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Energy policy innovation and dynamic capabilities in renewable electricity firms in South Africa

Khumoetsile Kotelo
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A research report submitted to the Wits Business School at the University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Innovation Studies

Johannesburg, 2026

ABSTRACT

Rolling blackouts and global calls for lower carbon emissions have spurred South Africa to deploy renewable energy policy instruments that pressure and propel the behaviour of renewable electricity firms. Against this backdrop, this study investigates how renewable electricity firms navigate a shifting policy landscape to stay competitive while advancing a just energy transition. Most studies in the literature reviewed have focused on technological innovation in developed economies, with far less attention to broader, including product and organisational, innovations in developing economies facing evolving regulations. This misalignment between compliance and agile innovation threatens policy goals and firm strategy. Thus, the objective of the study was to investigate and compare how a multinational independent power producer and domestic electricity trader, innovate to secure competitive advantage when renewable energy technology instruments are deployed.

Adopting a theory-guided, qualitative design, the research combined 19 in-depth participant interviews, policy-document analysis, and the lenses of dynamic capabilities, social constructivism, and just energy transition objectives. The framework emphasised sensing, seizing, transforming, and aligning technologies with operations and customer needs to deliver competitive advantage and a just energy transition. Findings reveal that the target IPP leverages ambidextrous structures, technological congruence through trial and error, and cross-regional knowledge transfer, while the target trader emphasizes contractual innovation, portfolio liquidity, and bespoke digital platforms.

Implications for policymakers highlight crafting instruments that spur firm-level innovation aligned with just energy transition goals. The study contributes to such practices by clarifying how policy design can unlock technological and non-technological firm level innovation in developing economies. Finally, it calls for future research to test these renewable energy technology policy designs and implementation processes to deepen understanding of renewable electricity firms' influence on innovation and achieving the just energy transition objectives.

KEY WORDS

Energy policy innovation, dynamic capabilities, renewable electricity firms, renewable energy technology, policy instruments, just energy transition, South Africa

DECLARATION

I, Khumoetsile Kotelo “declare that this dissertation is my own unaided work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Innovation Studies at the Wits Business School in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other University.

Signature: Khumoetsile Kotelo



On the 27th day of February 2026

DEDICATION

I dedicate this work to myself, and to every young black woman who has risen through adversity to lead, to disrupt, and to redefine what is possible. To the trailblazers who dared to enter spaces not built for them and claimed their place with courage, excellence, and purpose.

Above all, this dedication is grounded in faith to a God who makes a way where there is no way, who opens doors no one can shut, and who reminds us that favour, resilience, and calling are never accidental.

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I would also like to thank my previous employer for the flexibility and support that allowed me the time and space to focus on completing this research report. I am particularly grateful to the CEO SA for the unwavering support and understanding shown during this period, which made a meaningful difference in enabling me to see this work through to completion.

To my friends who never stopped cheering and praying for me and family, thank you for walking this long journey with me. To my mother and my little brother, SJ, I know this road has been long and demanding. Thank you for never giving up on me, for your constant encouragement, and for standing by me even when the finish line felt far away.

Finally, to my husband, I have no words except thank you. Thank you for carrying me through this journey, for supporting me, believing in me, and loving me through my lowest moments. Your strength, patience, and unwavering presence made it possible for me to keep going.

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1 Contents

ABSTRACT ii
KEY WORDS iii
DECLARATION iii
DEDICATION iv
ACKNOWLEDGEMENTS v
List of Abbreviations and Acronyms xi
List of Figures xiii
1 Chapter 1: INTRODUCTION 1
1.1 Purpose of the study 1
1.2 Context of the study 2
1.3 Problem statement 9
1.4 Research objective 11
1.5 Research questions 11
1.6 Significance of Study 11
1.7 Delimitations of the Study 12
1.8 Assumptions 13
1.9 Definition of Key Terms 13
1.10 Outline and Structure of the Report 16
1.11 Summary 17
2 CHAPTER 2: LITERATURE REVIEW 18
2.1 Introduction 18
2.2 Energy policy innovation 18
2.3 RET Policy Instruments 2019 – 2024 19
2.3.1 Energy action plan and tax incentives 19
2.3.2 REIPPPP 20
2.3.3 Renewable energy certificates 21
2.3.4 IRP 2023 & Interim rid capacity allocation rules (IGCAR) 23
2.3.5 Carbon Credits 24
2.4 2021 Schedule II Amendments to the ERA (2006) 26
2.5 Just Energy Transition 30
2.6 Dynamic Capabilities in the energy sector 32

2.7 Theoretical Framework 33

2.7.1 Dynamic Capabilities Framework 33

2.8 Social Construction of Target Populations Framework 37

2.8.1 Overview 37

2.8.2 Target Populations 39

2.8.3 Behavioural Assumptions and the types of policy tools 42

2.9 Conceptual Framework 43

2.10 Summary 45

2.11 Statement of propositions 47

2.11.1 P1: Parties identified as “Advantaged” in relation to the 2021 schedule II amendments to ERA (2006) will have a positive social construction viewed as deserving and important in the political and social hierarchy. 47

2.11.2 P2: Parties identified as “Contenders” in relation to the 2021 schedule II amendments of ERA (2006) will have power but will be negatively viewed, as part of the minorities. 47

2.11.3 P3: Parties identified as “Dependents” in relation to the 2021 Schedule II amendments of ERA will have a positive social construction and weak political power. 47

2.11.4 P4: Parties identified as “Deviants” in relation to the 2021 schedule II amendments of ERA (2006) will have a negative social construction and will be viewed as likely criminals. 47

2.11.5 P5: Sensing dynamic capabilities of renewable electricity firms include developing robust stakeholder networks to observe market and industry trends and new technology opportunities, gather information about the actors in the environment and investments into R&D and related activities. 48

2.11.6 P6: Seizing dynamic capabilities of renewable electricity firms include, developing new products and services, designing revenue architectures and business cases, communicating business case potential with stakeholders, minimising decision errors, controlling bottlenecks, demonstrating leadership, raising capital. 48

2.11.7 P7: Reconfiguration dynamic capabilities of renewable electricity firms include managers’ ability to identify which routines are vital for operational efficiency 48

2.11.8 P8: Technological congruence dynamic capabilities of renewable electricity firms include the development of unique and difficult-to-replicate assets, the ability to create tailor-made solutions that meet customer needs 49

2.11.9 P9: A coherent mix of renewable energy transition (RET) policy instruments will most effectively enable renewable electricity firms to maintain competitive advantage while simultaneously contributing to the achievement of all Just Energy Transition (JET) objectives. 49

3 CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY 50

3.1 Introduction 50

3.2 Research Strategy and Design 52

3.3 Selection of Participants 53

3.4 Data Analysis 54

3.5 Limitations of the Study 57

3.6 Ethical Considerations 58

3.7 Reliability and Validity 58

3.8 Chapter Summary 59

4 CHAPTER 4: RESULTS AND INTERPRETATION 61

4.1 Introduction 61

4.1.1 Research question 1: What is the social construction of the target populations of the 2021 schedule II amendment of ERA? 61

4.1.2 Research question 2: How do renewable electricity firms operating in South Africa, sense, seize, transform and achieve technological congruence when government implements RET policy instruments? 61

4.1.3 Research question 3: What types of RET policy instruments would enable renewable electricity firms to both maintain achieve competitiveness and contribute towards the JET objectives? 62

4.2 Background Profile of Respondents 62

4.2.1 The role in the organisation of Target IPP respondents that participated in the study. . 63

4.2.2 The role in the organisation of Target Trader respondents who participated in the study. 64

4.2.3 The role in the organisation of Expert respondents that participated in the study. 64

4.3 Process followed 65

4.4 Contextual Understanding of the Just Energy Transition 66

4.4.1 What is your understanding of the JET? 66

4.5 Research question 1: What is the social construction of the target populations of the 2021 schedule II amendment of ERA? 72

4.5.1 *What* is *the role of IPPs and/or Traders in the JET?* 72

4.5.2 *Which parties or groups have been influential in shaping RET policy?* 74

4.5.3 *What was the allocation of benefits of the 2021 schedule II amendment of ERA 2006 and who benefited the most?* 77

4.5.4 *Describe the challenges of 2021 schedule II amendment of ERA 2006?* 81

4.5.5 *Which group had the least to benefit from the 2021 schedule II amendment of ERA 2006 and who was burdened the most??* 84

4.6 Research question 2: How did renewable electricity firms sense, seize, transform and achieve technological congruence when the government implemented RET policy instruments in the period 2019-2024 86

4.6.1 *Sense: How do renewable electricity firms keep up to date with market changes and RET policies, and how does this knowledge flow into the organisation?* 86

4.6.2 *Sense: Which Departments are involved in exploring new technological opportunities and how do they do this?* 92

4.6.3 *Seize: What governance protocols to embrace or mitigate impacts of RET policy*

instruments? 96
4.6.4 *Seize: "What new products and/or services have resulted from RET policy?* 98
4.6.5 *Transform: What changes in the firm's organisational structure, processes and activities occurred as a consequence of any of these RET policy instruments?* 101
4.6.6 *Transform: Has the implementation of any of these RET instruments resulted in the identification of specialised complementary assets, such as battery energy storage in relation to PV solar and wind?* 103
4.6.7 *Technological congruence: What emerging or advanced technologies did the firm have to develop or acquire to facilitate and embrace the opportunities of the energy policy instruments?* 104
4.6.8 *Technological congruence: How have renewable electricity firms aligned their technological know-how in order to embrace/mitigate risks and opportunities from RET policy instruments?* 107
4.7 Research question 3: What types of policy instruments would coerce and/or motivate renewable electricity firms to achieve competitive advantage and contribute towards the JET objectives? 112
4.7.1 *Did any of the burdens, challenges and or penalties the firm identified from the introduction of any RET policy **instruments** lead to a reduction in supply or the inability to provide renewable energy? If yes, please provide details?* 112
4.7.2 *Did any of the burdens and or penalties the firm identified from the introduction of any RET policy instruments lead job losses, job creation or skills develpmenr? If yes, please provide details?* 113
4.7.3 *Can you describe the most impactful RET policy instrument for coal dependent communities?* 116
5 CHAPTER 5: ANALYSIS OF THE RESEARCH FINDINGS 120
5.1 Introduction 120
5.2 Just energy transition summary 120
5.3 Social construction of target populations summary of key findings 121
5.3.1 Advantaged 121
5.3.2 Dependents 122
5.3.3 Contenders: 123
5.3.4 Deviants: 123
5.4 Summary of research question 1 key findings 124
5.5 Target IPP summary of Dynamic Capabilities 124
5.5.1 Sensing Capabilities: 124
5.5.2 Seizing Capabilities: 125
5.5.3 Reconfiguring Capabilities: 126
5.5.4 Technological congruence: 128
5.6 Target Trader summary of Dynamic Capabilities 128

5.6.1 Sensing Capabilities: 128
5.6.2 Seizing Capabilities: 129
5.6.3 Transformational Capabilities 129
5.6.4 Technological Congruence Capabilities 130
5.7 RET policy instruments that enable dynamic capabilities and contribute to the JET objectives 131
5.8 Summary of Discussion 132
6 CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS 135
6.1 Introduction 135
6.2 Statement of propositions 136
6.3 Major findings and key conclusions of the study 138
6.3.1 Research question 1 138
6.3.2 Research question 2 139
6.3.3 Research question 3 141
6.4 RECOMMENDATIONS 142
6.4.1 Managerial recommendations for renewable electricity firms 142
6.4.2 Policy recommendations 143
6.5 Suggestions for future research 144
7 References 147
APPENDIX 1: Interview Schedule 161
APPENDIX-1: Letter Requesting Permission 166
APPENDIX 3: Participant Consent form 169

List of Abbreviations and Acronyms

AI – Artificial intelligence

BESS - Battery energy storage

BEE - Black Economic Empowerment

BBBEE - Broad-Based Black Economic Empowerment Act of 2003

C&I - Commercial and industrial

COP - Conference of the Parties

CPA – Central Purchasing Agency

CSI - Corporate social investment

DME – Department of Minerals and Energy

DMRE - Department of Mineral Resources and Energy

DSI - Department of Science and Innovation

DTIC – Department of Trade, Industry and Competition

EAP - Energy Action Plan

EMS – Energy Management System

ERA - Electricity Regulations Act of 2006

ESG - Environmental, social, and governance

ESI - Electricity Supply Industry

IPP - Independent power producer

IRP – Integrated resource plan

IRP2023 - The Draft Integrated Resource Plan published for comments in 2023

JET – Just Energy Transition

JET-IP - Just Energy Transition Investment Plan

NECOM – National Energy Crisis Committee

NERSA - National Energy Regulator of South Africa

NTCSA – National Transmission Company of South Africa

OEM - Original Equipment Manufacturers

PPA - Power Purchase Agreements

PPP - Public–private partnerships

PV – Photovoltaic

RE- Renewable energy

RECs – Renewable energy certificates

REIPPPP – Renewable Energy Independent Power Producer Procurement Programme

SSEG – Small-scale embedded generation

TSO – Transmission System Operator

UAE - United Arab Emirates

List of Tables

Table 1: Summary of opportunities within the large-scale renewable energy market 8

Table 2: Table summary of policy instruments opportunities and challenges from literature review 30

Table 3: Target groups, characteristics and policy types 41

Table 4: Behavioral Assumptions of Policy Tools 42

Table 5: Background profile of respondents 53

Table 6: Background profile of respondents 63

Table 7: Categorisation of themes and sub-themes related to the Just Energy Transition 66

Table 8: Themes representing key influencers in shaping the RET policies 74

Table 9: Themes and sub-themes for market sensing and knowledge flows 86

Table 10: Summary of propositions and key findings 137

Table 11: DC & RET policy instrument design combinations 145

List of Figures

Figure 1: Eskom Wheeling Contractual Arrangement 27

Figure 2: IPP wheeling over Eskom and municipal electrical infrastructure to delivery electricity to a municipality customer 27

Figure 3: Trader Wheeling Arrangement 29

Figure 4: Social Construction 39

*Fig*ure 5: Stakeholder Interests in Renewable Energy Policy Instruments 40

Figure 6: Variations in how policy treats Target Populations and allocates benefits and burdens 43

Figure 7: Conceptual Framework 44

Figure 8: Heuristic illustration combining Theoretical Frameworks 45

1 Chapter 1: INTRODUCTION

1.1 Purpose of the study

Climate change mitigation presents a significant challenge for humanity, leading to widespread consensus on the necessity of a decarbonised energy transition (Schmid & Lumsden, 2023). To facilitate the increased deployment of renewable energy technology (RET), national governments are implementing policy instruments aimed at supporting RETs (Schmid & Lumsden, 2023). These policy instruments must effectively address systemic market failures as well as bottlenecks within innovation systems that hinder the diffusion of RETs (Schmid & Lumsden, 2023).

There is sufficient evidence in the energy policy literature that the implementation of RET policy instruments results in the transformation of energy markets facilitating the adoption of renewable energy technologies such as solar, wind, hydropower, geothermal and biomass (RETs) (Marinescu, 2020; Samant et al., 2020; Sung, 2019; Zhang et al., 2022). RET policy instruments can accelerate the deployment of RETs that have the potential to create local economic growth and a clean energy transition that promises to offer market opportunities for all economies in the coming decades (Del Río & Kiefer, 2022; Thapar et al., 2016).

In the context of renewable electricity firms , the ability to respond effectively to external disruptions is essential for maintaining competitive advantage and achieving strategic objectives (Feiler & Teece, 2014; Idries et al., 2022; Teece et al., 1997). At the core of navigating these dynamic energy landscapes lies the concept of dynamic capabilities (DCs). As articulated by Teece (1997), DCs refer to a firm's ability to integrate, build, and reconfigure internal and external competencies in response to changing market conditions.

A crucial part of responding lies in understanding the social constructions of these policy instruments, which send different messages (who benefits or loses) from policy instruments to different target groups (Schneider & Ingram, 1993). The understanding of the challenges and opportunities resulting from the policy instruments (Schneider & Ingram, 1993) and the responsiveness is particularly critical in environments

characterised by rapid technological advancements and shifting regulatory landscapes. It is in these circumstances that government intervenes with the deployment of policy instruments, whereby renewable electricity firms must not only adapt but also proactively shape their operational strategies to align with emerging RET policy instruments (Enzensberger et al., 2002). Recent literature underscores the importance of policy interventions in shaping electricity markets, arguing that effective policy frameworks can facilitate the transition to low-carbon energy systems, thereby enhancing energy security and accessibility (Marinescu, 2020).

The aim of this study is to explore the intersection of RET policy instruments and DCs within the context of renewable electricity firms in South Africa. The research objectives are threefold. First, to understand the social construction of RET policy instruments deployed in SA between 2019-2024, and more specifically the 2021 Schedule II amendments to the Electricity Regulation Act 4 of 2006 (ERA). The second objective is to explore how renewable electricity firms engage in firm-level innovation in response to the South African government's implementation of RET policy instruments. The third and final objective is to utilise the results of the study and propose policy design and implementation of RET policy instruments that would coerce and/or motivate renewable electricity firms to respond innovatively for competitive advantage and contribute to South Africa's just energy transition (JET) outcomes. The JET outcomes largely align with international goals to create local economic growth, (Del Río & Kiefer, 2022; Thapar et al., 2016), transition to low-carbon energy systems, thereby enhancing energy security and accessibility (Marinescu, 2020).

1.2 Context of the study

The South African government is facing challenges such as energy shortages and reliance on fossil fuels, and has recognised the critical role of renewable energy in addressing these issues (Mulugetta et al., 2022; The Presidency of the Republic of South Africa, 2022). In South Africa, the need for reliable and secure electricity is paramount, not only for stimulating economic growth but also for ensuring the well-being of its citizens (Jahns, 2023). South Africa is a signatory to the Paris Agreement, which was adopted at the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (Terblanche et al., 2024). This agreement establishes a global objective of limiting the increase in average global temperature to well below two degrees

Celsius, with a preference for maintaining the rise below one point five degrees Celsius in comparison to pre-industrial levels (Terblanche et al., 2024). In addition, research conducted after 2020 accentuates the socio-economic ramifications of load shedding, pointing to its debilitating consequences on enterprises, families, and national output (Erero, 2023).

In 2007, South Africa faced an electricity supply crisis, as anticipated in the 1998 Energy White Paper (DME, 1998), which highlighted the urgent need to bolster the country's electricity generation capacity (Worch et al., 2019). This crisis manifested in widespread loadshedding, a measure implemented to manage the shortfall in supply (Ramluckun et al., 2024). Although the government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) garnered international acclaim for its success in integrating renewable energy sources, it ultimately fell short of addressing the growing energy demands of the nation (Marinescu, 2020; Oikonomou & Jepma, 2008; Todd & McCauley, 2021). The challenges were exacerbated by the aging coal-fired power stations that had suffered from inadequate maintenance (Van der Merwe, 2019; Worch et al., 2019).

The situation deteriorated significantly in 2019, leading to frequent power outages that became increasingly disruptive (Erero, 2023). The electricity supply crisis has continued to escalate, and by 2023, loadshedding had become a daily reality for South African citizens, highlighting the systemic issues within the energy sector and the urgent need for comprehensive reforms (Erero, 2023).

This ongoing crisis underscores the critical importance of transitioning to a more sustainable and resilient energy framework. Scholars argue that addressing the root causes of the electricity supply shortage requires a multifaceted approach, including investment in infrastructure, diversification of energy sources, and improvements in maintenance practices for existing facilities (Baker et al., 2021). Without these strategic interventions, South Africa's energy landscape will continue to face significant challenges, impacting its economic stability and the well-being of its citizens.

It is against this backdrop that the South African energy sector has had to navigate through a period of profound transformation, driven largely by the need to balance

decarbonisation, sustainable development, and address an ongoing energy crisis (Bridle et al., 2022). As an intervention to address the crisis and the calls from the international community , the government has implemented various RET policy instruments. Some of these RET policy instruments include, deregulations (Pienaar, 2023), tax incentives (Dippenaar, 2018), renewable energy certificates (RECs) (SAGEN, 2022), and auctions also known as government procurement programmes (Kitzing et al., 2022). South Africa's ambitious goals in the Integrated Resource Plan (IRP), updated in 2023, emphasise the importance of diversifying the energy mix to include a significant increase in RETs (Bridle et al., 2022). These efforts are underpinned by the recognition that the country's historical reliance on coal-based energy is unsustainable, both environmentally and economically (Ramluckun et al., 2024).

Given the complexities of this transition, the DCs Framework as articulated by Teece (2007), offers a useful lens through which to analyses how renewable electricity firms can successfully plan to capture opportunities or mitigate risks which arise from the government's deployment of RET policy instruments. By concentrating especially on the South African setting, this study provides an insightful analysis of the difficulties and possibilities confronting renewable electricity firms in this active market. The study provides useful advice for renewable electricity firms trying to increase their competitiveness in the face of continuous transition and helps to deepen knowledge of how RET policy instruments affect organisational adaptation and innovation (Wolf, 2023).

Renewable energy firms' landscape in South Africa and the role of energy policy and technology

The landscape of energy production in South Africa is undergoing significant transformation, driven by the need for sustainable energy solutions and the integration of RETs, (Naidoo, Kriosha, 2019). South Africa has set an ambitious target of reaching net zero greenhouse gas emissions by 2050, alongside the need to maintain energy security in both the long term and the short term (Bauer, Alexandre et al., 2024). Innovation, especially in RETs is a key element of the clean energy transition (Del Río & Kiefer, 2022). Innovation enhances RETs leading to improvements and cost reductions, thereby making it easier and more affordable to meet renewable energy goals and facilitate the clean energy transition (Del Río & Kiefer, 2022). To accomplish this, South

Africa must decrease its emissions by 12-27% by 2030, which will also promote economic growth (Bauer, Alexandre et al., 2024; Swilling et al., 2016).

This endeavour will require considerable investment in infrastructure, the incorporation of RETs such as solar, wind, hydropower, geothermal, and biomass in addition to the supportive systems like Battery Energy Storage Systems (BESS) (Bauer, Alexandre et al., 2024). RETs provide a sustainable alternative to fossil fuels due to their ability to be renewed, environmental benefits, and economic gains (Sanni et al., 2014). Market sector reports reflect solar photovoltaic (PV) and wind technologies as being the only RETs currently utilised in the commercial and industrial sector (C&I), also known as private procurement whilst this use of BESS and gas are commonly referenced only in the context of public procurement (Terblanche et al., 2024). In the draft update to South Africa's IRP (2023), the country's official electricity strategy which has been released for public consultation, proposes increased capacity allocations for distributed generation, as well as specific provisions for PV systems and projects designed to facilitate the integration of wind technology (Terblanche et al., 2024).

The South African government has indicated its goal of establishing a more competitive electricity market, allowing all consumers the freedom to choose their electricity suppliers (Bredesen, Hans-Arild, 2022). Independent power producers (IPPs) in the C&I sector are particularly influential, navigating complex interactions between policy frameworks, technological advancements, and market dynamics (Bredesen, Hans-Arild, 2022). This study focuses on these C&I IPPs, which do not participate in the REIPPPP, and electricity traders.

Playing fields were levelled following the 2021 Schedule II de-licensing amendments to the ERA for IPPs and electricity traders, subject to IPPs having to register renewable energy projects with the National Energy Regulatory of South Africa (NERSA). Traders who buy or sell electricity as a commercial activity having obtained a trading license (Pienaar, 2023) creating a private procurement market for RE (Pienaar, 2023; Terblancheet al., 2024). Rapid growth has been observed in this sector and it is acknowledged that developers in South Africa are increasingly turning their attention to the private sector, where they can secure higher returns by engaging in power purchase agreements (PPAs) with private off-takers (Terblanche et al., 2024). The rise of private

renewable energy development is illustrated by the growing number of projects that have been registered with NERSA, reflecting a shift in the energy landscape, and highlighting the increasing interest and investment in RETs by private entities (Terblanche et al., 2024).

IPPs in the C&I sector are crucial players in South Africa's energy landscape. Unlike those involved in REIPPPP, these IPPs typically establish inter-bilateral PPAs with off-takers, which can include large commercial entities and municipalities (Brewis et al., 2024; NMBM, 2012; RES4Africa Foundation, 2023). They often utilise embedded generation systems, allowing them to produce electricity on-site, or they engage in wheeling arrangements where electricity is transmitted through the grid to reach end users (Moodlliar et al., 2023). These contracts provide IPPs with a stable revenue stream while enabling off-takers to secure renewable energy at competitive rates (Pienaar2023; RES4Africa Foundation, 2023). By circumventing the traditional utility model, these IPPs help alleviate the pressure on the national grid and contribute to energy security (RES4Africa Foundation, 2023).

Diverse players in the South African energy market include domestic and multinational IPPs, traders and finance institutions (Akinbami et al., 2021; Crompton, Rod & Matsika, Ruwadzano, 2021; Hanto et al., 2022; Moodlliar et al., 2023). Research conducted since 2020 shows that domestic IPPs focus on fulfilling local energy needs, whereas foreign-owned or multinational companies drive large-scale renewable developments (Bridle et al., 2022; SAPVIA South African Photovoltaic Industry Association., 2014). As of 2023, there were more than 100 IPPs in operation in South Africa (NERSA, 2023). While both IPPs and traders contribute to the electricity landscape, their operational focuses differ; IPPs primarily generate electricity, while traders facilitate the buying and selling of electricity, reflecting distinct roles within the market (Rubanda et al., 2023; Vickerman & Arrieta, 2024).

Traders play an important role in creating competition and choice in the energy sector, giving consumers more options and flexibility in pricing (Moodlliar et al., 2023). Traders also encourage investment in renewable energy projects, which helps build a more sustainable energy future (Moodlliar et al., 2023). As the energy sector evolves, the value of traders as practical facilitators becomes clearer, promoting innovation, market growth

and overall efficiency (Moodlliar et al., 2023). Traders provide practical solutions that benefit both generators and consumers (Moodlliar et al., 2023). As licensed entities, they can act as intermediaries, connecting local users with broader power markets at both domestic and regional levels. The role of traders is to streamline the energy supply in the market by allowing multiple generators to serve various end users (Moodlliar et al., 2023).

The South African renewable energy sector observes an evolution in electricity trading from traditional, centralised models to modern, decentralised systems that leverage advanced technologies like blockchain and artificial intelligence (Andoni et al., 2019). Electricity trading's emergence as a dynamic component of electricity will be explored in depth, emphasising its transformative impact on energy markets worldwide (RES4Africa Foundation, 2023). Due to the global transition towards cleaner energy sources, electricity trading has become an essential mechanism for efficiently distributing renewable energy, addressing supply and demand fluctuations, and ensuring grid stability (RES4Africa Foundation, 2023). Table 1 below summarises some of the consequential opportunities and challenges from the implementation of RET policy instruments, particularly 2021 schedule II amendments to ERA (2006) which enabled private procurement of renewable energy.

Table 1: Summary of opportunities within the large-scale renewable energy market

OPPORTUNITY					
PRIVATE PROCUREMENT OF RENEWABLE ENERGY					
MARKET SIZE	KEY DRIVERS	BARRIERS	STAKEHOLDERS	TERM	MACRO CONTEXT
Solar PV: R116 billion **Wind power:** R98 billion **Total:** R214 billion by 2030 / R36 billion per year	• Improved cost competitiveness of renewable energy technology • Carbon emissions reduction for large power users • Energy security (loadshedding) • Enabling environment for wheeling (virtual) • Removal of generation licence requirements in 2023 • Registering of energy traders • Creation of the National Transmission Company of South Africa • Eskom's transmission development plan • Decommissioning of Eskom coal power fleet • 2023 draft Taxation Laws Amendment Bill	• Grid capacity constraints • Energy curtailment to accommodate grid constraints • New Eskom grid allocation rules requiring higher state of readiness for developments • Low carbon tax • Skills shortage	• Developers • Independent power producers (IPP) • Energy-intensive users • Energy traders • Financiers • Eskom • DMRE • NERSA	Short-term (present)	• Power blackouts driving a demand for energy storage and generation units • National Energy Crisis Committee (NECOM) focussing on unblocking barriers to new energy projects • Invest SA Energy One-Stop-Shop launched to provide assistance to investors to fast-track projects

Source: Terblanche, U et al. (2024)

On August 16, 2024, the Electricity Regulation Amendment Act 38 of 2024 (ERA Act) was promulgated, statutorily transitioning the regulation of electricity from a vertically integrated system dominated by Eskom to a competitive "hybrid market model" (Brewis et al., 2025). This change, effective January 1, 2025, aims to facilitate various market transactions and promote competition among multiple electricity producers (Brewis et al., 2025). The ERA Act (2024) supports the restructuring of Eskom into distinct entities for generation, transmission, and distribution, allowing IPPs to operate more freely and sell electricity to a broader range of consumers, including individuals and businesses (Brewis et al., 2025).

Central to the ERA Act (2024) is the establishment of a transmission system operator (TSO) and the National Transmission Company South Africa (NTCSA), which will oversee various transitional measures (van der Poel, 2025). A TSO's role include acting as a transmitter, system operator, and central purchasing agency (CPA), which will manage the transition to a competitive market (van der Poel, 2025). By ensuring a reliable supply of electricity and facilitating transactions between IPPs and Eskom, the TSO aims to create a fair and transparent market while avoiding conflicts of interest that arise from Eskom's dual role as both a generator and transmission grid operator (van der Poel, 2025).

The ERA Act (2024) also introduces a national framework for wheeling, allowing privately generated renewable energy to be transmitted across the national grid to various customers (NERSA, 2024). The proposed wheeling rules are currently under public consultation, aiming to update previous regulations that have become obsolete (NERSA, 2024). Overall, the ERA Act (2024) establishes a comprehensive regulatory framework for the reformed energy sector, including a new market code that outlines trading, settlement rules, and the operational structure of the competitive electricity market, ensuring both short-term efficiency and long-term security of supply (NERSA, 2024).

1.3 Problem statement

Energy policy instruments and innovation are dependent on each other (Hille et al., 2020). Energy policy instruments exert significant influence on the behaviour of firms, particularly regarding innovation activities associated with RETs such as investment into RET’s and thus promote technological innovation and improve production efficiency (Del Río & Kiefer, 2022; Hille et al., 2020; Zhang et al., 2022). However, many studies in the field have primarily focused narrowly on technological innovations and developed economies (Hille et al., 2020; Nesta et al., 2014; Thapar et al., 2016; Zhang et al., 2022) and less so on innovation, in its broader sense. The latter would include product innovations: “new or improved material goods as well as new intangible services; it is a matter of how things are produced” and process innovations which are “are new ways of producing goods and services” (Borrás & Edquist, 2013, p. 1513). As such, they may be technological or organisational, with the intersection between them being decisive for

effective deployment.

Key tensions arise from these conflicting regulatory frameworks within energy policy that prioritise compliance with environmental standards and energy reliability, which is seen to inadvertently stifle innovation as innovation policy encourages investment in novel technologies and processes, which may not align with the immediate goals of energy policy (Cervantes et al., 2023). There is no doubt that there are competing interests when it comes to renewable electricity firms investing in the high cost of research and development (R&D) and the imperative to deliver affordable energy whilst reducing expenses due to increased regulatory uncertainties and increased risk (Kim et al., 2012). This gap highlights an unresolved issue within the policy framework. Despite this, companies in the renewable electricity sector do innovate by using strategies like ambidexterity and DCs.

