outages thus further threating security of supply,
- Deeply rooted corruption within the organization,
- Delayed market reforms. It was only in June 2021 that the SA President announced the 100MW license-exemption (previously the DME set the cap at 10 MW) for independent generators and introduced a proposal for a feed-in tariff for self-generating households and businesses. This is a positive step to encourage investment in embedded generation and to alleviate pressure off Eskom.

Much of the electricity generated by Eskom (~80%) is from coal which is a high GHG emitter (Pierce & Le Roux, 2022). Renewable Energy is therefore seen as an answer to address the power supply challenges in South Africa as well as a pathway to a low carbon economy.

The financing of renewable energy projects is a key enabler to the country meeting its energy transition and sustainable development objectives. However, with Eskom being financially constrained, coupled with South Africa's rising foreign debt which the IMF estimates at 74% of GDP, it is the private sector that the country needs to look to for a successful transition. Moreover, the role of South African commercial banks as an actor in the implementation of large renewable energy projects has not been sufficiently probed.

2.2. The Research Purpose (Aim and Objectives)

2.2.1. Research aim

The aim of this study was to examine the perceptions of senior bankers on the role of South African commercial banks in financing large-scale renewable energy projects. It further attempted to establish whether the role that South African commercial banks are playing in implementing renewable energy projects is adequate to narrow the funding gap related to these projects and to solve the current energy supply challenges.

2.2.2. Research objectives

To achieve the research aim and address the research question the study pursued the following objectives:

1. To explore bankers' perceptions on the role of commercial banks in renewable energy financing.
2. To examine the perceived barriers and enablers to banks' participation in renewable energy financing.
3. To assess whether commercial banks view themselves as key actors in South Africa's energy transition.

2.3. Research Questions

The central question guiding this research is: How do senior bankers perceive the role of South African commercial banks in financing large-scale renewable energy projects? Following this guiding question, the following are the sub-questions included:

1. What factors enhance or constrain banks' participation in renewable energy financing?
2. How do bankers evaluate the bankability of large-scale renewable projects?
3. What implications do bankers' perceptions have for policy and practice?

2.4. Research Propositions

Based on the research problem, objectives, and the theoretical framework, this study explored the following propositions:

Proposition 1 (Coercive Pressure): Commercial bank participation in LSA-REPs in South Africa is primarily driven by coercive institutional pressures, specifically transparent, stable government policies (e.g., REIPPPP stability, reliable grid access policies), overriding purely speculative profit motives (Chen et al., 2011).

Proposition 2 (Normative Pressure): The integration of Environmental, Social, and Governance (ESG) strategies and adherence to international green finance norms acts as a powerful normative institutional pressure, compelling SA commercial banks toward LSA-REP financing, sometimes in tension with short-term, fossil fuel-based profitability (Ding & Wang, 2025).

Proposition 3 (Resource Dependence): Due to the high capital intensity and long financing tenures characteristic of LSA-REPs, South African commercial banks rely heavily on resource-sharing relationships, particularly co-financing arrangements and risk guarantees provided by Development Finance Institutions (DFIs) and international partners to manage critical resource risks (e.g., grid capacity) (Neneve et al., 2020).

2.5. Delimitations of the Study

While the role of South African Developmental Finance Institutions (DFIs) in the financing of renewable energy projects is also an important consideration, DFIs are excluded from this research due to the unique, statutorily mandated role that they play in the economy. While commercial banks pursue profitability and shareholder value maximization, South African DFIs pursue objectives such as socio-economic impact, empowerment, and economic inclusion. The focus on commercial banks will therefore be the first basis of delimitation under the study.

Green investment involves a range of mechanisms as well as finance institutions that include IFIs, national governments, DFI's, commercial banks and private finance (Gujba et al., 2012). As stated above, the first basis for delimitation was a focus on commercial banks, to the exclusion of developmental finance institutions. Attempting to include the role of players with differing mandates or commercial objectives was likely to bring unwelcome complexity to the study. This is not to suggest that it was not important to understand the role of developmental finance institutions in green finance; however, it was the process of gaining an understanding which needed to be gradual and incremental. Moreover, there was not sufficient time to broaden the ambit of this study to include developmental finance institutions. Further to the above, the study was limited to large-scale renewable energy projects that have been implemented in South Africa and the role that a major South African commercial bank plays in facilitating renewable energy projects.

The study thus focused on the period 2011 to 2024. This was because 2011 was the year in which the South African government introduced the country's first REIPPPP, following regular occurrence of power cuts since 2008. Moreover, only renewable energy projects funded by a major commercial bank and the DBSA were considered. The operational aspects of renewable energy projects did not form part of this study due to time constraints and potential difficulties in accessing information.

2.6. Assumptions

The study was based on the following assumptions: that I would have access to interviewing senior bankers who had been involved in implementing funding for renewable energy projects. This included two major South African Banks and the DBSA. The institutions were approached confidentially, and the interviews were based on the overall approach to financing renewable energy projects, level of participation in renewable energy projects, and lessons learnt from the renewable energy projects.

2.7. Significance of the Study

The study examined the perceptions of bankers on the role of banks in renewable energy projects in South Africa. Such perceptions provide a preliminary understanding of the research question, given that this topic has not been extensively explored.

2.8. Conclusion

This chapter clarified the conceptual foundations of the study by defining the research problem, aims, objectives, and guiding questions. It established the rationale for focusing on commercial banks as key actors in South Africa's transition to large-scale renewable energy deployment and justified the choice of a qualitative approach rooted in practitioner perceptions. The chapter further positioned the study within the broader context of South Africa's ongoing electricity crisis, fiscal constraints, and the critical need for private-sector participation. These elements collectively provide a structured framework that directs the methodological choices and data analysis presented in the subsequent chapters.

3. CHAPTER 3: LITERATURE REVIEW

3.1. Introduction

This chapter has three broad objectives: namely, to understand the research problem, to identify the knowledge gap, and to develop a framework for interpreting the research findings. This chapter is a review of literature on the theory of renewable energy finance. The literature review covers the definition of green finance, the historical development of renewable energy finance, renewable energy technologies and suitability to South Africa, actors in financing renewable energy, and factors that impact the role of the banks. This chapter also highlights the knowledge gap that exists in the literature.

The literature review on the research topic has been influenced by global energy transition developments and the imperative on nations to reduce their carbon emissions to curb climate change. The context out of which renewable energy financing emerged will be discussed against the theoretical background. A discussion on the role that banks have played until present in renewable energy projects will then follow. The focus will be on what the literature suggests about the role of banks in financing renewable energy projects, the knowledge deficiency and what this role should be in the future. The literature review covers both the theoretical and empirical review, as well as a summary of the research gap.

3.2. Conceptual and Theoretical Frameworks

To provide a robust analytical lens for this study, two core theories were adopted: Institutional Theory (IT) and Resource Dependence Theory (RDT). This framework helps to explain why South African commercial banks perceive their role in a particular way and how they structure their financial involvement in the renewable energy sector. Furthermore, this combined approach provides a comprehensive lens to interpret how banks navigate the pressures of achieving market profitability while conforming to non-market, external expectations characteristic of the highly regulated and rapidly evolving green finance sector (Neneve et al., 2020; Zournatzidou, 2025).

3.2.1. Institutional theory

The IT posits that organizations conform to external pressures (isomorphism) to gain legitimacy, ensure survival, and secure resources, often driving them toward homogenization of practices (DiMaggio & Powell, 1983; Pinto, 2017; Silva et al., 2023). The three forms of isomorphic pressure applied directly to this study are briefly summarized below:

- **Coercive Isomorphism:** Explains bank compliance with formal regulations, laws, and policy mandates set by the South African government, such as the parameters established by the Integrated Resource Plan (IRP 2019) and the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

- **Normative Isomorphism:** Reporting on compliance with professional standards and internationally recognized standards, namely, the incorporation of Environmental, Social, and Governance (ESG) strategies, compatibility with Sustainable Development Goals (SDGs), and use of international standards (e.g., Green Bond Principles) (Sossou & Moyeyegue, 2024).

- **Mimetic Isomorphism:** Explains the inclination of banks to follow the example of bankrupts to emulate the models of successful green finance set by their peers or Development Finance Institutions (DFIs) in high uncertainty periods, reducing the risk of operation and reputation (Chen et al., 2011).

3.2.2. Resource dependence theory

The RDT complements IT by focusing on how organizations manage their reliance on critical external resources required for survival (Pfeffer & Salancik, 2003). RDT was considered essential for interpreting the structural barriers identified in the research, such as the acute lack of stable grid capacity and the reliance on risk-sharing mechanisms. When a critical resource, such as electricity grid connection capacity, is controlled externally, the bank is dependent and must adopt strategies (Public-Private Partnerships (PPPs), DFI co-funding) to manage this scarcity and secure the required resources (Chen et al., 2011). The conceptual framework, therefore, positioned the external institutional and resource environment as the primary drivers shaping commercial bank perceptions and lending criteria regarding LSA-REPs, linking these theoretical concepts directly to the research objectives.

3.3. Symptoms, Root Causes, and Consequences

The following section discusses the root causes to the problem statement defined in section 1.2.1 as well as outlining the potential outcomes should this challenge not be addressed.

3.3.1. Challenges to wider adoption of RE include:

Competition from thermal technologies - LCOE

The levelized cost of electricity ('LCOE') measures the cost of generating electricity. Levelized cost considers the capital invested, fuel cost and related operating and maintenance costs of the power plant throughout its life span (Mulongo & Kholopane, 2018). Levelized cost however does not factor in costs relating to distribution and transmission of electricity.

This phenomenon is used to assess economic competitiveness across different technologies (Johnston et al., 2020). In their study which compared the cost of producing electricity amongst 10 different electricity technologies, Mulongo and Kholopane (2018) found that coal technology had the least expensive LCOE among thermal technologies, owing to the abundance of the fuel source in South Africa and globally. They concluded that, while RE technologies would assist in combating climate change, RE technologies load factor is low in comparison to thermal technologies and thus may not be an economically viable option (Mulongo and Kholopane, 2018).

Notwithstanding the findings of Mulongo and Kholopane (2018), the LCOE for RE technologies has decreased in the last two decades which has made the technology more appealing to electricity actors (Timilsina, 2021).That said, RE technologies present other complexities and additional costs such as integration into the electricity grid through investment into additional transmission lines, modifications to the electricity grid and energy storage options, given the intermittent nature of wind and the sun (Holechek et al., 2022). When these costs are factored in, RE may become less appealing to investors in RE projects.

Renewable energy sources are also intermittent in nature and require large upfront investment for the technology to integrate with the electricity grid. While RE technologies would assist in combating climate change, RE thus continues to face stiff competition from thermal technologies (Mulongo & Kholopane, 2018).

3.3.2. Upfront costs

Another impediment to large scale deployment of renewable energy is the associated high upfront investment costs. Large capital investment is generally required for wind turbines, solar panels, and energy storage systems (Holechek et al., 2022). Eskom/government subsidies could have assisted in fast tracking large scale deployment of Solar (Sarkar & Singh, 2010). There is room for SA Government to do more to incentivise investors and customers to increase the penetration on Solar energy. However, if government incentives keep rising and RE technology costs keep decreasing, this might encourage renewable energy projects and help make them more financially feasible. It is challenging and expensive to integrate renewable energy sources into the existing electrical grid. Investors into RE projects must consider possible obstacles associated with grid integration, such as the requirement for additional transmission lines, modifications to the current system, and energy storage options.

3.3.3. Integration with electricity grid

Due to the historically-coal centric electricity supply, a large part of the country's transmission network lies in Mpumalanga in the northeast, while the most optimal wind and solar resources are found in the Southwest regions of the country (Eskom, 2020). As renewable energy reshapes the electricity supply mix, a substantial investment will therefore need to be deployed into the transmission network. During Bid Window 6 of the REIPPPP bidding cycle, capacity constraints of the grid in the Southwestern areas were apparent, as over 3GW of renewable energy projects were unable to proceed because of the lack of available grid connection capacity (Eskom, 2020).

Eskom estimates that the country's transmission network will require a total of 14,000 km of new transmission lines at an estimated cost exceeding R200bn to expand the transmission network capacity (Mahlaka, 2024). This is beyond the financial capacity of the utility, therefore requiring private capital and the taxpayer to foot the bill for this expansion. This could see the National Transmission Company (NTC), which was unbundled from Eskom to oversee the electricity grid, conducting a procurement auction to select firms to handle the financing, building, and operation of the grid (or transmission lines) for a duration of 20 to 30 years (Mahlaka, 2024).

3.3.4. Environmental impact

In addition to degrading the aesthetics of natural landscapes and possibly endangering birds, wind turbines are noisy and disrupt people's sleep. Wind turbines also demand large amounts of iron and copper, which means that additional mining is required (Holechek et al., 2022). Large volumes of metals like aluminium, copper, and lanthanides are also needed for solar power developments; if these metals become the main sources of power on a large scale, their depletion could make them unaffordable (Holechek et al., 2022).

3.3.5. Land availability

Another major obstacle to using wind and solar energy to replace fossil fuels is the availability of land. According to a recent evaluation and meta-analysis of the spatial requirements of various renewable and non-renewable energy sources, wind power requires roughly 370 times more area than natural gas to produce a megawatt of power (Van Zalk & Behrens, 2018).Given its size and low population density, South Africa could however readily accommodate the projected space needs for renewable energy sources

3.3.6. Governance and policy uncertainty

The lack of political commitment to renewable energy technology adoption in South Africa; lack of clear regulations, misalignment in state policies; and non-existent government support could pose a further challenge to investment in renewable energy. The first official national policy statement advocating for the broad, albeit gradual, reform of the electricity supply industry was the Energy White Paper (EWP) on the Energy Policy of the Republic of South Africa (Africa, 1998).