Historically, research has demonstrated that in developed economies, multinational companies usually have well-developed global innovation systems with strong connections to firms universities, policymakers, and various intermediaries (Binz & Truffer, 2017). Research has demonstrated that these multinational firms have created organised, globally connected interactions between the different actors ensuring that knowledge production is initiated to drive innovation (Barnard & Chaminade, 2017). As such, the majority of innovation has occurred predominantly within large multinational firms headquartered in these developed economies (Barnard & Chaminade, 2017).

However, this position is shifting, and solid innovation systems are now also seen in middle-income economies, with small and large multinational firms being able to lead the emergence of stronger global innovation networks (Barnard & Chaminade, 2017). The insufficiency of empirical data on the relationship between energy policy and innovation in its broad sense as well as innovation in the context of multinational firms in developing economies calls for further research on this topic. The gap in research relates to how both multinational renewable electricity firms operating in developing economies and domestic renewable energy traders engage in innovative activities and create competitive advantage when responding to government policy interventions.

1.4 Research objective

The main objective of the study is exploring how renewable electricity firms in South Africa respond to the governments deployment of RET policy instruments introduced between 2019 and 2024.

1.5 Research questions

Arising from the research problem, this study addresses the following research questions:

1. What is the social construction of the target populations of 2021 Schedule II amendment to ERA (2006)?
2. How do renewable electricity firms operating in South Africa sense, seize, transform and achieve technological congruence when the government implements RET policy instruments in the period 2019-2024?
3. What types of RET policy instruments would enable renewable electricity firms to both maintain competitiveness and contribute towards the achievement of all JET objectives?

1.6 Significance of Study

By using the South African energy sector as a case study, this novel piece of work offers key learnings that can inform future research and policy development on how IPPs and renewable energy electricity traders participate in changing policy environments towards achieving a low-carbon transition. The results of this research seek to improve theoretical advancements on a focused dimension, which is understanding implementation in terms of the change at policy and capability level as well as in view of managerial experiences.

Through a comparative analysis of a multinational IPP (Target IPP) with a local subsidiary and a domestic licensed electricity trader (Target Trader), the research illustrates how organisational structures, operational models, and regulatory requirements shape distinct processes for capturing opportunities and mitigating risks arising from RET policy instruments. Although both entities supply renewable electricity to end users, their strategies diverge significantly. These differences reveal varied dynamic capability pathways in sensing, seizing, reconfiguring, and aligning technologies to resources and

customer needs that underpin competitive advantage in a volatile policy environment. By situating these findings within South Africa's policy context, the study contributes to the literature on the strategic management of innovation by demonstrating that policy instruments are not merely compliance triggers but active catalysts for organisational adaptation and innovation. This work enriches DCs theory by extending its application to emerging markets and embedding it within the socio-political realities of energy transitions, thereby providing a foundation for future research on the intersection of regulation, firm strategy, and innovation ecosystems.

Therefore, the results of this study offer insights into the pivotal policy levers that must be pulled to construct an adaptive capacity within energy companies and where politicians, regulators and other industry stakeholders in South Africacan thereby place their resources (Thusi et al., 2023; Todd & McCauley, 2021). The lessons learned from this work can be used by policymakers to develop evidence-based interventions that will assist in the just energy transition whilst avoiding undesired social and economic impacts. Moreover, insights from this study can also help companies create initiatives that increase organisational resilience and competitiveness in a challenging environment.

This study could therefore add value both to academic discourse and immediate policy practice by shedding light on the different dynamic capabilities sensing, seizing, technological congruence and reconfiguring that can contribute most renewable electricity firms being competitive in the market.

1.7 Delimitations of the Study

The research focuses exclusively on the RET policy instruments implemented in South Africa between 2019 -2024. This potentially overlooks earlier or other existing RET policy instruments that may still influence current practices in the electricity sector, which may not capture the long-term effects of RET policy instruments on the capabilities of the Target IPP and the Target Trader.

- The study concentrates on the South African electricity industry, which may limit the generalisability of findings to other contexts or countries with different regulatory environments and market conditions.
- The research is limited to firms engaged in the distribution and management of renewable energy, particularly those affected by renewable energy policies in South Africa.
- The study does not fully account for external factors such as economic fluctuations, technological disruptions, or changes in consumer behaviour that could influence the effectiveness of the RET policy instruments.

1.8 Assumptions

Underlying this research, it is assumed that:

- RET policy instruments introduced between 2019 and 2024 investigated by the South African government have a direct and measurable impact on the electricity industry.
- Multinational IPPs and domestic electricity traders have the capacity to develop dynamic capabilities to address the implementation of such RET policy instruments.
- Available data from case study companies and policy documents is dependable and sufficient to draw meaningful conclusions.
- The selected participants have a broad understanding of electricity management and development of capabilities in the South African electricity industry; and
- The findings from the cases explored can be integrated into a conceptual framework that is reliable and transferable.

1.9 Definition of Key Terms

Innovations

New creations of economic and societal significance are primarily carried out by firms but not in isolation; they include new or improved products and/or services, new ways of producing goods and services, and they can be technological or organisational, (Borrás & Edquist, 2013).

Policy

Policy refers to the outlines of what a government is going to do and what it can achieve for society. It also includes what government does not want to do.

Policy Innovation

Changes in policy that may be innovative or may affect the innovation process (Howlett & Cashore, 2009).

Innovation Policy

Innovation policies are policies that have an important impact on innovation (Edquist, 2011) or policies designed with the explicit intent of influencing innovation or policies primarily created for other purposes which have a significant impact on innovation activity, (Edler & Fagerberg, 2017).

Innovation Policy Instruments

An innovation policy instrument is “a purposive regulatory, economic, financial, or soft tool through which governments intervene in innovation systems to shape actor behaviour and steer innovation outcomes toward specific societal and policy goals(Borrás & Edquist, 2013).

Independent Power Producer

Independent power producers are private entities that generate electricity for sale to utilities, government buyers or directly to consumers. They operate outside the utility frame, which allows them to introduce competition into the energy market (Vickerman, & Arrieta, 2024)

Electricity Trader

Electricity Traders are entities that buy and sell electricity on behalf of consumers or other businesses. They operate in a competitive market environment, facilitating transactions between electricity producers such as IPPs and consumers. Their primary function is to optimise electricity procurement and sales ensuring that supply meets demand

(RES4Africa Foundation, 2023). Traders require a trading license to on-sell electricity they have purchased to a consumer known as an off-taker (Brewis et al., 2024).

Dynamic Capabilities

Dynamic Capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece et al., 1997).

Strategic Management of Innovation

Strategic Management of Innovation is concerned with using appropriate strategic management techniques and measures to augment the impact of the firm's innovation activities on firm growth and performance (Keupp et al., 2012).

Wheeling

Refers to solution in terms of which IPPs can generate electricity in one location and utilise the existing transmission and /or distribution network to supply customers situated in a different location to the generation plant (Pienaar, 2023).

Embedded Generation

Power generation facilities located at residential, commercial or industrial sites where electricity is generally consumed by the consumer on site and such electricity can be exported onto the grid (Filipova, & Morris, 2018).

Regulations

Regulations are acts/statutes and rules within a law that specify how the ideas of a law are going to be implemented.

Competitive Advantage

Competitive advantage refers to the attributes that allow an organisation to outperform its competitors, resulting in superior market performance. It is often achieved through

unique resources, capabilities, or strategies that provide value to customers in a way that competitors cannot replicate.

1.10 Outline and Structure of the Report

The report is structured into 6 chapters, and each chapter covers the following:

Chapter 1: Introduction

This chapter introduces the purpose of the study which is to identify the target population and the identified research problem, as well as key concepts, limitations and assumptions under the study.

Chapter 2: Literature Review

This chapter reviews the literature informing the study. It expands on the research gaps identified in the study, as well as the theoretical and conceptual framework related to the study.

Chapter 3: Research Methodology

This chapter discusses the research strategy and design used in the study. It describes the target population and how participants were chosen. A qualitative approach was selected, involving semi-structured interviews and the analysis of the policy documents directly related to the RET policy instruments including public and company documents. Additionally, it covers the study's limitations and the care taken in conducting the research.

Chapter 4: Presentation of Results

This chapter presents the study's results, which come from public policy documents, company records, and semi-structured interviews with senior managers, executives, and industry experts.

Chapter 5: Analysis of results and Discussion

The findings in Chapter 4 are compared to the literature on RET policy instruments and dynamic capabilities from Chapter 2. This comparison uses established theories to confirm how dynamic capabilities and those policy instruments are related, as discussed in existing literature. It also looks for any other important and unexpected factors that may have come up.

Chapter 6: Conclusions and Recommendations

This chapter summarises the main results of the study, which come from analyzing public documents, company documents, semi-structured interviews, and existing literature. Based on these findings, several recommendations are made, including ideas for future research.

1.11 Summary

The JET is at the heart of South Africa's plans to move from a fossil-fuel-based energy system towards one based on renewable sources as well as addressing socio-economic structural inequalities and environmental degradation. Policy instruments are used to motivate or coerce a certain group in society to comply with specific laws, guidelines, or desired behavior. To achieve the JET objectives, the South African government has introduced a number of RET policy instruments such as new REIPPP rounds, the 2023 enhanced renewable energy tax incentive through the inclusion of S12BA in the Income Tax Act 58 of 1962 (ITA), IRP 2023 and RECs to name a few.

Although a number of policy instruments were introduced between 2019 and 2024, this study focuses on one main RET policy instrument.

The study utilises the DCs Framework, the Social Construction of the Target Populations Framework and JET objectives to create a conceptual framework. This conceptual framework will assist in the understanding of how renewable electricity firms, identify, adapt, transform their operational strategies and align their technological know-how with business opportunities in response to the South African government's introduction of RET policy instruments. In addition, the combined conceptual framework enabled a basis to understand the target populations and the allocation of burdens and benefits of a specific RET policy instrument being the 2021 schedule II amendments to ERA (2006). Finally, the study recommends ways in which existing and future RET policy instruments targeted at renewable electricity firms could be designed and implemented to enable firm level innovation and achieve the JET objectives.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive literature review that underpins the study's theoretical and conceptual foundations. It begins by examining energy policy innovation and providing an understanding of the distinct types of RET policy instruments deployed globally by governments to shape industry behaviour. The chapter then provides a comprehensive examination of some of the RET policy instruments introduced in South Africa between 2019 and 2024. The discussion then shifts to explore dynamic capabilities within the energy sector and the concept of a just energy transition, incorporating the theoretical frameworks of the DCs Framework and the Social Construction of Target Populations Framework. Based on the insights gained from the literature review regarding JET objectives, a conceptual framework is established, which is further validated through the research conducted in this study. By synthesising these strands of literature, Chapter 2 lays the foundation for the study's propositions and provides the analytical structure used to answer the research questions.

2.2 Energy policy innovation

Energy policy instruments are tools used by governments and other stakeholders to influence innovation activities, guide technological advancement, and foster economic growth (Prontera, 2009) While these tools can be broadly categorised into several types, their application in the energy sector requires specific tailoring to address unique challenges such as climate change, energy security, and the transition to renewable energy sources (Nazari & Musílek, 2023). Innovation policy instruments are tools used by governments and other stakeholders to influence innovation activities, guide technological advancement, and foster economic growth (Fagerberg, 2018) While these tools can be broadly categorised into several types, their application in the energy sector requires specific tailoring to address unique challenges such as climate change, energy security, and the transition to renewable energy sources (Nazari & Musílek, 2023).

Energy policy innovation is increasingly recognised as a vital component of the transition towards sustainable energy systems (Carley, 2011; Schmid & Lumsden, 2023; Thapar et al., 2016). This type of policy innovation encompasses the design and implementation of energy

policy instruments that address the multifaceted challenges of energy production and consumption (Carley, 2011). RET policy instruments ranging from regulatory measures to financial incentives, serve as tools to implement broader policy objectives (Azhgaliyeva et al., 2018; Enzensberger et al., 2002; Fouquet, 2013), such as socio-economic reforms as well as narrow policy objectives such as the reduction in greenhouse gas emissions.

Insights from studies such as *"Economic and Environmental Effectiveness of Renewable Energy Policy Instruments"* provide a foundation for understanding how these instruments can be tailored to maximise both innovation and environmental outcomes (Polzin et al., 2019). These studies highlight that while general policy instruments may encourage broad innovation, energy-specific policies must account for unique market conditions, such as the need for grid integration of renewable energy and balancing intermittent energy sources. The effectiveness of instruments like feed-in tariffs or renewable energy quotas is context-dependent, influenced by factors such as market maturity, institutional capacity, and societal readiness for change (Ang et al., 2022).

2.3 RET Policy Instruments 2019 – 2024

2.3.1 Energy action plan and tax incentives

The National Energy Crisis Committee (NECOM), introduced the energy action plan (EAP) in 2023. The EAP was analysed for its objectives, such as stabilising the energy supply, expediting renewable energy projects, and removing administrative bottlenecks (National Crisis Committee (NECOM), 2024). The implementation of the EAP meant resulted in implementation of substantial tax incentives and enhanced financing mechanisms has catalyzed a significant expansion in distributed renewable energy generation, with rooftop solar installations by commercial entities and households surpassing 5,000 MW—effectively alleviating pressure on the national grid (National Crisis Committee (NECOM), 2024). Concurrently, the accelerated recommissioning of three units at the Kusile power station, ahead of projected timelines, coupled with improved operational performance and intensified maintenance during the summer period, has contributed to a marked increase in the availability and reliability of Eskom’s existing generation capacity (National Crisis Committee (NECOM), 2024).

The publication of the renewable energy incentives in the 2023 Draft Taxation Law Amendment was disseminated for public comment in April 2023 (Brewis, T et al., 2024). The National Treasury and the South African Revenue Service (SARS) released the draft legislative amendments aimed at implementing two renewable energy tax incentives announced in the 2023 budget (Brewis, T et al., 2024). These proposals are designed to contribute to alleviating the country's energy crisis while simultaneously fostering private investment in the expansion of electricity generation capacity.

The expedited implementation of the initial provisions of the 2023 Draft Taxation Laws Amendment Bill encompasses two key initiatives: the expansion of the renewable energy tax incentive and the rooftop solar tax incentive. The urgency of deploying these incentives is underscored by the proposed early effective dates, which are intended to enhance certainty for individuals and businesses seeking to invest in renewable energy without delay.

Under the enhanced renewable energy tax incentive, taxpayers conducting business activities will be eligible to claim a 125% tax deduction in the first year for qualifying capital expenditures related to all renewable energy projects, with no restrictions on generation capacity (Brewis, T et al., 2024). This section of the Income Tax Act (ITA) applies only to the actual plant and machinery used to generate renewable and any improvements made to them including supporting structures like foundations (Brewis, T et al., 2024). This incentive will be available for a period of two years, applicable to investments in the renewable energy sector that are brought into use for the first time on or after March 1, 2023, and before March 1, 2025, (Brewis, T et al., 2024).

2.3.2 REIPPPP

In 2024 the renewable energy sector saw the launch of round seven of REIPPPP. Much like its previous rounds REIPPPP is designed to align with international best practices, ensuring that South Africa remains competitive in the global transition toward sustainable energy systems (Oliver, & Brewis, 2024). The introduction of REIPPPP as a public competitive process and also known as an auction in literature, has resulted in increased renewable energy capacity for South Africa (Kitzing et al., 2022). REIPPPP is recognised as a pivotal RET policy instrument that has not only driven competition amongst IPPs and encouraged job creation in parallel sectors. These sectors included energy experts developers and lawyers it stimulated economic growth by incorporating rigorous

environmental, social, and economic criteria into the procurement process (Relancio et al., 2016). The program has demonstrated its commitment to sustainability while creating job opportunities and enhancing skills development in local communities (Eberhard & Naude, 2016; Relancio et al., 2016).

2.3.3 Renewable energy certificates

RECs or energy attribute certification (EAC) offer a mechanism for firms to demonstrate their commitment to renewable energy and can be traded to support compliance with regulatory requirements (Brick & Visser, 2011). An EAC system often referred to as a REC in the context of low carbon energy sources, is viewed as a potent mechanism for enhancing transparency and creating market opportunities withing the renewable energy sector (Brick & Visser, 2011). RECs are currently unregulated and registration with available standards is undertaken on a voluntary basis. Brewis et al. (2024) highlights the growing interest of off takers in the C&I space for this voluntary energy policy instrument for environmental reporting purposes. RECs are proof of 100MW of electricity generated and imported on the national grid, as such players in the sector can offset greenhouse gas (GHG) emissions /scope 1 emissions with RECs (Brick & Visser, 2011).

The introduction of RECs in South Africa has emerged as a crucial mechanism for companies aiming to lower their Scope two emissions, which encompass indirect emissions from the consumption of purchased electricity. RECs provide proof that a certain amount of renewable energy has been generated and injected into the grid, allowing companies to claim that they are using renewable energy equivalent to the amount of certificates they hold (Haffner & de Jong, 2020). This not only aids in compliance with reporting requirements but also enhances corporate sustainability profiles, making businesses more attractive to environmentally conscious consumers and investors (Meyer & Becker, 2021). By purchasing RECs, companies can effectively offset their carbon footprint associated with electricity usage, thereby aligning with global sustainability goals and regulatory frameworks.

Despite the potential benefits, the South African REC market faces several challenges that hinder its effectiveness and growth. One of the primary issues is the lack of a robust trading platform that can facilitate the buying and selling of RECs efficiently (Baker et al.,

2020). This market fragmentation can lead to price volatility and uncertainty, making it difficult for companies to assess the true value of their investments in renewable energy. Additionally, there is often a lack of transparency regarding the certification process and the actual environmental benefits associated with specific RECs, which can undermine confidence among potential buyers (Gonzalez et al., 2021). These challenges may discourage companies from investing in RECs, limiting the overall impact on emissions reduction.

Furthermore, the effectiveness of RECs in reducing Scope two emissions reporting is contingent upon regulatory clarity and the alignment of national policies with international standards. The current inconsistencies in how RECs are treated in regulatory frameworks can create confusion for businesses attempting to navigate compliance and sustainability strategies (Cavazzi et al., 2020). Additionally, without a stable and transparent regulatory environment, the potential for RECs to drive significant emissions reductions may remain untapped. Addressing these challenges will be critical for maximising the value of RECs and ensuring they play a pivotal role in achieving South Africa's climate goals.

Two private business based RECs systems currently operate in South Africa namely “zaRECs” and “IREC” (Discovery Green Pty Ltd, 2024). Both schemes adhere to international standards have established effective frameworks within specialised industry pockets (Discovery Green Pty Ltd, 2024). What is described in the zaRECs market is a steady growing membership organisation in zaRECs, which offers valuable experience in self-regulation, a reliable set of rules and industry support. It must however be flagged that the impact of RECs systems on the electricity market has been limited as plants participating in REIPPPP are not included in the scheme (Chvanova et al., 2023). Consequently, many potential customers in the domestic electricity market do not consider zaRECs in their energy procurement decisions due to lack of awareness regarding the available opportunities (Chvanova et al., 2023). Industry players are uncertain of the opportunities that lie with EACs and carbon offsets (Chvanova et al., 2023).

There is significant value associated with EAC’s whether it be RECs or carbon credits (Holt et al., 2011; Patel et al., 2024). Eskom has an interest in claiming the REC’s which

are currently not being sold under REIPPPP, so that they can sell them to customers that need to achieve them RE targets (Chvanova et al., 2023). There is an increasing demand for EACs, and Eskom, IPPs and players in the market have an opportunity to generate additional income from trading the RECs (Chvanova et al., 2023). Customers in the SA market who are pursuing emission reduction goals are said to pay a premium for these EACs (Chvanova et al., 2023).

2.3.4 IRP 2023 & Interim rid capacity allocation rules (IGCAR)

Proposed changes to energy policy from the IRP 2023 include renewed importance for renewable energy integration, energy storage, and less dependence on coal-based power (DMRE, 2024). In addition, the BESS request for proposals (RFP) indicates an increasing focus on new technologies to drive grid reliability and facilitate the integration of renewable energy (Brewis et al., 2024).

The IRP 2019's emphasis on increasing renewable energy capacity places additional pressure on firms to integrate new technologies into an aging grid system, which presents significant technical and financial challenges (Ateba et al., 2024). a key issue in the recent literature grid capacity constraints, with authors attributing insufficient transmission infrastructure as a major hurdle to increasing renewable energy capacity and ensure a sustainable energy mix (Ateba et al., 2024). IPPs inability to guarantee grid capacity without the increasing the projects capital costs and project risks through self-build provisions, remains uncertain (Pienaar, 2023). While competition among electricity generators will be encouraged, the transmission and distribution networks must function as regulated monopolies (Bredesen, Hans-Arild, 2022). This structure is crucial since all market participants need access to the network, making non-discriminatory third-party access a vital requirement for enabling competition (Moodlliar, et al., 2023).

In response to the infrastructure pressures, Eskom published IGCAR to facilitate the allocation of grid access. All grid connection applications will be handled fairly and without discrimination to ensure open and equal access to the grid (Thopil et al., 2018). IGCAR requires Eskom to follow the first come, first served principle. This means that capacity will be given to projects that can show they are ready to build the generation facility and

the necessary infrastructure to connect to the grid NECOM, 2023; NECOM, 2024). The readiness of each project has been assessed based on a broad set of criteria which include the following:

- **Environmental consents** – having obtained all necessary consents, licenses (WUL), authorisations (EAs) or approvals required by any regulatory agency or any organ of state for the construction of the generation facility and the grid connection works.
- **Power Purchase Agreement (PPA) term sheets that are bankable** – having demonstrated to the satisfaction of Eskom that the relevant agreements relating to the off-take of the generated capacity are in place.
- Alternatively, financial guarantees issued by a financial institution approved by the Eskom.
- Appointment of relevant contractors such as engineering and design consultants and such other personnel required for the execution of the project.
- Any other legal, financial or technical criterion reasonably required for the assessment of project readiness (NECOM, 2023).

In the final months of 2024 NECOM is set to concentrate on implementing key priorities outlined in the energy action plan, two of those priorities include the codification of the IGCAR to ensure clarity regarding grid capacity allocation as well as streamlining enhancements to the grid connection process to reduce the time required for issuing cost estimate letters (CELs) and budget quotations (BQs) NECOM, 2024).

2.3.5 Carbon Credits

Leaning towards the transition to a low carbon economy, the Carbon Tax Act of 2019 (CTA 2019) was introduced to penalise polluters whilst on the other hand, incentivising industry and consumers who are taxpayers to utilise credits carbon credits generated through eligible carbon offsets projects as a means of reducing their carbon tax liability (Brewis et al., 2024). In the first phase, industry-specific tax-free emissions allowances will allow current emitters to gradually transition to energy efficiency, renewables and

other low-carbon measures (Brewis et al., 2024). The second phase is expected to have higher taxes, depending on an impact assessment of the first phase, and will run from 2023 to 2030 (Gathright, 2019; Duncan, 2019; SARS, 2020).

Organisations that combust fossil fuels to generate electricity are required to pay a carbon tax in accordance with the CTA (2019) (Brewis et al., 2024). The current rate is R134 per ton of CO2 equivalent (CO2e) emitted by a taxpayer (Brewis et al., 2024). This tax applies to all greenhouse gas emissions from the electricity producer such as fuel combustion, industrial processes and fugitive emissions, (Chvanova et al., 2023)). Tax obligations can be lowered by using carbon offsets allowances which involve buying carbon credits that are certified by approved schemes (Chvanova et al., 2023; Irwin et al., 2024). The carbon tax is collected and managed by SARS (Brewis et al., 2024). Additionally, carbon credits can be traded on the South African carbon market, enabling emitters of GHG to offset their emissions under the carbon tax while also engaging in voluntary efforts to make their companies environmentally friendly (Chvanova et al., 2023).

Carbon credits are a voluntary scheme aimed at reducing greenhouse gas emissions and energy consumption. It is recognised in terms of CTA 2019 (Chvanova et al., 2023). Consumers are only indirectly charged by their suppliers when buying electricity with fossil fuel components. Carbon credits represent a quantified reduction or removal of greenhouse gas emissions, measured in tonnes of carbon dioxide equivalent (tCO_2e), and may be used to offset an equivalent volume of emissions
(Chvanova et al., 2023). Carbon offsets will be administered by the DMRE through the carbon offset administration incentivises investment in qualifying renewable energy projects by customers liable for carbon tax and those looking to generate and sell carbon credits to carbon taxpayers.

The introduction of the carbon border adjustment mechanism (CBAM) by the European Union (EU) represents a significant shift in global trade dynamics, particularly for exporters of goods from countries with less stringent carbon regulations. CBAM aims to equalise the price of carbon emissions between domestic products and imports, thereby incentivising exporters to adopt greener practices or face financial penalties (Branger & Quirion, 2014). For South African exporters, this adjustment could lead to increased

costs for carbon-intensive products, putting them at a competitive disadvantage in the EU market unless they proactively seek ways to reduce their carbon footprint (Harrison et al., 2021). The implications for industries such as mining, agriculture, and manufacturing are profound, as companies will need to re-evaluate their production processes and supply chains to align with the EU's environmental standards.

IPPs can play a crucial role in helping South African exporters reduce their scope three emissions, which encompass the indirect emissions associated with their value chain, including the use of purchased electricity. By investing in renewable energy projects, IPPs can provide cleaner energy solutions that not only help exporters meet the EU's carbon expectations but also enhance their overall sustainability profile (IRENA, 2020). Utilising renewable energy sources such as solar or wind can significantly cut down on emissions associated with electricity consumption, thus facilitating compliance with CBAM (Pérez-Lombard et al., 2008). Furthermore, by sourcing energy from IPPs, exporters can mitigate the risks associated with fluctuating energy prices and ensure a more stable and predictable cost structure.

Moreover, trading carbon credits presents an additional avenue for exporters to manage their carbon liabilities effectively. By participating in carbon markets, companies can purchase credits to offset their emissions, thereby enhancing their compliance with CBAM regulations. This mechanism allows businesses to invest in carbon reduction projects, either domestically or internationally, thereby broadening their impact on global emissions reduction efforts (Kłonowski, 2021). For South African exporters, engaging in carbon credit trading can provide financial incentives to innovate and invest in cleaner technologies, thus driving a transition towards more sustainable practices while maintaining competitiveness in the EU market.

2.4 2021 Schedule II Amendments to the ERA (2006)

The 2021 schedule II amendments to ERA (2006) has led to a notable increase in the procurement of RE within the C&I sector The amendments made to the Electricity Regulation Act of 2006 (ERA) allow utility-scale generators to sell electricity to one or more customers through wheeling arrangements without the necessity to obtain a license (Moodlliar et al., 2023; Msimango et al., 2023). Experts in the field have said that these

amendments “unlocked” private electricity generation and procurement in South Africa, enabling private customers with electricity needs to now procure RE directly from IPPs’ under PPAs (Pienaar, 2023).

Experts in the field have observed a significant increase in the procurement of renewable energy in the C&I space as a result of the 2021 schedule II amendments to ERA (2006), recording several solar PV and wind projects having reached financial close in 2022/2023 (Brewis et al., 2024). This relaxation of licensing conditions combined with rising grid prices has fostered a more favourable environment for the emergence of private generators (Brewis et al., 2024). Figures 1 and 2 below illustrate the long-standing wheeling arrangements that were existing but not practical prior to 2021 schedule II amendments to ERA (2006) (RES4Africa Foundation, 2023).

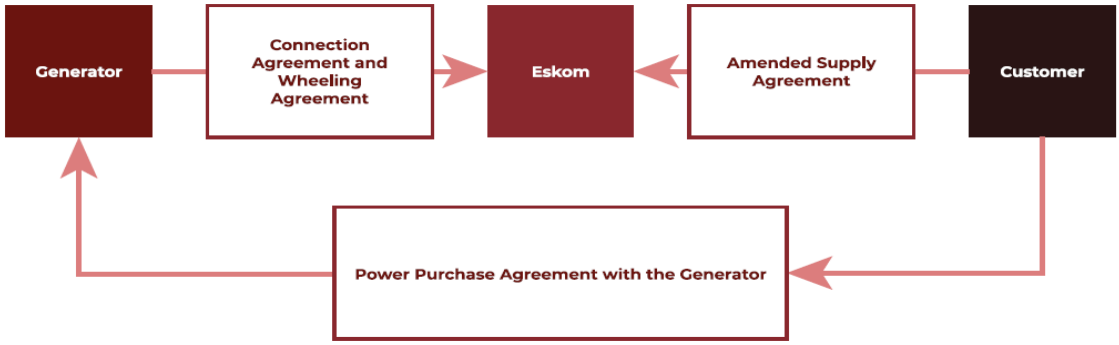


Figure 1: Eskom Wheeling Contractual Arrangement
Source: RES4Africa Foundation (2023).

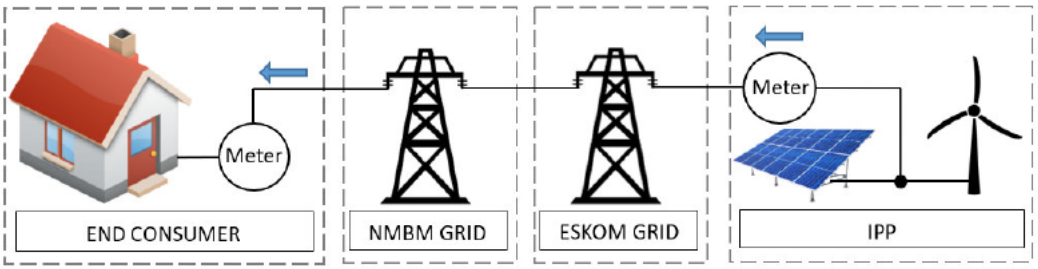


Figure 2: IPP wheeling over Eskom and municipal electrical infrastructure to delivery electricity to a municipality customer

Source: NMBM (2012).

Where an IPP plans to deliver electricity from another network through the municipal network to a customer connected to the municipality’s distribution grid, the following

conditions must be met for municipal and Eskom approval before the IPP can use the infrastructure:

- PPA concluded between IPP and end customer;
- Use of systems agreement concluded between IPP and Eskom;
- Amendments to the Eskom/municipal electricity supply agreement required for reconciliation of accounts; and
- Agreement to be concluded between municipal and the end customer (NMBM, 2012).

A novel wheeling arrangement is emerging in which traders assume responsibility for wheeling electricity purchased from IPP, acting as intermediaries between the generators and the end users. Under the 2021 schedule II amendments of ERA (2006), NERSA grants a license to traders permitting them to procure electricity from IPPs and sell it to end users (Pienaar, 2023). Traders have the capability to aggregate supply and demand, allowing them to facilitate distribution of electricity from numerous off takers, rather than relying on traditional one-to-one wheeling scenarios typically managed through Eskom or the municipalities (RES4Africa Foundation, 2023).This development enhances market efficiency and broadens access to diverse energy sources (RES4Africa Foundation, 2023). Figure 3 below illustrates the Trader Wheeling Contractual Arrangement, highlighting the innovative contractual structures developed to ensure that all transactions and processes within the wheeling framework are legally binding and compliant with regulatory requirements.

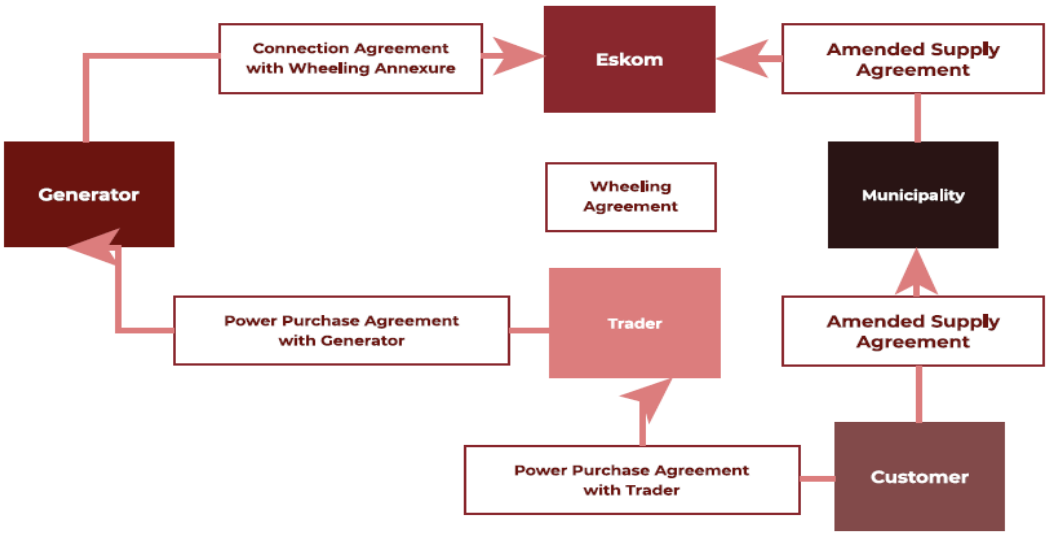


Figure 3: Trader Wheeling Arrangement
RES4Africa Foundation (2023).

Rooftop solar installations have surpassed expectations, with small scale embedded generation now contributing to at least four percent of South Africa's electricity generation (NECOM, 2024). NECOM's current focus is on implementing measures that will incentivise households and businesses to feed excess power into municipal and Eskom distribution grids, thereby promoting increased adoption of RETs (NECOM, 2024) Net billing and progressive wheeling tariffs that support wheeling within the NMBM creates opportunities for IPPs and Traders as customers are now provided with an alternative to contract for long term off-take and promote renewable energy (Nelson Mandela Bay Municipality, 2012). The net-billing framework, developed by NECOM and submitted to NERSA in March 2023 aims to establish a net-billing system across all municipalities. Once implemented, this framework will facilitate the integration of surplus power generated from rooftop solar installations into the grid (NECOM, 2024).

Table 2 below, provides a synthesised summary of the author's interpretation of opportunities and challenges associated with key RET policy instruments namely carbon credits, 2021 schedule II amendments to ERA (2006), and the IGCAR based on insights drawn from the literature review.

Table 2: Table summary of policy instruments opportunities and challenges from literature review

Policy Instrument	Potential impact for Renewable energy firms
Carbon Credits	Opportunity: Carbon credits can be used to lower tax obligations, as Renewable energy firms can sell carbon credits to taxpayers and lower greenhouse gas emissions. Carbon Credits can also be used to lower scope t3 emissions which is critical for entities exporting goods to the EU. Challenge: Long expensive administrative process
ERA	Opportunity: new offerings, products, and services (embedded generation, national wheeling, municipal wheeling, virtual wheeling, one too many wheeling) Challenge: Not all municipalities have wheeling frameworks and without a national wheeling framework connection processes differ
IGCAR	Opportunity: Balanced and fair access to the grid will allow long-term planning. More efficient processes. Challenge: Optimisation of grid infrastructure by IPPs through Self Build Agreements with no cost sharing for upstream infrastructure variability affects the bankability of projects. IPPs inability to guarantee grid capacity without increasing the projects' capital costs and project risks through self-build provisions.

Source: Author's own summary from literature review

2.5 Just Energy Transition

The JET is at the heart of South Africa's plans to move from a fossil-fuel-based energy system towards one based on renewable sources as well as addressing socio-economic structural inequalities and environmental degradation (Swilling et al., 2016). This transition seeks to address the dual challenges of reducing greenhouse gas emissions and fostering social justice, particularly in communities historically reliant on coal mining and other fossil fuel industries (Thopil et al., 2018). Central to this approach is the acknowledgment that the energy transition must not exacerbate existing inequalities but instead provide opportunities for economic growth, job creation, and skills development for affected workers and communities (Thopil et al., 2018).

This transition seeks to address the dual challenges of reducing greenhouse gas

emissions and fostering social justice, particularly in communities historically reliant on coal mining and other fossil fuel industries (Hanto et al., 2022). Central to this approach is the acknowledgment of the four main objectives of JET being, (i) to increase economic growth through new investment in renewable energy in South Africa worth one trillion Rand (ii) reskilling and upskilling to create new jobs in the RE sector, (iii) increasing renewable energy generation and deployment to alleviate loadshedding and (iv) addressing the risk of climate change by decreasing carbon emissions and deploying more sustainable energy for South Africa to become a global player (Hanto et al., 2022).

South Africa's commitment to JET is underscored by its inclusion in global initiatives like the Paris Agreement and partnerships such as the Just Energy Transition Partnership (JETP) with international stakeholders, (Hanto et al., 2022). These collaborations aim to provide financial and technical support to facilitate a fair and sustainable transition. These policies also bring significant implications for stakeholders, including government agencies, private sector investors, labor unions, and local communities. For workers in the coal sector, reskilling and upskilling programs are essential to enable them to transition into emerging renewable energy industries (Hanto et al., 2022). The JET Implementation Plan outlines a framework for transitioning from coal-dependent energy sources to renewable energy while ensuring that the interests of various stakeholders, including workers, communities, and businesses, are prioritised. This transition is vital not only for addressing climate change but also for fostering economic growth and social justice in a country marked by high unemployment and economic disparity (Mulugetta et al., 2022; Winkler et al., 2023).

Traders and IPPs play a pivotal role in the implementation of the JET. Traders facilitate the buying and selling of renewable energy credits and carbon offsets, creating financial mechanisms that support the transition (Bauer, Alexandre et al., 2024; Zadeh & Romagnoli, 2024). Their involvement is crucial in establishing a vibrant renewable energy market that can attract investment and drive innovation. IPPs, on the other hand, are essential for expanding the generation capacity of renewable energy. By diversifying energy sources and increasing competition, IPPs help lower energy costs and improve reliability, which ultimately benefits consumers and businesses alike (Eberhard & Naude, 2016). Their participation is vital for achieving the ambitious targets set forth in the JET Implementation Plan.

2.6 Dynamic Capabilities in the energy sector

DCs involve the ability to sense and seize new opportunities in a rapidly changing environment (Eurico Soares De Noronha et al., 2024; Feiler & Teece, 2014). In the renewable energy sector, DCs are particularly crucial due to the volatile regulatory landscape, fast-paced technological advancements, and increasing competition (Eroglu, 2021; Eurico Soares De Noronha et al., 2024; Noronha et al., 2023). Renewable energy resources significantly contribute to the global industry due to their energy security attributes, (Eurico Soares De Noronha et al., 2024). This section delves into how renewable electricity firms strategically develop, deploy, and reconfigure their resources and processes to thrive in such an environment. Insights from both global and local case studies will be analysed to illustrate these adaptive strategies.

Renewable electricity firms operate in a sector marked by complexity and uncertainty. Regulations often vary not only between countries but also within regions, requiring firms to be highly agile. For instance, policy changes related to subsidies, feed-in tariffs, and carbon taxation can have a significant impact on profitability (Lancker & Quaas, 2019). Firms that have cultivated strong DCs are better equipped to foresee, respond to, and even capitalise on these shifts. They achieve this by fostering innovation, developing robust stakeholder networks, and continuously investing in R&D (Usman & Hammar, 2021).

Sensing these opportunities is only the first step, in this context, DCs applied to renewable energy projects should focus on fostering national policies within the sector and the policy innovations they promote (de Noronha et al., 2023). Consequently, renewable electricity firms operating in the national sector must reconfigure their strategies and processes in response to RET policy innovations in the national economy (Brink, 2019). RET policy instruments such as auctions can be detected at national level (sensing) so that renewable electricity firms have the opportunity to reposition their resources (adapt and reconfigure) in order for the renewable electricity firms can continue to align with policy innovations, (Eurico Soares De Noronha et al., 2024).

In changing business environments, firms in the oil and gas sector required ambidexterity across mature and emerging domains as a key DC that requires leaders of firms to

simultaneously promote both establishing separate business entities, business models, and processes and cultures while holding them together through a unified business strategy (Shuen et al., 2014).

2.7 Theoretical Framework

The theoretical concepts that are relevant for this study are DCs as a strategic management theory and the concept of social construction of target populations.

2.7.1 Dynamic Capabilities Framework

The central focus of strategic management as a field of study is to understand how firms sustain and attain competitive advantage, (Sturluson, 2016; Teece et al., 1997). The concept of DCs, which is grounded in the theoretical frameworks of the resource-based view, organisational learning, contingency theory and evolutionary economics, represents one of the most influential paradigms within the field of strategic management (Eisenhardt & Martin, 2000; Sturluson, 2016; Teece et al., 1997). Capabilities can impact performance across various levels and can be leveraged to transform short-term competitive positions into sustainable long-term advantages (Feiler & Teece, 2014; Teece et al., 1997). DCs represent a manager's approach to transforming their firms' competencies, knowledge systems and organisational culture to adapt to dynamic environments thereby ensuring organisational survival (Feiler & Teece, 2014; Teece et al., 1997).

Unlike ordinary capabilities that can be easily acquired in the market, DCs are the business processes and models that produce value enhancing differentiation. These processes tend to be unique to the firm, stem from organisational heritage and are challenging for competitors to replicate (Shuen et al., 2014). DCs also differ from resources, which are unique, hard to replicate assets specific to a firm, which can include components like trade secrets and implicit knowledge (Teece et al., 1997). The DC Framework is extensively analysed so that we can understand how it can assist in understanding how renewable electricity firms seized and reconfigured their operational strategies because of the South African's government deployment of the RET policy instruments.

Teece et al. (1997) seminal studies sparked significant discussion in strategic management regarding the abilities of organisations to adapt to changing environments. These studies aimed to deepen the understanding of how firms can successfully adjust and respond to dynamic market conditions. Teece (2007) clarifies the definition of “environment”, addressing the width of the definition in that it does not cover markets alone, but also considers public policies.

According to Teece et al. (1997), the concept of DCs hinges on organisational competencies to effectively utilise information for the reconfiguration of acquisitions and the integration of innovations into business models. Furthermore, DCs extend beyond mere adaptation, they involve the combination of resources for both internal and external applications to foster the development of new products, business models and processes.

Teece et al., (1997) described DCs as encompassing three components identified as (i) integration, which requires managers to coordinate and combine resources for new product development, (ii) learning is an outcome of experimentation and repetition that enables tasks to be performed effectively and (iii) reconfiguration, which requires recombining of existing resources. Then this description was synthesised, and the above three components were further described as “orchestration processes/activities” (Shuen et al., 2014). These orchestration processes and activities, therefore, become the three key aspects on which the DCs Framework is then based on being (i) sensing; (ii) seizing, and (iii) reconfiguring (Shuen et al., 2014).

2.7.1.1 Sensing

Sensing refers to a company’s capacity to analyse and scan the market and identify opportunities that leverage its business capabilities as well as recognise and address its challenges, (Teece, 2007). . Sensing includes scanning the external and internal environments to identify new opportunities and make appropriate strategic decisions (Feiler & Teece, 2014). The sensing process involves detailed analysis of customer needs, procurement cycles, competitor positions, and cost structures to validate hypotheses and inform business model choices (Teece et al., 1997).

- Micro foundations of sensing

This includes micro foundations such as observing market and industry trends, exploring new technological opportunities, evaluating markets, and gathering information about actors in the business environment (Feiler & Teece, 2014). In this way, sensing may involve investments in R&D and related activities (Feiler & Teece, 2014).

2.7.1.2 Seizing

Seizing refers to the ability to plan and implement strategies that manage resources to encourage innovation within the organisation and to adjust business models to create effective market solutions or mitigate risk (Feiler & Teece, 2014).

- Micro foundations of Seizing

Seizing often consists of micro foundations such as developing new products. Organisations with DCs can make informed, interconnected investment decisions, supported by quality processes and leadership to mitigate biases (Feiler & Teece, 2014). During the seizing phase, decision-makers evaluate the potential impact of changes on customer needs and revenue, considering market segments and value capture mechanisms (Teece, 2007).

Effective seizing includes designing revenue architectures and business cases, communicating business case potential with stakeholders, minimising decision errors, controlling bottlenecks, demonstrating leadership, raising capital and planning to execute (Feiler & Teece, 2014).

2.7.1.3 Reconfiguring

Reconfiguration is the company's ability to adapt and reshape capabilities amidst swift technological and/or market shifts (Teece, 2007). Transformation requires actions to redesign business models when faced with industry challenges. Reconfiguration is essential for maintaining evolutionary fitness and, when necessary, for escaping unfavorable path dependencies (Teece, 2007).

- Micro foundations of reconfiguration

To realign and reconfigure assets and organisational structures as the business adapts

to changing markets, managers must identify which routines are vital for operational efficiency and which processes require modification to align with the changing environment and revised business models (Feiler & Teece, 2014). A key managerial function involves ongoing redesign and enhancement, along with efforts to build, maintain, and adjust complementary product offerings and operational systems, (Feiler & Teece, 2014).

Firms that can effectively reconfigure typically have organisational structures that position top management close to new technologies, customers, and market dynamics (Teece, 2018). Leadership skills at the top management level are crucial for sustaining DCs (Feiler & Teece, 2014). As enterprises expand, pursuing decentralisation is vital to preserve flexibility and responsiveness. Reconfiguration should facilitate the identification and development of specialised complementary assets, such as BESS in relation to PV solar and wind (Teece, 2007). Effective incentive design and knowledge-sharing procedures are critical for business performance and form a foundational aspect of DCs (Teece, 2007).

2.7.1.4 Technological Congruence

DCs in a sustainability context involve building and integrating resources and capabilities that integrate sustainability into new innovations, with the aim of meeting new market needs (Dangelico et al., 2017). DCs need to achieve congruence between technological, business opportunities and customer needs (Carmichael & Van Der Hoven, 2021; Hermundsdottir et al., 2024; Shuen et al., 2014). Therefore, diversifying firms must simultaneously develop or acquire new resources suitable for the new industry (Mäkitie, 2020; Pisano, 2017).

Accordingly, Teece et al. (1997) suggests that (i) a DC must be tailored to meet user needs (there is a source of revenue); (ii) a DC should be unique, allowing product/services to be priced independently of the competition and (iii) a DC should be difficult to replicate to protect profits from competitive pressures. Once a technological or market opportunity is identified, it requires development and commercialisation through new products, processes, or services, often necessitating significant investment (Teece, 2007). Firms must maintain and enhance technological competencies and

complementary assets (Feiler & Teece, 2014), strategically investing in market technologies likely to gain acceptance (Teece, 2007). Additionally, firms must integrate knowledge from external sources to access and capitalise on opportunities (Teece, 2007).

2.8 Social Construction of Target Populations Framework

2.8.1 Overview

Public policy usually aims to change the behaviour of specific groups that are connected to the issues that the policy is trying to address, as such Ingram and Schneider (1991) hold the view that, to understand how government policies are created and carried out and their effects on the world, it is essential to consider the behaviour of key government institutions. This includes legislators, courts, administrative agencies, and chief executives, as well as the actions of interest groups, the general public, and the media (Sabatier, 1991). As a result, the commencement of the 1980's saw policy theorist adopting a design approach that was initially proposed to address the many factors influencing the selection, implementation, and evaluation of public policy (Ingram & Schneider, 1991; Schneider & Ingram, 1988, 1990, 1993). It is in this context, the concept of the social construction of target populations was introduced (Schneider & Ingram, 2017).

The work involving the social construction of target populations was explained in both positive and negative ways to focused on how benefits and burdens are shared among different groups, aiming to reflect and maintain the perceptions that society has about these groups (Sabatier, 2007; Schneider & Ingram, 1993). The framework of the social construction of target populations can be utilised to create empirical, testable propositions that are closely linked to significant ethical issues related to justice, citizenship, effective problem-solving, and democracy (Sabatier, 2007). This framework acknowledges that policy design carries profound social and political implications, shaping not only the lives of individuals within target populations but also the broader societal landscape (Sabatier, 2007).

In the context of this study, social construction is a process that shapes how we understand the world (Sabatier, 2007). It involves the ways we define reality, including the images, stereotypes, and values we assign to people, objects, and events (Sabatier, 2007; Schneider & Ingram, 2017). These elements are crucial for making sense of policy and politics, influencing how decisions are made and how issues are perceived (Sabatier, 2007). Recent studies on policy design highlight that the features of laws, guidelines, implementation structures, and service delivery methods are crucial for understanding how policies work (Mansoor & Williams, 2024; Whitsel et al., 2024).There is a growing interest in why certain policies are selected over others and how these choices affect the target populations (Sabatier, 2007).

The theory presented here suggests that some aspects of policy design particularly the tools used and the reasons behind the policies will vary based on how target populations are socially constructed and the political power they hold (Sabatier, 2007). Policy tools are the elements of a policy that aim to encourage target populations to follow the policy or take advantage of its opportunities (Ingram & Schneider, 1991; Sabatier, 2007). Figure 4 below depicts a summary of the social construction framework, identifying the essential elements including, whether target population have a positive or negative image, their political power and the different types of target populations.

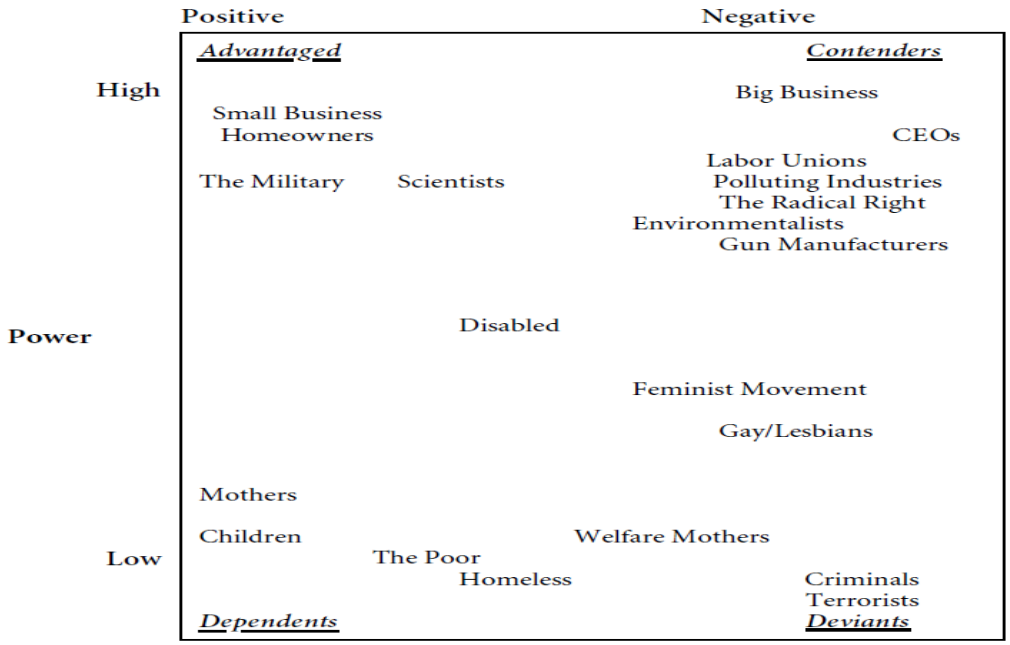


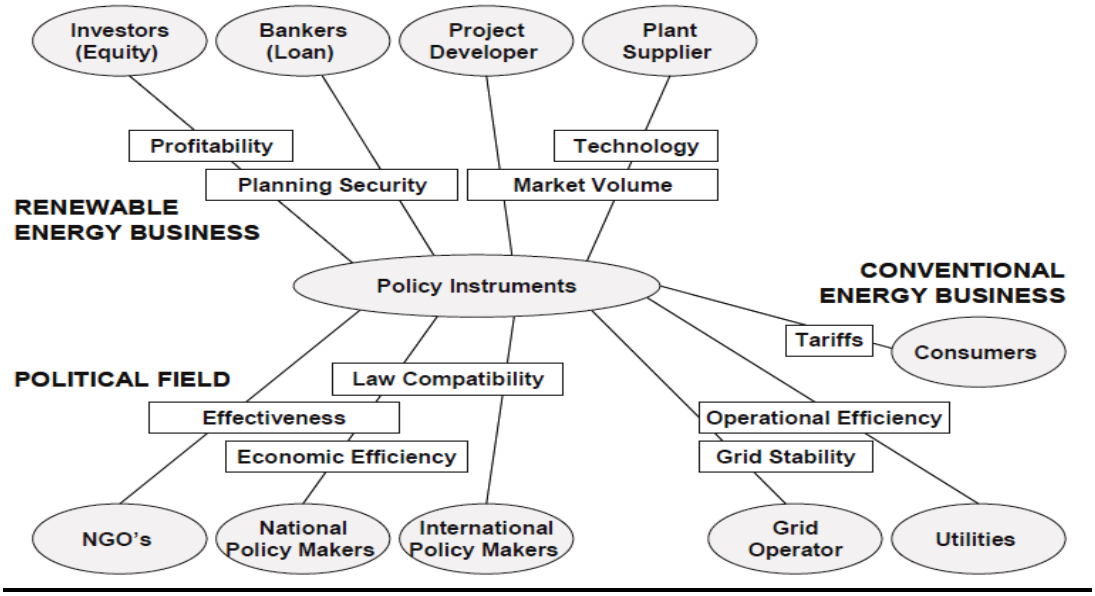
Figure 4: Social Construction

Source: Ingram et al. (2007) : Social Construction and Policy Design

2.8.2 Target Populations

The theory presented here suggests that certain aspects of policy design, particularly the tools used and the reasons behind the policies, will vary based on how target populations are viewed and their political influence (Sabatier, 2007).This theory helps explain several ongoing challenges in a democratic society that other frameworks do not address well (Sabatier, 2007). In their journal submission *"The Choice of Target Populations"* Ingram and Schneider (1991, p. 334) define target populations as "*the persons, groups, or firms selected for behavioural change by public policy initiatives such as statues, agency guidelines or operational programs*". Policy design also includes other important elements, such as the goals to be achieved and the tools meant to change behaviours.

Policy tools are the components of a policy aimed at encouraging target populations to follow the rules or take advantage of what the policy offers (Sabatier, 2007; Schneider & Ingram, 1993). Different target groups may have different expectations and requirements regarding a new policy instrument (Enzensberger et al., 2002). In *Figure 5* below, Enzensberger (2002) proposes to differentiate between the various target groups within the energy network of interests and their individual objectives.



*Fig*ure 5: Stakeholder Interests in Renewable Energy Policy Instruments

Source: Enzensberger et al. (2002).

Target populations are the groups of individuals expected to heed policy directives or embrace the opportunities offered (Sabatier, 2007). As observed by Ingram and Schneider (1991), public policy often works through the actions of people to achieve its aims. Thus, if these groups do not make choices or take steps that align with policy goals, the desired outcomes may remain out of reach, leaving intensions unfiled (Ingram & Schneider, 1991). How well policies can address problems and change outcomes largely depends on the choice of target populations (Ingram & Schneider, 1991). Policies are most likely to succeed if they identify the groups that are logically linked to the desired goals (Kuks & Ligteringen, 1996), can be motivated to desired goals, can be motivated to participate and whose actions do not create negative effects elsewhere that would undermine the policy's impact (Ingram & Mann, 1980).

Policy designers often have a range of target groups to choose from, each with different levels of connection to the problems they are trying to resolve (Ingram & Schneider, 1991). By focusing on target groups, attention shifts to how policies influence both the people involved in the policy-making process and those who gain or lose from a specific policy (Schneider & Ingram, 1993).

However, Ingram and Schneider (1991, p. 335) argue that the exercise that entails defining and the choice of the target group have been more of a political exercise than a

"simple technocratic exercise in logic*."* As such, political power in the design of policymaking often creates contrasting perspectives on public policy. Whereas, where target populations are included in the policy design but suffer negative impacts from policies, such target groups tend to seek exclusion from such policies and naturally on the other hand, target groups who are excluded from the beneficial policies strive to gain inclusion (Ingram & Schneider, 1991). Table *3* below outlines the categorisation of target populations based on their social construction, associated characteristics, and the corresponding policy instruments applied to influence their behavior.

Table 3: Target groups, characteristics and policy types

Social construction target group	**Characteristics**	**Policy type**
Advantaged groups	High levels of political power resources Enjoy positive social construction as deserving people is important in the political and social hierarchy. Most likely to receive benefits in public policy such as tax deductions or credits	Policy tools will emphasise capacity building, inducements, and technologies that enable the target population to learn about the results of its behaviour and act on a voluntary basis. Non-income-tested subsidies Free information Training and technical assistance Political payoffs are that outreach programmes will be common. When policy instruments are not effective, they may change to standards and charges
Contenders	Power but negatively viewed. The rich Minorities	Benefits largely hidden from the public. It is difficult to see from statute who policy favours dependent on public opinion at the time.
Dependents	Children mothers disabled	Subsidies with eligibility requirements Involve labelling and stigmatising recipients. **Symbolic and hortatory tools** The use of authority defined as statements that grant permission, prohibit action, or require action will be more with dependents because they are considered

		self-reliant. **Information tools**
Deviants	Powerless and negatively viewed. Criminals Subjected to the authority of authors	Policy tools are more coercive Authoritative policy tools

Source: Authors own summary of Social Construction of Target Populations: Implications for Politics and Policy (Schneider & Ingram, 1993)

2.8.3 Behavioural Assumptions and the types of policy tools

Table 4 below describes the various types of policy tools in details in the table summary above along with the behavioural assumptions.

Table 4: Behavioral Assumptions of Policy Tools

Social Construction of Target Populations: Behavioral Assumptions of Policy Tools

Policy Tool	Behavioral Assumptions of Policy Tools
Authority	Authority policy tools are most common policy tool and is often used in conjunction with other tools. Authority tools assume that target populations will comply because they want to obey laws without the need of a concrete incentive.
Incentive	Incentive policy tools rely on the use of incentives or sanctions to achieve the desired behavior. There are four sub-categories, all of which have different behavioral assumptions: • *Inducements* assumes that target populations will respond to positive incentives • *Charges* assumes that target populations will comply with establish guidelines or face sanctions • *Sanction* assumes that target population will comply to avoid more severe sanctions then those associated with charges • *Force* assumes that the target population will respond to the threat of punishment.
Capacity	Capacity tools assume that the target population would comply if they had the appropriate information and rely on education and training instead of the use of incentives.
Symbolic Hortatory	Symbolic and hortatory tools assume that the target population is self-motivated and will comply based on how policy tools align with their person beliefs and values.
Learning	Learning tools are used when insufficient information is known about the target population in terms of what would be the most effective approach at achieving the desired behavior.

Adapted from Schneider, & Ingram, (1993). Social construction of target populations: Implications for politics and policy. The American Political Science Review, 87(2), 334-347. https://doi.org/10.2307/293904

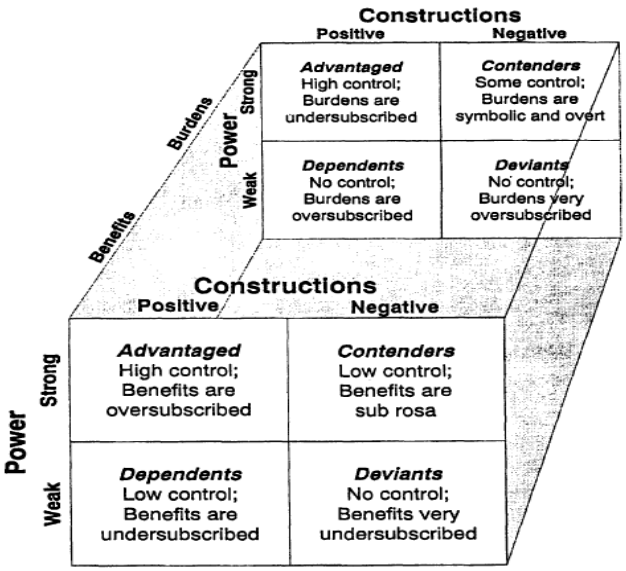


Figure 6: Variations in how policy treats Target Populations and allocates benefits and burdens

Source: Schneider & Ingram (1993): Social Construction of Target Populations: Implications for Politics and Policy

2.9 Conceptual Framework

The conceptual framework of this study explores the three objectives of this study. First, understanding the social constructions of the target populations of 2021 schedule II amendments to ERA (2006) to identify the target populations and the benefits and burdens allocated to such target populations. Second (ii) to explore how the Target IPP and Target Trader have sensed, seized, transformed and aligned their technologies and the required capabilities to meet their customers' needs for competitive advantage. Finally, to identify RET policy designs that would coerce and/or motivate renewable electricity firms to respond for competitive advantage and to contribute to the JET objectives.

Figure 7 below, illustrates the conceptual framework developed for this study, which combines two distinct theoretical lenses: the DCs Framework and the Social Construction of Target Populations Framework. The integration of these perspectives is exploratory, as they originate from different scholarly traditions—strategic management and public policy design. The framework positions dynamic capabilities (sensing, seizing, reconfiguring, and technological congruence) alongside policy tools (authority, capacity, incentive, symbolic and learning) to examine how renewable electricity firms respond to policy instruments within South Africa's evolving energy landscape.

This approach enables the study to capture both organisational adaptation processes and the socio-political context shaping firm behavior. By embedding these elements within the overarching objectives of the JET such as increased renewable energy supply, economic growth, and job creation and skills development. The framework provides a holistic lens for understanding the interplay between policy and firm-level innovation. Rather than prescribing causal relationships, the framework serves as a heuristic tool to guide inquiry through open-ended questions, allowing for nuanced insights into an underexplored intersection of policy and strategy. Figure 7 below illustrates the elements of the conceptual framework

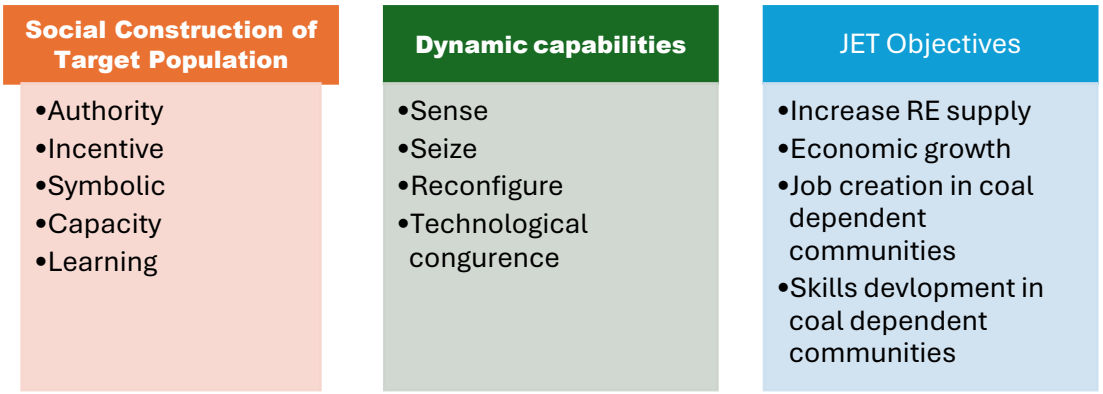


Figure 7: Conceptual Framework

This framework integrates two distinct theoretical perspectives the DCF and the Social Construction of Target Populations Framework, within the context of South Africa's renewable energy transition. It illustrates the exploratory linkage between firm-level adaptive processes (sensing, seizing, reconfiguring, and technological congruence) and socio-political tools (authority, incentive, symbolic, capacity and learning) embedded in policy design, aligned with the overarching objectives of the JET. Figure 9 below is a Heuritic illustration combining the theoretical frameworks. The conceptual framework in Figure 7 should be understood as exploratory, particularly because it brings together social construction theory and the dynamic capabilities framework, which stem from different bodies of scholarship. As a result, the study prioritises exploratory research questions, rather than seeking to advance formal propositions in an area where the literature remains limited.