The EWP also set out to achieve the following objectives (Africa, 1998):

- Improving access to affordable electricity: This was intended to promote access to electricity by the previously disadvantaged households and communities.
- Unbundling of the vertically integrated value chain by separating generation from transmission and distribution.

- Introducing private sector participation to increase competition in the relevant parts of the ESI with a certain percentage of generation being provided by IPPs.
- Introducing a state of fair play where IPPs would be able to access the transmission grid and operate in a fair ESI market; and
- Improving energy governance through the setting up of an independent regulator to promote good governance structures and a transparent regulatory framework which would bolster private sector investment into the ESI.

For the above objectives to be a reality, certain electricity policies needed to be adopted to facilitate reform in the ESI. However, the implementation of the EWP reform policy has been slow. Eskom remains state-owned, has the monopoly, and is in a far worse off position than it was 26 years ago when the EWP was first released. Moreover, Eskom remains operationally inefficient and continues to struggle with generation capacity (Eskom, 2023). Eskom's Energy Availability Factor (EAF) further deteriorated to 55.3% for the interim period ended 30 September 2023, following severe load shedding, which intensified to 47 days of stage 6 load shedding during the period. Eskom targets an EAF of above 70% but in recent years has been consistently below 60% (Eskom, 2023).While some of the objectives have been partially met, a large part of the objectives of the EWP remain unimplemented. This has been due to the SA government's failure to adopt policies that are facilitative, a lack of political will, indecision, and misalignment in state policies.

3.3.7. Corruption and governance failures

Literature defines corruption as a phenomenon where those in public office use their positions for personal gain (Ortiz-Ospina & Roser, 2024). It is a common problem in developing economies, is more prominent in countries with poor governance, posing a great obstacle to a nation's progress and development (Spyromitros & Panagiotidis, 2022). Another reason that South Africa finds itself grappling with an electricity crisis is due to poor governance at the state utility, Eskom. This occurrence has undermined the capacity of Eskom to deliver on its mandate. Over the years, a large number of Eskom's governance structures and practices were either ineffective, tainted, or otherwise compromised (Kessides, 2020).

These governance failures extend to financial mismanagement, irregular procurement decisions and procedures, growing costs related to the utility's capital expenditure programme and inefficient cost structure which have all been manifestations of deeply rooted corruption (Kessides, 2020). Due to the importance of Eskom's role to South Africa's economy, the country's ranking in the Corruption Perceptions Index (CPI) has deteriorated over the years (Transparency International, 2024). For example, Transparency International revealed that the 2023 Corruption Perceptions Index ranks South Africa as the 83rd least corrupt country in the world out of 180 countries. From 1996 to 2023, South Africa's Corruption Rank averaged 55.21, and peaked at 83rd in 2023 compared to its ranking of 23rd in 1996. At the 83rd position, it outperforms 97 countries and is topped by 82 countries. In the BRICS group countries, it has the second highest ranking after China (China ranks 76th), while India, Brazil and Russia 93rd, 106th and 141 respectively (Transparency International, 2024).The downward trend in the CPI ranking peak suggests that recent efforts by state organs of fighting corruption are not enough.

3.4. Barriers to Financing Large-Scale Renewable Energy Projects

The barriers to the global transition to renewable energy are a lack of long-term financing, low rates of return on investment, a lack of capacity by renewable energy project developers, and technology risks inherent on renewable energy technologies (Taghizadeh-Hesary & Yoshino, 2020).

Geddes et al. (2018) in their study of the role of state-owned banks in low-carbon energy discovered a major financing gap for renewable energy projects needed to reduce global carbon emissions to target levels. This is due to concerns that investments in large-scale renewables diffusion will not materialize quickly enough. They further assert that utilities' balance sheets are often constrained, necessitating innovative funding mechanisms for the fast deployment of renewable energy.

Furthermore, revenue certainty for these projects relies on long-term power purchase agreements. In their Australian study, Geddes et al. (2018) found that revenue uncertainty is an impediment to renewable energy developers accessing funding in that market because lenders require long term power purchase agreements based on feed-in tariffs. They go on to argue that, while these agreements somewhat de-risk renewable energy projects, they do not reduce the novelty risk and technology risk associated with renewable energy technology.

Based on the characteristics described above, renewable energy projects are perceived to yield lower rates of return for banks, and as a result, face stiff competition from fossil fuels (Taghizadeh-Hesary & Yoshino, 2020). This is because subsidization of fossil fuels creates an incentive for investments in carbon-intensive industries with no penalties imposed to influence investments in low-carbon industries (Bak et al., 2017).Financial sector regulatory compliance such as Basel capital adequacy requirements also acts as a barrier for banks favouring renewable energy projects (Bak et al., 2017). Capital that could otherwise fund shorter-dated projects is tied up on 10–20-year renewable energy projects at less attractive returns for the banks. Further, participation of the private sector in large scale energy transition is hampered by macroeconomic risks and weaknesses in governance. Transforming the financing landscape to drive a greater involvement by the private sector will require open engagement from the public sector (Bak et al., 2017).

3.5. Knowledge Gap Analysis

The importance of renewable energy financing mechanisms has been studied, nevertheless research has not been extensive and has been limited to investment grade countries (Esty & Matysiak, 2004). In fact, the field of study is still in development worldwide (Steffen, 2018). Therefore, the current research was important to South Africa, considering the ongoing energy crisis, transition and energy security efforts being undertaken. Further, researchers such as Steffen (2018), who have conducted similar research in investment grade countries, have had the benefit of existing projects, and novel data sets, which are limited in South Africa. It is therefore proposed that commercial bankers be approached directly for their perceptions to add to the existing knowledge base for future research in this field.

(Geddes et al., 2018) studied the multiple roles of state investment banks ('SIB') in low carbon energy financing in Australia, the UK and Germany. Their study found that, aside from the provision of capital and de-risking RE projects, SIBs play a much bigger role in encouraging private investment in low-carbon projects. They facilitate financial sector learning, fostering project trust, and act as early adopters to help projects establish a track record that subsequently attracts private funding for subsequent projects (Geddes et al., 2018). Notwithstanding their extensive study on the role of SIBs in RE, the study was limited to SIBs in developed RE markets (Australia, UK and Germany) and did not consider the role of private finance or perspectives from a commercial bank.

Barriers and opportunities to financing projects that use clean energy technologies have been studied and well documented. With literature asserting that the most appropriate financing instrument for RE projects is project finance (Goldman et al., 2005). It is considered the most appropriate way to get RE products from early adopter customers to mainstream consumers. Thus, project finance is a vital facilitator for the widespread application of RE. The ability to attract an affordable combination of debt, equity, and other sources of funding for the project is key to commercial success (Goldman et al., 2005). They went on to study the risks prevalent in financing clean energy projects. These include:

- Technology risk – This is the risk that the technology will not perform as intended or will become obsolete. It includes the absence of data sets to draw comparisons from.
- Credit worthiness – This relates to the debt capacity of the project based on cash flows to be generated by the project.
- Revenue security risk – RE projects are capital intensive and require the costs to be amortized over a long period. This must be supported by power purchase agreements which may not always be in place to secure the revenue.
- Competition risk - The intermittent nature of renewable energy makes it prone to facing competition from fossil fuels.

The above-mentioned study (Goldman et al., 2005) provides insights into the suitability of project finance as an RE financing mechanism to fund RE projects. The study was undertaken in 2005 and so much has changed since then, including the way that inherent risks of RE projects can be mitigated. Literature informs us that the biggest barrier to green financing and investment in Renewable Energy Projects is the lack of long-term financing, in particular private finance. Because RE projects are inherently capital intensive, they require to be financed over the long term i.e. 10 years. The absence of such financing slows down the deployment of large scale RE projects which in turn delays the achievement of global sustainability objectives (Taghizadeh-Hesary & Yoshino, 2020).

Taghizadeh-Hesary and Yoshino (2020) write about the creation of public financial institutions (PFIs) that offer long-term funding as a solution to bridging the RE projects long-term financing gap. They further support (Geddes et al., 2018) assertion on the role of SIBs – for instance, KfW Germany, extending beyond the provision of capital and being more comprehensive in the UK, Germany and Australia. This financing gap could be addressed through non-banking financial institutions (NBFI) such as pension funds and insurance firms' participation in green finance. Solutions include NBFI's participation through long-term green investments, using spillover tax to enhance rates of return on green projects, credit guarantee schemes as credit risk enhancers, and de-risking projects through carbon tax collection from polluting industries While the study provides insights into alternative financing solutions, the study is based in Asia (Taghizadeh-Hesary & Yoshino, 2020).

Bracking (2015) writes about the economic activities in South Africa which have been financed through the Clean Development Mechanism ('CDM') of the UN Framework Convention on Combatting Climate Change (UNFCCC) between 2007 and 2012. She finds that climate finance has not grown adequately in relation to the needs of climate change mitigation and adaptation in terms of the environment (Bracking, 2015). It is imperative that the Green Economy be conceptualized at a global scale (Bracking, 2015). This is due to the relative failure of climate finance to grow in relation to the needs of climate change mitigation and adaptation in terms of the environment, as well as changes required to human-built environments for a sustainable future.

3.6. Green Finance: A Broad Overview

3.6.1. Green finance

Green finance has been broadly defined by scholars and the financial industry. In general terms, it is defined as the financing of investments in initiatives aimed at protecting and conserving the environment. Chowdhury et al. (2013) state that there is no standard definition of green financing, and attempt to define it as financial support from green growth, which significantly reduces GHGs and air pollutant emissions. Doval and Negulescu (2014) offers a more technical definition of green finance as a phenomenon that includes financing initiatives that prevent the harming of the environment, restoring and maintaining natural capital.

3.6.2. Recourse vs non-recourse finance

Non-recourse finance refers to a type of loan where the lender is restricted from collecting repayment on the collateral listed in the loan agreement. In the event of a default, the lender cannot pursue the borrower's other assets or income. This type of financing is prevalent in large-scale projects (Steffen, 2018). Nevertheless, a resource loan allows the lender to collect repayment from the borrower's other assets if the collateral does not cover the full amount of debt (Yescombe, 2002).

3.6.3. The development of green finance

The Kyoto Protocol is a United Nations treaty which was first signed in 1992 but only came into force in 2005 to put into effect the United Nations Framework Convention on Climate Change (UNFCC'). The Kyoto Protocol has played a key role in developing mechanisms to respond to climate change. In particular, the Clean Development Mechanism ('CDM') and Joint Implementation ('JI') were mechanisms created to encourage investments in initiatives aimed at reducing emissions of GHGs in developed and developing nations and were used to impose emission limits on developing nations (Labatt & White, 2011).

The mitigation of greenhouse gas emissions, adaptation to the effects of climate change, and the financing mechanisms for these aspects are all addressed in the "Paris Agreement." This was negotiated by the UNFCCC Conference of Parties ('COP') in December 2015 and implemented in November 2016 (UNFCCC, 2017a). The Paris Agreement however, requires a substantial and quick change in the energy generation sector to fulfil the objectives outlined in it (Clemencon, 2016).

Renewable energy projects are infrastructural, focusing on reducing emissions of GHGs, and are long-term and capital-intensive in nature. The global transition to renewable energy is fundamental to nations meeting their SDG goals of reducing carbon emissions. This energy transition however, is not happening fast enough due to a number of barriers which prevent the advancement of renewable energy on a large scale (Geddes et al., 2018)

Globally, governments have committed to adding 826GW of renewable energy capacity by 2030, at a cost estimated at US$1 trillion to advance the global energy transition (Ajadi et al., 2020). However, these commitments are deemed inadequate to meet the requirements and commitments made under the Paris Agreement. In order for nations to meet their SDG goals, the diffusion of renewable energy has to happen at a large scale and be fast-tracked (Geddes et al., 2018).

3.7. The SA Context

In response to the COP23 and COP24 call to action, South Africa has taken steps to assess the efforts to reduce GHG emissions. In accordance with the Paris Agreement, it revised its nationally determined contributions (or "NDC") in 2021 (Department of Forestry, 2021).In the revised NDCs, South Africa's adaptation plans centre on strengthening governance, incorporating climate change into laws, and putting sector-specific initiatives like climate-smart agriculture, better water management, and ecosystem preservation into action. In the face of climate change, these initiatives seek to promote resilience and guarantee sustainable development (Department of Forestry, 2021). SA has therefore made commitments to reduce GHG to 350-420 MtCO2e by 2030 and to achieve net zero emissions by 2050.

The NDCs also outline the countries climate finance strategy to mobilize at least USD 8 billion per year by 2030, focusing on both mitigation projects and adaptation measures. The strategy emphasizes the importance of international support, public-private partnerships, and innovative financing mechanisms to achieve its goals (Department of Forestry, 2021). South Africa’s annual spend on climate finance is estimated at R130 billion and it requires ~R330 billion and R535 billion a year to meet its net-zero and NDC target by 2050 and 2030 respectively, thus presenting a financing gap(Smith, 2024).Transparency and accountability are key, with provisions for monitoring and reporting on the use of climate finance. The purpose of these initiatives is to guarantee that South Africa can successfully carry out its plans for climate action and meet its long-term sustainability objectives (Department of Forestry, 2021).

3.8. Types of Renewable Energy Projects: Mitigation, Adaptation and Project Finance

3.8.1. Bankability criteria

The term "bankability" in the context of renewable energy refers to a project's appeal to investors and lenders. When a project is bankable, it indicates that investors are willing to invest and that the Renewable Energy market has faith in the company's viability (Vickerman, 2024). However, the development of renewable energy infrastructure (such as offshore wind, solar panel farms and hydropower) might take years or even decades. The development stage is an important and intricate one that frequently necessitates a large financial outlay with little assurance of success (Mohamadi & Mohamadi, 2021).