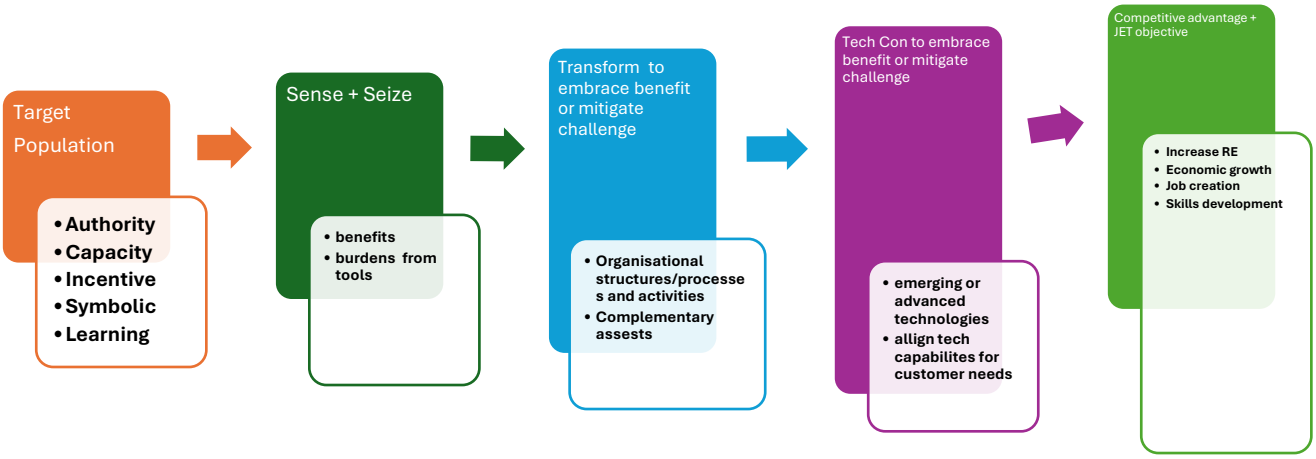


Figure 8: Heuristic illustration combining Theoretical Frameworks

The interview guide was made based on this chapter's review of relevant literature on dynamic capabilities and consisted of questions related to the micro foundations of sensing, seizing, and reconfiguring (Mousavi et al., 2018; Teece, 2007) and technological congruence. The DC Framework accounts for industry-specific context, recognising that sectoral characteristics and nuances can shape the framework's effectiveness. In contrast, the Social Construction of Target Populations Framework focuses on political power, industry influence, and the design of RET policy instruments. The interview guide also provided a basis to investigate the JET objectives by exploring the impacts of RET policy on the JET objectives. The aspects of the DC Framework elements that can be extracted from the combined conceptual framework have the potential to enhance our understanding of the processes, activities and resources that enable renewable electricity firms to respond and adapt to these various RET policy innovations.

2.10 Summary

South Africa's energy sector is at crossroads as it grapples with the constant deployment of new policy instruments requiring renewable electricity to not only identify the opportunities and challenges that come with such RET policy instruments but adequately sense, adapt, reconfigure their business processes and resources and align their

technological capabilities with business opportunities through technological congruence to remain competitive.

In attempting to understand the practical aspects of this framework, the research method employs a comparative multiple case study approach, the case of the Target IPP and Target Trader. These renewable electricity firms are attempting to achieve and maintain a competitive advantage in a sector where the government is constantly employing a variety of policy innovations to increase generation capacity, drive competition, and enable an efficient energy market supported by clear policy instruments. The research questions for the case studies are framed around understanding how renewable electricity firms' development of dynamic capabilities is geared toward supporting organisational efforts to respond to and adapt to policy instruments deployed and achieve competitive advantage.

2.11 Statement of propositions

The following propositions are formulated based on the conceptual framework and literature review, aiming to guide the empirical investigation into (i) the social construction and allocation of burdens and benefits in respect of the 2021 schedule II amendments of ERA (2006) (ii) the relationship between RET policy instruments and DCs within South African electricity firms (iii) RET policy design elements which give renewable electricity firms competitive advantage and contribute to the JET objectives.

Research question 1: What is the social construction of the target populations of the 2021 schedule II amendments of ERA (2006)?

2.11.1 P1: Parties identified as “Advantaged” in relation to the 2021 schedule II amendments to ERA (2006) will have a positive social construction viewed as deserving and important in the political and social hierarchy. The Advantaged population will receive an over-subscription of benefits where policy tools will emphasise capacity building and the target population to act on a voluntary basis

2.11.2 P2: Parties identified as “Contenders” in relation to the 2021 schedule II amendments of ERA (2006) will have power but will be negatively viewed, as part of the minorities. The Contender population will receive sub-rosa benefits and symbolic and overt burdens through the 2021 schedule II amendments of ERA (2006).

2.11.3 P3: Parties identified as “Dependents” in relation to the 2021 Schedule II amendments of ERA will have a positive social construction and weak political power. The Dependent population will receive an under-subscription of benefits and an over-subscription of burdens through the 2021 schedule II amendments of ERA (2006).

2.11.4 P4: Parties identified as “Deviants” in relation to the 2021 schedule II amendments of ERA (2006) will have a negative social construction and will be viewed as likely criminals. The Deviant population will receive an under-subscription of benefits and an over-subscription of burdens through the 2021 schedule II amendments of ERA (2006).

Research question 2: How do renewable electricity firms operating in South Africa sense, seize, transform and achieve technological congruence when the government implements RET policy instruments in the period 2019-2024?

Accordingly, this research question is further unpacked into a series of sub-questions to operationalise the analysis and to facilitate the development of hypotheses derived from the theoretical and empirical literature.

Research question 2a: How do renewable electricity firms sense risks and opportunities of RET policy instruments of 2019-2024?

2.11.5 P5: Sensing dynamic capabilities of renewable electricity firms include developing robust stakeholder networks to observe market and industry trends and new technology opportunities, gather information about the actors in the environment and investments into R&D and related activities.

Research question 2b: How do renewable electricity firms seize risks and opportunities of RET policy instruments of 2019-2024?

2.11.6 P6: Seizing dynamic capabilities of renewable electricity firms include, developing new products and services, designing revenue architectures and business cases, communicating business case potential with stakeholders, minimising decision errors, controlling bottlenecks, demonstrating leadership, raising capital.

Research question 2c: How do renewable electricity firms reconfigure to mitigate risks and/or achieve competitive advantage from RET policy instruments of 2019-2024?

2.11.7 P7: Reconfiguration dynamic capabilities of renewable electricity firms include managers' ability to identify which routines are vital for operational efficiency and which processes require modification to align with the changing environment and revised business models, top management remaining close to new technologies, customers and the market, identification and development of specialised complementary assets and effective incentive design and knowledge-sharing procedures.

Research question 2d: How do renewable electricity firms achieve technological congruence to mitigate risks and/or achieve competitive advantage from RET policy

instruments of 2019-2024?

2.11.8 P8: Technological congruence dynamic capabilities of renewable electricity firms include the development of unique and difficult-to-replicate assets, the ability to create tailor-made solutions that meet customer needs and independently price them, investing in market technologies, and aligning technological capabilities with technologies to meet customer needs.

Research question 3: What types of RET policy instruments would enable renewable electricity firms to both maintain competitiveness and contribute towards the achievement of all JET objectives?

2.11.9 P9: A coherent mix of renewable energy transition (RET) policy instruments combining authority-based regulatory tools, market-based financial incentives, capacity-building measures, and learning-oriented instruments will most effectively enable renewable electricity firms to maintain competitive advantage while simultaneously contributing to the achievement of all Just Energy Transition (JET) objectives.

3 CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY

3.1 Introduction

This study seeks to understand the relationship between RET policy instruments and DCs in Renewable energy firms. The study is framed as a social science study, where a qualitative research approach has been adopted, and data has been collected by conducting semi-structured interviews. This chapter outlines the research strategy followed for this study to answer the research questions.

The main objective of this study is to bring together the DCs of renewable electricity firms with the RET policy instruments and assess their interactions in the South African context. The DCs Framework provides a perspective for analysing the ways that firms adapt, integrate, and reconfigure internal and external resources to address challenges arising from altered policy environments (Worch et al., 2019). The study offers unique insights into the management of renewable electricity firms operating in South Africa as they respond to the opportunities and challenges offered by this rapidly changing energy context (Prentice, 2018).

The research questions posed in this study encourage an approach grounded in the interpretive paradigm, which perceives the world through the personal experiences of individuals. Interpretivism is a paradigm that rejects objectivism, as it recognises the complexity and multifaceted views of the world; it acknowledges reality accessed *"through the social constructions such as language, consciousness and shared meanings"* (Creswell & Poth, 2016).The data were interpreted using constructivism, which recognises the subjective meanings that individuals assign from their experiences (Creswell & Poth, 2016) thus, the qualitative research approach was followed.

This study advances scholarly discourse by bringing a firm-level perspective of dynamic capabilities into conversation with the policy perspective of social constructions, a linkage that remains underexplored in energy transition literature. Through comparative analysis of the Target IPP and Target Trader, the research illustrates how organisational structures, operational models, and regulatory requirements shape distinct processes for capturing opportunities and mitigating risks arising from RET policy instruments.

The research is positioned as social sciences research concerned with the intersection of the RET policy instruments and organisational strategy. The emphasis on the changing nature of firm level responses to pressures makes a qualitative research perspective optimal (König, 2020). The study investigates through qualitative research methods the firm coping strategies that help navigate the regulatory environment through context-sensitive, nuanced processes that keep firms in business and compliant. It adds further justification for the qualitative design as it captures the lived experiences and insights of those directly involved in policy implementation and the strategic decision-making process.

For practitioners and policymakers, the study offers tangible insights to inform strategies and interventions that can accelerate South Africa's JET objectives. Findings underscore the need for policymakers to understand the internal dynamics of renewable electricity firms so that RET policy instruments are designed to stimulate innovation while balancing investor returns with socio-economic objectives.

Data were collected via semi-structured interviews conducted to explore perspectives of participants and to allow the interviewer the flexibility to probe further into themes that emerged. These are supplemented by secondary data obtained from firm-specific documents, industry reports and policy analyses to paint a comprehensive picture of the elements shaping firm responses. This triangulation of data sources strengthens the depth of analysis in the study.

The second objective of the study is to describe the social constructions of renewable electricity firms in relation to the RET policy instruments. As such the study includes a critical analysis of such RET policy instruments and publicly available documents and reports to ascertain the type of target population the Target IPP and the Target Trader fall within, as well as the messages sent by the government to the target populations in deploying the RET policy instruments.

This chapter describes the methodological framework of the research: research strategy; sampling; data analysis methods; and the ethical principles applied to the study. It further elaborates on the strategies adopted to achieve reliability and validity, fundamental in

establishing good credibility of the findings (Osuagwu, 2020). Lastly, the chapter discusses the limitations of the study, helping to demarcate its scope and delimitations, and preparing for the analysis and discussion in the following chapters. The chapter provides a basis on which to appreciate the methodological latitude as exercised in this research by addressing these elements (Montagud et al., 2022).

3.2 Research Strategy and Design

The research was conducted using the qualitative research approach, an approach that is appropriate for researching the specific and dynamic responses of firms to the RET policy instruments. The study adopts a qualitative methodology because it enables deep investigation into complex phenomena, and in this case, it captures the detail of how firms respond to and cope with policies impacting complex systems of energy. The research uses both primary as well as secondary data sources, making the overview of the subject matter more intense.

The main data for the study are collected through conducting semi-structured interviews with renewable energy experts and participants in two chosen companies. It offers flexibility in exploring the participants, and at the same time, objectivity across interviews. Firm level documents, such as annual reports, strategy papers, and policy analysis documents, are secondary data (Sulich & Sołoducho-Pelc, 2021). These sources function as a surrounding context for the analysis of the primary data.

The report analyses RET policy instruments implemented from 2019 to 2024. A qualitative content analysis is performed of these instruments with the aim of assessing their impact on renewable energy companies (Marinescu, 2020). A document analysis of firm-level records is used to gain insight into how the RET policy instruments have affected strategic decision-making and operational changes. The research design includes comparative complementary case studies that provide defects to comparison similarities and differences between the firms selected.

The two renewable electricity firms are selected as case studies represent different operational models in the renewables sector. One is a multinational IPP the Target IPP, serving commercial and industrial clients (Schabek, 2020). This firm participates in all aspects of energy development and provides a complete perspective on the reaction of

firms with integrated capabilities to the RET policy instruments at play. The second firm is a domestic energy trader, licensed electricity trading firm the Target Trader, whose operations are restricted to selling energy (Yang et al., 2019). This comparative design offers a rare opportunity to examine the impact of licensing requirements and operational scope on policy responses.

3.3 Selection of Participants

To collect meaningful data, the study employed a purposive sampling technique in selecting the participants. Renewable energy insiders are included to offer a wider view of the industry and its interaction with energy policies. The list includes policymakers, consultants, and academics who have invaluable experience in South Africa's energy sector. The sample of participants also includes various case study firms from which employees and executives responsible for strategy decisions and policy compliance activities are selected.

With a set sample size target of 19 participants, the research captured a variety of perspectives, while ensuring that the data collection and analysis remained manageable. As listed below in Table 5 participants were chosen who had deep personal stake and experience in the renewable energy space in order to elicit rich and detailed data. Table 5 below presents the profile of participants interviewed for the study including their designation, organisational affiliation and level of accountability.

Table 5: Background profile of respondents

Target IPP	Industry Experts
1. CEO SA	2. VP of Project Finance of multinational IPP
3. General Counsel (Based in UAE)	4. CEO and founder of Economic Development Consulting firm
5. Head of Procurement (Based in UAE)	6. Projects and Infrastructure Partner
7. Senior Project Manager Wheeling	8. Project Development and Construction Partner

9. Energy Storage Specialist	10. Director Energy Solutions Company
11. Paralegal (Based in UAE)	12. Private equity and industry executive
13. Senior Manager Corporate Development & Sustainability (Based in UAE)	14. Senior Business Development
15. Commercial Intelligence Analyst (Based in UAE)	16. Senior Investment Banker
	17. Private equity and Energy M&A Specialist
	18. M&A Specialise
Target Trader	
19. Operations Officer	

3.4 Data Analysis

In this research clues from interview data, firm documents, and comparative case studies were synthesised. Using a thematic analysis on the semi-structured interview data, the researcher identified key themes and patterns. This approach enabled the researcher to elicit similarities and differences in responses, which does justice to the nature of variation in responses to policy innovation instruments across firms (between groups) and within firms (differences).

The thematic analysis is complemented by analysis of documents, especially as document analyses provide context to, and supports the findings gained through interviews. The researcher evaluated firm-level documents such as annual reports and strategy papers to extract operational and strategic adjustment data triggered by specific policy instruments. The analysis center's around contextualising these findings in relation to the core themes that emerged within the interviews.

This comparative case study design consists of a comparison based on two selected firms to pinpoint differences between responses to RET policy instruments (Steinebach, 2022). This overview presents the strategic nuances of diverse types of renewable electricity firms, including appropriate licensing requirements, operational scope, and firm

size. Combining these data sources and methods allowed for a holistic and rigorous assessment of the study propositions as set out below:

- Research question 1: What is the social construction of the target populations of the 2021 Schedule II amendments to ERA (2006)?
    - Proposition 1: Renewable electricity firms, project developers, lawyers, banks and intensive energy users have a positive social construction viewed as deserving and important in the political and social hierarchy as thus identified as Advantaged in relation to the 2021 schedule II amendments of ERA (2006). The Advantaged population will receive an over-subscription of benefits where the 2021 schedule II amendments of ERA (2006) will emphasise capacity building the Advantaged population will have the opportunity to act on a voluntary basis.
    - Proposition 2: As the sole producers of electricity in South Africa, Eskom will be identified as Contenders in relation to the 2021 schedule II amendments of ERA (2006). The Contender population will receive sub-rosa benefits and symbolic and overt burdens through the 2021 schedule II amendments of ERA (2006).
    - Proposition 3: Coal dependent communities will have a positive social construction but weak political power and thus identified as Dependents in relation to the 2021 Schedule II amendments of ERA (2006). The Dependent population will receive an under-subscription of benefits and an over-subscription of burdens through the 2021 schedule II amendments of ERA (2006).
    - Proposition 4: Non-compliant communities and contractors and project developers who don’t comply with renewable energy project requirements have a negative social construction and likely criminals. This group is identified as deviants” in relation to the 2021 schedule II amendments of ERA (2006). The Deviant population will receive an under-subscription of benefits and an over-subscription of burdens through the 2021 schedule II amendments of ERA (2006).

- Research question 2: How do renewable electricity firms operating in South Africa sense, seize, transform and achieve technological congruence when the government implements RET policy instruments? Proposition 5: Sensing dynamic capabilities of renewable electricity firms include developing robust stakeholder networks to observe market and industry trends and new technology opportunities, gather information about the actors in the environment and investments into R&D and related activities.
    - Proposition 6: Seizing dynamic capabilities of renewable electricity firms include, developing new products and services, designing revenue architectures and business cases, communicating business case potential with stakeholders, minimising decision errors, controlling bottlenecks, demonstrating leadership, raising capital.
    - Proposition 7: Reconfiguration dynamic capabilities of renewable electricity firms include managers' ability to identify which routines are vital for operational efficiency and which processes require modification to align with the changing environment and revised business models, top management remaining close to new technologies, customers and the market, identification and development of specialised complementary assets and effective incentive design and knowledge-sharing procedures.
    - Proposition 8: Technological congruence dynamic capabilities of renewable electricity firms include the development of unique and difficult-to-replicate assets, the ability to create tailor-made solutions that meet customer needs and independently price them, investing in market technologies, and aligning technological capabilities with technologies to meet customer needs.

- Research question 3: What types of RET policy instruments would enable renewable electricity firms to both maintain competitiveness and contribute towards the achievement of all JET objectives?
    - Proposition 9: Renewable electricity firms are more likely to maintain competitiveness and contribute meaningfully to all Just Energy Transition (JET) objectives where RET policy instruments are deployed as an integrated mix of regulatory authority, financial incentives, capacity-building measures, and learning-oriented tools, rather than as isolated instruments.

3.5 Limitations of the Study

Although the study offers insight into the research topic, there are limitations. Due to limiting its focus, the findings of the study are explorative and cannot be generalised beyond the two examined firms to the greater renewable energy industry. Furthermore, some access to firm documentation was limited, such as internal strategy papers. This limits the analysis depth. The researcher only measured the Target IPP and the Target Trader's response to RET policy instruments introduced between 2019 -2024 and not any other earlier policy impact which may have affected the behaviour of the renewable electricity firms (Peng et al., 2023). However, given that the aim of the study is only to explore the relationship, the study design and methodology are sufficiently calcified for significant and relevant conclusions within the scope defined.

This study contributes to the academic literature by offering an integrative perspective that brings a firm-level strategic management lens, through the dynamic capabilities framework, into dialogue with a public policy perspective grounded in social construction theory. While these bodies of literature have largely developed in parallel, this study demonstrates the value of examining how policy instruments are interpreted and enacted within firms, rather than treating policy and organisational response as analytically separate domains. In doing so, the study does not seek to advance or test new theory, but rather to provide exploratory insights into how policy design, political signalling, and firm-level capabilities intersect within the context of South Africa's renewable energy transition.

In addition to its theoretical relevance, the study aims to make a practical contribution to the community of practice. By grounding the analysis in the experiences of renewable electricity firms operating under evolving policy conditions, the study seeks to inform ongoing policy and industry discussions around the just energy transition. The findings offer empirically grounded insights that may assist policymakers, regulators, and industry stakeholders in understanding how policy instruments are translated into organisational practices, and how these practices may either support or constrain the realisation of just energy transition objectives. In this way, the study aspires to contribute, in a modest and applied manner, to bridging the gap between national policy discourse and the practical challenges of implementation.

The researcher acknowledges the limitations of this study. This limitation of only focusing on two firms provides valuable insights within the renewable energy industry but limits the generalisability of findings to a larger industry environment. Identifying and interviewing informants proved challenging due to limited public records and the voluntary nature of participation. Nevertheless, the study's methodological rigor, combined with comprehensive data collection and analysis procedures, helped to mitigate these limitations (Halkos & Gkampoura, 2020).

3.6 Ethical Considerations

Maintaining the following ethical considerations of research practice ensured the necessary respect, protection and integrity of all persons involved in this study (Kessio, & Chang'ach, 2020). All participants were debriefed with information about the purpose, methods, and significance of the study before they participate (Palmer, 2021).
To preserve confidentiality, the identities of both participants and firms were anonymised in the analysis and reporting phase of this study. The research data is stored on password-protected devices, and only the researcher has access to it (Mukona et al., 2024). The participants were informed and aware that they could leave the study at any time without being penalised or victimised. These precautions helped ensure that the research is ethical and builds trust between researchers and participants.

Given that this study involved human participants through semi-structured interviews, formal ethics clearance was sought and obtained from the university's ethics committee prior to data collection. All research activities adhered to established ethical principles, including informed consent, confidentiality, and voluntary participation. While the study engaged participants to gather qualitative insights, the process was entirely non-invasive and posed no physical risk or harm. Interviews were conducted in a manner that respected participants' autonomy and privacy, ensuring that their involvement did not result in any discomfort or adverse consequences. These measures were implemented to uphold the integrity of the research and protect the rights and well-being of all participants.

3.7 Reliability and Validity

In conducting the study various strategies were used to ensure the reliability, credibility

and validity of its findings. Triangulation from various sources of data (interviews, documents, and case studies) lends credibility to the research. Member-checking, was done to confirm the accuracy of the interview data collected by sharing preliminary research findings with participants (Bularafa & Haruna, 2022). To achieve validity, the researcher based the study on the DC Framework and the Social Construction of Target Populations Framework and aligned conceptual content between the theoretical frameworks, JET objectives and the actual research findings (Grant & Osanloo, 2014; Salawu et al., 2023; Teece et al., 1997). The results were also contextualised by means of comparisons with existing literature (Bleady et al., 2019; Wang & Ahmed, 2007). An audit trail documenting the research process in detail across all stages enhances reliability, enabling other researchers to replicate the study (Bowen, 2009; Carcary, 2009).

The chapter delineates the participant selection process, incorporating purposive sampling techniques to make sure only participants involved in the renewable energy relevant industry are included. The study ensures that the data collected was rich and diverse by targeting industry experts and participants from the selected case study firms, demonstrating its appropriateness in attaining the research objectives. The addition of nineteen participants allows for rich analysis without making the sample too large to manage in terms of resources and time available for conducting the analysis as part of this study (Mashuri et al., 2022).

3.8 Chapter Summary

This chapter disclosed the methodology of gathering resourceful information for this research, clarifying all processes in detail. With this chapter, the researcher provides the rationale for the qualitative research strategy and design through which the study investigates how, necessarily sensitive to political context, renewable electricity firms respond to policy innovation instruments. A combination of both primary and secondary data obtained ensured maintaining a balanced approach to the study by reserving space for firsthand accounts while also focusing on more established organisational strategies. The selected method is in accordance with the aims of this study, namely, to gain insight into the research questions formulated for this work within a specific design frame.

The methodological components described in this chapter serve as the foundation of the

study. They outline a transparent pathway for data collection, analysis, and interpretation that guarantees that the findings discussed in subsequent chapters are methodologically sound, credible, and rooted in a coherent research process. Thus, this methodological rigor underpins the present study as well as offers a valuable input to future research examining RET policy instruments and firm-level strategies of renewable electricity firms.

4 CHAPTER 4: RESULTS AND INTERPRETATION

4.1 Introduction

This chapter presents the study's results, derived from semi-structured interviews with participants. The respondents include employees from South African renewable electricity firms along with energy experts. The profiles of the interview participants and the data analysis are detailed here. The results of this chapter address the following research questions:

4.1.1 Research question 1: What is the social construction of the target populations of the 2021 schedule II amendment of ERA?

- Interview questions:
  - What is the role of IPPs and/or Traders in the JET?
  - *Which parties or groups have been influential in shaping RET policy?*
  - *Describe the challenges of 2021 schedule II amendment of ERA 2006?*
  - Which group had the least to benefit from the 2021 schedule II amendment of ERA 2006 and who was burdened the most??

4.1.2 Research question 2: How do renewable electricity firms operating in South Africa, sense, seize, transform and achieve technological congruence when government implements RET policy instruments?

- Interview questions:
  - Sense: How did renewable electricity firms keep up to date with market changes and RET policy instruments of 2019-2024 and how does knowledge flow into the organisation
  - Sense: Which departments were involved in exploring new technological opportunities and how do they do this?
  - Seize: what governance protocols were in place to embrace or mitigate impacts of the RET policy instrument of 2019-2024?
  - Seize: what new products and/services have resulted from RET policy instruments introduced between 2019-2024?
  - Transform: what changes in the firms organisational structure, processes and activities occurred because of the implementation of the 2019-2024 RET policy instruments?

- Transform: Has the implementation of any of these RET instruments resulted in the identification of specialised complementary assets, such as battery energy storage in relation to PV solar and wind?
- Technological congruence: What emerging or advanced technologies did the firm have to develop or acquire to facilitate and embrace the opportunities of the 2019-2024 RET policy instruments?
- Technological congruence: How have renewable electricity firms aligned their technological know-how to embrace /mitigate risks and opportunities of the 2019-2024 RET policy instruments?

4.1.3 Research question 3: What types of RET policy instruments would enable renewable electricity firms to both maintain achieve competitiveness and contribute towards the JET objectives?

- Interview questions:
  - Did any of the burdens and or penalties the firm identified from the introduction of any RET policy instruments lead job losses, job creation or skills development? If yes, please provide details?
  - Did any of the burdens, challenges and or penalties the firm identified from the introduction of any RET policy instruments lead to a reduction in supply or the inability to provide renewable energy? If yes, please provide details?
  - In your experience, what is the single most impactful aspect of any RET instruments that has been most helpful to coal dependent communities?

The study is a comparative analysis between the Target IPP and the Target Trader. A comparative analysis between Target IPP and a Target Trader would involve examining and contrasting the two entities, to identify their differences, similarities, and potentially how each performs in the South African renewable electricity supply sector. This would explore how they differ regarding roles, strategies, and outcomes, offering insights into how each entity contributes to its respective field or industry.

4.2 Background Profile of Respondents

Most individuals, eleven (11) are designated as experts, eight (8) individuals from the Target IPP headquartered in the UAE with South African subsidiary firm, and one (1)

individual from a domestic electricity with a trading license, the Target Trader. Table 6 below sets out the profile of the respondents of the interviews.

Table 6: Background profile of respondents

Name	Institute	Level of accountability
Respondent 7	Target IPP	Head of corporate sustainability
Respondent 15	Target IPP	Head of Procurement
Respondent 8	Target IPP	Paralegal
Respondent 13	Target IPP	General Counsel
Respondent 9	Target IPP	Senior Project Manager Wheeling
Respondent 14	Target IPP	Commercial Intelligent Analyst
Respondent 10	Target IPP	CEO SA
Respondent 17	Target IPP	Energy Storage Specialist
Respondent 11	Target Trader	Head of Operations
Respondent 1	Expert	Director and Team Leader of Natural Resources and Infrastructure Law Firm
Respondent 2	Expert	Economic Development Specialist
Respondent 12	Expert	Project Finance Specialist
Respondent 6	Expert	Business Development Specialist
Respondent 4	Expert	Mergers and Acquisitions Specialist
Respondent 3	Expert	Private Equity and Mergers and Acquisitions Specialist
Respondent 5	Expert	Former CEO and Investor in Private Equity in Renewable Energy Projects and Platforms
Respondent 16	Expert	Partner and Head of Projects
Respondent 19	Expert	Founder and Director of Energy Services Company Focused on C&I, Solar and Battery Solutions
Respondent 18	Expert	Senior Investment Specialist

4.2.1 The role in the organisation of Target IPP respondents that participated in the study.

The roles described by these participants demonstrate a diverse range of responsibilities that span across leadership, project management, legal and regulatory affairs, and market analysis within the renewable energy sector. These roles are pivotal in supporting the transition to a more sustainable energy market

and ensuring the successful development, execution, and scaling of renewable energy projects.

Leadership roles like that of Respondent 7 and Respondent 10 involve overseeing large-scale operations and sustainability efforts, emphasizing a strategic direction for the company. Project execution roles, such as those of Respondents 9 and 17, focus on implementing renewable energy projects, ensuring their technical feasibility and economic viability. Legal and regulatory roles (Respondents 8 and 13) ensure that projects are legally sound and comply with changing regulations, supporting the smooth operation of the company in complex markets. Market and strategic analysis roles, such as those of Respondents 14 and 15, are critical for positioning the company to take advantage of market trends and ensuring procurement practices are aligned with business needs.

4.2.2 The role in the organisation of Target Trader respondents who participated in the study.

Respondent 11 mentions their transition from completing a thesis at the university to joining the organisation in 2018 which reflects extensive experience of more than five years in their role. This signals a move from an academic or research-focused background into a practical, operational role within the energy sector. Respondent 11 clearly defines their role as the "head of operations," indicating a leadership and strategic position within the organisation which provides more insight into this study’s objectives. Contracting and onboarding of IPPs shows that a key responsibility is managing the process of bringing new energy producers into the fold of the organisation.

4.2.3 The role in the organisation of Expert respondents that participated in the study.

Many respondents, such as Respondents 1, 2, and 4, have been involved in renewable energy for over ten years. Their involvement encompasses various aspects of renewable energy, including project development, advisory roles, investment, and advisory for mergers and acquisitions (M&A). Several respondents,

such as Respondent 2, shared experiences about their transition from traditional energy sectors (like coal-based energy or mining) to renewable energy projects.

expertise include:

(i) project development and advisory roles: several respondents describe roles focused on the development and advisory aspects of renewable energy projects, from initial planning through to completion, including legal, regulatory, and financial guidance. (Respondent 1 and 5);

(ii) leadership and senior management roles: leadership positions were mentioned by respondents in senior management or executive roles, often involving oversight of large-scale projects or organisational functions. (Respondent 2, 18 and 19);

(iii) finance, investment, and economic structuring: a significant number of respondents are involved in finance, investment, and economic structuring, especially within the context of renewable energy. Their roles encompass managing investments, structuring financing solutions, and analysing the financial feasibility of projects. (Respondent 6, 12);

(iv) legal and regulatory support: some respondents focus on the legal and regulatory aspects, helping organisations navigate complex rules, regulations, and compliance issues related to renewable energy projects. These roles often include ensuring that contracts and permits are in place, as well as handling disputes. (Respondent 1, 3); and

(v) community engagement and development: respondents also described their roles in community engagement and impact, particularly in rural areas where renewable energy projects are being developed. These roles focus on ensuring that communities are involved, informed, and benefit from the projects, whether through job creation or social investments. (Respondent 2).

4.3 Process followed

This chapter presents qualitative results that emerged from interviews conducted from nineteen respondents. Thematic analysis was used to analyse the results, and evidence was based on respondents' views recorded and transcribed through Microsoft Teams. The data results below are organised according to the research questions and corresponding interview questions. A thematic analysis was conducted to identify key themes which are represented in tables for each interview question, highlighting both the

main themes and sub-themes derived from the responses.

The data results below are organised according to the research questions and corresponding interview questions. A thematic analysis was conducted to identify key themes which are represented in tables for each interview question, highlighting both the main themes and sub-themes derived from the responses. Not all themes and subthemes are discussed in each analysis. Some themes have been presented through the table with categories, followed by themes and thereafter codes identified in the interview responses. These responses will be integrated to provide a comparative analysis between the Target IPP and Target Trader and identifies their differences, similarities, and potentially how each performs in the South African renewable electricity supply sector.

4.4 Contextual Understanding of the Just Energy Transition

4.4.1 What is your understanding of the JET?

Based on the responses received, all respondents confirmed various elements of the just energy transition, especially in the context of South Africa. The themes identified for this category were as indicated in Table *7* below.

Table 7: Categorisation of themes and sub-themes related to the Just Energy Transition

Categories	**Themes**	**Sub-themes**
Just energy transition	1. Shift from Coal to Renewable Energy	Coal Dependency vs. Renewable Energy Transition
	2. Social Implications of coal dependent communities	Social aspects
	3. Economic Growth and Sustainable Development	Net zero carbon emissions
	4. Policy and Regulatory Support	Policy changes and regulatory reforms
	5. Community Engagement and Stakeholder Participation	Public-private partnerships and stakeholder engagement
	6. Global commitments/ more than just South Africa	Sustainable
	7. Global and Local Considerations	Challenges and opportunities in infrastructure
	8. Job Creation	Transition

Shift from Coal to Renewable Energy

Many respondents emphasised the fundamental shift from coal-based energy production to cleaner, renewable energy sources such as wind, solar, and hydro resources. This theme centres on the transition to reduce carbon emissions and mitigate climate change. For example, respondents said:

> *"The goal is to move away from coal-based energy."*
>
> *"Transitioning from coal to renewable energy."*
>
> *“Moving South Africa away from being a carbon intensive coal-intensive electricity producer to one focused on less carbon-intensive production.”*

Thus, this reflects the importance of South Africa's energy shift toward more sustainable and decarbonised systems, aiming to achieve net-zero carbon emissions.

Social Implications and Job Creation

All three participant groups stressed the need for inclusivity in the transition. The target IPP and expert perspectives focused more on social obligations, skills development, and community engagement, while the target trader’s perspective introduces the balancing act of energy security, affordability, and sustainability, all within the framework of social justice. Respondents said:

> *"The transition needs to recognise the social consequences of stopping mining coal and coal power."*
>
> *"We need to create employment opportunities in the green energy sector for communities affected by the transition."*
>
> *“Just making a quick change from coal to solar will cause a lot of problems.”*

*Respondent 11 Target Trader said "Trying to achieve a state where no one is left behind."*In contrast Respondent 5 Expert and Respondent 18 Expert highlighted that private sector did not have a sufficient focus on the “just” element of the JET and that even though they were well versed in the energy transition the just aspect of the process was not a focus.

Respondent 5, an expert, said “I don't think that there's a specific focus on the just component within IPPS and traders, I think there should be. The energy transition isn't always characterised as a just energy transition, I think it should be, but it's not.”

Respondent 18, an expert, said “Look, I won't pretend to be an expert on the just energy transition. I'm very much focused on the renewable energy transition or the generation side of things, The “just” part of it. Not really part of my wheelhouse.”

All three perspectives agree on the importance of job creation and skills development. However, the Target IPP and Target Trader analyses focus more on the practical aspects of transitioning workers through training mechanisms and local employment opportunities, whereas the expert analysis takes a broader view, acknowledging these needs within the context of social and policy challenges. It emphasizes balancing the environmental goals with the livelihoods of people in the coal industry. However, Respondent 3 from the expert participants highlighted a practical barrier for the implications of this balancing act.

Respondent 3, an expert, said: “if you look at it from a geographical point of view, the, people who are affected by the move away from coal, tend to be, in places that are not all that close to where renewable production is happening now, so I don't see that they have any involvement in that, because I think it would be quite difficult for them to have that kind of involvement."

Economic Growth and Sustainable Development

Respondents mention that the transition should also support economic growth by creating new industries, attracting foreign investment, and facilitating the development of new infrastructure. Respondents said:

"Economic growth, social justice, and sustainability are key objectives."

"Foreign investment is crucial for job creation in coal-dependent areas."

There is a clear focus on aligning renewable energy development with broader economic and social development goals, with a strong emphasis on localising energy production and infrastructure, such as encouraging private sector participation.

Global and Local Considerations

Respondents acknowledge the global commitments such as the Paris Agreement that influence the local transition in South Africa, while also noting the unique local context, including the socio-economic realities and the legacy of coal mining communities. Respondents said:

"We are part of international agreements like the Paris Agreement and have commitments to net-zero carbon emissions."

“It’s not just a South Africa thing; it's a combination of all the markets that we're working in.”

Community Engagement and Stakeholder Participation

Respondents emphasized the growing role of public-private partnerships and stakeholder engagement in the energy transition process. There is an emphasis on the involvement of a variety of groups, including local communities, interest groups, government entities, and private sector participants.

Respondent 1, an expert, said: “There's, a lot of other issues because of coal companies being the cash cows in a lot of these areas, so it's rife with corruption, money is in the hands of a few people, and you get things like the construction mafia”

Respondent 2, an expert, said: "Stakeholder engagement is a key aspect of making policy objectives work in the South African context."

Respondent 2, an expert, said: “the type of tactic that's being used and I'm speaking fresh off speaking to some suppliers that I have been in supplier development programmes with and they're saying they've been screwed over in terms of the pricing that they're getting negotiated on that they are

not even, they're not making profit, they're just doing the work, so they got work”

This theme reflects the importance of inclusive participation in the transition process, where stakeholders from various sectors, including local communities, are actively involved in shaping the policies and actions taken.

Challenges and Opportunities in Infrastructure

A recurring theme involves the need for enhanced infrastructure to support the energy transition. This includes issues related to grid capacity, energy storage, and transmission infrastructure, which currently hinder the rollout of renewable energy projects.

"The infrastructure is not able to support those projects."

"The relationship between IPPs and transmitters will now be organic, helping to expedite renewable energy integration."

“Battery Energy Storage Systems (BESS) – To address grid stability challenges and store excess energy for later use”

There are infrastructure challenges, particularly related to transmission capacity and grid integration. The involvement of private sector entities in the development of infrastructure, as well as public-private collaboration, is seen as a solution to these challenges.

Policy and Regulatory Support

Several responses address the dynamic policy changes and regulatory reforms that are critical to facilitating the transition. Policies aimed at simplifying processes, providing incentives, and removing barriers to renewable energy projects are mentioned by the respondents. Respondents said:

"Key policy changes have fostered renewable energy evolution in our country."

“Dynamic policy changes have helped to expedite the renewable energy integration plan.”

"The ERA bill is a significant step to address infrastructure issues and support renewable energy ambitions."

The theme highlights the crucial role of government actions in facilitating the transition, with policies being adjusted to foster the growth of renewable energy while addressing infrastructure and financial constraints. The involvement of private sector players in energy transmission infrastructure is also discussed.

Just Energy Transition Framework

A final overarching theme is the concept of the just energy transition itself, which respondents explain as a comprehensive approach that considers both environmental goals and social impacts, ensuring a fair, equitable transition. Respondents said:

"The Just Energy Transition is trying to manage the transition from a coal or fossil fuel-based economy to a renewable energy-based economy."

"The social obligation needs capital power that generally comes through IPPs from external investments."

The JET theme encapsulates the idea that the transition must address environmental concerns and ensure that the negative social and economic impacts are mitigated through appropriate policies, job creation, skills development, and community involvement. Target populations are large intensive users who are significant polluters to transition to sustainable energy. Developers, generators and all players implicated in the renewable energy value chain are required to not extend the socio-economic chasm as the country transitions and attempts to achieve its local and international commitments.

4.5 Research question 1: What is the social construction of the target populations of the 2021 schedule II amendment of ERA?

4.5.1 *What* is *the role of IPPs and/or Traders in the JET?*

IPPs and electricity traders play a crucial role in implementing renewable energy projects that replace coal-fired plants. IPPs drive most of the development and installation of renewable infrastructure and traders act as aggregators for all generators. Respondents repeatedly highlighted the importance of job creation, especially in areas historically dependent on coal. Key responses from Respondent 11 from the Target Trader highlighted the following:

Creation Of the Private Energy Trading Market

Respondent 11 from the Target Trader emphasizes that their firm has played a pivotal role in creating a market for private energy trading. This market allows multiple customer participants (such as businesses or large consumers) to interact with a range of renewable energy generation sources. The firm's efforts in obtaining a trading license have empowered the development of this market, enabling energy trading that wasn't possible before.

Facilitating The Exchange of Renewable Energy

Traders act as intermediaries between renewable energy producers (such as solar, wind, and hydro facilities) and energy consumers. Respondent 11 from the Target Trader describes how their company buys energy from various renewable sources, such as solar, wind, and hydroelectric plants, and then makes this energy available to consumers. The flexibility in the market allows different generation sources to contribute energy that meets diverse customer needs.

Affordability And Sustainability

One of the key roles of traders, as outlined by Respondent 11 from the Target Trader, is to provide alternatively priced renewable energy that is competitive with municipal tariffs. This addresses the ongoing energy dilemma of affordability and sustainability, helping customers to access renewable energy at a lower cost than what they might pay to traditional grid operators like municipalities. This can be crucial for businesses that need

to balance their energy consumption with their sustainability goals.

> *Respondent 16, an expert, highlights IPPs role "Channelling investment from your stakeholders around the world and using that investment using those funds to produce efficient generation capacity which can be deployed to those people that need power in our energy crisis, where we simply don't have enough energy supply."*

> *Respondent 9 from the Trader IPP said ""[our] company bringing more capacity into trying to deal with ESKOM's shortfall but transitioning to clean energy along the way. Also bringing in foreign investment for job creation, it's one of the big things."*

Real-Time Energy Availability

The ability to provide real-time energy is another critical aspect of the trader's role. The market allows customers to access renewable energy on demand, which is especially important in an energy market facing challenges such as load shedding and supply instability. Traders facilitate the dynamic exchange of energy, ensuring that customers have reliable access to power while also contributing to the broader transition to clean energy.

Financial Institutions

> *Respondent 3, an expert, said: "Lenders are the most influential, that's all lenders, private sector lenders, public sector lenders, they were all influential in shaping policy."*

> *Respondent 10 from the Trader IPP said: "A lot of us come from an investment banking background where we worked at financial institutions and in this case, funders are always, a big part of the solution, and so we work with funders to come up with those solutions alongside ourselves."*

Comparative analysis on views on the role of firms in the JET

While all three groups Experts, Target IPP, and the Target Trader recognise the central role that renewable electricity firms play in the JET, their perspectives vary based on their focus and the aspects of the transition they prioritise. Experts stress the need for policy

alignment and social justice, while the Target IPPs' focus on the operational aspects of renewable energy generation, community engagement, and sustainability. The Target Trader, on the other hand, emphasise market creation, flexibility, and affordability. The common thread across all perspectives is the need for collaboration to ensure that the transition is not only environmentally sustainable but also socially just and economically viable.

4.5.2 *Which parties or groups have been influential in shaping RET policy?*

Themes identified for this category are briefly touched on in the below, however not all themes in Table *8* will be discussed in detail if they have been addressed in other sections.

Table 8: Themes representing key influences in shaping the RET policies

Categories	**Themes**	**Sub-themes**
Key influencers in shaping the RET policies	Key Influencers in Shaping RET Policies	Government Entities Independent Power Producers (IPPs) and Traders Private Sector Entities
	Policy Development and Regulations	Roadmaps and Regulatory Instruments Role of the State in Legislation and Governance
	Community and Social Influence	Community Engagement Just Energy Transition
	Educational and Capacity Building Efforts	Knowledge Sharing and Awareness Training and Capacity Building
	Economic Impacts and Sustainability	Economic Development Sustainability
	Corporate and Shareholder Pressure	Global Influences and Market Demand Corporate Social Responsibility (CSR):

Respondents indicated several groups and individuals who have had a significant influence on the shaping of RET policies.

Government Entities

Most respondents mentioned the role of ministers and government regulations in determining the country's energy mix.

> *Respondent 16, an expert, said: "The situation in South Africa is pretty unique, so government has looked at this and said, how do we do good by the people that voted us into power? Let us let us bring power to them and to the businesses that drive our economy and job creation by making policies that will allow for this."*

Independent Power Producers (IPPs) and Traders

Respondents pointed out the significant role of IPP's in the development, construction, and operation of renewable energy projects.

Financial enablers and Intensive Energy Users

Several participants identified intensive energy users such as manufacturers and mining companies as key to influencing RET policy change in recent years. Also, highlighting the enabling role played by investors and banks as key drivers of the energy transition through their investments and financing of these projects which has a ripple effect in their role in job creation and economic growth.

> *Respondent 16, an expert, said: "That's the job of an IPP channelling investment from your stakeholders around the world and using that investment, using those funds to produce efficient generation capacity "*
>
> *Respondent 12, an expert, said: "Lenders were the most influential in terms of shaping policy. Government had ideas, lenders would say it's not going to work, we're not going to do it, and they actually listened to them around that"*

Corporate and Shareholder Pressure

Some respondents mentioned how shareholder pressure and the global market play a role in shaping RET policies. The Respondent 11 from the Target Trader emphasised how multinational companies are pushing for renewable energy solutions as part of their corporate sustainability goals, driving corporate accountability and alignment with international environmental standards. Several respondents, particularly Respondent 7, 8, 13, and 10 from the Target IPP noted that their company and shareholders increasingly recognise the moral responsibility of contributing to the just energy transition, whether through direct employment or corporate social investment (CSI) programs aimed at benefiting the communities in which they operate.

> *Respondent 13 from the* Target IPP: *"It is not something that is as a private-to-private contractual terms, it's not something that is cast in stone and legally required, but it is the right thing to do, as acknowledged by our shareholders".*

Knowledge Sharing and Awareness

Respondent 2, an expert, stressed the importance of educating the public, especially communities, about renewable energy, career opportunities, and the impact of these projects. It suggests that there is still a lack of awareness and interest in the general population regarding energy transition initiatives, which highlights the need for more proactive education and outreach programs. Several respondents noted the importance of skills development in the energy transition, with Respondent 10 from the Target IPP emphasising the role of training programs in equipping communities with skills needed for renewable energy projects. This approach ties into the broader objectives of economic empowerment and job creation within the transition process.

> *Respondent 10 from the Target IPP said: "So not just at a skills level where you need professional services, but also at a semi-skilled and unskilled level as well, where you need a certain level of training as well"*

4.5.3 *What was the allocation of benefits of the 2021 schedule II amendment of ERA 2006 and who benefited the most?*

IGCAR improved structure and certainty for developers

Two respondents highlighted the regulatory clarity provided by the IGCAR, especially in terms of project readiness and certainty for developers.

> *Respondent 1, an expert: "It's allowed for developers to have a lot more certainty on areas of what would be required for projects that are shovel-ready…That has changed the landscape, because it's forced project developers to actually develop projects to be ready and prioritising those projects…"*
>
> *Respondent 14 from the Target IPP: "Grid allocation amendments were also an important policy amendment because it helped us... with projects which were development fees... allowed to proceed ahead."*
>
> *Respondent 14 from the Target IPP: "We can go to those clients, and we can say that we already have project development in the development phase and we can supply the power to you."*

The intention of the interim grid allocation rules was to facilitate a more efficient and transparent grid connection process removing the bottle necks if the old system where developers were observed to be "hogging" the grid with projects that are not construction or "shovel ready" and easier development of renewable energy projects by ensuring developers know the requirements upfront.

Increased Opportunities Across the Value Chain

RET policy instruments have broadened opportunities across various business sectors, such as marketing, legal, environmental consulting, and construction. This extends beyond just the project developers to companies that support the development of renewable energy projects.

> *Respondent 2, an expert, said: "It is so broad and I mean if you look at the value of the project in terms of the scopes of work, you know it's across*

borders, around the parts and it's just a lot of opportunities across the value chain in terms of businesses that can support that value chain…"

Respondent 12, an expert, said: "Opportunities of each and every business in the renewable energy value chain from marketing to HR, legal, banks, environmental advisors because environmental studies need to be done."

The transition to renewable energy is benefiting a wide array of industries, from environmental studies to financial services, illustrating how deeply renewable energy policies impact the economy.

New Market Opportunities and Product Innovation

2021 schedule II amendments of ERA (2006), by removing the need for a generation license, has allowed IPPs and electricity traders to operate with greater flexibility. This change provides an opportunity for these players to bypass bureaucratic hurdles and operate without depending on government procurement processes, allowing for more autonomy in how they develop, sell, and manage power.

Respondent 3, an expert, said: "The biggest opportunity there is to avoid government procurement... and get on with it now and on our own."

Respondent 4, an expert, said: "Removing the generation license requirement has been huge for IPPs. They can continue to develop as much as they want, knowing that if they have grid capacity and an off taker, they can get projects to financial close."

Respondent 3, an expert, said: "Eventually we end up in a world where there's a short-term market for power... you could sell it into that market and the market itself then basically becomes the buyer of last resort."

Growth of Carbon Credit and Renewable Energy Credit (REC) Markets

From the interview responses, carbon credits and RECs are emerging as revenue opportunities for developers, particularly where environmental attributes of projects are monetised.

Respondent 19, an expert, said: “Carbon credits. One of the most exciting aspects of carbon credits is the potential for further opportunities for businesses or industries to reduce their carbon footprint.”

Respondent 16, an expert, said: “Carbon credits or renewable energy certificates (RECs) have benefitted various segments of society beyond IPPs, from local communities and households by lowering energy costs and providing cleaner energy, which is beneficial for their health.”

Respondent 16, an expert, said: “To corporations and large energy consumers that were able to lower operational costs, enhance brand image and receive compliance and tax benefits that would enable exports and the operations of their businesses.”

However, views from Respondent 5, an expert, were that "The larger IPPs don't see a lot of value in [carbon credits and RECs]. It's always been part of the IPP strategies, but they've never actually monetised their assets."

Respondent 19, an expert, said: highlights how expensive it is to originate carbon credits describing a slow realisation of the growth of the carbon credits market which is dependent on a poor economy.

Respondent 19, an expert, said: “the carbon tax only allows us to recognise it's either the VERA or the gold standard, both are overseas, so it is relatively expensive to originate carbon credits.”

Respondent 19, an expert, said: “It really just relates to the carbon tax and that's been a big driver for carbon credits in South Africa, “I think there's just also a bit too slow in my opinion, on encompassing who's subject to carbon tax and that's just a function of how poor the economy is performing at the moment.”

Local Manufacturing Opportunities

There is a growing emphasis on local manufacturing of renewable energy components, such as PV panels and windmills, but challenges remain in terms of capacity and technology.

Respondent 6, an expert, said: "We may not have all the skill sets required, but definitely, we can get there. We just need the manufacturing space to get the support that they need."

While the potential for local manufacturing in renewable energy exists, companies face challenges around technology, investment, and skill development to fully capitalise on this opportunity. Government support is seen as essential for fostering local manufacturing capabilities.

Increased Investment and Foreign Capital

The RET policies are seen as crucial in attracting foreign investments, especially with policy adjustments such as the removal of generation caps.

Respondent 9 from the Target IPP: "The ERA has opened up the door… the relaxation of the cap on megawatts, you can generate more, and as you generate more, the company would attract more foreign investments."

Respondent 11 from the Target Trader explains how the firm now access to financial backing has due to the government's policy instruments, especially related to guarantees for projects. They mention how these guarantees were initially not common in their sector but are now seen as a critical enabler for renewable energy projects:

"They've looked at coming into our PPAs and saying guys, working will assist you... that's when we, that's where we are currently taking advantage of that. We've got the financial backing now... we seem to be getting financial backing."

Regulatory and Financial Constraints

Respondents also discussed how regulatory frameworks and financial institutions influence technology adoption. Changes in policies, such as the ability to wheel power (transmit electricity to different areas), have opened new opportunities for innovation, but regulatory hurdles remain.

Example: "The removal of the need for a license was one of the things that allowed us to take certain views." (Respondent 18 Expert)

Example: "The banks in South Africa are notoriously conservative, their credit committees are notoriously conservative." (Respondent 4 Expert)

4.5.4 *Describe the challenges of 2021 schedule II amendment of ERA 2006?*

Overall, although such opportunities exist, significant challenges remain regarding the implementation of effective RET policies. A key challenge is the rollout of regulations, which is taking its time. Although policies, such as the 2021 schedule II amendment of ERA 2006, are intended to make the process more efficient, respondents noted that delays in gaining approvals and permits remain major impediments to executing projects. Such bureaucratic inefficiencies can discourage potential investors and impede the transition process.

Challenges in Policy Implementation

Several respondents pointed out that while the policy environment for RETs is promising, there are significant challenges in implementing these policies effectively. These challenges are often exacerbated by systemic issues like grid capacity constraints, delays, and bottlenecks in the regulatory process.

Respondent 9 from the Target IPP discussed how IGCAR and environmental assessments create significant delays and upfront financial burdens for developers.

Respondent 2, an expert, said: "The problem is in the implementation side... there are just so many challenges."

Respondent 17 from the Target IPP: “Projects are facing delays due to "first ready, first served" policy, and limited transmission capacity blocking project connections”

Respondent 11 from the Target Trader: “So, we've had projects that, good prospects that we're experiencing delays, delays on them that we kind of looked forward to, so that and some of them have just been shafted…it’s not clear, so, it's that frustration of the IGCAR, that we've experienced and, we would like, would really advocate for change in that."

Respondent 2, an expert, said: "It's very, very unfortunate. It's actually become pretty much a risk factor to the sector, you know, international investors are saying you guys don't even know how anybody can access a grid. It's become opaque."

Carbon Credits and Financial Incentives

Carbon credits were mentioned as a potential benefit, although some respondents noted that the process of obtaining and trading carbon credits is currently cumbersome and doesn't offer significant financial benefits. However, there is optimism that this might change in the future as the market matures.

Respondent 7 from the Target IPP: indicated that "while the carbon credits market is currently challenging, it holds future promise as the process becomes more streamlined."

Respondent 7 from the Target IPP: "The opportunity will come in the future... the challenges are bigger than the benefits."

Respondent 4, an expert, said : discussed how "carbon credits could be an avenue for increasing revenue, especially if they are structured effectively within a company's portfolio."

The Need for Streamlined Processes and Transparency

The lack of transparency and the fragmented nature of information about renewable energy was another key theme. Several respondents highlighted the difficulty in accessing clear and consistent information regarding renewable energy projects and their associated incentives. Respondent 7 from the Target IPP compared the renewable energy sector's opacity to more transparent industries like financial markets, noting that the lack of clear information creates opportunities for consultants and other intermediaries to profit.

Respondent 7 from the Target IPP: "The carbon credit and REC industry... is very opaque. It is very difficult to get transparent information."

Respondent 19, an expert, said: "It really just relates to the carbon tax and that's been a big driver for carbon credits in South Africa. I think there's

just also a bit too slow in my opinion, on encompassing who's subject to carbon tax and that's just a function of how poor the economy is performing at the moment."

Grid Capacity and Connection Challenges

Despite the positive impact of the policy instruments, multiple respondents pointed out that grid capacity issues remain a significant obstacle. Even though regulatory changes opened new opportunities, the lack of sufficient infrastructure to connect new renewable projects limited the expansion of renewable energy supply.

Example:

Respondent 2, an expert, observed, "Grid capacity... if you don't have a space to connect, that's one of the biggest issues. You can have everything in place, but if there's no space on the grid to connect, it's all for nothing."

Respondent 18, an expert, also highlighted that, while renewable energy projects help businesses manage their scope two emissions, the "external pressure on investors" plays a key role, showing that while policies are advancing, infrastructure limitations are impeding further scaling.

Private Sector's Role and Adaptation

The private sector, particularly renewable electricity firms , is seen as a crucial player in the successful implementation of renewable energy policies. Many respondents noted that the private sector is adapting to these new policies, but there are still hurdles to overcome, particularly with financing, project structuring, and policies that ensure a separation of powers so that renewable energy firms are not restricted by Eskom in potentially overextending its powers.

Respondent 6, an expert, spoke positively about how the private sector is benefiting from the policy changes, and emphasized the importance of continued adaptation as they complement and assist in the energy deficient.

"The introduction of IPPs is just merely bringing forth a solution that by ourselves... [we] wouldn't be able to address."

"IPP's complement rather than replace state-owned entities like Eskom and municipalities."

Respondent 10, from the Target IPP said: NERSA's inability to practically separate its powers from Eskom in the past the bottleneck in that everything had to go through a cuddle process with the regulator, then a process with the state monopoly as well, the State electric company Eskom."

Respondent 16, an expert, said: "A vertically integrated monopoly like Eskom has never been incentivised by the market to behave in an efficient way"

4.5.5 *Which group had the least to benefit from the 2021 schedule II amendment of ERA 2006 and who was burdened the most??*

Eskom

Respondent 16, an expert, said: "Schedule 2….Eskom, because they would lose customers"

Respondent 11 from the Target Trader: "But that's always an explanation or an interpretation thing, we always seek that interpretation, but the only challenge it's brought is the utilities like your Eskom, where they feel like we're taking some of their lunch because now it's also their customer, remember it's not a new customers' segment that we come up with, but it's their current customer.

Coal Dependent communities

Respondent 11 from the Target Trader: "Coal-fired communities because as a trader, we are technology agnostic, and we [are] also agnostic with regards to where the power comes from. So unfortunately, we can't be seen to be controlling factors such as where's your plant, so we'll give you a better discount if you're located in Mpumalanga cause, that's where the decommissioning will happen"

Respondent 2, an expert, said: As much as I spoke so much about the opportunities for the communities, I feel that they are also least benefiting from it because the need is the highest there and the gaps are very big"

Respondent 10 from the Target IPP: "So, there needs to be a change, it can't be, one for one job substitution. There needs to be other elements added to it, now there's a social side of the coal communities in that there's huge health issues. There's, a lot of other issues because of coal companies being, the cash cows in a lot of these areas, so it's rife with corruption, money is in the hands of a few people. You get things like the construction mafia, etc. So, on average, the community is not really gaining in these coal communities as opposed to the positive outcomes we've seen in renewable energy projects in [the] Northern and Eastern Cape"

Respondent 1, an expert: Schedule 2 would have not been beneficial to small businesses without capital for renewable adoption, indigenous and rural communities without grid infrastructure; fossil fuel workers without reskilling opportunities"

4.6 Research question 2: How did renewable electricity firms sense, seize, transform and achieve technological congruence when the government implemented RET policy instruments in the period 2019-2024

4.6.1 *Sense: How do renewable electricity firms keep up to date with market changes and RET policies, and how does this knowledge flow into the organisation?*

The results reveal that renewable electricity firms utilise a mix of formal channels, networking, proactive engagement, and internal structures to keep up to date with market changes and policies. A combination of industry bodies, regulatory engagement, internal knowledge management tools, and active participation in shaping policies enables effective information flow within organisations. However, the approach by the renewable electricity firms varies between proactive strategy and reactive adaptation to market demands and regulations. Some of the themes identified in Table *9* below are briefly discussed below.

Table 9: Themes and sub-themes for market sensing and knowledge flows

Themes	**Expert: Subthemes**	**IPPs Subthemes**	**Trader: Subthemes**
Keeping up to date with market changes	Formal and Informal Information Channels Proactive vs Reactive Knowledge Acquisition Role of Knowledge Management in the Organisation Learning by Doing and Innovation	Information Sources: External and Internal Channels Internal Communication Mechanisms: Alignment and Collaboration Market Intelligence Systems: Playbooks and Commercial Teams Stakeholder Engagement: Networks and	Information Sources: External and Internal Channels

	Collaboration and Information Sharing Government and Policy Influence	Government Relations Knowledge Transfer Practices: Continuous Learning and Adaptation	
Involved departments in exploring new technological	Technological Advancements for Operational Efficiency Commercially Proven Technologies and Risk Aversion Regulatory and Financial Constraints Innovation through Strategic Partnerships Market-Driven Technological Innovation Challenges with Carbon Credits and Renewable Energy Certificates (RECs)	Product Development and Innovation Teams CEO and Leadership Networks Cross-functional Collaboration Vendor Relationships and Technological Advancements Engineering and Technical Teams Innovation and Strategic Planning Procurement and Operations Teams Research and Development (R&D)	Collaboration Between Business Development and Operations Teams

Information Gathering Methods

Respondent 5, an expert: “Most of the smaller renewable energy companies, it's partly because they tend to be small and so they tend to be informal, and so things tend to get discussed around the coffee machine "

Publications & News Sources

Respondent 1, an expert: "Sign up for news updates from specific publications that focus on Energy Engineering News."

Respondent 6, an expert: "Information is quite easy to get hold of... there are platforms that allow that."

Respondents emphasized the importance of staying informed through specialised publications and news sources that focus on energy engineering, policy changes, and the renewable energy area. A significant amount of knowledge is acquired through industry webinars, conferences, and events were experts and key stakeholders present policy insights.

Respondent 10 from the Target IPP: “Attending free webinars gives an outlook and insight from those driving policy objectives.”

Respondents highlighted the role of industry bodies and networks in exchanging information, which is vital for staying up to date with market changes and policies.

Respondent 17 from the Trader IPP: "So, there's various ways we do that. One is by being part of industry bodies. We are part of the SAPVIA [South African Photovoltaic Industry Association] and we're a member of SAPVIA .

Respondent 11 from the Target Trader: "we are cofounders of what we call, the South African Energy Traders Association, much like SAWEA [South African Wind Energy Association], it’s an association where market information is disseminated, interrogated and we give an opportunity to influence it or lobby as a grouping of traders. So that's the one part where information is received, disseminated, but it's also just keeping up with your various information hubs that are related to all energy matters”

Global and Local Connections

Networking both within local organisations and internationally was described as an important means of keeping up to date with trends and policy shifts.

Formal Regulatory Bodies and Formal Engagements

The role of regulators and formal consultation processes was mentioned frequently to stay informed and ensure compliance.

> *Respondent 10 from the Target IPP: "Through relationships with Eskom and the IPP office, IPPs manage a lot of these changes proactively."*
>
> *Respondent 16, an expert: "I'm guessing that there are those who are in charge of government relations and keep an open channel of communication with the Department of Electricity and Energy, or NECOM. Many IPPs have government liaison functions – traders as well"*

Legal and Market Intelligence Teams

Internal teams such as legal and market intelligence were highlighted as vital for processing and disseminating information within the Target IPP. The trader does not have a specialised team or formalised platforms to keep abreast with market changes. However, the trader explained that they utilise all sources available to them to ensure they have the most relevant information available in the market. Respondent 7 from the Target IPP described how the company's market playbook gathers all the relevant data across multiple sectors, making this information easily accessible for employees. This system ensures that employees can quickly understand industry-specific insights. They explained,

> *"The playbook includes our pipeline and how we develop our targets. We have tried to put all the relevant information in the playbook so everyone can have access to it immediately."*

Respondent 9 from Target IPP spoke about a dedicated commercial intelligence team that plays an important role in scanning for relevant updates and describing how updates are gradually funnelled to the organisation. They also mentioned individual engagement with organisations like SAPVIA and Eskom to collect insights.