The development actors comprising the project developer, the sponsor and the utility must diligently work on complex aspects of developing the project. Usually this is done by contracting a team of experts and consultants to carry out the feasibility studies, environmental impact assessments, resource measurements, land purchase or lease negotiations and public relations with the municipalities and social communities (Mohamadi & Mohamadi, 2021). The degree of development perfection will determine the project's appeal to investors. In principle, a sound development results in a bankable project (Acharya, 2022).

A Power Purchase Agreement (‘PPA’) is generally described as a contract entered into between the public sector entity (the off-taker) and private or independent power producers sector entities that supports the power sector (Leonhardt et al., 2022). It is usually between a privately owned power producer and a public sector purchaser (also known as an "off-taker"), which is typically a state-owned electrical utility in countries where the power industry is predominantly run by the state. The PPA de-risks the power project as it offers the revenue stream and cash flow, which serves the funding for the PPP project (Leonhardt et al., 2022).

Since the cost of renewable energy is declining, the imperative is upon nations to meet their energy transition goals. Independent Power Producers (‘IPP’) now have additional options to de-risk their projects thanks to the PPA strategy. Furthermore, the PPA makes renewable energy projects more bankable and ensures a consistent flow of revenue and cash flows even in the absence of subsidies (Acharya, 2022). The section below will discuss the factors which influence the bankability of renewable energy projects are influenced by the following factors

3.8.2. Socio-economic considerations

The primary factor driving the transition from fossil fuels to renewable energy is climate change. The term "energy transition" refers to the protracted process of replacing systems that now rely on fossil fuels with clean energy from renewable sources (International Energy Agency, 2022). Despite South Africa's high natural resource endowment, the socio-economic challenges are worsening, posing a risk of stagnation in the face of an unparalleled energy crisis, constricting infrastructure and logistics, unfavourable external conditions and climate change challenges (IMF, 2023b). Energy consumption and land usage have always been strongly linked to the growth of any economy and the advancement of human development, which has led to an increase in emission levels (Raihan & Tuspekova, 2022).

Some studies in renewable energy argue that not only does it promote access to energy and a reduction in carbon emissions but also has socio-economic benefits such as the creation of new jobs and skills (Bohlmann et al., 2023). Others argue renewable energy generation is less labour intensive and that jobs will be lost (Inglesi-Lotz, 2021).

The coal mining industry was estimated to employ 90,000 people as of 2022, according to (Nel et al., 2023), while the coal transportation sector and Eskom coal power plants employed 40,000 and 10,000 people respectively (Hermanus et al., 2022). The coal electricity value chain is thus responsible for approximately 100,000 jobs, and the country cannot afford to lose these jobs due to current high unemployment rates. Consequently, the electricity transition to cleaner sources of electricity should not risk the loss of jobs particularly in view of the already prevalent high employment rate (~32.4%) in South Africa. Renewable energy employment statistics are drawn from data reported by IPPs partaking in the REIPPPP and these are considered biased (Hermanus et al., 2022).

Table1: A summary of a study undertaken by Hermanus et al. (2022) of the numbers of electricity jobs:

Actor	Unit	Methodology/ Formula	Latest Figures (2020/21)
Statistics South Africa	Headcount/Jobs	Person employed	- Electricity Sector (June 2021): 56 000 employees - Loss of 1000 jobs

Actor	Unit	Methodology/ Formula	Latest Figures (2020/21)
			registered from 2020 to 2021 in the electricity sector
Eskom	Headcount/ jobs -	Total number of people employed per year	As of 31 March 2020: 44 772 - As of 31 March 2021: 42 749 − Cumulative headcount, reflective of annual jobs created from new build projects
IPP Office	Job-year	One hundred seventy-four hours per month for REIPPPP bid window (BW) 1 and 2, averaged over 12 consecutive months. - One hundred sixty hours per month for BW3, BW3.5, BW4, 1S2 and 2S2), averaged over 12 consecutive months.	Job-years created from 2016 to 2021: 57 071
TIPS	Headcount/jobs	Persons employed	- Total employed persons: Coal Mining: 80 000 Electrical Generation (Eskom only): 12 000 Petrochemical production (Sasol only): 26 000
DMRE (IRP)	Headcount/jobs	Total number of jobs (headcount)	Total net employment increased by 2030 (2020 baseline year) based on allocated MW per technology**: +55 000 (Natural Gas) +50 000 (Solar) +60 000 (Wind) +44 000 (Nuclear) - 100 000 (Coal)
IRENA	Headcount/ jobs	Estimates are derived from primary data (typically government reports) and fed into the Cambridge E3ME macroeconomic model. - IRENA has dedicated country focal points	Total jobs Solar PV: 21 451 CSP: 10 442 Wind: 18 840 Coal (direct): 92 000 Coal (indirect): 170 000

Actor	Unit	Methodology/ Formula	Latest Figures (2020/21)
		which provide country-specific data.	

Table 1: (Hermanus et al., 2022)

While the above data and evaluations on the number of jobs in the electricity sector is widely available, (Hermanus et al., 2022) argue that the evaluations offer incomplete characteristics of employment, and that due to different data sources these produce inconsistent data. This can make planning and comparisons across the electricity value chains challenging. Precise data, definitions and criteria for both required and voluntary report should be specified (Hermanus et al., 2022). According to (Hermanus et al., 2022), the incomplete characteristics relate to :

- Employment status i.e., permanent, or casual.
- Direct and indirect employment, direct being in the construction or operation of power plants and indirect employment being in the value chain; and
- Induced employment – employment created by direct and indirect employees from spending money on goods and services.

Due to renewable energy reshaping the electricity landscape and weakening the prominence of coal in electricity generation, job losses in the coal electricity value chain (i.e. coal mining, coal power plants and coal transportation industries) are likely. This consequence will have a ripple effect on revenue generation by local municipalities and local economies providing goods and services (Strambo et al., 2019). It is thus imperative that risk management measures be taken to achieve social acceptance, reduce resistance to these, and prevent worsening poverty. Inequality and high levels of unemployment are already a prevalent socio economic challenge in South Africa (Strambo et al., 2019). The energy transition therefore needs to be implemented in a systematic and balanced way that is socially just to sustain jobs and to minimise adverse impact on the livelihoods that depend on coal electricity sector and related industries in the value chain (Department of Energy: Republic of South Africa, 2019b). Consideration should be given to transferability of jobs and skills by redeploying jobs into the renewable energy industry.

3.8.3. Project finance and financing structure

Private capital in SSA nations is critical to fulfilling the Paris Agreement's climate change mitigation objectives, bridging the financing gap as well as enabling the Sustainable Development Goal (SDG) 7, which advocates for universal energy access (Minas et al., 2024). Energy Project finance has been propelled by global trends in utility unbundling, capital investment in the public sector being privatised, and internationalisation of large-scale infrastructure investment, with power generating projects being the most significant sector (Baker, 2015). Nevertheless, project finance is a non-recourse financing mechanism to an SPV, which is legally and commercially independent and exists solely for the purpose of carrying out the project (Steffen, 2018).Financing a renewable energy project entails, the developer or sponsor creating a non-recourse SPV to implement the project (Solar Financed, 2021). The sponsor and sponsor partners contribute equity in the SPV through the subscription of shares or purchase of shares before financiers can lend to the SPV (Yescombe, 2002).Since the SPV is financed without any, or extremely limited, guarantees from the sponsors, lenders to the SPV are solely dependent on the cash flows from the project in the future and have no recourse against the sponsors' balance sheet (Steffen, 2018).Financiers lend to the SPV once it has been capitalized by the sponsors and secured through a power purchase agreement with the offtaker, Eskom (Solar Financed, 2021). Project finance has been the most popular type of financing structure, while around one-third of the projects in the third round made use of corporate financing arrangements (Eberhard et al., 2014) . The majority of REIPPPP projects in bid windows 1 to 5 have been financed with 70 to 80% debt and 20% to 30% equity (Baker, 2015).

3.8.4. Legal and regulatory considerations

In South Africa, electricity from renewable energy sources is regulated by the National Energy Regulator (NERSA), one of three energy regulators established under the National Energy Regulator Act 2004 (Republic of SA, 2004). NERSA’s mandate is to regulate the electricity, piped-gas and petroleum pipelines industries in terms of the Electricity Regulation Act 4 of 2006, Gas Act 48 of 2001 and Petroleum Pipelines Act 60 of 2003 (Republic of SA, 2004). In terms of the Electricity Regulation Act 4 of 2006, NERSA is the custodian and enforcer of the national electricity regulatory framework. It issues licences and offers registrations for the generation, transmission, distribution, trading and the import and export of electricity and regulates prices and tariffs connected therewith (Electricity Regulation Act, 2006). Schedule 2 of the Electricity Regulation Act was a significant advancement in January 2023. This saw the MW capacity threshold for embedded generating removed by the amendment. The draft Energy Regulation Amendment Bill for 2022 established a multimarket, competitive energy supply company under the management of a transmission system operator (Ministry of Minerals and Energy, 2023).

The National Energy Act 34 of 2008, is a significant law that established the legislative guidelines for the country's energy sector. The act ensured the security of the energy supply, promoted sustainable energy service provision, supported renewable energy sources, and improved energy efficiency.(Republic of South Africa, 2008). Additional regulation may nonetheless be required depending on the RE project size. According to the National Environmental Management Act 107 of 1998, an environmental authorization is necessary for the development of RE facilities larger than 10 MW, apart from facilities or infrastructure developed for photovoltaic installations that are located within urban areas or on pre-existing infrastructure. Further to NERSA, the institutions involved in RE regulation are:

3.8.4.1. Department of Mineral Resources and Energy ('DMRE')

The overall regulatory direction and policy-making for South Africa's energy industry falls within the purview of the DMRE. To guarantee the sustainable growth of the nation's energy resources, it creates energy policies, strategies, and regulations (Department of Energy: Republic of South Africa, 2019b).

3.8.4.2. Eskom

While not a regulatory body, Eskom is essential to the regulation of RE. NERSA has authority over Eskom's operations, especially with regard to tariff determination and operational standards (Republic of SA, 2004).

3.8.4.3. The Independent Power Producers Procurement Programme Office

The DMRE, National Treasury and the DBSA established the IPP Office to facilitate the objectives set out by the REIPPPP. The parties entered into a Memorandum of Agreement in November 2010 which sought DBSA's support to implement the REIPPPP and establish the IPP office. The MOA has been extended three times since it was first agreed on (IPP Office, 2023). Some of the responsibilities of the IPP include:

- Obtaining electricity capacity from IPPs for non-renewable energy sources, as determined by the Minister of Energy.

- It is a procurement vehicle for achieving the country's goals for increasing renewable energy capacity; and
- Offers advisory services pertaining to program and project planning, development, implementation, and financing with the goal of fostering an environment that is stable and supportive of IPPs.

3.8.5. Financing actors of renewable energy in South Africa and characteristics of renewable finance

South Africa has developed globally integrated financial markets, which means that it may have less ground to cover in integrating private finance into energy projects, in comparison to other markets in SSA. Extracting lessons for application of RE into SSA may therefore be quicker and easier, if the South African experience is the subject of study. This is appropriate, given that some authors have speculated on the desirability of integrated and detailed regional plans for renewable projects and their financing (Chirambo, 2018). Private finance could have an important role to play in this regard.

In a study for the World Bank, (Eberhard et al., 2017) estimate the finance requirements for Africa's energy infrastructure to be US$40.8bn a year. Current spending is estimated at US$11.6bn thus leaving a funding gap of approximately US$29bn. The major actors engaged in financing RE in South Africa are development finance institutions (DFIs), climate funds, banks and asset managers which are described below.

3.8.6. Development finance institutions

3.8.6.1. Industrial Development Cooperation (IDC)

The Industrial Development Cooperation(‘IDC’) is owned by the South African government under the supervision of the Economic Development Department (Baker, 2015). It plays a role in both debt and equity financing of the REIPPPP and has funded over R15.8bn in REIPPPP projects, and more than 25 community trusts, enabling local participation in REIPPPP (IDC, 2022).

3.8.6.2. The Development Bank of South Africa

Established in 1983, the Development bank of South Africa (DBSA) is a government-owned finance institution. Its mission is to advance regional integration and economic growth for sustainable development projects and activities in South Africa, SADC and the greater Sub-Saharan Africa (DBSA, 2022). The DBSA has played an active role in the deployment of renewable energy through the establishment of the IPP office for the Department of Mineral Resources and Energy's REIPPPP as well as a key funder, where it has provided funds of R17bn to 33 REIPPPP projects.

3.8.6.3. African Development Bank

The African Development Bank ('AfDB') is a multilateral financial institution that provides funding to African governments and commercial businesses. AfDB has made green growth a priority in its portfolio in recognition of the continuing effects of climate change on Africa, and as such manages a multi donor fund, the Sustainable Energy Fund for Africa (SEFA). SEFA offers catalytic financing to open up private sector investments in energy efficiency and renewable energy (AfDB, 2022). The African Development Bank offers catalytic financing to open private sector investments in energy efficiency and renewable energy.

3.9. Climate Funds

Direct loans are made and money is managed for climate change mitigation through the World Bank. These funds include the Carbon Partnership Facility (CPF), the Strategic Climate Fund (SCF), and the Climate Investment Fund (CIF), each of which has two sub-funds. The World Bank was the first organization to develop green bonds with the purpose of financing climate change adaptation. It has financed in excess of US20bn dollars in the energy sector in Africa (Schwerhoff & Sy, 2017).

Closer to home and most recently, the World Bank approved US$497mn in funding for South Africa. The funds will be used to decommission and repurpose the Komati coal-fired power plant using renewables and batteries (Engelbrecht, 2022). This project includes other energy financing alongside the World Bank such as the Canadian Clean Energy and Forest Climate Facility (CCEFCF) and Energy Sector Management Assistance Program (ESMAP) US$47.5mn and a US$10mn grant funding respectively (Engelbrecht, 2022)

3.10. Commercial Banks

Lending for REIPPPP has primarily been done by the five major South African commercial banks: Standard, Nedbank, ABSA, RMB, and Investec (Eberhard et al., 2014). The "big five" commercial banks—Standard Bank, ABSA, First Rand Bank/Rand Merchant Bank and Nedbank dominate the South African banking landscape, accounting for ~90% of total bank assets (Baker, 2015). In the first three rounds of the REIPPPP, 56 out of 64 projects were project financed, while the remaining issued corporate bond issues and were commercially financed. Corporate finance on REIPPPP became an emerging trend during Rounds 1 to 3 of the REIPPPP and continues to be prevalent in Rounds 4 to 6 (Eberhard et al., 2014). In their study, Eberhard et al. (2014) further state that the trend in corporate financing in REIPPPP may or may not continue, and that there is a likelihood of international utilities showing interest in entering South Africa's renewable energy market. This has been evident through an increased presence of international players, such as Engie and Enel Green Power. The project financing standards and "bankability" requirements established by the major debt providers are highly prescriptive in terms of the way a project is developed and its contractual arrangements, such as the choice of technology, the terms of the engineering procurement and construction contract, and the equity structure (Baker, 2015). Renewable energy project financing is typically structured on a 70:30 debt-to-equity cost of the project basis. In SA however, there have been instances when this ratio is 80:20 (Eberhard et al., 2014).

While it may appear that the funding capital structure is highly indebted, it should be noted that the more debt there is, the lower the average cost of financing, the lower the tariff, thus the overall cost of the project is cheaper (Baker, 2015). The lender's main priority when funding a renewable energy project is repayment of the loan they are advancing. Typically in these funding structures, the debt providers are first in line to receive the revenues generated by the project, while the returns for the equity investors are dependent on the project's success and the generation of a return (Yescombe, 2002).

Nevertheless, it is well documented that there remains a huge funding gap in financing the energy transition globally. In recent years, SA major banks have made bold commitments in green finance initiatives and are committed to complying with Green Loan Principles to improve disclosure transparency.

Absa, which has funded R50bn in renewable projects in South Africa to date, has committed to doubling the percentage contribution of renewable energy funding to total loan funding by 2030. The bank in 2021 received US$150mn in funding from the World

Bank’s IFC. The loan funds would be deployed to support the bank’s strategy to expand its green finance objectives (Quinn, 2021).

Standard Bank, the biggest bank in Africa by assets, funded R55bn in renewable energy projects across Africa in 2022. It is targeting to fund a cumulative total of R300bn in green finance by the end of 2026. This commitment comes as part of the plan for lenders to cut its Scope 3 emissions, those caused by its financing of fossil fuel projects(Standard Bank Group, 2023). In 2023, Standard Bank also secured a loan of US$250mn from the World Bank’s IFC to increase its climate finance initiatives (Matsoso, 2023).

First Rand Bank, through its Investment Banking division, Rand Merchant Bank, has funded R20bn in renewable energy projects in South Africa to date. In 2020, it concluded the first-ever REIPPPP refinancing for the Bokspoort CSP project and has been instrumental in providing equity financing for Black participants in renewable energy projects (RMB, 2023).

Nedbank has arranged funding for 42 large-scale renewable energy transactions worth a total of R35.6bn. The bank is also committed to increasing its loan book in embedded-energy financing both in South Africa and in the markets, it operates in, in Southern Africa. In 2023, it concluded the raising of US$200mn with the World Bank’s IFC for green finance expansion goals (Nedbank Group, 2021).

3.11. Renewable Energy Technologies in South Africa

Generally, sources of renewable energy include biomass energy (divided into solid fuels, gaseous products and liquid biofuels), solar energy (divided into active and passive solar systems), wind energy, hydraulic energy and geothermal energy (Wood, 2015). One could potentially argue that biomass power plants, thermal power plants and nuclear power plants could be viewed as distinct sources of renewable energy (Wood, 2015). The South African government, in August 2011, undertook the Renewable Energy Independent Power Purchase Programme (‘REIPPPP’) to increase power-generating capacity. This was done in an effort to attract private sector investment in onshore wind, photovoltaic, concentrated solar power (CSP), biomass, landfill gas, and small hydro technologies (Baker, 2015).

The National Development Plan and the Integrated Resource Plan 2010 both include the REIPPPP program as one of the energy mixes. Onshore wind power currently holds a 52% market share in terms of renewable energy supply capacity per technology, followed by photovoltaic power (36%) and CSP (9%), respectively (Department of Energy: Republic of South Africa, 2019b).

Table 2: SA's targeted energy mix (Department of Energy: Republic of South Africa, 2019b)

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

Table 2:(Department of Energy: Republic of South Africa, 2019b)

In 2022, the share of renewable energy technologies (wind, solar PV, and CSP) in the total energy mix climbed to 7.3% and reached a total installed capacity of 6.2 GW. The output of solar production (PV and CSP) fell for the first time that year (Pierce & Le Roux, 2022). Competitive tenders have been the main driver of utility-scale RE deployment and over the years, RE projects have developed into PPAs as a financing mechanism internationally as well as in SA, which transitioned from renewable energy feed-in tariff ('REFIT'). The scoring system in South Africa on REIPPPP assigns 70% of the points to bids that fall below a predetermined cap, and 30% goes towards economic development, which takes into account things like creating jobs, including historically underrepresented groups, protecting local content, developing rural areas, fostering community ownership, and developing skills (Baker, 2015). Before discussing the characteristics and features of each technology, I look at the levelized cost of energy per renewable energy technology. Levelized cost of energy (LCOE) is a method used to calculate a metric that factors in the performance, operational and maintenance (O&M), capital, and fuel expenses of renewable energy sources (2016). The below table illustrates how the different technologies fair against each other in terms of LCOE.

Table 3: LCOE comparison by technology

Technology	Cost (R/kWh)	Life span (years)
Wind	0.66	20
Solar PV	0.64	25-40
Concentrating solar	0.33	30

Table 3:(Johnston et al., 2020)

3.11.1. Wind power

The kinetic energy from moving air (Global Wind Energy Council) can generate power (IRENA, 2021).To capture the wind, the wind turbine is elevated high above the ground on a tower. Stronger winds have less turbulence which are ideal for power generation. To capture stronger winds, the towers must be positioned high. A shaft inside the nacelle, which also houses the generator, connects the rotor to it. Wind-driven blades lift off and spin a rotor, which powers a low-speed shaft coupled to a high-speed shaft that is connected to an electricity-generating generator (IRENA, 2021).Wind energy is well established as a mature technology to produce electricity and has an estimated installed base of 906 GW worldwide. Installed capacity reached its peak growth of 94GW in 2020. Wind is one of the fastest growing renewable energy technologies and is increasingly being included in energy plans around the world (Global Wind Energy Council, 2022). China is the largest wind market by installed capacity since 2010, with a record 54GW of wind installations in 2020 representing a multiple of 18 times of the 3GW installed capacity in South Africa (Global Wind Energy Council, 2022).

The fact that wind energy uses a free fuel source makes it appealing. However, while wind may be available in abundance, key determinants to the viability of installing a wind power facility is the accuracy and availability of information pertaining to the wind resource speed, strength of wind, frequency and direction of the wind (Eskom, 2007). Notwithstanding South Africa's great wind potential for large scale power systems, this remains underutilised due to, inter alia, the intermittent nature of the energy source, capital cost associated with wind turbines and wind power being mainly applied in small- and-medium sized power projects. Adefarati and Obikoya (2019) identified the barriers to large scale wind projects as including the intermittent nature of wind, and high capital costs. Government policies until only recently, did not support the use of wind resources, and land use restriction, ineffective power quality control, and a lack of accurate information existed regarding the technical and financial advantage of using wind for power generation.

3.11.2. Solar energy

It is widely known that Africa is blessed with abundant sun all year round and South Africa is no exception. Most areas in South Africa average more than 2,500 hours of sunshine every year, with an average daily solar radiation level of between 4.5 and 6.5 kWh/m^2. South Africa receives an average of approximately 220 W/m^2 of yearly 24-hour global solar radiation, compared to areas of the USA at about 150 W/m^2 and Europe and the UK at about 100 W/m^2 (Haw & Hughes, 2007). Similarly to Wind Energy, South Africa has great potential for solar energy, yet this remains underutilised with the fuel source contributing only 2.7% to South Africa's total energy mix (Department of Energy: Republic of South Africa, 2019b).

3.11.3. Solar photovoltaics

Solar photovoltaics (Solar PV) directly converts solar radiation to electrical energy. This is accomplished through a mechanism whereby electrons are released from a substance when sufficient wavelength of light strikes a semiconductor. Photovoltaic cells are devices that convert energy of the sun directly into electricity. According to the International Energy Agency, the total installed and commissioned PV capacity increased by more than 25% globally in 2022 reaching 1,185 GW. China remained the nation with the biggest installed capacity, doubling the installed capacity from 55GW in 2021 to 106 GW in 2022 (IEA, 2023).

South Africa's solar PV industry has been previously highly regarded and enjoyed 9th position, however has declined to 28th position (IEA, 2023) . Large scale solar PV projects grew from 21 MW 2,287 MW between 1 Nov 2013 to 31 Dec 2022 (Pierce & Le Roux, 2022). According to Green Cape 2023 Energy Services Market Intelligence Report, the rooftop solar market at the end of 2023 was estimated at 3.2GW with potential to grow to 10 GW by 2030 presented by the residential and commercial and industrial addressable markets.

3.11.4. Concentrated solar power

The Concentrated Solar Power technology uses lenses or mirrors to focus solar radiation on a particular area that contains a working fluid in order to produce energy from solar power systems (Potts & Walwyn, 2020). The fluid (thermal oil) is heated by solar radiation, which creates steam that drives a steam turbine and, as a result, generates electricity.
Fluri (2009) investigated the possibility for concentrating solar electricity in all provinces in South Africa. The study considered variables like the amount of sunlight, the distance from current transmission lines, the topography in the area, and the ecosystem of the potential sites. The Eastern Cape and the Free state were recognized as suitable sites, albeit to a lesser extent, whereas the Northern Cape was chosen as the most ideal place for the large-scale deployment of CSP technologies. The total potential generation capacity of South Africa was anticipated to be around 500 GW, particularly if the solar resource in the Northern Cape can be used properly. This study was undertaken at a time when there was not even a single CSP plant in South Africa (Fluri, 2009). Notwithstanding that South Africa has one of the highest local resource indices globally, the full potential of solar energy is yet to be realized. The country had an installed capacity of 1.4 GW in 2022 (Pierce & Le Roux, 2022).

Table 4: Top five CSP plants in South Africa (Goosen, 2022)

Plant	Province	Installed capacity
Redstone CSP	Northern Cape	480,000 MW
Kathu CSP	Northern Cape	100 MW
Karoshoek Solar One	Northern Cape	100 MW
Xina Solar One	Northern Cape	100 MW

Table 4: Top five CSP Plants (Goosen, 2022)

3.11.5. Hydropower

Hydropower uses kinetic energy of moving water, such as a river, to drive a turbine which in turn produces electricity. To guarantee that the entire generation potential is reached, the energy supply, or river, must flow sufficiently throughout the year and ideally not be subject to seasonal changes in water flow. To establish the power generation systems and safeguard the aquatic ecology, changes to the present river hydrology are likely to be necessary. Aquatic ecosystem may be negatively impacted for a long time by changes to the hydrological flow. Given that water flows continuously through a turbine and across a river, hydropower often has a high capacity factor (Bartle (2002).

In 2022, hydropower contributed 1.4% to the country's energy mix (3.1TWh) (Pierce & Le Roux, 2022). This is modest when compared to global standards, where hydropower contributes c. 16.7% (1,357GW) of total power plant installations (Global Data, 2023).

3.11.6. Carbon capture and storage technology

3.11.6.1. CCS Defined:

CCS is a process where Carbon Dioxide ('CO_2') is captured from large point sources, such as industrial sites or power plants that burn either fossil fuels or biomass as fuel. If not used immediately, the captured CO_2 is compressed and either injected into deep geological formations like depleted oil and gas reservoirs or salty aquifers, or it is transported by pipeline, ship, rail, or truck for use in a variety of applications (World Energy Council, 2007).

3.11.6.2. Development of CCS:

The driving factor behind CCS is in reducing climate change brought on by economic expansion and development. Scientists and analysts identify Carbon Capture and Storage Technology as potentially capable of making a significant contribution to meeting global GHG mitigation objectives. CCS could provide a technological bridge for achieving near to midterm GHG emission reduction goals (Kulichenko & Ereira, 2012)

While South Africa has committed to reducing GHG emissions through transitioning part of the energy mix to renewable energy technology, it remains an incredibly daunting and costly task to transition all the country's coal-fired power plants to cleaner energy. South Africa as the highest emitter of GHG on the continent has started exploring its CCS potential since 2004 as a viable option to extract CO_2 from flue gas and store it in an underground reservoir (Ko et al., 2021). The CCS roadmap endorsed by the SA Cabinet in 2012 provides the direction of the South African Centre for Carbon Capture and Storage ('SACCCS') (Beck et al., 2013). The 2010 Atlas on geological storage of CO_2 in South

Africa identified Kwa-Zulu Natal and the Eastern Cape as the regions with the most potential for safe and secure CO_2 storage. Following this, the role of SACCCS would be to continue with feasibility and advancing the technical aspects of CCS technology. The following are the milestones set:

Target year	Milestone
2017	CO_2 test injection project of 10,000-50,000tCO_2
2020	Commencement of a CCS demonstration plant 1,000,000tCO_2 per year
2025+	Implementation of large-scale CCS deployment

Table 4: CCS Roadmap (Beck et al., 2013)

While international organizations such as the World Bank provided South Africa with assistance for its feasibility tests and completion of the development of the South African CO_2 Geological Storage Atlas in 2010, not much has progressed in terms of deployment of the technology. Media sites have stated that the CCS deployment has not progressed as expected, even though it was supposed to start in 2013.