Proactive Engagement

Several respondents mentioned that staying informed through proactive efforts such as engaging early in the consultation process is key to staying ahead of market changes. Respondents also touched on the importance of collaborative efforts between different players in the sector to stay informed and make sense of emerging policies. Respondent 12 noted that for some, the relationship with IPPs is more of a partnership to achieve mutual goals, while others still see it as a more transactional relationship.

> *Respondent 12, an expert: "For most companies, the relationship with the IPP is still seen primarily as a means to an end, rather than a collaborative, enabling partnership."*

Reactive Adaptation

On the flip side, there was also mention of reactive strategies, such as responding to requests for proposals (RFPs) or market adjustments that require immediate adaptation.

> *Respondent 9 from the Target IPP: "Information sometimes takes one or two months to come into the organisation, and the organisation's response is often dependent on internal governance."*

> *Respondent 13 from the Target IPP: "The problem with our organisation is that this information is all very siloed, like each department kind of has a bit of understanding about what it does. I think each department is in their own little bubble and is completely siloed. There aren't [aren't] information transfers. It's all kind of done informally. One thing we don't do well is communicate information"*

> *Respondent 12, an expert: "Generally, in individual organisations, there's a poor ability to assimilate and disseminate information and changes at the core phase"*

> *Respondent 5, an expert: "There is no central body that says that this has happened, this has happened, there are a number of associations you can sign up to, not everyone signed up to all of them, and none of them are particularly brilliant at disseminating that information in a clear and regular fashion."*

Knowledge Management and Internal Alignment

Respondents mentioned the role of internal structures and tools in making sure that market knowledge flows smoothly within the organisation.

> *Respondent 7 from the Target IPP: "Internal alignment is crucial. Teams collect information and hold internal meetings to discuss impending changes."*
>
> *Respondent 7 from the Target IPP: "The market playbook brings together our industry expertise. We wanted to ensure that the information is available to everyone immediately."*

Target IPP Lack of dissemination

Despite actively sensing market changes through industry networks and regulatory consultations, the IPP struggles to disseminate this information internally in a timely and structured manner. Expert views corroborate this gap, noting that siloed communication and informal knowledge-sharing often delay strategic responses.

> *Respondent 8 from the Target IPP: "Unfortunately, I wouldn't be able to tell you too many details about it because until it reaches a certain level, it doesn't necessarily get communicated to every single member of every single team."*
>
> *Respondent 13 Target IPP: "One thing we don't do well is communicate Information"*
>
> *Respondent 5, an expert: "there's a poor ability to assimilate and disseminate information and changes at the core phase."*
>
> *Respondent 12, an expert: There is still a significant knowledge gap in the industry, and information is not readily available to everyone. It's challenging to get a comprehensive understanding of the industry without access to specialised knowledge and networks."*

Comparative analysis

Both experts and IPPs rely on external sources like publications, events, and government consultations to stay updated. However, experts emphasized informal channels like social media and personal networks, while the Target IPP stressed more formal mechanisms like market intelligence teams and playbooks. Both renewable electricity firms acknowledge the importance of proactive strategies to anticipate market changes, but the Target IPP seems to have a stronger focus on the reactive nature of their responses, highlighting their need to adjust immediately to changes as they occur.

4.6.2 *Sense: Which Departments are involved in exploring new technological opportunities and how do they do this?*

Technological opportunities

From participants responses, both the Target IPP s and Target Trader are constantly exploring technological opportunities to enhance efficiency and address challenges in the energy sector. However, their approach to adopting new technologies is heavily shaped by a mix of risk aversion, regulatory frameworks, and strategic relationships. Technological advancements are being driven by entrepreneurial thinking, industry networks, and internal collaborations with the Target IPP heavily reliant on the parent company based in the UAE when it comes to emerging technologies and investment in R&D the Target Trader's investment into their own tracking and monitoring system is homegrown.

> *Respondent 14 from the Target IPP: "So, in terms of technological opportunities, product development opportunities: we have a product development team which keeps up with the latest technological advancements in terms of solar development."*
>
> *Respondent 11 from the Target Trader: "… right now we are not looking at any R&D investment because we spent three years developing a unique trading platform to manage our customers and forecasting. This is uniquely built with a software company and continuously improved by our inhouse IT manager"*

At the same time, the sector faces barriers such as conservative financing and restrictive

regulations, which limit the pace of innovation. Target IPP calls for the government interventions through policy tools that emphasise capacity building, training and technical assistance.

> *Respondent 10 from the Target IPP: "I think this is where the governments can play a big role, in creating more training facilities, etc, for upliftment of skills training, put more money towards R & D, that is happening in other countries, etc."*
>
> *Respondent 10 from the Target IPP: "To provide the tax incentives for foreign investors to have their R & D facility based in South Africa, so instead of doing R & D in California and Germany and the UK for example, have that government funding or have the incentives to get foreign investors setting those sorts of facilities up in South Africa."*

The technological journey is thus a balancing act between exploiting proven solutions and navigating the uncertainties of new opportunities. The business model of traders needs more to explore technological opportunities for a knowledge perspective as recipients and the generators of technology. However, no efforts or processes indicate investments into technologies for their own operations. Their focus is on proactively engaging Eskom about improving the efficiencies of wheeling *transactions.*

> *Respondent 11 from the Target Trader: "Also the biggest stakeholder that we do work with is Eskom themselves because at the end of the day, they own the utility, so, everything in terms of how the wheeling will happen. So, for us mainly though the innovation not so much in the IPP space in the technologies, because I did say as a trader, we do want to enjoy that independence."*

Risk Aversion and Conservative Approach to Technology Adoption

> *Respondent 12, an expert: indicates that IPPs in South Africa are highly risk-averse, stating that they "would only implement technology that is commercially proven elsewhere with a proper track record," emphasizing the reluctance to adopt unproven innovations.*

This sentiment is further echoed by Respondent 18, an expert, who notes that “banks in South Africa are notoriously conservative,” making it difficult to secure financing for untested technologies.

Technological Exploration Through Strategic Relationships and Networks

Respondent 6, an expert, points to the importance of "strategic technology partners" and collaboration, noting that "relationships between technology providers and IPPs" are key for discovering technological opportunities.

Respondent 7 from the Target IPP: discusses how relationships with "vendors" and industry "events" (e.g., Abu Dhabi World Future Energy) play a significant role in staying abreast of the latest innovations, suggesting that partnerships are crucial for accessing new technologies.

Respondent 11 from the Target Trader : “It would be working closely with the thought leaders of that technology or that particular program. So, let's say we're working with clean hydrogen, you'd obviously want to keep in touch with these government development institutions with your role players with the IPPs that are actually doing these things, just to keep in touch with them”

Procurement and Operations Teams

The procurement and operations teams are critical in sourcing new technological solutions. Respondent 15 from the Target IPP discusses how they organise workshops with manufacturers to understand product roadmaps and feedback on what works in the field.

Example: "We organise these workshops with all of our manufacturers...to understand from a product roadmap perspective, how has the technology changed."

Entrepreneurial and CEO-led Innovation

Respondent 7 from the Target IPP: also refers to the role of the group CEO's "network" in driving technological innovation, such as the example of connecting with his hometown Canadian software company for "AI energy management software." The group CEO’s network fosters "niche products" that evolve into "mainstream" solutions, showing the role of high-level entrepreneurial thinking in technological discovery.

Respondent 7 from the Target IPP: emphasizes that keeping abreast of technological developments is a "competitive advantage," noting that their organisation utilises both inbound (e.g., vendor updates) and outbound (e.g., industrial fairs) strategies to stay ahead in the technology space.

Respondent 17 from the Target IPP: "we also have non-profit organisations like Green Cape, which actually does this kind of research and publications to informed investors in our local market, so this is quite very key and fundamental in actually getting to know new policies that are at least out there"

Lack of R&D funding

Respondent 10 from the Target IPP: "As a country, we need to be doing more, because private power producers will look at it, to a large extent in connection with a specific project and a specific community. I think this is where the governments can play a big role, in creating more training facilities, etc., for upliftment of skills training, put more money towards R and D, that is happening in other countries, etc. To provide the tax incentives for foreign investors to have their R&D facilities based in South Africa, so instead of doing R&D in California and Germany and the UK for example, have that government funding or have the incentives to get foreign investors setting those sorts of facilities up in South Africa."

Respondent 16, an expert: "Exploring new technology will probably need research and development budgets in which renewable energy forms can explore"

Respondent 12, an expert: "Renewable energy firms would have to do R&D focused research to find new technological innovations, which I don't think any renewable energy firm is doing. There needs to be a way to provide research funding to enable innovation"

Comparatively

Both experts and the Target IPP share a similar cautious approach to adopting new technologies, prioritising proven solutions. The Target Trader, while still cautious, is more focused on ensuring the operational feasibility of these technologies in a market context. The Target Trader, like the Target IPP, focuses on established technologies, but their viewpoint

is more oriented toward ensuring the feasibility of energy transactions rather than the operational integration of new technologies. The risk management aspect is centered on ensuring reliable and affordable energy exchanges.

4.6.3 *Seize: What governance protocols to embrace or mitigate impacts of RET policy instruments?*

Streamlined Working Groups and Cross-functional Teams

There is a focus on embedding specialised expertise within organisations to address specific challenges such as grid connectivity, carbon credits, and renewable energy strategies keeping senior stakeholders and boards close to developments as they are uncovered. This allows for more informed decision-making.

> *Respondent 7 from the Target IPP: "Shareholders are involved in the decision-making process, and internal alignment is achieved before matters are taken to the board or country working groups"*

> *Respondent 1, an expert : "Teams within Independent Power Producers (IPPs) and traders are now structured to consider data and its implications"*

Several respondents emphasized the importance of organising teams within renewable energy to align with policy objectives. These teams are streamlined to focus on specific objectives like data analysis and grid strengthening, mirroring the efforts seen in government and private sector collaboration in energy policy.

Regulatory Alignment and Policy Compliance

Respondents highlighted that once market intelligence is acquired, aligning with local regulations and legislation becomes a key focus. Regulatory hurdles are often seen as gatekeepers, sometimes hindering the pace of project development. Respondent 18, an expert, notes the importance of corporate governance despite the regulatory changes that have simplified some processes: *"Getting a license is so easy now... but we absolutely like it's a proper legal process."*

Internal and External Consultations

Internal consultations are crucial for ensuring that IPPs and traders understand and integrate market and policy changes. Some companies engage in informal discussions with senior stakeholders or sustainability champions before moving forward with any strategic decision.

> *Respondent 7 from the Target IPP: "We brainstorm with the sustainability champions in the company to understand its implications"*

Board Approvals and Shareholder Engagement

A significant aspect of governance includes aligning internal teams with shareholder and board approvals. In some cases, obtaining shareholder buy-in becomes a formal process that involves detailed communication of the policy landscape and market opportunities.

> *Respondent 13 from the Target IPP: "So, at a small medium enterprise level or at a standalone project level, parties would look to do that on a deal-by-deal basis. We are a few steps above that, we have been set up as a company, by, international shareholders, private equity and other institutional funders to get on board"*
>
> *Respondent 18, an expert: "The general corporate governance is as important for us as it's ever been, you know anti-fraud, anti-corruption, all those sorts of things. As lenders we need to see proper governance that's been gone through"*
>
> *Respondent 7 from the Target IPP: "Quote: "I've seen a more formal and bureaucratic approach, which is just not to say it's all about budgets, approvals, more bureaucratic, less informative"*

Deep Dive into Risk Management

Respondents describe how companies must conduct deep dives into project risks, ensuring their readiness for competitive bids by addressing issues of non-compliance and risk management.

> *Respondent 7 from the Target IPP: "Things move quickly. Applications have increased substantially. This is not only just because of the increase*

in private sector engagement, but even on the renewable energy fund programs, have moved at a rapid speed."

Respondent 9 from the Target IPP: "The ERA amendment has been there for a while, and my assumption is that the shareholder would have leveraged off that based on their experience with a previous IPP that they have to take first mover advantage which we didn't"

Depending on the complexity and the urgency, renewable energy firms, as per compliant corporate governance, have governance structures in place where opportunities and challenges can be openly discussed prior to presenting to more formal groups in the organisation. The Target IPP is not as nimble and as envisaged, although the structure is leaner to ensure operational efficiencies as described by the local leader.

4.6.4 *Seize: "What new products and/or services have resulted from RET policy?*

These themes are derived from various references made by the respondents, encapsulating innovations, market shifts, and strategic adaptations in the renewable energy sector.

Innovative Contracting Models:

Respondents observed that the market's competitiveness has led to innovative approaches, especially around contracting and structuring deals to attract clients. As the energy market becomes more competitive, differentiation becomes key through creative credit models, contracting strategies, and flexible PPAs.

Respondent 10 from the Target IPP : "We need innovation! We need off-take and credit innovation! What are we asking of the off takers?"

Respondent 18, an expert: "Traders adds portfolio and liquidity in the market… then of course we've got to innovate as the bank as to how do we provide that liquidity, how do we support them"

Respondent 18, an expert, highlights a shift in how IPP products are structured, moving from guaranteeing capacity availability to guaranteeing the delivery of kilowatt-hours at specific times, reflecting a move towards more flexible and tailored energy contracts:

"The product that the IPPs are selling has moved from wind farm capacity to I will deliver to you electrons at a certain period of time."

Shorter-Term Contracts and Flexible Energy Agreements

Expert 10 discussed the shift from long-term bilateral PPAs to more flexible and shorter-term contracts, emphasizing how businesses, particularly in cyclical industries like resource extraction, are hesitant to lock into long-term commitments.

Respondent 3, an expert: "A lot of people now prefer to buy 5 megawatts for [on?] a 5-year basis because a lot of these businesses are quite cyclical."

This trend has led to the emergence of new business models such as trading and aggregation, where traders offer shorter contracts with less risk exposure to the off takers:

Respondent 3, an expert: "Enter the whole trading and aggregation model where the traders and aggregators don't require you to take a risk on a 20-year PPA."

Innovative Energy Solutions and Hybrid Systems

The development of hybrid energy solutions, particularly combining solar and BESS, was frequently mentioned. Respondents 7 and 17 from the Target IPP elaborated on the innovation in hybrid solutions, such as short-term rental options and the introduction of carbon credit pilots.

Respondent 17 from the Target IPP: the introduction of Schedule 2 ERA amendments and ICGAR rules has driven the need for BESS to enhance grid stability. Many IPPs and traders are investing in hybrid solutions that integrate storage with PV solar and wind projects. Battery storage is crucial for peak demand management, enabling firms to store surplus energy during the day and dispatch it at night.

Carbon Credits and Environmental Sustainability

Carbon credits emerged as another key innovation in the market, with Respondent 7 from the Target IPP specifically discussing their work on a carbon credit pilot for hybrid

projects. The use of high-quality carbon credits, which focus on not just environmental but also social impacts, is becoming an essential offering.

> *Respondent 7 from the Target IPP: "We will touch more than just the environmental impact, and we'll also mention the social impact of our projects."*

> *Respondent 19, an expert: “So, we had to go get the group project validated to ensure that it became a demonstrable tradable instrument that's accepted by the market.”*

This indicates a growing demand for sustainability-focused products, where projects generate both financial and social benefits. Target IPP5 and 9 also highlighted the passing of carbon credits downstream to off takers, demonstrating the financial advantages of integrating these instruments into energy solutions:

> *Respondent 9 from the Target IPP: "Carbon credits can be passed on to the producer, downstream to maybe McCain's or whoever it is that buys off the off takers."*

> *Respondent 11 from the Target Trader: “we've traded, we've got a couple of PPAs with some multinationals where they need the green attributes to demonstrate that they are mitigating carbon as part of their strategy.”*

> *Respondent 18, an expert: “What is interesting that's starting to happen. Is a separation - the notion of selling an electron and selling a renewable energy certificate. Normally they've been stapled together - if you're buying the electrons, you're also buying the racks. But we've now started seeing that there's a concept of being separated.”*

Wheeling and Off-Taker Market Expansion

Wheeling opportunities and expanding off-taker segments, particularly with the addition of renewable energy solutions like hybrid systems, were also discussed. Respondent 2, an expert, mentioned that new off-taker segments such as mines are emerging as important players.

> *Respondent 11 from the Target Trader: "We've also had to look at selling power to different markets, that we've never had, we were targeting your*

mines, your manufacturers. The customer sector that we're looking at has significantly changed. Customer diversification is certainly one that has come with all of these policy instruments"

Respondent 2, an expert: "New off-taker segments as opposed to new products and services such as Mines etc."

This reflects a broader trend where renewable energy firms are targeting non-traditional sectors, diversifying the market for renewable energy.

4.6.5 *Transform: What changes in the firm's organisational structure, processes and activities occurred as a consequence of any of these RET policy instruments?*

The analysis reveals several key themes regarding how firms are adapting to RET policies. These changes primarily involve: Streamlining organisational structures to increase efficiency and align with new opportunities; the creation of new business development and project development teams to handle emerging technologies like BESS. The hiring of specialised personnel and expanding teams, especially in engineering, M&A, and financial modelling to better manage complex renewable energy projects. Enabling innovation through collaboration in financial solutions and contracting models to stay competitive; and a stronger focus on market competitiveness and risk management, responding to the rapid pace of renewable energy development and the growing competition.

Streamlined Working Groups and Cross-functional Teams

Several respondents emphasized the importance of organising teams within IPPs and traders to align with policy objectives. These teams are streamlined to focus on specific objectives like data analysis and grid strengthening, mirroring the efforts seen in government and private sector collaboration in energy policy.

Respondent 1, an expert: "Working groups within organisations are becoming more streamlined, similar to the presidency's approach to energy changes and private sector engagement"

Role of BESS and Project Development Teams

This theme highlights how firms have adjusted to changes in project development, new business opportunities, and the inclusion of new technologies like BESS. .

> *Respondent 14 from the Target IPP: mentions how the firm created a specialised land development team and focused on new product offerings, including BESS , responding to market needs and regulatory changes.*
>
> *Respondent 7 from the Target IPP: "Creation of a specialised land development team to identify land for wheeling opportunities enabled us to hire those individuals in other markets like South Africa."*

Expansion of Teams and Skills Requirements

This theme addresses the expansion of teams, the hiring of new personnel, and the need for specialised skills to align with the growing demands of the renewable energy sector.

> *Respondent 9 from the Target IPP: Expansion of M&A and Investment Teams: Target IPP5 explains how changes in policy and market dynamics have led to the growth of the firm's Mergers and Acquisitions (M&A) department, with an emphasis on capital acquisition to support new investments in renewable energy projects:*
>
> *Respondent 10 from the Target IPP: "We have used our innovation that we've got within utility transactions, not just in South Africa but on the continent from our experience looking at first and foremost bankability, because you can have a good project, but if you do not have the financing to go along with it, if you don't have the funding for the good ideas, it just remains that, good ideas."*

In-House Innovation and Cross Regional Collaboration

> *Respondent 10 from the Target IPP: describes the "summit" and "core" process, where a cross-functional team collaborates to implement? large scale complex new ideas, through the summit team suggesting more informative and collaborative approach to innovation contractual*

regulatory and financial innovation. The summit incubator strategy team is compiled of a "multi-disciplinary team" involving legal, finance, and technical experts allows for the comprehensive exploration of technological opportunities. This enables the core team to leverage [the] experience of the firm to continue to provide the business as usual to small scale embedded generation projects.

Respondent 13 from the Target IPP: "….Bringing expertise from all the different areas that were already were doing it, we'd already done wheeling projects in Jordan, we understood the concept, we have a really strong technical team that could help provide some insight on that"

Innovation in Energy Models and Customer-Centric Solutions

Respondents also highlighted the evolving nature of energy business models and the need to create customer-focused solutions. Innovation plays a crucial role in how firms communicate opportunities and shape business cases. Respondent 5, an expert, talked about experimentation with different contract models and energy solutions, including virtual wheeling and offering green electrons:

"You've got projects that are delivering to multiple customers, you've got virtual Wheeling with Vodacom... It's not about contracts; it's about managing electrons."

This shows how firms are using innovative solutions to meet customer demands and differentiate themselves in a competitive market.Overall, the firms have shown flexibility and adaptability in their structures, processes, and activities to thrive within the evolving renewable energy market shaped by government policies.

4.6.6 *Transform: Has the implementation of any of these RET instruments resulted in the identification of specialised complementary assets, such as battery energy storage in relation to PV solar and wind?*

Battery Energy Storage and Hybrid Technologies in Relation to PV Solar and Wind

Respondent 5, an expert, highlights the significant potential of integrating BESS and hybrid solutions to optimise renewable energy projects. They note that the introduction

of these technologies is creating new opportunities in the market, such as combining solar with battery storage to ensure grid stability and overcome intermittency challenges.

> *Respondent 11 from the Target Trader: "we want to encourage it, we would want to incentivise that in our tariffs where we'd have a certain tariff incentive, if you are supplying battery powered dispatchable power, you can start resolving other issues where you start targeting those peak periods where we find those shortages mainly,"*
>
> *Respondent 17 from the Target IPP: the introduction of Schedule II ERA amendments and ICGAR rules has driven the need for BESS to enhance grid stability. IPPs are exploring grid scale storage projects to help mitigate intermittency challenges. Other complementary assets identified include hydrogen storage and smart grid technologies for demand response management.*
>
> *Respondent 5, an expert: "The new products and services the firm has been able to add, the credit innovation, technology innovation, where we look at use of power versus the cost of use of power, and we try and use solar power versus batteries at the time that is most cost efficient"*

4.6.7 *Technological congruence: What emerging or advanced technologies did the firm have to develop or acquire to facilitate and embrace the opportunities of the energy policy instruments?*

Utilisation of AI and bespoke EMS for optimisation and efficiency

Artificial intelligence (AI) and energy management systems (EMS) are becoming essential technologies for renewable electricity firms to optimise the use of energy sources and ensure cost-efficiency. Respondent 5, an expert, discusses the development of a custom EMS that is tailored to real-world operational conditions, such as monitoring and advising on battery usage and solar energy. AI-driven systems help manage energy resources more efficiently by utilising real-time data and offering insights into the most effective energy source to use at any given time.

Respondent 3, an expert: "It's a little different for traders and aggregators because they have a big information management component to what they do, so there's a lot of technological innovation around energy saving, around how you look at markets, how you manage customers."

Respondent 16, an expert: "Wheeling traditionally has been done on an Excel spreadsheet matching demand and supply. So, all of that has to be mechanised and moved away from a manual system which is prone to error."

AI for forecasting

Respondent 17 from the Target IPP: "Forecasting is good in the sense that it reduces the probability numbers you're working for, the P90 numbers, and then it actually helps us to mimic how despite all the natural causes that are going to happen, it can help you to forecast, so tools like software and then models that we developed that's Excel models, yeah, those are the tools that we use to develop a solution."

Respondent 16, an expert: digitisation of electricity systems is going to become important, and I think making sure that you've got. Ever increasingly accurate forecasting is going to be super important under the new market code."

Respondent 11 from the Target Trader: "three years ago we developed a unique trader platform with a software company… as operations having to manage over hundreds of customers with a spreadsheet was becoming too much"

Respondent 11 from the Target Trader: "… yes so I would say this initiative was led by me and the operations team but there was support from the senior stakeholders to work with a software company and give them inputs to develop this platform where we get updates every thirty minutes"

Development and adoption of higher efficiency and bifacial solar panels

This represents an emerging trend where IPPs and traders are expected to adopt advanced solar technologies that offer better performance and higher returns. These

technologies, especially when combined with hybrid systems, will likely play a significant role in optimising energy production.

> *Respondent 9 from the Target IPP: "You would have a look at Higher Efficiency panels, PV modules… we now have bifacial modules."*
>
> *Respondent 15 from the Target IPP: "let's take PV modules, we know that this is how the energy generation policy works or this is the energy required and we try to see how we can use the most energy efficient module."*

Waste-to-Energy Technologies

Exploration of waste-to-energy technologies to address base load and sustainability:

> *Respondent 6, an expert: "The other technologies must definitely be looked at, I don't think we only rich in solar and wind in South Africa."*
>
> *Respondent 6, an expert: "Is hydro is also something we can look at, which brings, which is able to address that base load."*
>
> *Respondent 6, an expert: "There's the waste to energy in South Africa; waste is a big problem."*

Waste-to-energy (WtE) technologies are identified as a potential solution to South Africa's energy challenges, especially for addressing base load demands. As an alternative or complement to intermittent renewable sources like solar and wind, waste-to-energy technologies could help stabilise the grid and offer a sustainable way to deal with waste issues. This is particularly relevant in regions with large waste management problems.

In conclusion, renewable electricity firms will need to focus on acquiring or developing advanced technologies in storage, hybrid systems, AI-driven optimisation, and waste-to-energy solutions to fully leverage the opportunities presented by renewable energy policy instruments.

4.6.8 *Technological congruence: How have renewable electricity firms aligned their technological know-how in order to embrace/mitigate risks and opportunities from RET policy instruments?*

Results reveal several key themes about the technological know-how, experience, skills, and capabilities that renewable electricity firms need to effectively embrace the opportunities offered by RET policy instruments. Below is a breakdown of the emerging themes.

Technical Expertise in RET

Specialised knowledge on solar, wind, and hybrid systems: Experts emphasised the importance of renewable electricity firms to understand the intricacies of RETs like solar, wind, battery storage, and hybrid systems. From a trader's perspective, collaborations with software companies that can build platforms increases accuracy in forecasting and efficiency.

> *Respondent 16, an expert: "You need solar panel experts, integration experts, and hybrid experts who understand combinations of battery or diesel generators."*
>
> *Respondent 6, an expert " You need experts in solar, wind, and battery energy storage solutions, as the technologies continue to evolve."*

Understanding advancements in existing technologies: Technological expertise in the evolving landscape of renewable technologies is critical. Respondents noted that while some technologies like solar and wind are mature, constant improvements and innovations in panels, batteries, software platforms and other components are necessary.

> *Respondent 7 from the Target IPP: "The technology is refined incrementally, and OEMs (Original Equipment Manufacturers) are at the forefront of these advancements."*

Respondent 11 from the Target Trader: “Well we developed the software with an external firm, but we continue to improve it internally… this is led by our internal head of IT”

Research and Development (R&D) and Innovation

Incorporating R&D teams within firms: Firms that engage with renewable energy solutions must have dedicated R&D teams to stay abreast of technological developments and to innovate for more efficient energy production and consumption.

Respondent 6, an expert: "Having a research and development team within renewable energy firms can drive technology innovation and allow for improvements to existing systems."

Respondent 5, an expert: "If IPPs aim to participate in the value chain, they need a strategic focus on technological development, beyond just selling power purchase agreements (PPAs)."

Collaboration with technology providers

Collaborating with technology providers and staying updated on new technologies is crucial for IPPs to integrate the latest advancements.

Respondent 7 from the Target IPP: “Abu Dhabi world future energy was one of them and there are other ones. “And in those events, there is an army of employees visiting all the booths so that we can have access to [the] latest innovation."

Respondent 15 from the Target IPP: “Vendors who sell us new and emerging technologies, keep the firm on radar [and] when there's a new technology, they bring this to us because they know we are a big organisation and it has the procurement capabilities”

Cross-Disciplinary Collaboration and Integration

Effective collaboration across departments, such as engineering, business development, product development, and project management, is needed to navigate the complexities of hybrid systems and ensure that solutions are aligned with clients’ needs.

Respondent 14 from the Target IPP: "To provide a real solution, you need to go to the client side and understand their challenges. This requires enormous collaboration between teams."

Respondent 5, an expert: "Business developers, engineers, and product developers need to work closely to integrate technical solutions that meet the customer's needs and ensure project success."

Silos and integration of departments

The integration of different technical domains (e.g., PV, BESS, wind within the same engineering framework is critical to ensure the smooth operation of complex energy systems.

Respondent 5, an expert: "Silos between PV and BESS need to be broken down to develop integrated solutions that address the whole energy system."

Real-World Experience and Learning Through Trial and Error

Hands-on experience: Experience from previous projects and the ability to learn through trial and error is essential for building effective solutions. Respondents emphasize the value of "real-life experience" over theoretical knowledge, especially in the renewable energy sector.

Respondent 7 from the Target IPP: "The skill set required is developed through a process of trial and error, and experience is essential in the renewable energy field."

Respondent 15 from the Trader IPP: "Real-world experience, such as in utility-scale projects, cannot be replaced by theoretical knowledge alone."

Respondent 15 from the Target IPP adds, "It was uncomfortable... it pushed us to have conversations and discussions that we've never had before," referring to the challenges that lead to innovation in their approach to dealing with grid constraints and adapting to new technologies.

Strategic Alignment with Customer Needs

Understanding client-specific requirements: Understanding the technical needs and consumption patterns of clients (e.g., industrial or commercial clients) is essential for developing tailored energy solutions that are both economically viable and technically efficient.

> *Respondent 17 from the Target IPP: "You need to understand the customer's challenges and align your solution with their energy needs. In C&I applications, you need to optimise the energy systems based on the customer's consumption patterns, which are often non-uniform."*

Consultative approach with clients

Having the ability to consult closely with clients and understand their requirements is crucial in delivering the best technological solutions.

> *Respondent 10 from the Target IPP: "Business developers who understand client needs should work closely with technical teams to ensure alignment in the design of energy solutions."*

Transfer of Knowledge and Skills

Cross-border expertise transfer: Knowledge transfer from regions with advanced renewable energy markets, like the Gulf, is crucial for gaining insights into best practices and innovations. Companies often rely on international teams to transfer knowledge and expertise.

> *Respondent 10 from the Target IPP: "We utilise the knowledge from our UAE-based teams to inform battery storage solutions for our South African projects."*

Diverse Skills in Renewable Energy Projects

Diverse skill set for project execution: IPPs need a wide range of competencies, including technical expertise, project management, financial acumen, and legal knowledge, to navigate the complexity of renewable energy projects.

Respondent 10 from the Target IPP: "The renewable energy industry requires a diverse set of skills across various disciplines, from engineering to project management to finance and legal."

The responses reveal that the key capabilities renewable electricity firms need to embrace RET opportunities are a combination of technical expertise, hands-on experience, R&D, cross-disciplinary collaboration, and alignment with customer needs. Furthermore, renewable electricity is advised by Experts to ensure access to evolving technologies and continuously adapt their approaches, either by learning from past experiences or collaborating closely with technology providers. This will enable them to remain competitive and effectively implement renewable energy solutions within the regulatory and market position.

4.7 Research question 3: What types of policy instruments would coerce and/or motivate renewable electricity firms to achieve competitive advantage and contribute towards the JET objectives?

4.7.1 *Did any of the burdens, challenges and or penalties the firm identified from the introduction of any RET policy **instruments** lead to a reduction in supply or the inability to provide renewable energy? If yes, please provide details?*

The results reveal that while the RET policy instruments have made significant strides in increasing renewable energy supply in South Africa, challenges remain. Regulatory changes have encouraged investment, but infrastructure limitations, especially grid capacity, pose major barriers. Furthermore, the shifting focus toward economic development obligations and the need for stronger leadership and policy alignment suggest that more work is needed to ensure that renewable energy projects benefit all sectors of society. From the responses provided, several key themes emerge. Below are the primary themes along with relevant quotes from respondents.