The World Bank highlighted the inadequate state of CCS deployment in South Africa is due to intricate government structures, and varied laws on land ownership. Notwithstanding, it has given support of US$23mn towards actual demonstration. The demonstration project will unfold in Leandra, Mpumalanga where CO_2 will be compressed and transported via pipeline from significant emitters, such Sasol's Secunda, to the designated injection location, which is shielded from the elements by an "impermeable rock cap. The aim of this experiment is test feasibility of injecting 10,000 to 50,000 metric tonnes of CO_2/year to a depth of 1 km, with the first injection expected towards the end of 2025 (Vourliotakis, 2024) .

In their study, (Ko et al., 2021) found that, while South Africa made early progress in CCS diffusion, this did not progress to large-scale adoption due to the following:

- Regulatory framework was developed using the assistance of consultancy firms; however, government has not successfully implemented the legal and regulatory framework dedicated to CCS. This leaves great uncertainty for investors and stakeholders.

- Lack of sufficient funding support for CCS innovation projects.
- CCS R&D activities are more prevalent in academic institutions, and there has not yet been large scale deployment or commercialization. Due to the unproven empirical evidence and technical knowledge, the projects have not yet scaled up.
- Government's lack of commitment to CCS development.

Globally, the deployment of CCS has also not scaled up and is characterized by controversy, where critics view it as a strategy to delay the use of fossil fuels rather than focusing efforts on phasing them out. South Africa also recently came on the spotlight with its latest support on CCS, forming part of the 2023 Draft IRP (Nicholas, 2024).

3.12. Conclusion to Literature Review

The literature review introduces the concept of green finance, the characteristics of renewable energy technologies, and covers the opportunities, the natural endowments of renewable energy sources (wind and solar), and the suitability of the technology in South Africa. The literature review has highlighted the prominent role that financing actors can play in further propelling renewable energy and bridging the financing gap, as well as impediments related to large-scale deployment.

4. CHAPTER 4: RESEARCH METHODOLOGY

4.1. Introduction to Research Methodology

Because the study aimed to expand knowledge in a less-explored topic on the role of South African banks in Renewable Energy Projects, the study was exploratory in nature. Exploratory research is used to deepen an understanding or add to a body of knowledge for which little or no prior studies on the subject have been conducted (Brown, 2006). The objective of this research was to gain a better knowledge of the phenomenon of renewable energy projects landscape in South Africa, understand the role of South African major banks in financing renewable energy, how South African banks go about de-risking these projects, and whether South Africa will close the financing gap relating to these projects required to reduce carbon emissions to target levels. Given the exploratory nature of the study, the qualitative research method was applied.

4.2. Research Strategy

Given the explorative and interpretive nature of the research question, as well as the aim of attaining a deep understanding of the topic, the research lent itself to the qualitative paradigm (Marshall & Rossman, 2014). The methodology discussed below included a survey, which was conducted by face-to-face and/or virtual interviews. Marshall and Rossman (2014) note the ability of qualitative research to involve a combination of enquiry approaches. It is proposed that deep understanding, rather than conclusiveness, is the main objective of the prospective researcher, which would be supported by the deductive nature of qualitative research (Saunders & Lewis, 2012).

4.2.1. Qualitative research

The methodological approach employed in this study was an exploratory, interpretive qualitative design (Cohen et al., 2018). This approach involved systematic collection, organization, and interpretation of material derived from discussions or observations used in the evaluation of meanings of social phenomena as experienced by individuals themselves (Malterud, 2001; Creswell & Creswell, 2023).

A qualitative method of research argues from the underlying philosophical nature of each hypothesis, enjoying a deeper understanding through detailed assessments and open-ended interviews. The benefit to the researcher is that this approach allows for a deeper understanding and insight into complex research questions (Buchanan & Jones, 2010).

According to Leedy et al. (2014), qualitative researchers are primarily concerned with the problem's overall complexity. This qualitative method was chosen because it allowed for a deeper insight into complex research questions, such as the perceptions and internal drivers of senior financial experts, which are difficult to explain numerically. The core focus was to understand the complexity and multiple facets of the research problem (Leedy et al., 2014.

The benefits of selecting qualitative research methodology are:

- Corbin and Strauss (2014), asserts that qualitative methods can give insight about any phenomenon about which little is known. They can also be used to get new views on topics that are well-known, or to obtain more detailed information that is difficult to explain numerically.
- Qualitative research is used either to first identify the variables which might later be tested quantitatively, or in cases where the researcher has established that quantitative methods cannot be used, to describe or interpret a situation (Hoepfl, 1997).
- Qualitative research allows the researcher to fully describe a situation from multiple perspectives, not only the researcher's.
- Hoepfl (1997) relying on the work of Yvonna and Guba (1985) supports the view that if a researcher wants people to comprehend things better than they would otherwise, qualitative research methodology provides people with knowledge in the format they are most familiar with.
- Qualitative research allows a researcher to put particular assumptions, assertions, ideas, or generalizations to the test in real-world situations (Leedy et al., 2014).

The study was both normative and descriptive to the extent dictated by the nature of the findings. Given the developing nature of studies conducted on green finance, some aspects of the problems may still not have been fully understood. To this extent, an exploration of the various topics was undertaken, which lent itself to qualitative research methods (Twinn, 1997). Data was also required to buttress some of the observations. To this end, the qualitative research approach was undertaken.

4.2.2. Quantitative research

Quantitative research uses numerical analysis and experimental methods to test hypothetical generalizations (Hoepfl, 1997). Creswell (2017) defines quantitative research as a way of explaining phenomena by gathering statistical data and analyzing it using mathematically based approaches. Quantitative researchers focus on the measurement and analysis of causal relationships between variables.

Researchers who use quantitative research employ experimental methods and quantitative measures to test hypothetical generalizations according to (Hoepfl, 1997), and they also emphasize the measurement and analysis of causal relationships between variables

(Denzin and Lincoln, 1998). As a result, ensuring the validity and reliability of quantitative research becomes a primary concern to deliver benefits such as the testing of theory.

The study did not employ quantitative research methods, since this is focused on the measurement and analysis of causal relationships between variables using numerical data (Creswell, 2017). Quantitative research was therefore deemed inappropriate given the exploratory aim of investigating subjective perceptions (trustworthiness: credibility, dependability, confirmability, transferability), rather than testing statistical generalizations (Creswell & Creswell, 2023).

4.2.3. Mixed-method research

Mixed-method research integrates qualitative and quantitative data collection techniques and procedures. This method enables the researcher to collect complementary data on the same topic so that the results of the study have more depth than either qualitative or quantitative methods alone (Creswell, 1999). Creswell further asserts that where the research problem is too complex, there will be greater benefit in combining research approaches and data to expand the understanding of the research problem(Creswell, 2017).

The study did not adopt a mixed-methods research design. Although mixed methods integrate both qualitative and quantitative data, the current research maintained a strict focus on the interpretive qualitative paradigm to achieve the required depth of understanding of the bankers' perceptions and institutional constraints (Creswell, 1999; 2017).

4.3. Research Design, Procedure and Methods

4.3.1. Data collection method

Given the explorative and interpretive nature of the research question, as well as the aim of attaining a deep understanding of the topic, the research lent itself to the qualitative paradigm (Marshall & Rossman, 2014). As indicated above, data was collected through expert interviews, which were either face-to-face or through other means, such as electronic media (Marshall & Rossman, 2014; Saunders & Lewis, 2012).

The data collection process included setting the study's boundaries, gathering information through semi-structured observations and interviews, reviewing documents as well as defining the procedures for capturing and recording information. Data was collected using open-ended semi-structured interviews targeting professionals and experts within the South African Energy Financing sector.

- Primary data was collected through interviews. These were held face-to-face and virtually with professionals and experts within the South African energy financing sector. They included finance sector professionals from major South African banks.
- Secondary data included data from the SARB, energy policies and other information that was publicly available electronically.

4.3.2. Primary data

An interview can be described as a conversation that happens for the purpose of gathering information through questions and responses. An interview is considered an appropriate data collection method to gather in-depth information on people's opinions, perceptions, thoughts and feelings. When the topic of investigation necessitates in-depth questioning and probing, interviews are beneficial. Primary data was collected from interviews. Given the developing nature of the study, semi-structured interview questions were adopted. Semi-structured interviews allowed open-ended questions to be used to enable the participants to engage and share information on renewable energy projects that they have funded. To ensure that participants were consistent in their responses, a topic guide serving as a checklist was circulated prior to the interviews.

According to (Leedy & Ormrod, 2010), qualitative studies benefit from interviews that are either open-ended or semi-structured, particularly if these are guided by key themes. Semi-structured interviews allow for flexibility in that the researcher can refine the detailed structure of the questions in the context of the research problem. The respondents also have a degree of flexibility in how to respond, the extent of detail to disclose, and the manner in which they respond to the researcher's questions (Drever, 1995). (Drever, 1995) further states that the method would not be suitable in studies involving a large number of people. (Leedy & Ormrod, 2010) share this view, in that it may prove to be difficult to make comparisons between the respondents.

Unstructured interviews have no precise criteria, constraints or preparation. The interviewer offers a few broad questions to elicit an open, informal, and spontaneous response from the responder. Whilst these are flexible, it may prove to be difficult to make comparisons among the respondents thus distorting the research findings (Leedy & Ormrod, 2010). Respondents were asked to provide their perceptions about funding renewable energy projects in general. The theme guide included the following:

- The capital investment cost of large-scale renewable energy projects.
- The decision-making process involved SA banks in funding large-scale renewable energy projects.
- The appetite for SA banks to fund large-scale renewable energy projects.
- The motivation for SA banks to fund renewable energy projects.
- Criteria used by SA banks when considering participation in large-scale renewable energy projects (i.e. size of project, socio-economic considerations such as job creation, local participation, etc.).
- The funding structures implemented (tenure, capital, structure, pricing, etc.) by SA banks on large-scale renewable energy projects and whether these are profitable for the banks.
- Benefits that SA banks derive from funding large-scale renewable energy projects (ESG reporting, global accreditation).
- The extent to which energy policy has a bearing on renewable energy projects being funded; and
- Performance of the respective renewable energy projects previously funded by SA banks both from a return on investment for the banks and performance of the large-scale renewable energy projects against key objectives.

Mattered (2001) states that what a researcher investigates, the positioning of their inquiry, the techniques adopted for the task, the results deemed most appropriate, and the framing and communication of conclusions will all be influenced by the researcher's professional and personal context. She further indicates that, while different researchers will have access to different but equally reliable descriptions of the situation under review, their opinions are influenced by their varying backgrounds and viewpoints. In qualitative research, rather than a lack of reliability, these different approaches to the same subject contribute to a deeper understanding of complex phenomena (Malterud, 2001).

4.3.3. Data analysis

The primary data was analysed using thematic analysis, following a rigorous six-phase process (Braun & Clarke, 2006). NVIVO® software was used to organize the data, ensure coding consistency, and manage the audit trail. Innovations in qualitative data-analysis software have provided the qualitative researcher with powerful tools to assist in the research process. Qualitative researchers can benefit from more efficient data administration, more rigorous and thorough coding and interpretation, and shorter analysis times when they use the right tools (Jones, 2007). One such tool is the NVIVO ®. NVIVO ® makes what would otherwise be tedious and mechanical activities associated with data analysis, such as constructing concept cards, categorizing, segmenting, coding, and duplicating, more straightforward for the researcher (Jones, 2007).

Following Braun and Clarke (2006), the six phases of data analysis were executed as follows:

1. **Familiarising with the Data:** The researcher transcribed all five semi-structured interviews verbatim and engaged in repeated reading to achieve deep immersion in the dataset.
2. **Generating Initial Codes:** Using NVIVO® software, raw data segments were systematically tagged and coded. These codes identified key attributes reported by bankers, such as 'grid constraints,' 'ESG integration mandates,' and 'DFI co-financing reliance'.
3. **Searching for Themes:** Initial codes were grouped and synthesized into broader, conceptually related thematic areas. Codes related to the IRP, REIPPPP, and the Electricity Regulation Amendment Act, for example, were grouped under the emerging theme of "Coercive Institutional Policy".
4. **Reviewing Themes:** The potential themes were rigorously tested against the raw data and the conceptual framework (IT and RDT) to ensure internal thematic coherence and clear differentiation.
5. **Defining and Naming Themes**: The final themes were clearly defined and named, providing the analytical structure presented in Chapter 4, which includes Government Policy as an Enabler and Resource Dependencies: Challenges in Renewable Energy Financing.

6. **Writing the Report:** The analysis is written in Chapter 4, integrating the thematic definitions with explicit evidence drawn from verbatim quotes, and linking the findings back to the theoretical framework.

4.3.4. Data collection instrument

The primary data collection instrument was the semi-structured interview guide (contained in Appendix A), which focused on eliciting in-depth perceptions on themes such as capital investment, decision-making processes, appetite, funding structures, and the influence of policy and ESG.

4.3.5. Target population and respondent selection

4.3.5.1. Population

The target population comprised senior executives and specialized management personnel (e.g., Head of Project Finance Transactor: Energy Finance) who possessed direct, current knowledge of LS-REP financing within the South African commercial banking sector.

4.3.5.2. Sample and sampling method

As part of the quantitative portion of the study, a sample was drawn from participants in renewable energy projects as follows:

Company	Location	Min No. to be Sampled	Proposed Respondents
Commercial Bank 1	Johannesburg	Three	• Head of Project Finance • Head of ESG • Head of Energy, Power and Utilities
Commercial Bank 2	Johannesburg	Three	• Head of Project Finance • Head of ESG • Head of Energy, Power and Utilities

4.4. Ethical Considerations

The study complied with the university's code of conduct and ethics policy. Duty of care was exercised throughout the process to ensure that the research did not harm the participants but that the researcher acted in a way that benefited the participants (Wiles, 2012). As a way of adhering to the university's ethical guidelines, the researcher also implemented the following specific measures:

- Obtained signed, informed consent from all participants (Wiles, 2012).
- Ensured confidentiality and anonymity by removing all identifying information from the report; and
- Advised participants of their voluntary participation and right to withdraw, and ensured secure, password-protected data storage.

4.5. Methodological Rigour

Methodological rigour or research trustworthiness are collective terms for the criteria used to evaluate the quality and rigor of research, including validity, reliability, credibility, and dependability, is trustworthiness or methodological rigour (Bryman, 2016). These terms are briefly discussed below.

4.5.1. Validity

Creswell and Miller (2000) define validity to the degree to which the story accurately reflects participants' perceptions of the social phenomenon and is credible to others. To improve validity, (Creswell & Miller, 2000) suggest the following procedures:

- Triangulation - data was collected from multiple sources i.e. interviews with experts from South African banks, analysis of documents and observations.
- Member Checking – this involves a review and validation of the respondent's data to confirm that the data is being correctly interpreted. Feedback from respondents was fed back to respondents for them to confirm.
- Researcher Reflexivity – a researcher may disclose their assumptions, beliefs, or biases to shape the nature of the inquiry. The disadvantage of this procedure is that it may potentially lead to response bias.

In this study, validity was enhanced through data triangulation, where interview data were supported by documentary evidence such as policy documents, industry reports, and historical REIPPPP implementation data. Furthermore, the interview guide was structured to align directly with the research questions and theoretical framework, ensuring that the data collected accurately reflected the constructs being examined. Member checking was also employed, allowing participants to verify the accuracy and interpretation of their contributions, thereby strengthening construct validity.

4.5.2. Reliability

Reliability refers to how similar a test, technique, or tool, such as a questionnaire, will produce the same results in different situations, provided nothing else has changed (Roberts & Priest, 2006). Reliability is the degree to which findings are consistent and repeatable. (Saunders & Lewis, 2012) mention that comparing answers to several versions of the same topic or set of questions is one technique to ensure questionnaire reliability.

Reliability in this study was strengthened by using a consistent semi-structured interview guide across all participants, ensuring that data collection followed a standard process. Additionally, the data analysis process was supported by NVivo software, which allowed for systematic coding, theme development, and the creation of an auditable analytical trail. Detailed description of data collection, coding procedures, and interpretive steps enables replication of the study, therefore enhancing dependability.

4.5.3. Credibility

Qualitative analysis results in a different type of knowledge than does quantitative inquiry because one party argues from the underlying philosophical nature of each paradigm, enjoying detailed interviewing, and the other focuses on the apparent compatibility of the research methods, “enjoying the rewards of both numbers and words” (Glesne & Peshkin, 1992, p. 8).

To ensure the findings were a plausible interpretation of the data, member checking was conducted by sharing a summary of key themes with each participant for verification of accuracy. Additionally, triangulation was achieved by comparing interview findings with public documents like bank sustainability reports and government policies (Creswell & Creswell, 2023).

4.5.4. Transferability

While the findings are context-specific, rich, thick descriptions of the context and participant perspectives are provided to allow readers to assess the potential applicability of the findings to other similar settings (Cohen et al., 2018).

Transferability was ensured through giving descriptive, rich, contextual accounts of the South African renewable energy financing climate, the roles of the participants and organisational conditions that allow the reader to figure out whether the findings can be relevant to a similar situation. The elaboration of themes and quotations also enables other researchers and practitioners to make an analysis of their applicability to similar financial and energy-based settings.

4.5.5. Dependability

To ensure the research process was logical and well-documented, a clear audit trail was maintained, including interview protocols, transcripts, and a detailed description of the thematic analysis process outlined above (Bryman, 2016).

Dependability, just like validity, was maintained with a well-documented process of research, such as the application of a uniform semi-structured interview guide, a systematic coding process in NVivo, and the description of methodological choices, which made it possible to replicate the study in identical conditions. The data collection and analysis protocols were audited, which enhanced the credibility of the resulting data.

4.5.6. Confirmability

To ensure findings were grounded in the data and not researcher bias, researcher reflexivity was practiced (Creswell & Clark, 2017). The extensive use of direct participant quotes in Chapter 4 further links the findings directly to the participants' voices.

Lastly, NVivo was used to ensure confirmability by ensuring an objective and traceable connection between raw data and the themes produced with the help of direct quotation of the respondents to depict the evidence-based interpretation. One way in which the researcher's bias was reduced was through keeping reflective notes and making sure that the interpretations were based on the perspective of the participants and not any personal assumptions.

4.6. Limitations on the Methodology Adopted

Interviews are an important tool in qualitative research for gaining in-depth insights and vivid narratives. When examining intricate phenomena that call for sophisticated comprehension, this method is especially beneficial (Leedy & Ormrod, 2010). However, conducting interviews involves overcoming a number of procedural and logistical obstacles, such as interviewee availability, the necessity of rescheduling appointments, and situations when interviewees speed through their answers.

4.5.7. Availability of interviewees

One of the primary challenges in qualitative research through interviews is ensuring the availability of interviewees. The schedules of the interview participants selected from the banks proved difficult to predict. The first round of interviews was scheduled in the month of November, which is the busiest period for bankers in South Africa, as it leads up to the period before the year-end break. The interviews could therefore not be secured during that period due to the schedules of bankers being rather busy. A degree of flexibility to have the interviews in the new year was necessary to maintain the diversity and representativeness of the sample, thereby enriching the data collected.

4.5.8. Meeting rescheduling

Another major issue that researchers commonly face is rescheduling meetings. Interviewees may be forced to request adjustments to the initially agreed-upon schedule due to unforeseen events, such as personal emergencies or work obligations. These interruptions may cause the research schedule to be delayed and call for extra logistical planning. To guarantee ongoing participation and collaboration, researchers must skilfully handle these changes while keeping in constant contact with participants. I had to be reschedule a number of times to find a mutually convenient time to conduct the interviews. This impacted the research timeline.

4.5.9. Rushed responses

A further complication in qualitative interviews is the occurrence of rushed responses from interviewees. Time constraints and external pressures may lead participants to expedite their answers, potentially compromising the depth and quality of the data. To address this issue, researchers should create a conducive environment for the interview, emphasizing the importance of thoughtful and reflective responses. Additionally, employing open-ended questions and allowing ample time for interviewees to articulate their thoughts can mitigate the tendency to rush. Follow-up questions and probes are instrumental in eliciting comprehensive and elaborative answers, thus enhancing the richness of the qualitative data.

4.7. Conclusion

Although conducting qualitative research through interviews is a reliable way to get in-depth information, there are a number of issues with interviewee availability, meeting rescheduling, and hurried responses. To guarantee the accuracy and comprehensiveness of the information gathered, researchers must overcome these obstacles using adaptability, clear communication, and strategic questioning methods. Researchers can improve the interview process and make significant contributions to their disciplines by tackling these problems.

5. CHAPTER 5: PRESENTATION OF RESULTS

5.1. Introduction

In this chapter, a thematic analysis of the interviews is presented. Thematic analysis of the qualitative data collected was conducted to identify themes and patterns that occurred (Fouché & Brent, 2019). Through these interviews, I gained a greater understanding on how commercial banks think about investing in renewable energy, what drives their decision-making, as well as the challenges and opportunities that exist in the field of renewable energy financing.

The themes manifest through this analysis included the following: The Role of Government Policy as an Enabler, Financial and Investment Considerations, Renewable Energy Financing Challenges, ESG Strategy and Sustainability Goals: Making Each Matter Work, and The Role of Private Capital Adding Capital to Meet Infrastructure Gaps (Eitan et al., 2019). Collectively, these themes embody the complex interplay between regulatory frameworks, financial risk assessments, market dynamics, and sustainability objectives, all of which influence the landscape of renewable energy financing in South Africa (Khonjelwayo & Nthakheni, 2020).

This chapter explores these elements and provides contextualization of the views of interviewees in relation to the broader financial, policy, and energy transition-related narrative by synthesising views of multiple interviewees. This chapter draws on qualitative data, and through retaining original quotes from the participants, it demonstrates how banks navigate the shifting energy financing landscape and the implications of these practices (Polzin et al., 2021).

Further, this chapter discusses the approach that banks follow when deciding on funding renewable energy projects. This includes assessing the suitability of various renewable energy technologies, assessing the risks and rewards (financial and otherwise), ensuring international acquisition and domestic sustainability targets, and managing continuously shifting regulatory regimes (Kiviranta et al., 2021).

Lastly, the chapter points to the contribution of South African banks in financing renewable energy projects, and what this means for energy security, economic development and the environment. Through this analysis, the study adds to the body of knowledge about banks' role in facilitating the global imperative of renewable energy adoption and penetration (Anton & Nucu, 2020).

The interviewees were asked to rate the factors mostly influencing renewable energy financing on a scale of 1 to 5, with 5 representing the most likely driver influencing a funding decision and 1 representing the least influential factor. The table below displays the combined results of the interviews, illustrating that Government Policy (Intergrated Resource Plan), is a material driver which has enabled an environment for banks to participate in renewable energy financing. This factor received a five rating from all interviewees. Sustainability Objectives (the Global Drive towards Energy Transition) along with Energy Security are also influential factors for banks when funding RE. The factor with the lowest total score is Resource Endowment which scored 12, 48% and is a secondary rather than a primary factor in renewable energy financing.

Table 5: Summary of interview outcomes on the most influential factors in renewable energy financing

Factor	Interview 1 Project Finance Expert (Mining & Renewables)	Interview 2 Project Finance Expert (Mining & Renewables)	Interview 3 Renewable Energy Finance Expert	Interview 4 Renewable Energy Finance Expert	Interview 5 Project Finance Expert (Renewables)	Score
Government Energy Policy	5	5	5	5	5	25 100%
Sustainability Objectives	5	5	4	4	4	22 88%
Energy Security	5	4	5	5	4	23 92%
Access to the grid	2	4	4	5	3	18 72%
Resource endowment	2	3	2	3	3	13 52%

5.2. Presentation and Discussion of Main Results

5.2.1. Government Policy

A prominent theme during the interviews is that government policy is not merely a backdrop but a strategic enabler in renewable energy investments in South Africa. Participants noted that the alignment of multiple policy instruments created a coherent and attractive investment landscape. These instruments included the IRP, REIPPP, the Electricity Regulation Amendment Act, 2004, as well as South Africa's commitments under the Paris Accord (Sustainability & Institute, 2023). Derisking mechanisms through government guarantees and tax incentives have reduced the perceived investment risk, promoted private investment participation in the sector, and enhanced the viability of large-scale renewable energy projects.

> *"The reason that South Africa has such a well-structured and well-executed renewable energy program is because of the government policy that was put in place that allowed for private sector participation to occur."* (Interviewee 2)

"The removal of the licensing threshold in 2022 really unlocked investment activity by the private sector …when you are enabling institutions to do things, especially in the private sector, that's when you end up seeing an increase in investment." (Interviewee 4)

Besides the adoption of these policies, respondents pointed to the importance of regulatory stability in building investor confidence. Policies with clarity and long-term commitment from the government allow banks to commit the capital required to fund renewable energy projects and project sponsors to invest in these projects with more certainty (Odass, 2023). Uncertain or frequently changing regulations, conversely, can discourage investment and delay project realization.

"Policies have created an enabling environment, including lifting the previous limitation on corporate energy generation (less than 100MW), allowing for greater participation by corporates such as Sasol (900MW) and Anglo (1GW)" (Interviewee 1).

5.2.2. Financial and investment considerations

All interviewees pointed to project financing structures, credible project sponsor, creditworthiness of offtakes, and risk assessment as vital to project bankability. Financing decisions are based on many things, including the financial strength of project sponsors, revenue security, and contractual agreements such as PPAs (Project & Structured Finance, 2023).

"We look to fund Tier 1 sponsors…sponsors who have a strong track record and experience in delivering large-scale renewable energy projects as well as a good balance sheet." (Interviewee 3)

"If it is under the REIPPPP, that's so much easier because the project is fully structured and packaged. However, in the C&I space, we assess the developer's experience, the financial strength of the off-taker, and the project's long-term viability." (Interviewee 2)

Interviewees also remarked that investment risk mitigation strategies are an important part of decision-making. This includes due diligence in financial models, making sure revenue streams are secured, and stress-testing projects against downside risk scenarios, such as economic slowdowns or high inflation (Talebolfakhr et al., 2020). For example, the existence of financial backstopping mechanisms (e.g., sovereign guarantee, insurance coverage against default) was also identified as an important consideration.