Policy Impact on Renewable Energy Supply and Market Growth

This theme captures the general sentiment that the RET policy and related instruments have contributed to increased renewable energy supply in South Africa, although with some constraints and challenges.

> *Respondent 1, an expert: "The ERA has opened up the market, not only for us, but for all the other IPPs. As a company, we're bringing more capacity into trying to deal with Eskom's shortfall but transitioning to clean energy along the way."*
>
> *Respondent 14 from the Target IPP: "Definitely on both metrics increased, that was the bottleneck in the past that everything had to go through a cuddle process with the regulator, then a process with the state monopoly as well, the state electric company Eskom."*

The RET policy has provided an opportunity to increase renewable energy supply. Respondent 9 from the Target IPP highlights that the Schedule II ERA (2006) is significantly assisting to open the market, allowing renewable electricity firms to contribute more capacity. Respondent 10 from the Target IPP further supports this by

describing the bottleneck that was alleviated through regulatory changes, which encouraged an influx of renewable energy projects and subsequent job creation.

Comparative analysis

Both Target Trader and Target IPP respondents recognise the significant role that policy instruments, particularly the 2021 Schedule II amendments of ERA (2006). However, there are nuanced differences in their perspectives on whether these changes have led to a notable increase in renewable energy supply, with both highlighting opportunities and challenges.

4.7.2 *Did any of the burdens and or penalties the firm identified from the introduction of any RET policy instruments lead job losses, job creation or skills development? If yes, please provide details?*

This theme focuses on the role of renewable energy projects in local job creation and economic development, but it also addresses gaps in meeting the broader community benefits from these projects.

Economic Growth

Respondent 10 from the Target IPP noted the multiplier effect:

"Because industry can't grow if they don't have the power to grow their businesses, so it's got that multiplier effect,"

suggesting that reliable renewable energy supports overall economic development. Experts recognise that the renewable energy sector's growth, spurred by favorable policies, has a broader economic impact, particularly in terms of job creation and skills development. This growth is seen as a necessary element of long-term sector transformation.

Job creation and skills development

Respondent 1, an expert: "Localisation in job creation is not enough; specific targets are needed."

Experts recognise that the renewable energy sector's growth, spurred by favorable policies, has a broader economic impact, particularly in terms of job creation and skills development. This growth is seen as a necessary element of long-term sector transformation.

Example: Respondent 12, an expert, highlights, "We're looking at the possibility of up to 100 projects in a year, which can create far more job and skills development opportunities."

Respondent 4, an expert, mentioned that the energy trading business model does not create significant direct job opportunities, highlighting that job creation is more often associated with IPPs, which are involved in entire renewable energy projects.

"A lot more opportunities for jobs are created by IPPs because IPPs are involved in the entire project."

Opportunities for External Parties and Industrial Upskilling

In contrast, some respondents mentioned that certain external industries and external contractors in South Africa have benefitted from upskilling due to the growth in renewable energy infrastructure. These industries can benefit from the growing demand for skilled labor to support the renewable energy transition. Respondent 18 discussed how original equipment manufacturers (OEMs) and engineering, procurement contract (EPC) contractors could scale up their operations in South Africa, thereby increasing their capacity to provide goods like transformers, pylons, and overhead lines. This has led to labor absorption in these industries. The respondent mentioned:

Respondent 18, an expert: "Those industries are hugely labour absorptive, and there's a lot that can, you know, with a steady supply of demand, upscale their factories and bring a lot more skills at that level."

While renewable energy projects have led to job creation, Respondent 6 an expert argues that localisation targets and clear economic development obligations are necessary for equitable growth. Respondent 2, an expert, discusses how renewable energy projects create jobs, but also stresses the importance of aligning projects with broader community development needs.

Challenges in Implementation of Economic Development Obligations

Respondent 2, an expert: "There is a gap between project rollout and true sector transformation."

Respondent 2, an expert, points out that the relaxation of economic development obligations has hindered the potential for long-term economic transformation. The shift from compulsory economic development obligations to more incentivised measures may reduce the program's effectiveness in driving meaningful transformation in local communities.

Coal Communities and Job Losses

Several respondents highlighted that coal-dependent areas face significant job losses due to the phasing out of coal-fired power stations and coal mining (Respondent 9, Respondent 10). The decline of the coal industry has left many individuals unemployed or with fewer economic opportunities.

Example: "Decommission means loss of labour in some cases absorbed" (Respondent 9 from the Target IPP)

Example: "The large coal mines pay a lot more to the unskilled labour that they have at night versus and they have a lot more" (Respondent 10 from the Target IPP)

Training and Upskilling for New Opportunities

Target IPP Respondents frequently noted that the renewable energy sector is offering opportunities for reskilling and training, especially in areas where coal has historically been dominant (Respondent 9, Respondent 10, Respondent 13 from the Target IPP).

Example: "There's an opportunity for these individuals to gain employment in the renewable energy sector, through training mechanisms" (Respondent 9 from the Target IPP)

Example: "There's a need to train in other sectors and to bring in that innovation where you're bringing in additional skills, not just the unskilled side" (Respondent 10 from the Target IPP)

Example: "We are using people's land for these projects, land that could be used for other purposes. The least we can do is ensure that these communities are part of the process helping advance their skill sets" (Respondent 13 from the Target IPP)

4.7.3 *Can you describe the most impactful RET policy instrument for coal dependent communities?*

Job Creation and Economic Development

RET policy instruments are essential for job creation in coal-dependent areas, particularly through the effective allocation of energy transition funds and grants to the private sector. Although the government will offer grants and preferential procurement incentives to renewable electricity firms engaged in economic development initiatives while building renewable energy projects, these funds are not usually allocated to renewable electricity firms in the private sector.

> *Respondent 3, an expert, said: "renewable energy firms in [the] private sector don't have access to the kind of funds and facilities that are supposed to be a part of the just energy transition – though none of it is going to IPPs and Traders and because most of it is intended to go through government, this is probably a weakness on government's part"*
>
> *The corruption and non-compliant activities of South Africa's government is echoed by Respondent 16, an expert, said: "in late 2004, the government decided not to implement the plans as advised in the 1998 white paper and what then came into being is all of the corruption that went around the building of and the procurement of services for Medupi and Khulise power plants, leading to this crippling state capture that's made Eskom lurch from bad to worse over the years"*

These financial incentives are designed to enhance employment opportunities during both the construction and operational phases of renewable energy projects, with a strong emphasis on local content and community shareholding to maximise benefits for local populations**.**

Specialised Skills Development in Sustainability and Legal/Environmental Fields

Several respondents pointed out the increasing demand for specialised skills, especially in environmental, social, and governance (ESG) issues, as well as legal compliance. There is increasing demand for specialised skills in ESG, environmental law, and carbon

credits.

> *Respondent 3, an expert: indicated that “there was a need for expertise in areas like environmental law, ESG, and community trust management. This reflects a growing need for individuals with specific legal and environmental skills as the renewable energy sector expands.”*
>
> *Respondent 6, an expert: also mentioned the "carbon credits" as a critical area of focus for skill development, suggesting that employees in the sector must learn how to navigate new financial and regulatory mechanisms like carbon credit trading to facilitate market growth.*

Skills Transfer and Capacity Building

Some respondents observed that skills transfer is a key component of creating long-term job opportunities for communities, especially those impacted by the phasing out of coal industries. However, the process of skills transfer was not always executed effectively in practice. Respondent 2, an expert, expressed frustration over the lack of genuine skills transfer during project execution. While there were some obligations to hire locally, it appeared that corporate strategies often undermined this, and subcontractors preferred to bring in their own skilled labour, leaving local communities at a disadvantage. The respondent stated:

> *"On the ground, not everybody is doing it correctly in a sense of the skills transfer... it’s more of a corporate bullying type of tactic." (Respondent 2, an expert)*

Skills Development and Diversification of the Labor Market

Targeted energy transition funds, combined with grants, can facilitate significant skills development and workforce diversification in coal-dependent communities. By channelling these resources to the private sector, companies can establish training programs to equip workers transitioning from coal with new skills relevant to the renewable energy sector. This collaborative approach opens opportunities in fields such as engineering, maintenance, and information technology (IT), fostering a more adaptive and diverse labour market.

Role of Government and Policy in Job Creation and Skills Development

A few respondents also emphasized the importance of policy and government support in ensuring that the transition away from coal creates equitable opportunities for communities affected by coal dependency. Respondent 18, an expert, noted that the shift from coal to renewable energy, like that seen with IPPs in certain areas, is part of a broader industrial transformation. However, it also comes with challenges related to re-skilling individuals who have historically worked in the coal industry. The respondent pointed out:

> *"People didn't necessarily live in those towns until there was a coal mine and a coal-fired power station... communities will need to find other ways... those communities will need to upskill people." (Respondent 18, an expert).*

Respondent 5, also an expert, mentioned that renewable energy policies should not only create jobs in specific industries but also look at the broader structural issues such as energy curtailment policies and grid management that impact local communities. They alluded to how these challenges, if properly addressed, could lead to wider economic opportunities.

Stakeholder Engagement and Community Expectations

As per the guidance of Respondent 2, an expert, effective communication and stakeholder engagement are critical for managing community expectations regarding the impact of energy transition funds and the associated incentives. Without a collaborative movement involving a significant portion of the private sector and adequate government funding, the contribution of private companies to the JET will be limited to their own CSI responsibility initiatives. These initiatives may not necessarily target coal-dependent communities or be located near the renewable energy projects they are developing.

BEE (Black Economic Empowerment) Requirements and Compliance

Energy transition funds can also be utilised to ensure compliance with (Broad Black Based Economic Empowerment (BBBEE) requirements, enhancing overall economic development in underserved areas. IPPs in C&I are expected but not required to align their projects with local socio-economic goals, ensuring that the benefits extend to

previously disadvantaged groups and coal-dependent communities.

Learning and Adaptation of IPPs

The renewable energy industry increasingly recognises the importance of economic development, but this has largely been supported by government incentives, in achieving project sustainability. Respondent 2, an expert, advises IPPs must adapt their strategies to incorporate robust economic development practices that actively engage local communities and leverage the capabilities of the private sector. These elements highlight the necessity of a coordinated effort between government funding and private sector engagement to drive job creation and skills development in coal-dependent communities, ultimately facilitating a more effective transition to renewable energy.

5 CHAPTER 5: ANALYSIS OF THE RESEARCH FINDINGS

5.1 Introduction

In this chapter, the findings synthesised from Chapter 4 are presented. The study aimed to investigate three objectives. The first, required the identification of the social constructions of the target populations of the 2021 schedule II amendments to ERA (2006) and understand the allocation of benefits and burdens. Second, the study explored how this renewable electricity firms engaged and the various elements of the dynamic capabilities framework combined with the social construction framework to retain competitive in the wake of the South African government introducing various energy policy instruments between 2019-2024.

The implications of these findings underscore central challenges and opportunities in SA's energy transition, including the importance of supportive policy frameworks, stakeholder engagement, and infrastructure development (Marty et al., 2023). This chapter highlights the main findings from the analyses, discusses their implications, and provides recommendations for policies to improve the effectiveness of RET policy instruments and support the transition toward a sustainable energy future.

5.2 Just energy transition summary

Analysis from the expert, Target IPP, and Target Trader perspectives provide valuable insights into the multifaceted nature of the JET in South Africa. While each analysis offers distinct views, common themes emerge, reflecting shared understanding and concerns about the transition. Below is a comparative breakdown of the three analyses based on key themes such as global and local integration, inclusivity, policy frameworks, job creation, and renewable energy focus.

Thus, while the experts, Target IPP respondents, and Target Trader analyses approach the JET from different angles, there are significant common themes across all three. These include:

(i) the need for inclusivity, ensuring that no one is left behind during the transition, especially those in coal-dependent communities;

(ii) the importance of renewable energy as the cornerstone of the transition, though the Target Trader perspective includes transitional fuels such as gas,

(iii) the recognition of the need for strong policy frameworks and strategic planning to guide the transition;

(iv) the social and economic consequences, particularly regarding job creation and skills development, are seen as central to achieving a just transition.

(v) finally, global and local integration is emphasized, with all analyses stressing the importance of aligning local transitions with global sustainability goals. Each perspective contributes a unique lens, but collectively, they reinforce the importance of careful, inclusive, and well-planned strategies to ensure that the JET in South Africa is both fair and sustainable.

5.3 Social construction of target populations summary of key findings

The purpose of this the first reach question was twofold. First, identify the target populations of the 2021 schedule II amendments to ERA (2006) and to, understand whether target populations of this RET policy instrument were viewed as deserving or not. Second component of the question was to understand the allocation of benefits and the burdens to the various population groups as described in accordance with the Social Construction Framework population in relation to the schedule II amendment of ERA (2006).

5.3.1 Advantaged

IPPs and traders, banks, investors and renewable energy companies that construct renewable energy projects and part of the supply value chain are viewed favorably as enablers of energy transition, job creation, and foreign investment. This was supported by most study participants. Their role in driving economic growth and technological innovation positions them as key stakeholders in the renewable energy landscape. However, an insightful observation was made by Respondent 6, highlighting that while the potential for local manufacturing in renewable energy exists, local companies face challenges around technology, investment, and skill development to fully capitalise on this opportunity. Government support is seen as essential for fostering local manufacturing capabilities.

Supporting careers such as land and environmental specialists and lawyers also form part of this target population. Interestingly, intensive energy users, such as large mining companies, were viewed negatively in the early 2000s when the South African government first published a White Paper on Energy Policy in 1998 outlined the country's potential to transition to renewable energy. The lobbying efforts of these mining companies and Eskom influenced the country to ignore the recommendations of the White Paper on Energy Policy in 1998 and instead construct new coal-fired plants (Thabethe, 2010). However, these plants never became operational for various reasons, with corruption being the primary factor (Thabethe, 2010). However, this social construction shifted with the introduction of load shedding and rising electricity costs, turning these companies into prime beneficiaries of energy policy instruments.

This population has enjoyed an abundance of benefits, including an increase in customers, whether they are independent power producers, traders, developers, or banks. This group has reaped the most advantages from the 2021 schedule II amendments to the ERA (2006)Respondent 16 highlighted a unique benefit which included the ability for intensive users to establish trading subsidiaries. These subsidiaries allowed them not only to use renewable energy as electricity during load shedding but also to obtain renewable energy certificates or carbon credits from the projects.

Burdens included the requirement of registering RE projects with NERSA and for Traders, the requirement to obtain a license. Although not a direct consequence of the 2021 schedule II amendments to ERA (2006) it is however noted that entities connecting to the grid face significant challenges despite policies intended to enhance efficiency and transparency. Grid congestion, bureaucratic delays, and regulatory inconsistencies continue to hinder seamless market participation.

5.3.2 Dependents

Normal consumers and renewable energy value chain participants (e.g., small manufacturers) benefit from energy policy instruments but have lower political power. Their reliance on supportive policies and incentives underscores the need for sustained regulatory frameworks that promote inclusive energy transition.

Burdens for dependents, particularly those from coal dependent communities is the requirement to learn new renewable energy skills and to understand the sector. Respondent 2, an expert, highlighted that this group would also need to understand that the unskilled labour in renewable does not compensate as much as the unskilled work in coal sector. As such, both Respondent 2, an expert, and Respondent 7 from the Target IPP 7 highlighted the need for education and training for these communities.

5.3.3 Contenders:

Eskom is perceived negatively due to financial mismanagement and governance failures. Public discourse often frames Eskom as a barrier to energy reform, highlighting the urgency of restructuring state-owned utilities.

Burdens: Eskom faces the challenge of needing to provide grid infrastructure, but its financial limitations prevent it from doing so. Participants in the study emphasized the ERA Amendment Act , which assigns responsibility for infrastructure upgrades to the NTCSA of South Africa. This shift opens opportunities for private sector investment in South Africa's grid infrastructure through a transparent process, free from interference by Eskom, as noted by Respondent 1, an expert, Respondent 11 from the Target Trader and Respondent 17 from the Target IPP.

5.3.4 Deviants:

The study identified the construction mafia as identified by Respondent 10 from the Target IPP and Respondent 1, an expert, as a target population that is negatively construed, along with non-compliant subcontractors of renewable energy projects, and climate change skeptics as falling into the deviant category. This group is perceived as underserving, as the introduction of 2021 schedule II amendments to ERA (2006) conferred no benefits to them. However, it is important to note that without supporting policies, the 2021 schedule II amendments to ERA (2006) could provide an opportunity for these deviant individuals to persist in and even escalate their negative behaviors.

5.4 Summary of research question 1 key findings

While all three participating groups- the experts, Target IPP, and Target Trader recognise the central role that firms play in Just Energy Transition, their perspectives vary based on their focus and the aspects of the transition they prioritise. Experts stress the need for policy alignment and social justice, while Target IPPs focus on the operational aspects of renewable energy generation, community engagement, and sustainability. Target Trader, on the other hand, emphasize market creation, flexibility, and affordability. The common thread across all perspectives is the need for collaboration to ensure that the transition is not only environmentally sustainable but also socially just and economically viable.

Renewable energy firms such as IPPs and traders, along with banks and large energy users, were perceived as deserving and influential, benefiting significantly from the Schedule II ERA amendments through deregulated generation and wheeling rights, while facing only minimal burdens like registration and licensing requirements. In contrast, Eskom was negatively framed due to inefficiencies and governance failures, bearing symbolic burdens and operational constraints despite retaining some influence and responsibility for grid upgrades without sufficient financial capacity. Coal-dependent communities and small businesses were positively constructed but lacked political power, receiving limited benefits and facing burdens such as reskilling requirements and restricted access to RET incentives. Meanwhile, construction mafias and non-compliant subcontractors were negatively constructed as powerless, gaining no benefits and introducing additional risks to projects through coercive practices.

5.5 Target IPP summary of Dynamic Capabilities

5.5.1 Sensing Capabilities:

The Target IPP has strategically built robust formal and informal networks, allowing them to sense market changes and regulatory developments proactively. These networks include industry associations, governmental bodies, and cross-sector collaborations for the Target IPP that provide crucial insights into evolving policy landscapes and market opportunities. The Target IPP demonstrates stronger more proactive and entrepreneurial-led sensing by engaging in market intelligence, policy discussions, and trend analysis.

The Target IPP has institutionalised the use of market intelligence systems, notably comprehensive playbooks and specialised intelligence teams, to centralise and streamline access to critical industry data. These playbooks consolidate information across multiple sectors, including project pipelines and target development strategies, ensuring that employees can quickly retrieve insights and maintain alignment with market dynamics. This structured approach enhances organisational agility and informed decision-making. These sensing activities ensure the Target IPP remains adaptable to shifts in the energy landscape. It actively participates in industry forums, collaborates with think tanks, and leverages technological foresight to identify emerging opportunities.

Despite these efforts, Target IPP respondents highlighted inefficiencies in information dissemination within the firm, leading to siloed decision-making. The lack of a structured internal communication framework often results in delays in strategy execution and missed opportunities for collaborative innovation.

Firms with strong DCs are better equipped to anticipate, respond to, and capitalise on market shifts by fostering innovation, developing stakeholder networks, and continuously investing in R&D (Usman & Hammar, 2021). These capabilities enable firms to navigate regulatory changes, technological advancements, and competitive landscapes effectively. However, experts indicate that IPPs typically do not engage extensively in R&D, which may hinder their ability to develop proprietary technologies and innovative business models. Instead, they rely on market intelligence, strategic partnerships, and adaptive capabilities to remain competitive.

5.5.2 Seizing Capabilities:

Pilot Projects: The IPP engages in short-term pilot projects, such as BESS focused pilot projects and carbon credit pilot projects, to test and scale innovative approaches. These initiatives serve as testbeds for future large-scale deployments, enabling the Target IPP to refine its technical and financial models before full-scale implementation.

Stakeholder Collaboration: The Target IPP seizes risks and opportunities by engaging with key figures in the organisation and externally to support novel projects.. Respondent 10 from the Target IPP emphasised collaboration with policymakers, investors, and technology providers ensures access to critical resources and market insights, facilitating

more informed decision-making.

Development of unique, hard-to-replicate energy solutions. The Target IPP has been able to demonstrate a multifaceted approach hinge on regulatory synergy, enabling collaboration with regulatory entities to navigate and secure approvals for innovative structures and transactions that lack established processes. Complementing this is financial synergy, where the Target IPP harnesses the investment banking expertise of its employees to craft sophisticated funding strategies tailored to complex projects. Additionally, cross-pollination synergy plays a crucial role, allowing the Target to apply successful solutions from one region to similar challenges in another, thereby enhancing efficiency and adaptability. By effectively integrating these synergies, the Target IPP can create robust, innovative energy solutions that set them apart in a competitive marketplace.

Innovation around financial solutions to the challenges posed by RET policy instruments was further supported by Respondent 18 Expert discusses how there is innovation happening around grid access and capital raising for renewable energy projects. This involves using private sector participation to self-build grid connections, which is an important step in addressing grid integration challenges. Respondent 18, an expert, described the increased amount if innovation happening around grid access... “using private sector funds from IPPs to self-build the grid connections, MTS works, grid strengthening, etc."

5.5.3 Reconfiguring Capabilities:

The leadership of the Target IPP demonstrates their ambidextrous dynamic capability to reconfigure assets for simultaneous competition in both mature and emerging business sectors. By demonstrating a keen cognitive and behavioral aptitude, they have established, aligned, and sustained the necessary competencies, structures, and cultures that serve the dual objectives of advancing the mature business while driving innovation.

This approach allows the organisation to discern between its "core" and "summit" segments. The core team is dedicated to executing standard captive energy solutions, concentrating on clients seeking energy savings and security of supply during typical

business hours. This streamlined focus enables the core business stream to maintain controlled, replicable processes, enhancing productivity and minimising variance. In contrast, the summit team is tasked with pioneering innovative projects that break new ground in the industry. This team thrives on tackling complex challenges that demand creative problem-solving across technical, contractual, regulatory, and financial dimensions. By fostering an environment where both teams can operate effectively, The Target ensures that the organisation can leverage the stability of the core business while simultaneously embracing the agility required for groundbreaking ventures. This strategic separation not only optimises resource allocation but also cultivates a culture of innovation, positioning the company to excel in diverse market conditions.

Technological advancements have emerged as a cornerstone of new products and services developed in response to the introduction of RET policy instruments. These innovations primarily aim to improve energy efficiency, ensure reliable power delivery, and enhance energy storage capabilities. A notable example is the introduction of BESS products and services which respondents described as transformative for the South African market. Respondent 13 from the Target IPP emphasized that adopting battery units marked a significant shift, particularly because such solutions were previously restricted in other markets. Similarly, Respondent 7 from the Target IPP highlighted the development of hybrid energy storage solutions integrating BESS with solar technologies, noting that regulatory changes such as Schedule 2 and IGCAR enabled this innovation. Target IPP respondents further explained how the firm introduced a short-term rental model as part of a techno-commercial strategy, reflecting the sector’s growing emphasis on flexibility and creative business models.

The Target IPP demonstrated also focusing on improving solar technology, including adopting higher-efficiency panels and bifacial modules that can capture sunlight from both sides of the panel, thus enhancing solar energy generation. These innovations are particularly important in high-sunlight regions like South Africa. Many Target IPP respondents stressed the importance of an EM and AI-driven solutions in optimising the integration of different energy sources like solar, battery storage, grid, and diesel generators. These systems are designed to maximise efficiency and reduce costs by selecting the best energy source at any given time.

5.5.4 Technological congruence:

The hiring of key personnel, such as a vice president of product development and an energy storage solutions specialist, ensures technical expertise in renewable energy modelling and technology integration. These experts work closely with the business development team from the initial stages of deal structuring to tailor solutions to specific customer needs using the most advanced technologies available.

Playbooks for Standardisation: The Target IPP's creation of structured playbooks to streamline operations and knowledge transfer across business units. These playbooks document best practices, project execution methodologies, and regulatory compliance strategies to enhance organisational efficiency and effectiveness.

The Target IPP demonstrates a strong commitment to innovation through a trial-and-error approach, as highlighted by Respondent 7 from the Target IPP, who noted that experts often learn by experimenting with different solutions before arriving at the most effective one. This iterative process fosters adaptability and continuous improvement in technological development. Similarly, Respondent 15 from the Target IPP emphasized that navigating challenges such as grid constraints and new technologies has pushed the organisation into unfamiliar territory, prompting deeper conversations and collaborative problem-solving. These experiences underscore the role of discomfort and experimentation as catalysts for innovation and strategic advancement in the renewable energy sector.

5.6 Target Trader summary of Dynamic Capabilities

5.6.1 Sensing Capabilities:

Market-driven innovation Traders focus on contractual, organisational, and process-driven innovations rather than technology-driven ones. Market opportunities arise from customer needs, which dictate service offerings. By maintaining a customer-centric approach, traders can develop tailored financial solutions that align with evolving market conditions. Increased collaboration with the banking sector and more customers has led to increased funding, enabling the firm to co-develop financial solutions in collaboration with banks. These collaborations facilitate risk mitigation, optimise transaction structures,

and enhance financial viability for renewable energy projects.

Whilst Target IPP depends on the product development team and the strategy at C-Suite level two to acquire or develop emerging technologies, in contrast, the Target Trader relies on the business development team to leverage its network and gain insights into the operations of the technologies employed by the generating facilities. Although the Target Trader does not currently invest in R&D activities, it is important to note that in its infant stages the Target Trader established their own trading platform to manage customer interactions and energy generation forecasts. This investment has resulted in the creation of unique, hard-to-replicate software technology used within the organisation, which is continuously enhanced by the internal IT manager.

5.6.2 Seizing Capabilities:

In comparison to the Target IPP which solely looks at PV opportunities the Target Trader is technology agnostic. The Target Traders operates in a technology-agnostic environment, adapting contractual mechanisms and risk management strategies rather than physical infrastructure. This flexibility allows the Target Traders to remain responsive to market fluctuations and regulatory changes.

Traders highlighted that rather than technological advancements, the sector's main innovations are related to market adaptation and financial structuring. This includes dealing with the capital-intensive nature of renewable energy projects, which requires new financing models to make such projects feasible.

5.6.3 Transformational Capabilities

The Target Trader has demonstrated strong reconfiguration dynamic capabilities by proactively adapting its business model to emerging technologies such as hybrid solutions and BESS. Expert insights highlight the growing potential of integrating BESS with renewable energy projects to enhance grid stability and mitigate intermittency challenges (Adeyinka et al., 2024; León Gómez et al., 2023). In response, the Target Trader has not only recognised these opportunities but also initiated tariff incentives to encourage the supply of battery-powered dispatchable power, particularly during peak

demand periods (Supriyanto et al., 2022; Meier et al., 2015). This strategic approach reflects key elements of reconfiguration capability, including the ability to identify critical operational routines, modify processes to align with evolving market conditions, and design effective incentives that foster innovation (Girod & Whittington, 2017; Zhou et al., 2019).

Furthermore, by remaining closely connected to technological advancements and customer needs, and by leveraging specialised complementary assets, the Target Trader exemplifies how renewable electricity firms can dynamically adjust to environmental changes and revised business models through knowledge-sharing and adaptive governance (Hermundsdottir et al., 2024; Helfat & Martin, 2015).

Expert Respondents 1, 4 and 5 suggested exploring AI and big data management technologies to enhance operational efficiency, particularly for managing spreadsheets and mitigating forecasting penalties under market codes. Implementing AI-driven analytics can improve decision-making accuracy, optimise energy trading strategies, and enhance regulatory compliance.

5.6.4 Technological Congruence Capabilities

The acquisition of the trading platform software by the trader demonstrates their technical alignment and capability. They successfully developed technology that is difficult to replicate, continuously enhancing it through internal resources. The trader highlighted that the software development was driven by a growing customer base, ensuring that business development needs aligned with customer needs to accurately forecast energy requirements. However, it is important to note that this software was developed before the introduction of renewable energy transition policy instruments. Consequently, the trader has not yet fully realised the impact of the recent energy policy changes on the organisation, as new PPAs are still being negotiated. Organisational changes will only occur once the projects are constructed and operational.

The Target Trader’s responses focus on how businesses can align their technological strategies with the evolving market, particularly in relation to the financial side of renewable energy projects. According to the Target Trader’s response

The Target Trader positioned themselves as central actors in aligning technological solutions with financial incentives, pricing mechanisms, and prevailing regulatory frameworks.

5.7 RET policy instruments that enable dynamic capabilities and contribute to the JET objectives

While renewable electricity firms are inherently self-motivated, the diversity among them makes it challenging for policymakers to create a unified policy that aligns the beliefs and practices of a significant majority. However, it can be positively assumed that being corporate entities, these firms will comply with laws without requiring concrete incentives.

Respondent 7 from the Target IPP and Respondent 1, an expert, both highlighted a persistent information gap within society regarding the renewable energy transition. They noted that limited public understanding of the objectives, mechanisms, and practical implications of the transition has contributed to misaligned expectations, resistance at community level, and uncertainty about the roles of different actors within the energy system.

Literature advises that learning tools are appropriate policy instruments where there is insufficient information about target populations and where policymakers are uncertain about which approaches will be most effective in achieving desired behavioural outcomes (Schneider & Ingram, 1993; Sabatier, 2007). Implement educational programs to help communities understand C&I projects and their limitations, ensuring that private sector projects are not unnecessarily paused by disgruntled communities that expect same or similar benefits of ownership in REIPPPP (Tallberg, 2002).

Therefore, authority policy tools should be developed alongside capacity-building tools to help communities understand the energy transition and the roles of renewable energy firms (Tallberg, 2002). This approach will also help manage expectations about community education, job creation, and the limitations private IPPs face compared to fully government-supported REIPPPs. The effectiveness of authority policy and capacity building policy tools was supported by the Target Trader participant, highlighting that projects that had a focus supporting the workforce and local economies through training programs, creating clean energy jobs, and investing in local infrastructure can make a significant difference. Consequently, it will be essential to combine authority and capacity tools with sanctions or

enforcement measures to address issues like the construction mafia and contractors who engage in corporate bullying to evade compliance with local content requirements outlined in contracts (Tallberg, 2002; Davies & Malik, 2024; Gómez-Quintero et al., 2023).

Although some of the case study experts have highlighted that coal dependent communities have benefitted the least from most RET policy instruments, other experts said its important not to disincentivise private sector from contributing the energy transition even though their contributions to the “Just” aspect is not as significant.

5.8 Summary of Discussion

The study was guided by three core research questions, operationalised through a set of propositions in Chapter 2. Together, these propositions provided a structured analytical lens to test how renewable electricity firms interpret, respond to, and are shaped by renewable energy transition (RET) policy instruments in South Africa.

Research Question 1 examined how RET policy instruments socially construct target populations and allocate benefits and burdens.
This question was theoretically anchored in the Social Construction of Target Populations Framework, with propositions distinguishing between advantaged, contenders, dependents, and deviants.

Research Question 2 explored how renewable electricity firms develop and deploy dynamic capabilities (sensing, seizing, reconfiguring, technological congruence) in response to RET policy instruments.
Propositions in Chapter 2 operationalised each micro-foundation of the Dynamic Capabilities Framework.

Research Question 3 focused on policy design: identifying which types and combinations of RET policy instruments would both enable firm-level competitiveness and contribute meaningfully to all JET objectives.

The empirical findings from respondents in Chapters 4 and 5 provide strong validation of this conceptual structure and allow for cross-question synthesis.