5.2.3. Challenges in renewable energy financing

While investments in renewable energy have advanced, this has not been without challenges. These encompass grid capacity restrictions, regulatory ambiguity, and the financial constraints of governmental entities. Participants articulated how these issues generate barriers in project development and halt investment in the sector (Moorthy et al., 2019).

> *"The government is financially constrained. They cannot invest in grid capacity on their balance sheet. Aside from financial constraints, they are not completing projects on time because of lack of expertise, corruption, and inefficiencies."* (Interviewee 3)

> *"No, the renewable energy generated by mining companies is typically not used in their production processes. Instead, it is fed into the grid to offset their GHG emissions. When renewable energy is fed into the grid, Eskom credits the independent power producer for supplying clean energy, even though the producer itself may continue to use Eskom's traditional energy supply. This phenomenon is known as emission offsetting* ". (Interviewee 1)

Another difficulty addressed was the accessibility of proficient technical professionals to oversee extensive energy projects. Participants observed that, although financial capital is essential, limitations in technical capacity—such as insufficient knowledge in grid integration and project implementation—can hinder the viability of renewable energy ventures (Le et al., 2020).

> *"Advancements in solar panel efficiency and technology have enabled efficient use of land i.e. large-scale projects can be developed on the same field size. Previously, a 100MW plant required significant space, but today, with 500-600W panels, larger projects can be built on the same field size".* (Interviewee 1)

> *"Grid is probably the biggest bottleneck, particularly in the eastern and western parts of the country. We expect a program that will focus on the transmission segment of*

the ESI, led by the private sector, given the large capital requirements." (Interviewee 2)

5.2.4. ESG strategy and sustainability objectives

South African banks have integrated Environmental, Social, and Governance (ESG) frameworks into their investment strategies, aligning business objectives with sustainability and carbon reduction pledges (Uhunamure & Shale, 2021) . Thus, ESG compliance is progressively emerging as a prerequisite for project funding, guaranteeing that energy investments correspond with climate objectives and social development targets.

> *"Our strategy has always been to provide financing for more sustainable projects…energy being one of them. We started participating in renewable energy projects way before the government-backed REIPPPP program commenced."* (Interviewee 4)
>
> *"It is a good return because we exist for our shareholders, but it is an ESG-adjusted return in that it is driving social positives…profit with impact."* (Interviewee 3)

Alongside sustainability objectives, interviewees emphasised the increasing demand from international DFIs to ensure that projects comply with rigorous ESG criteria (Tan, 2022). Numerous renewable energy initiatives receive co-financing from DFIs, which enforces stringent environmental and social performance standards.

5.2.5. The role of private capital in bridging infrastructure gaps

Private sector involvement was deemed essential for addressing infrastructure deficiencies, especially in funding transmission lines and grid growth. As public finances tighten, financial institutions are turning to Public-Private Partnerships (PPPs) to bridge the financing gap (Monk et al., 2019).

> *"Private capital will have an immense role once again in bridging the financing gap. The only way you can fight inefficiencies is to bring in some procurement process that includes a private-public partnership."* (Interviewee 3)
>
> *"We are seeing more partnerships between local banks and international DFIs to finance large-scale renewable energy projects. However, challenges remain in*

ensuring that these partnerships translate to a lower cost of capital for projects." (Interviewee 2)

The dependence on private finance indicates a transition towards cooperative funding strategies to meet infrastructure requirements. These collaborations provide both financial resources and technical skills, as well as project management capabilities essential for successful project implementation (Vecchi et al., 2021).

The thematic analysis illustrates that government policy, when implemented correctly, acts as an enabler to the advancement of renewable energy financing. If implemented poorly, government policy can be an impediment to the advancement of renewable energy. This is what regulatory frameworks such as the IRP, Electricity Regulation Amendment Act, and the REIPPPP have laid as a foundation to attract investment and encourage the participation of the private sector in South Africa's renewable energy sector (Kitzing et al., 2022). However, participants indicated that inconsistency in the implementation of policy and protracted approvals to regulatory requirements are deterrents for prospective investors and hinder project progress. It is thus important to instil confidence among financial institutions and energy developers by making policies transparent, stable, and clear (Sercy & Cavert, 2024).

The engagement of materials arising from the policy drivers will be contingent on structured investment practice, which is a critical component determining banks' involvement in renewable energy financing. In the last one, where banks and financial institutions seek stable revenue streams, various project finance structures, risk assessment processes, and long-term return estimates establish whether investing in renewable energy is viable (Taghizadeh-Hesary & Yoshino, 2020). Key financial considerations when choosing to fund include the availability of creditworthy off-takers, the possibility of PPAs, as well as the balance sheet strength of the project sponsors. In the absence of those assurances, it would be impossible to access long-term financing that is necessary for large-scale renewable energy projects (Lam & Law, 2018).

The prominence of ESG strategies has also influenced banks' involvement in the sector. For example, financial institutions are shifting their investments to converge with international sustainability pledges, including the Paris Agreement and the United Nations

SDGs (He et al., 2021). Currently, ESG factors are incorporated into due diligence processes, ensuring that projects are not only financially viable, but also environmentally and socially acceptable. It is evident that sustainable investments contribute to a long-term, successful economy and help mitigate climate change risk, thereby driving the growing trend towards sustainability (Hughes et al., 2021).

Notwithstanding the advances discussed above, significant hurdles remain in renewable energy financing. For instance, limits on grid capacity continue to be one of the significant bottlenecks hindering the commissioning of new energy projects into the national power grid system (Sustainability & Institute, 2023). In South Africa, transmission and distribution networks require significant upgrades to accommodate the increasing deployment of renewable energy, however, the slow pace of infrastructure development exacerbates uncertainty for investors. Investors in renewable energy may never fully reap the benefits of grid expansion and modernization if the development of such infrastructure does not align with the urgent timeline to achieve the next level of clean power (Kiviranta et al., 2021).

In addition, financial constraints and funding shortages remain barriers to the large-scale deployment of renewable energy. Although local banks are crucial in financing these projects, they often have limited capital, thus restricting their participation in certain projects (Le et al., 2020). Blended finance structures, green bonds, syndicated loans, and risk-sharing structures to unlock risk pooling are some of the innovative financing models that banks are increasingly turning towards in addressing this issue. Such models allow the combination of public and private capital to create more resilient funding solutions.

Private investors and foreign development organizations are also expected to have a more substantial impact on South Africa's funding landscape. This is because DFIs and multilateral organizations are acting as intermediaries, providing concessional financing, technical assistance, and de-risking mechanisms to encourage the entry of commercial loans into the industry (Sierra-Escalante & Karlin, 2021). Moreover, the engagement of foreign investors and impact investors introduces new capital flows that enhance project bankability. These developments create opportunities for increased financing of renewable energy in South Africa as it advances its energy transition and decarbonization objectives (Eberhard et al., 2014).

The future of funding for renewable energy in South Africa, therefore, depends on how investors, financial institutions, and legislators respond to these potentials and obstacles. Increasing policy coherence, putting in place reliable grid infrastructure, embracing flexible financing options, and forming international alliances are all necessary to realize the potential of investments in renewable energy (Edmark & Persson, 2021).

In the next chapter, I will discuss the findings in detail and recommendations based on these themes. I will also look at concrete actions to enhance the financing tools, dismantle existing barriers, and create a more resilient and inclusive RE financing environment.

5.3. Discussion of Findings in Relation to Theory and Literature

The findings of this study strongly reinforce the principles of Institutional Theory, which suggests that decision-making within organisations is shaped by coercive, normative, and mimetic pressures. Participants' emphasis on regulatory clarity, structured procurement processes, and predictability in government planning reflects coercive pressures linked to formal oversight and policy mandates. This supports existing literature arguing that uncertainty in the institutional environment increases perceived investment risk and can constrain capital flow into renewable energy infrastructure. Normative pressures were also evident, with participants highlighting growing expectations around ESG compliance, international reporting standards, and alignment with global sustainable finance practices. These findings align with research suggesting that banks increasingly consider non-financial factors to safeguard reputational capital and meet stakeholder expectations. Additionally, mimetic tendencies were observed in the alignment of commercial banks' strategies with industry leaders and development finance institutions, particularly regarding risk-sharing structures and financing models.

The findings also align with Resource Dependence Theory, which posits that organisations rely on external actors for critical resources and must therefore manage interdependencies strategically. Participants highlighted the energy system's structural constraints—such as limited grid capacity, dependence on Eskom for transmission access, and reliance on government-led procurement frameworks—as key determinants of investment decisions. These insights mirror literature from developing economies where financial institutions often lack full autonomy in infrastructure financing and must partner with state institutions, DFIs, and private developers to mitigate risk. The results suggest that banks view themselves as central investors but operate within systemic limitations beyond their direct control.

Furthermore, the study reveals an important tension between the long-term developmental objectives associated with renewable energy financing and shorter-term commercial return considerations. While participants affirmed an increased willingness to deploy capital for clean energy projects, they also noted that banks must remain prudent given capital adequacy regulations, shareholder expectations, and market risk exposure. This supports empirical studies showing that while sustainable finance has gained prominence, implementation is often moderated by the need for financial viability and risk mitigation.

Overall, the findings illustrate that commercial banks in South Africa perceive themselves as critical enablers of the country's renewable energy transition but are constrained by institutional instability, infrastructural bottlenecks, and evolving market expectations. Unlocking greater investment will therefore require policy consistency, accelerated grid expansion, administrative efficiency, and strengthened collaboration between the state, private sector, and development finance institutions. These insights provide valuable context for the conclusions and recommendations that follow in the next chapter.

6. CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Summary of Findings

6.1.1. Institutional commitment and policy alignment

The research found that South African banks are dedicated to financing large-scale renewable projects. The commitment, in fact, is driven by a few national policies, including, amongst others, the IRP, Electricity Regulation Amendment Act and REIPPPP, and NDC commitments under international regimes such as COP21 and the Paris Agreement. The banks have made ambitious targets, including deploying more than R100 billion in renewable energy projects. This illustrates that financial institutions have goals aligned with national energy transition plans (Sustainability and Institute, 2023).

The study also highlighted that banks have adopted ESG principles and integrated these into their investment decisions to align projects with sustainable development objectives (Sustainability and Institute, 2023). This alignment represents a broader evolution in the financial sector, where sustainability and financial capital are increasingly intertwined. Additionally, innovations in financial instruments, such as green bonds and blended finance, facilitate long-term investments in green energy (Puschmann et al., 2020).

6.1.2. Project participation and funding

The big five South African banks are funders of the REIPPPP and C&I projects in South Africa. The banks' mandate is not only to provide the funding to RE project sponsors and corporate emitters, but also to ensure that RE projects themselves do not pose harm to the environment and that they are developed in accordance with ESG principles (Kitzing et al., 2022). Banks are promoting greater participation in the renewable energy sector by offering competitive pricing and innovative funding structures to encourage participation in sustainable efforts. The challenges that remain are limited capital, opportunity cost of capital, and long payback periods, which may be less attractive for banks compared to shorter-dated investment opportunities (Ndlovu & Telukdarie, 2020).

6.1.3. Renewable energy integration and emission offsetting

A major takeaway from the research is that renewable energy generation by C&I developers, in particular mining and industrial companies, is not necessarily used directly in their production processes. The energy produced is fed into the national grid to compensate for greenhouse gases emitted during production. This phenomenon is known as emission offsetting and allows companies to earn carbon credits while contributing to the energy security of the nation (Frey et al., 2020).

The study also revealed that energy wheeling and PPAs were becoming increasingly common in the industry. A common occurrence is businesses now engaging directly with IPPs to purchase clean electricity, therefore reducing dependence on Eskom. This pattern indicates a rising need for market-oriented energy sourcing and decentralised energy (Parlane & Ryan, 2020).

6.1.4. Drivers of renewable energy adoption

There are several interlinked factors that drive the adoption of renewable energy in South Africa, as the country tries to meet its energy transition and sustainability goals. A major problem is the need for more generation capacity to satisfy rising electricity demand and to reduce dependence on coal-fired power plants (Kosowatz, 2022). South Africa is still grappling with long-standing issues around electricity supply, including load shedding, which underscores the critical need for more diversified and sustainable energy sources. As a result, the wider adoption of renewable energy will enhance South Africa's energy security and reduce its dependence on electricity generated from fossil fuels (Uhunamure & Shale, 2021).

South Africa has a high endowment of renewable energy sources, which bodes well for an increased deployment of renewable energy projects. For example, the Northern Cape represents one of the global hotspots for solar PV and CSP systems, due to the irradiation levels in the region being one of the highest in the world (Duvenhage et al., 2020)). The Eastern and Western Cape also have strong winds, thus representing a good basis for scaling up sustainable power generation (Potts & Walwyn, 2020).

The global drive towards energy transition and sustainability objectives is propelling South Africa towards large-scale adoption of renewable energy. Under international climate action treaties, most notably the Paris Agreement, South Africa pledged to constrain its greenhouse gas emissions and operate as a low-carbon economy (Todd & McCauley, 2021). This shift has led to increased investment in renewable energy projects and the development of policies aimed at promoting cleaner energy production. Additionally, coal-based energy has come under scrutiny for causing air pollution and consuming large quantities of water, thereby strengthening the case for renewable energy as a less destructive resource (Arndt et al., 2019).

Regulatory reforms have also been a driving force behind renewable energy investments. The lifting of restrictions on the private and corporate generation of power and allowing companies to produce greater quantities of electricity without needing a government-issued license has seen greater participation by IPPs. This policy change has enabled companies to invest in renewable energy projects for their own consumption, thereby limiting their dependence on Eskom and easing pressure on the national grid (Murombo, 2022). The trend towards the liberalization of the energy market (with a reduction of the state involvement in the energy systems) will further accelerate the implementation of IPPs and decentralized renewable energy solutions (Heng et al., 2022).

Moreover, the cost for renewable energy technologies has been rapidly falling. RE technologies have become more competitive with fossil fuel-based energy sources from a cost perspective. The price of solar panels, wind turbines, and battery storage has fallen sharply in recent years, thanks to technological improvements and economies of scale (Imasiku, 2021). Because of this, renewable energy is becoming increasingly feasible for both commercial power generators and energy consumers seeking to lower their energy prices. The cost-competitiveness of RE technology, along with its contribution to environmental sustainability and supportive regulatory environment, suggests that RE will have a prominent role to play in South Africa's energy future (Murombo, 2022).

The transition towards RE in South Africa is due to a few factors in the country, such as the need for new generation capacity, the resource endowment of both solar and wind, global sustainability initiatives, regulatory mechanisms, and an ever-declining technology cost. These drivers can all play a role in the nation's transition to a more sustainable and resilient energy system (Arndt et al., 2019).

6.1.5. Decision-making process and financial considerations

In recent years, banks worldwide have adhered to an array of regulatory and financial standards designed to ensure long-term profit maximization while supporting sustainability objectives. This has seen the emergence of banks shifting away from new investments in fossil fuels. Banks evaluate projects based on their potential to generate returns and profitability, employing conservative assumptions to assess project viability. Furthermore, banks seek to ensure compliance with capital adequacy requirements such as Basel IV(Dias, 2021).

Beyond yields and regulation, banks also scrutinize the history and reliability of equipment suppliers in renewable energy projects. The quality, efficiency, and long-term durability of energy infrastructure, such as solar panels, wind turbines, and battery storage systems, are crucial for assessing an investment's financial viability (Le et al., 2020). Projects with quality equipment sourced from trusted suppliers with many installations are therefore more likely to get funding since they show a lower operational risk, and a higher guarantee of energy produced. Given climate change, the importance of renewable energy investment is not only for profitability but also in its role of community development initiatives. Banks also carefully evaluate whether renewable energy investment has any community development initiatives, including any negative impact that the project might have on job creation or the environment (Andika et al., 2021). Projects that develop skills, promote economic inclusion, and provide social benefits (in ways that align with investor priorities) to be better funded are an imperative, particularly in REIPPPP projects.

Currency devaluation, project delays, and regulatory risks are inherent in renewable energy projects. The international market for renewable energies subjects RE projects to exchange rate volatility, which can affect the price of imported equipment and economic forecasts (Asemokha et al., 2020) . Project delays tied to logistics, permitting, or supply-chain disruptions represent a major financial risk, too, and could lead to cost overruns and diminished investor confidence. In addition, there is always significant regulatory uncertainty, as shifts in government policy, feed-in tariffs, and incentive structures can have a considerable effect on the profitability and long-term stability of any project (Barbosa et al., 2020).

To address these risks and instil investor confidence, financial institutions have begun endorsing government-backed risk-sharing mechanisms. These can include tools such as loan guarantees, assurances of stability of existing energy policies, and financial incentives that serve to facilitate a risk-free environment for hosting renewable energy infrastructure (Chuang et al., 2019). Governments could mitigate roadblocks in the policies by some measures that share financial loads between the public and private aspects, which encourages capital to flow into the renewable energy sector while enabling long-term energy security and sustainability (Eitan et al., 2019).

6.2. Implications of Findings

Banks' participation in funding the global transition to renewable energy sources, including capital and financial means that banks will require to adjust and provide funds to new sustainable energy projects, as the world economy shifts to a low-carbon future. Expanding green finance methods is a pathway for banks to strengthen their involvement

(Taghizadeh-Hesary & Yoshino, 2020). Green financing consists of financial products and services that promote environmental sustainability, such as green bonds, sustainability-linked loans, and financing for renewable energy projects. Banks that expand the range of green financial products will appeal to eco-conscious investors who ascribe to ESG principles and can thus redirect funds more effectively into renewable energy projects (Edmark & Persson, 2021).

A second important tool for banks to fortify their contribution to renewable energy financing is collaboration with international development finance institutions. This type of concessional finance is through DFIs. When your loans are not found on the market, DFIs give concessional terms that result in decreased interest rates or extended repayment periods (Edmark & Persson, 2021)(Edmark and Persson, 2021). This helps support renewable energy investments, which commercial banks can de-risk through DFI partners. The former can then make financing available to renewable energy projects that may otherwise face challenges in accessing capital. Partnerships such as these can promote knowledge transfer between firms, assisting banks in developing competency in financing sustainable energy projects and refining risk assessment frameworks specific to the renewable energy industry (Taghizadeh-Hesary & Yoshino, 2020).

Additionally, banks need to support creative financing schemes that are integral to renewable energy promotion. Financial tools such as sustainability-linked loans and green bonds have emerged as efficient means of allocating funds to ecologically friendly initiatives. Green bonds are fixed-income securities designed especially to raise money for environmentally beneficial initiatives, such as infrastructures for renewable energy(Park, 2019). On the other hand, when borrowers meet their sustainability goals, sustainability-linked loans offer reduced interest rates or advantageous loan terms. This makes it easier to incorporate clean energy solutions into a company's overall business plan. Banks may encourage investment in renewable energy and hasten the shift to a green economy by making these tools open and accessible throughout the nation or just a small portion of a building (Edmark and Persson, 2021).

Supporting SMEs in obtaining funding for renewable energy projects is one of the most important functions that banks can do. In the renewable energy ecosystem, where they foster innovation and create clean energy technology to provide decentralised energy solutions, SMEs play an equally important role. However, because it involves upfront payment and is typically viewed as risky without collateral, many SMEs find it extremely difficult to obtain capital (Chi, 2022).

To close this funding gap, banks will be enlisted to create customised loan products, fortify credit guarantee systems, and employ blended finance arrangements that combine public and private funding to reduce the risk of investments in small-scale renewable energy projects. Furthermore, financial literacy programs and advisory services are examples of capacity-building initiatives that could help SMEs better traverse the finance environment and implement workable renewable energy solutions (Taghizadeh-Hesary & Yoshino, 2020).

6.3. Recommendations

6.3.1. Policy recommendations

6.3.1.1. Enhancing grid capacity

One of the biggest obstacles to turning green is storing and delivering energy from renewable sources, particularly when it comes to the grid. Given the growing proportion of electricity generation originating from renewable sources, the government and relevant stakeholders should expedite grid expansion and modernization projects to implement these technologies more quickly (Li et al., 2019).. Improving grid infrastructure will allow renewable energy to be deployed effectively, promoting grid stability and minimizing renewable energy curtailment, which occurs when renewable energy cannot be used because there is not enough grid capacity (Kiviranta et al., 2021). Real-time monitoring and advanced control systems will increase grid efficiency, resilience, and flexibility for managing variable energy sources like solar and wind power. Smart grid technology will be commercially available, and we will be ready to develop, build, and install it. This entails highly coordinated collaboration among utilities, independent power producers, and regulators to enable effective execution of grid expansion objectives (Kim, 2022).

6.3.1.2. Strengthening policy and regulatory frameworks

A strong and clear policy and regulatory framework is essential for creating a conducive environment for renewable energy development. Providing long-term regulatory certainty is necessary for policymakers, including ensuring that the approval process for renewable energy projects is made simpler and that decision-makers remain transparent in their deliberation (Assereto & Byrne, 2020).. By this, it means bringing in clarity and consistency with respect to wheeling, power purchase agreements (PPAs), and feed-in tariffs, among other things. Streamlining and cutting bureaucratic processes will also aid private sector participation and traction in renewable energy projects. Additionally, lawmakers ought to review and amend regulations to ensure alignment with the best practices internationally, and technological innovations to keep the legal framework competitive and appealing to investors (Sustainability and Institute, 2023).

6.3.1.3. Expanding green finance options

Access to affordable financing options is key to enabling a rapid deployment of renewable energy projects. However, commercial banks and development finance institutions must also expand their suite of financial instruments, including green bonds, sustainability-linked loans, and concessional financing mechanisms. Green bonds may make capital available for sustainable energy projects, specifically, and sustainability-linked loans may offer lower rates to borrowers who meet specific environmental and social goals (Khanna, 2020). By offering more favourable loan terms with lower interest rates, concessional financing can help lower financial barriers for renewable energy developers and stimulate investment in clean energy projects. More importantly, the introduction of government incentives such as tax breaks and credit guarantees can attract more investors to reduce the overall cost of financing renewable energy infrastructure (Le et al., 2020).

6.3.1.4. Promoting public-private partnerships

Collaboration between the public and private sectors is essential for scaling up investments in renewable energy and infrastructure development. By leveraging each other's strengths, the two can work together to finance expansive projects, especially in areas like grid infrastructure, energy storage solutions, and transmission upgrades (Edmark and Persson, 2021). Governments can expedite green projects while minimizing budget constraints by tapping into private sector knowledge and funding. Policymakers should establish a framework encouraging partnerships through clear laws, risk-sharing plans, and transparent procurement. Additionally, well-structured agreements outlining responsibilities, financial contributions, and performance targets will optimize the effectiveness of these arrangements (Parmaksiz et al., 2023).

Encouraging alliances between utilities, independent renewable energy producers, and financial institutions will also spur innovation and efficiency. The collaboration will drive progress, leading to an increasingly sustainable and resilient electricity system(Frey et al., 2020). Addressing grid capacity issues, strengthening regulations, broadening green finance options, and cultivating public-private collaborations are pivotal steps in advancing the adoption of clean power. Implementing recommendations like these, policymakers and stakeholders can generate a stable, efficient, and investment-friendly energy landscape supporting long-term sustainability and development in the renewable sector (Arndt et al., 2019).

6.3.2. Academic recommendations for further research

The findings of this exploratory qualitative study provide the foundation for future empirical research, addressing the identified limitations and advancing the theoretical framework:

- **Quantitative Testing of Institutional Pressures:** Future quantitative research should formally measure the direct correlation between adherence to international normative pressures (e.g., volume of DFI co-financing or ESG integration scores) and commercial bank financial performance (e.g., return on equity or risk-adjusted profitability) in LSA-REPs, thus empirically testing Proposition 2.
- **Comparative Institutional Study:** Future research should conduct a comparative qualitative study explicitly including South African DFIs (such as the DBSA and IDC) alongside commercial banks. This would explore how the differing institutional mandates (profit vs. development) lead to divergent approaches to resource acquisition (RDT) and risk mitigation in LSA-REP financing.
- **Expansion of RDT to Non-Financial Barriers:** Further investigation is needed into how Resource Dependence Theory applies to non-financial barriers, specifically technical skill shortages and procurement inefficiencies, which bankers identified as impeding the state's capacity to deliver infrastructure.

6.4. Conclusion

South Africa's transition to renewable energy holds immense promise to simultaneously address environmental and economic imperatives facing the nation. Tapping into vast solar, wind, and hydroelectric potentials can significantly curb dependence on fossil fuels, thereby lowering greenhouse gas emissions in alignment with commitments to international climate efforts. A strategic shift to renewables also nurtures opportunities for technological breakthroughs, attracts foreign capital, and positions the country as a leader driving sustainable solutions across Africa.

Nevertheless, to fully realize renewable energy's benefits, supportive policies and incentives must prioritize financial viability for public and private sector initiatives alike. Targeted investment in research and development complements collaborative efforts between government and industry to surmount challenges spanning grid integration, developing infrastructure, and regulatory hurdles. By cultivating stable, predictable energy frameworks, South Africa can encourage enduring investments accelerating renewables' adoption. Additionally, guaranteeing an equitable transition that benefits underserved groups through new jobs and community programs stemming from this expanding sector remains paramount.

South Africa's future resides in deftly harnessing renewable energy's potential to achieve energy security, economic resilience, and sustainability. Well-planned policies, investments and inclusive planning can propel the nation to the vanguard of regional renewable leadership while making a meaningful difference in international efforts against climate change.

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Annexure 1

All Participants

1. Please briefly describe your ESG strategy as it pertains to appetite to fund large-scale renewable energy projects.
2. Please comment on the following drivers, in your experience, that have an influence on renewable energy projects undertaken:
   - Sustainability objectives (i.e. reduction of GHG emissions).
   - Energy Security.
   - Government policy.
   - Resource endowment (wind, sun).
   - Access to the grid/transmission line.
3. Are there any other drivers, or determinants, that are material in renewable energy investment project decisions that have not been considered above
4. Please rate the drivers in (question 2) above and any other additional drivers that you have identified in influencing renewable energy investment decisions

   1 = least influential driver – not considered

   2 = neutral driver - does not influence investment decision in either direction, but is considered

   3 = important driver - can influence investment decision

   4 = most influential - material driver - can ‘make or break’ decisions
5. Please comment on the decision-making process involved for SA banks to fund large-scale renewable energy projects;
6. Please comment on the criteria used by SA banks when considering participation in large-scale renewable energy project and the extent to which the following have a bearing on the funding decision:
   - size of project,
   - Renewable energy technology
   - Project capital structure
   - Previous experience of sponsor
   - Local participation in project i.e. local socio-economic participation
7. Please rate the drivers in (question 6) above and any other additional that you have identified in influencing renewable energy investment decisions

   1 = least influential driver – not considered

2 = neutral driver - does not influence investment decision in either direction, but is considered

3 = important driver - can influence investment decision

4 = most influential - material driver - can ‘make or break’ decisions

8. Please comment on the funding structures typically considered for large scale renewable energy projects:
    - tenure,
    - to what extent does banking regulatory frameworks such as Basel/efficient use of capital factor influence funding structures)
    - capital structure,
    - pricing,
    - are longer funding tenures considered profitable for the banks;