Respondent feedback confirmed the Chapter 2 propositions that renewable electricity firms (IPPs and traders), financiers, and large energy users are socially constructed as advantaged and deserving, accruing the greatest benefits from the Schedule II ERA amendments—such as deregulated generation, wheeling rights, and expanded market participation—while facing limited compliance burdens. In contrast, coal-dependent communities and smaller value-chain participants were positively construed but politically weak, bearing disproportionate adjustment costs (including reskilling, relocation, and income loss) and receiving fewer direct benefits, while Eskom was negatively constructed as a contender due to governance and efficiency failures despite retaining influence over grid access. Deviant actors, including construction mafias and non-compliant contractors, were uniformly identified as undermining policy objectives and receiving no formal benefits, underscoring that RET policy instruments are not neutral but embed political judgments that shape the distribution of transition benefits and burdens.

Target IPPs demonstrated: Strong sensing through policy networks, market intelligence, and regulatory engagement; Seizing through pilot projects (BESS, carbon credits), financial innovation, and cross-regional knowledge transfer; Reconfiguring via ambidextrous organisational structures separating stable “core” activities from innovation-oriented “summit” teams; Technological congruence through AI-enabled forecasting, hybrid PV-BESS solutions, and iterative trial-and-error learning."

In contrast to IPPs, Target Traders exhibited market-driven sensing capabilities centered on customer demand, banking relationships, and price risk management rather than regulatory foresight. Their seizing behaviour was primarily expressed through contractual innovation, aggregation models, and liquidity provision, while reconfiguration occurred through tariff design and incentives for dispatchable power rather than physical asset transformation. Technological congruence was achieved through proprietary trading platforms that integrate forecasting, pricing, and compliance, validating the proposition that RET policy instruments activate differentiated capability configurations depending on firms’ business models, regulatory exposure, and asset intensity rather than producing uniform responses.

The study demonstrates that renewable electricity firms can and do remain competitive under RET policy instruments when those instruments activate dynamic capabilities. However, competitiveness alone does not guarantee a just transition. Achieving all JET objectives

requires intentional policy mixes that integrate authority, incentives, capacity building, learning, and enforcement.

In this sense, the JET is not only a technological or market transition, but a policy design challenge—one that must explicitly connect firm behaviour, social justice, and long-term system transformation

6 CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

Global energy issues are complicated and are strongly affected by politics (Kuzemko et al., 2019). Along with the rest of the world, South Africa has introduced various state interventions through RET policy instruments with the aim of providing solutions to the energy crisis (Crompton, Rod & Matsika, Ruwadzano, 2021). In the post-democratic era, the South African government has sought to balance the conflicting demands of market-driven reforms and the varying types of RET policy instruments to fulfil various economic and social aims (Hanto et al., 2022). These aims encompass the creation of a competitive market for affordable electricity, the advancement of black economic empowerment, economic development, and the promotion of a shift toward a more environmentally sustainable economy (Crompton, Rod & Matsika, Ruwadzano, 2021).

The 2021 amendments to the Electricity Regulation Act 4 of 2006 (ERA), which removed the licensing requirements for the various renewable electricity related activities generating, transmitting, and distributing and reselling electricity enabled IPPs to generate electricity without a license and provided traders with licenses to sell to multiple customers. This policy tool has increased competition and opened the flood gates to a number of IPPs, many backed by foreign investment and traders, promoting sustainable and affordable electricity in South Africa. Yet, South Africa's history of unclear policies has sometimes resulted in unintended consequences and constant market changes, particularly in relation to energy policy instruments. The introduction of new RET policy instruments, such as carbon credits and renewable energy certificates for emerging economies, require these renewable electricity firms to develop strong DCs to maintain their competitive advantage.

The study set out to firstly, investigate the social dynamics surrounding the introduction of three specific energy policy instruments being, 2021 schedule II amendments to ERA (2006) in order to identify which groups are allocated benefits or bear burdens. Secondly, the study set out to explore how two target groups: a new entrant multinational IPP (Target IPP) and a domestic electricity re-seller holding a trading

license (Target Trader), respond to the implementation of RET policy instruments. Finally, the study set out to provide policy recommendations of the type of policy tools that may enhance competitive advantage for renewable energy firms and support South Africa's JET objectives.

The following research questions were posed, which the study aimed to address:

1. What is the social construction of the target populations of the selected RET policy instrument being 2021 schedule II amendments to ERA (2006) ?
2. How do renewable electricity firms operating in South Africa sense, seize, transform and achieve technological congruence when the government implemented RET policy instruments in the period 2019-2024 ?
3. What types of RET policy instruments would enable renewable electricity firms both maintain competitiveness and contribute towards the achievement of all JET objectives?

6.2 Statement of propositions

The study aimed to address the above mentioned research questions by performing a comprehensive literature review to create a conceptual framework and put forward the following propositions. Table *10* below summarises the alignment between the research propositions set out in Chapter 2 of this study and highlights the key findings derived from the study. It provides a concise mapping of theoretical expectations to empirical evidence.

Table 10: Summary of propositions and key findings

Proposition	Integrated Findings
P1: Advantaged groups have positive social construction and strong political power. Advantaged population receives more benefits and fewer burdens.	Renewable energy firms (IPPs and traders), banks, and large energy users were socially constructed as deserving and powerful, receiving significant benefits from Schedule II ERA amendments. Benefits included deregulated generation and wheeling rights; burdens were minimal, limited to registration and licensing requirements.
P2: Contenders have negative social construction and moderate political power. Contenders receive sub-rosa benefits and overt burdens.	Eskom was framed negatively due to inefficiencies and governance failures, facing symbolic burdens and operational constraints. Eskom retained some influence but bore responsibility for grid upgrades without adequate financial capacity.
P3: Dependents have positive social construction and weak political power. Dependents receive fewer benefits and more burdens.	Coal-dependent communities and small businesses were positively constructed but lacked political power, receiving fewer benefits. Burdens included reskilling requirements and limited access to RET incentives.
P4: Deviants have negative social construction and weak political power. Deviants receive fewer benefits and more burdens.	Construction mafias and non-compliant subcontractors were negatively constructed and powerless. They gained no benefits and imposed additional risks on projects through coercive practices.
P5: Sensing dynamic capabilities include stakeholder networks and R&D.	IPPs and traders actively monitored policy changes through industry associations, regulatory consultations, and global networks.
P6: Seizing dynamic capabilities include new products and governance protocols.	IPPs demonstrated seizing capabilities through pilot projects, innovative contracting models, and flexible PPAs; traders focused on portfolio liquidity and bespoke trading platforms.
P7: Reconfiguring dynamic capabilities include structural and process changes.	IPPs adopted ambidextrous structures and specialised teams; traders adapted by incentivising battery-powered dispatchable power and revising tariff structures.
P8: Technological congruence capabilities include advanced technologies.	IPPs invested in AI-driven forecasting, bespoke EMS, bifacial solar panels, and hybrid PV-BESS solutions; traders developed proprietary trading software for forecasting and customer management.
P9: RET Policy instruments that are both competitive and contribute to JET objectives	Using a well-balanced combination of regulatory tools, financial incentives, capacity building, and learning measures enables renewable electricity firms to remain competitive while supporting all JET objectives.

6.3 Major findings and key conclusions of the study

This section outlines the major findings from this study, arranged as responses to research questions posed at the beginning of the study.

6.3.1 Research question 1

The introduction of Schedule 2 of the Electricity Regulation Act marked a pivotal shift in South Africa's renewable energy landscape. This liberalisation reduced Eskom's monopoly, stimulated private generation, and attracted significant investment into renewable infrastructure (Murombo, 2022; Department of Mineral Resources and Energy, 2021). Respondents highlight the manufacturing sector's struggle to keep up with the demand created by the transition. Many companies are still importing products, but there is potential for local manufacturing growth, particularly if the necessary technology and support are provided. This could help create local jobs and contribute to long-term economic benefits.

Several respondents mentioned that the policy instruments and the renewable energy transition are contributing to job creation and skills development. With more projects being developed, there is an opportunity for a wider range of skills to be developed, from construction to operations, and even in new areas like marketing and legal aspects of energy projects. Despite the positive contributions of exiting RET policy instruments, several respondents discussed the potential for liberalisation in the energy market, where private players could eventually sell power directly into a market, rather than through long-term contracts. This would create a more dynamic market with daily and instantaneous trading of power, offering greater opportunities for trading and flexibility.

These results highlight several crucial factors that affect the development and success of renewable energy projects in South Africa. The removal of the generation license cap and the growing significance of carbon credits and tax incentives have opened new opportunities for businesses in the sector. Additionally, despite these advances, challenges such as bureaucratic red tape and the complexity of grid allocation remain

significant barriers. Nevertheless, renewable electricity firms are actively leveraging these regulatory changes to expand their market presence and meet the increasing energy demands of large industries like mining and manufacturing.

The issue of carbon credits and RECs was mentioned in relation to their limited value in the South African context. While some IPPs recognise opportunities, the low value of these credits has hindered their full potential. Interview responses revealed that renewable electricity firms are actively exploring technological opportunities but are influenced by market conditions, regulatory frameworks, and financial constraints. Key technological advancements focus on improving operational efficiency, data processing, and better decision-making. However, the sector remains risk-averse, with a strong preference for commercially proven technologies. Strategic partnerships with technology providers play an essential role in fostering innovation, while carbon credits and RECs are currently underutilised due to low financial incentives.

6.3.2 Research question 2

Two emerging aspects of both the Target IPP and Target Trader operational strategy highlighted the impact of market adaptation and policy awareness. The study found that both Target IPP and Target Trader regularly track regulatory developments and engages key stakeholders to ensure that it knows what drives policy changes. Neither firm has created systems to monitor political changes and that this was through subscriptions and external networks, renewable electricity firm commented that improving how policy updates are communicated internally would benefit decision-making and strategic planning (SustainAbility and Institute, 2023).

Technological adjustment and upgradation still play a vital role in Target IPP competitive edge in the renewable energy space. It provides innovative solutions including battery storage, hybrid energy systems, and high-efficiency solar panels. Target IPP is at the forefront of renewable energy through partnerships with technology vendors, research institutions, and industry experts (Alshehri et al., 2020).

Although respondents highlighted advanced technologies such as AI, BESS, and EMS as critical for achieving technological congruence, a key insight emerging from this

study is South Africa's untapped potential in waste-to-energy (WtE) solutions. With escalating waste generation driven by urbanisation and industrial activity, WtE offers a dual advantage: addressing environmental challenges associated with landfill overflow while providing a reliable base-load power source to complement intermittent renewables like solar and wind. Leveraging WtE technologies could significantly enhance energy security, reduce greenhouse gas emissions, and create new economic opportunities through job creation and localised manufacturing. This opportunity positions WtE as a strategic component of South Africa's clean energy transition, aligning with just energy transition objectives and global sustainability commitments.

The study also found important opportunities and linkages as well as challenges with South Africa's renewable energy transition policies. Due to favorable policy updates, including modifications to schedule II of ERA (2006) and the imposition of carbon credits, new market opportunities opened for renewable electricity firms. These policy changes have lowered barriers to entry, incentivised foreign investment, and spurred job creation in the renewable energy sector.

The implementation of the ERA Act introduces a significant competitive challenge for IPPs and traders as Eskom transitions from a vertically integrated monopoly to an active market participant. While the Act separates transmission from generation, Eskom's dual role as generator and grid operator creates a structural imbalance that could restrict IPPs' ability to connect to the grid and sell power efficiently. This dynamic risks reinforcing Eskom's dominance and perpetuating inefficiencies, as historically, monopolistic structures have lacked incentives to innovate or operate cost-effectively. For IPPs and traders, this means navigating potential access barriers, pricing distortions, and regulatory uncertainty, all of which could undermine the objectives of a liberalised and competitive electricity market.

The implementation of the new market code underscores the growing importance of advanced technological systems in managing South Africa's evolving energy landscape. Central to this is the supervisory control and data acquisition (SCADA) system, which enables real-time monitoring and prediction of energy output, ensuring grid stability and operational efficiency. By forecasting how electricity will flow

throughout the day, SCADA provides the foundation for balancing supply and demand in a more dynamic market environment. As the sector transitions to competitive trading structures, science and technology will play a pivotal role in driving innovation moving beyond traditional manual processes toward integrated, automated solutions that support accurate forecasting, responsive dispatch, and seamless market participation.

6.3.3 Research question 3

For policymakers, the study highlights the importance of stable, clear, and effective regulatory frameworks for a smooth energy transition. According to research, investors are discouraged, and the deployment of renewable energy projects is slow as bureaucratic inefficiencies and approval processes drag (Pretice, Brent & Kock, 2021). As such, the need to reduce the complexity of policy implementation and ensure alignment of regulatory frameworks will be critical to expedite South Africa's renewable energy transition.

For renewable energy firms, the research emphasizes the need for proactive engagement with policymakers and industry associations (Anekwe et al., 2024). Although renewable energy firms may not have a direct hand in making policy, they may expand their influence by engaging in policy debates, contributing data-driven insights, and developing partnerships with the stakeholders. Moreover, better internal processes will help in policy responsiveness such as improving information-sharing mechanisms and market intelligence systems that warrant companies a robust engagement with regulatory changes (Petrescu & Krishen, 2023; Ukani & Sinai, 2024).

6.4 RECOMMENDATIONS

6.4.1 Managerial recommendations for renewable electricity firms

Despite the wave of technological innovations in the renewable energy sector, many firms still rely heavily on manual processes such as Excel spreadsheets to manage critical operations like procurement, energy wheeling, and forecasting. This approach is increasingly inefficient as portfolios expand and the new electricity market code introduces more complex trading mechanisms. To remain competitive and reduce operational risk, there is an urgent need to digitise these systems and integrate advanced tools such as AI-driven energy management platforms. AI can enable real-time forecasting, automate compliance reporting, and optimise procurement strategies, ensuring scalability and accuracy as businesses grow and adapt to dynamic market conditions.

Streamline knowledge and leverage existing technology. If legal needs to send to the board then request that all departments streamline info to legal monthly and create a monthly notification system that goes to all departments from the consolidated basis. Legal could create a template that all parties agree on and when there is a change that is completed and sent to legal and each markets changes and implications is shown and updated monthly by legal and on an ad hoc basis by commercial intelligence team. It may be useful to extend the scope of work of legal who sit in the local entities to also play the role of “Government liaison” as Respondent 16 one of our experts put it. This person will not only play the streamlining role but is able to pre-empt where possible upcoming changes in regulation. This is not a new process in the Target IPP as it already is implemented in other parts of the region as explained by Respondent 14 of the Target IPP.

Cross pollination works well for IPP and thus they should investigate doing it more often and at a larger scale where three times a year either leader of department meet with other leaders in the shareholders portfolio. These collaborations will provide a platform to find innovative solutions that aim to (i) optimise systems (ii) emerging technologies (iii) how IPPs overcame certain challenges be it regulatory, commercial contractual.

Encourage the Target Trader to actively seek out and communicate policy changes that could benefit customers, such as tax incentives for renewable energy purchases. Move beyond reliance on customers for information; implement proactive sensing activities within the firm to stay ahead of market developments.

Further, the Target Trader should keep abreast of emerging technologies to negotiate better terms with IPPs based on the efficiency of their offerings. It must be noted that Expert participants emphasized the need for renewable electricity firms to invest in AI and big data management technologies and resources. Allocate resources towards R&D to develop advanced forecasting technologies, thereby minimising the risk of market code penalties. Develop innovative solutions to tackle issues related to trader guarantees, like approaches taken by IPPs.

6.4.2 Policy recommendations

The paper concludes by making some recommendations aimed at strengthening energy policy instruments and facilitating a just and sustainable energy transition. Policy drafters must improve the implementation of policy measures to reduce delays and bureaucratic inefficiencies that hold back renewable energy projects. Streamlining approval processes, ensuring timely execution of regulatory decisions, and enhancing coordination among regulatory bodies will create a more business-friendly environment for renewable energy investments (Kumar et al., 2022).

Modernisation of grid infrastructure is necessary to accommodate an increasing proportion of renewable energy in SA's energy mix. The country's electricity grid was built for large-scale coal-based power generation, and it was not suited for the integration of decentralised energy supply by solar and wind. It will also be critical to address these technical barriers through upgrading transmission and distribution networks, investing in smart grid technologies, and expanding energy storage capacity (Zheng et al., 2024).

Policy drafters to prioritise enhancement of stakeholder engagement and keep the energy transition as inclusive and participative as possible. More effort is needed by policymakers to work with the private sector, industry associations, local communities,

and labor unions to mitigate the socio-economic impact of JET. Public–private partnerships (PPP) have great potential to enable large-scale renewable energy projects while improving the equitable distribution of the benefits of the transition (Oduro, Simpa and Ekechukwu, 2024).

It is vital to focus on workforce retraining and job creation programs to assist workers in transitioning out of fossil into renewable energy sectors. Develop Training Programs: Government agencies, educational institutions, and renewable energy companies should collaborate to create training programs that teach workers the necessary skills to enter the green economy. Communities that depend on non-renewable energy sources, especially coal, that put a tremendous burden on their environment and health must also be prioritised (Hanto et al., 2022).

Public awareness and education campaigns also need to be expanded to enhance knowledge and understanding of RET policies, financial incentives, and renewable energy solutions. Adoption rates are slowed in large part by a lack of awareness of these opportunities by many businesses and communities. This gap can be addressed through targeted awareness programs, workshops and informational campaigns to increase uptake in energy transition (Altunay, Bergek & Palm, 2021).

6.5 Suggestions for future research

Introducing inducement-based policy tools can accelerate innovation and competitiveness in renewable electricity markets. Incentivised mechanisms such as subsidies for R&D pilot projects during early stages, followed by results-based long-term policies embedded within broader frameworks, have proven effective in promoting technological advancement and market adoption (Pless, 2024; Petrin, 2018). **Incentive instruments** (including tax incentives, carbon credits, renewable energy certificates, and procurement mechanisms) stimulate investment, technological upgrading, and innovation aligned with decarbonisation objectives. Additionally, implementing payback reforms through “use tariffs,” where newly connecting IPPs compensate those who financed grid infrastructure, can enhance cost recovery and encourage investment in transmission assets (Alizamir, de Véricourt, & Sun, 2016; Yamamoto, 2018).

These strategies align with the best global practices for renewable energy policy instruments, which emphasize combining financial incentives, tariff-based mechanisms, and strategic planning to foster competitive advantage and achieve JET objectives (Azhgaliyeva, Belitski, Kalyuzhnova, & Romanov, 2018; Qudrat-Ullah, 2022).

Authority instruments (such as deregulation, licensing reform, market codes, and grid access rules) reduce regulatory uncertainty and enable market entry and scale, thereby supporting firm competitiveness. Capacity-building instruments (such as skills development, infrastructure investment, and support for local manufacturing) enable firms and communities to participate meaningfully in the transition, supporting employment creation and economic inclusion. Learning and symbolic instruments (including stakeholder engagement, information dissemination, and policy signalling) align firm behaviour with societal goals and facilitate adaptive capability development under dynamic policy conditions.

However, RET policy instruments that are deployed as an integrated policy mix, rather than in isolation are more likely to activate firm-level dynamic capabilities (sensing, seizing, reconfiguring, and technological congruence) while advancing JET outcomes related to energy security, economic growth, job creation, and social justice.Table *11* below, provides an updated summary of RET and JET policy design combinations. Each combination integrates policy tools and identifies dynamic capabilities required by renewable electricity firms. It also explains how each combination supports JET objectives such as decarbonisation, job creation, skills development, and economic growth.

Table 11: DC & RET policy instrument design combinations

Policy Design	Components of Policy Design	Dynamic Capabilities Required (IPP)	Dynamic Capabilities Required (Trader)	Detailed JET Contribution
1	Authority + Sanction + Incentive	Technological Congruence (AI forecasting, hybrid PV-BESS) and Seizing (carbon	Seizing (contract innovation, carbon credit trading) and Sensing (market intelligence)	Supports decarbonisation by reducing emissions, enables carbon

		credit pilots)		trading for exporters, and aligns with global competitiveness goals.
2	Authority + Capacity + Incentive	Reconfiguring (grid-scale BESS integration, land development teams) and Seizing (new PPAs)	Technological Congruence (trading platform optimisation) and Seizing (aggregation models)	Facilitates renewable integration, alleviates load-shedding, promotes infrastructure investment, and drives economic growth.
3	Incentive + Symbolic + Capacity	Seizing (capital structuring, foreign investment attraction) and Technological Congruence (advanced PV modules)	Sensing (policy engagement) and Seizing (financial product innovation)	Drives foreign investment, job creation, and skills development through localised manufacturing and project deployment.
4	Symbolic + Incentive	Seizing (REC monetisation, hybrid solutions) and Technological Congruence (AI-driven EMS)	Seizing (REC trading, flexible contracts) and Sensing (customer sustainability needs)	Enhances corporate sustainability, creates new revenue streams, and supports climate change mitigation.

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APPENDIX 1: Interview Schedule

TITLE: Energy policy innovation and dynamic capabilities in renewable electricity firms in South Africa

Qualitative Research: Semi-Structured Interview

The Just Energy Transition (JET) is at the heart of South Africa's plans to move from a fossil-fuel-based energy system towards one based on renewable sources as well as addressing socio-economic structural inequalities and environmental degradation. Policy instruments are used to motivate or coerce a certain group in society to comply with specific law, guidelines or desired behaviour. In order to achieve the JET objectives the South African government has introduced a number of renewable energy transition (RET) policy instruments such as new renewable energy independent power producer programme (REIPPP) rounds, the 2023 enhanced renewable energy tax incentive through the inclusion of S12BA in the Income Tax Act 58 of 1962 (ITA), the integrated resource plan (IRP 2023) and renewable energy certificates (RECS) to name a few.

The purpose of this study is to:

(i) understand the target populations and the allocation of burdens and benefits of RET policy instruments, particularly the 2021 schedule II Amendments of ERA (2006);

(ii) utilise the Dynamic Capabilities Framework (DCF) to understand how renewable electricity firms, particularly independent power producers (IPPs) and traders (Renewable energy firms) identify, adapt, transform their operational strategies and align their technological know-how with business opportunities in response to the South African governments introduction of RET policy instruments in the period 2019-2024; and

(iii) recommend to renewable energy firms how they can develop dynamic capabilities that will enable them to respond to renewable energy policy instruments and a contribution towards the JET objectives.

By completing the questions below, you agree to participate in this study. All information gathered from this research will be treated with complete confidentiality and anonymity. The data obtained will be stored in a secured and protected environment.

Kindly answer the questions below.

Section 1: Background		
No	**Renewable electricity firm (REF)**	**Experts**
1.	Please describe your role in the organisation?	Please can you briefly describe your experience in the renewable energy industry?
2.	What is your understanding of the Just Energy Transition?	What is your understanding of the Just Energy Transition?
3.	Describe the role of the firm in the Just Energy Transition?	Describe the role of IPPs and Traders in the Just Energy Transition?
4.	Which groups and / persons have been influential in shaping the RET policies in recent years?	Which groups and / persons have been influential in shaping the RET policies in recent years?
Section 2: How do Renewable energy firms sense, seize, reconfigure, and align their technological capabilities to business opportunities and/or risks and maintain competitive advantage in response to the South African government's introduction of RET policy instruments?		
Part 1: First element of the Dynamic Capabilities Framework – "Sensing" Sensing refers to a company's capacity to analyse and scan the market and identify its business opportunities and recognise and address its challenges.		
5.	How do IPPs and/or Traders keep up to date with market changes and RET policies, and how does this knowledge flow into the organisation?	How do IPPs and/or Traders keep up to date with market changes and RET policy instruments, and how does this knowledge flow into the organisation?
6.	Which Departments are involved in exploring new technological opportunities and how do they do this?	How do IPPs and Traders explore new technological opportunities?
7.	The South African government has deployed a number of renewable energy policy instruments to achieve objectives towards the Just Energy Transition (JET), Schedule 2 ERA amendments, ICGAR, Carbon Credits, to name a few. Can you describe the benefits firm identified from any RET policy instrument from 2019- 2024? Who benefited the most?	The South African government has deployed a number of renewable energy policy instruments to achieve objectives towards the Just Energy Transition (JET), Schedule 2 ERA amendments, ICGAR, Carbon Credits, to name a few. Can you describe the benefits firm identified from any RET policy instrument from 2019 -2024? Who benefited the most?
8.	Did any of the opportunities the firm identified from the RET policy instrument/s result in the increase of renewable energy supply in South Africa? If yes please explain how?	Did any of the opportunities the firm identified from the RET policy instrument/s result in the increase of renewable energy supply in South Africa? If yes please explain how?
Part 2: Second element of the Dynamic Capabilities Framework – "Seizing" *Effective seizing includes designing revenue architectures and business cases, communicating business case potential with stakeholders, minimising decision errors, controlling bottlenecks, demonstrating leadership, raising capital and planning to execute.*		

9.	What governance protocols do IPPs and Traders must follow to embrace the benefits/opportunities of these RET policy instruments?	What governance protocols do IPPs and Traders must follow to embrace the benefits/opportunities of these RET policy instruments?
10.	What new products and/or services has the firm been able to provide because of the introduction of any of the RET Instrument post 2021?	What new products and/or services has the firm been able to provide because of the introduction of any of the RET Instrument post 2021?
11.	Did any of the opportunities the firm identified from the RET policy instrument/s did result in job creation and skills development opportunities within the firm? If yes please explain provide details?	Did the opportunities identified by IPPs and Traders result in job creation and/or skills development within the firm? If yes please explain provide details?
12.	Did any of the opportunities the firm identified from the RET policy instrument/s did result in the job creation and skills development to third parties external to the firm and more specifically in coal dependent communities? If yes, provide details?	Did any of the opportunities identified by IPPs and Traders result in the job creation and skills development to third parties external to the firm and specifically to people in coal dependent communities? If yes, provide details?
Part 3: Third element of the Dynamic Capabilities Framework – "Reconfiguration" *To realign and reconfigure assets and organisational structures as the business adapts to changing markets, managers must identify which routines are vital for operational efficiency and which processes require modification to align with the changing environment and revised business models.*		
13.	What changes in the firm's organisational structure, processes and activities occurred because of any of these RET policy instruments, if any?	What changes in the firm's organisational structure, processes and activities would have been required because of any of these RET policy instruments, if any?
14.	Has the implementation of any of these RET instruments resulted in the identification of specialised complementary assets, such as battery energy storage in relation to PV solar and wind?	Has the implementation of any of these RET instruments resulted in the identification of specialised complementary assets, such as battery energy storage in relation to PV solar and wind?
15.	The South African government has deployed a number of renewable energy policy instruments to achieve objectives towards the Just Energy Transition (JET), Schedule 2 ERA amendments, ICGAR, Carbon Credits, to name a few. Can you describe the burdens or challenges firm identified from any RET policy instrument from 2021?	The South African government has deployed a number of renewable energy policy instruments to achieve objectives towards the Just Energy Transition (JET), Schedule 2 ERA amendments, ICGAR, Carbon Credits, to name a few. Can you describe the burdens or challenges IPPs and Traders were allocated from any RET policy instrument from 2021? Who benefited the least?

	Who benefited the least?	
16.	Did any of the burdens and or penalties the firm identified from the introduction of any RET policy instruments lead job losses, job creation or skills development? If yes, please provide details	Did any of the burdens and or penalties the firm identified from the introduction of any RET policy instruments lead job losses, job creation or skills development? If yes, please provide details
Part 4: Fourth element of the Dynamic Capabilities Framework – "Technological congruence" *Technological Congruence occurs when a firm's Dynamic Capabilities achieve congruence between technological opportunities and customer needs. Therefore, firms must simultaneously develop or acquire new resources suitable for the new industry.*		
17.	What emerging or advanced technologies did the firm have to develop or acquire to facilitate and embrace the opportunities of the RET policy instruments?	What emerging or advanced technologies do you think IPPs and/or Traders would need to develop or acquire to embrace the opportunities introduced by RET instruments sufficiently?
18.	How did the firm align its technological know-how to embrace opportunities introduced by the RET Instruments or any other RET instruments to align with the firm's business opportunities?	In your experience how have IPPs and Traders aligned their technological know-how to embrace opportunities introduced by the RET Instruments or any other RET instruments to align with the firm's business opportunities?
19.	Did any of the burdens, challenges and or penalties the firm identified from the introduction of any RET policy instruments lead to a reduction in supply or the inability to provide renewable energy? If yes, please provide details?	Do you think any of the burdens, challenges and or penalties of any of these RET policy instruments resulted in a reduction in supply or the inability to provide renewable energy? If yes, please provide details?
20.	In your experience, what is the single most impactful aspect of any RET instruments that has been most helpful to coal dependent communities?	In your experience, what is the single most impactful aspect of any RET instruments that has been most helpful to coal dependent communities?

APPENDIX-1: Letter Requesting Permission



Wits Business School
Graduate School of Business Administration
Master of Management in the field of Innovation Studies
2 St David's Pl & St Andrews Road, Park town,
Johannesburg, 2193 TEL / FAX: 011 717 3600 / 011 717
3514
Website: www.wbs.ac.za

20 January 2025

Dear Employer,

Re: Permission to conduct research

As you are aware, I am a student at the Wits Business School studying towards a Master of Management in the field of Innovation studies (MMIS). As part of the Master's programme, I am required to conduct a comprehensive research study to meet all the requirements. I am seeking permission to do research by interviewing selected colleagues in the organisation.

South Africa has introduced a number of renewable energy technology policy instruments between 2019 and 2024 including but not limited to (i) amendments to the Electricity Regulation Act 4 of 2006 (ERA); (ii) S12BA enhanced renewable energy tax incentive (iii) Interim Grid Capacity Allocation Rules (IGCAR) and (iv) Green Attributes such as carbon credits (Carbon Credits) and renewable energy certificates (RECS). I am conducting my research on the policy design of these renewable energy technology policy instruments and how renewable energy firms in SA have engaged in innovative activities in their response to government's implementation of these renewable energy technology policy instruments.

The aim of the research is firstly, to understand the innovative capabilities, processes and activities renewable electricity firms use to capture value or mitigate risk when new renewable energy policy tools/instruments are introduced. The second aim of this research is to suggest questions for future researchers to investigate how these renewable energy firms could develop dynamic capabilities to not only remain competitive but also to contribute to the just energy transition goals.

If the selected colleagues agree, they will be interviewed on the elements of the dynamic capabilities framework, which include (i) sense (search and identify), (ii) seize (evaluate and plan implementation), (iii) transform (update assets resources and business model); and (iv) technological congruence (align technical capabilities with business model and opportunities). Selected colleagues will also be interviewed on the just energy transition and the benefits and burdens of the renewable energy technology policy instruments they are knowledgeable about, which were implemented by the government during the period 2019-2024.

Participants will be asked to give their written consent before the research begins. Their responses will be treated confidentially, and identities (their names and the name of the organisation) will be anonymous unless otherwise expressly indicated. Individual privacy will be maintained in all published and written data resulting from the study. Data collected will form part of my research study and will be written as a research report. The report will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

The estimated time for the semi-structured interview is 60 minutes and will be conducted in the manner with which you are most comfortable. Your contribution, time and feedback would be appreciated. All information collected from this study will be confidential, anonymous and the data obtained will be stored in an environment protected with a username and password. I will contact you to make an appointment for a suitable time.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission at any time during this project

without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study.

I therefore request permission in writing to conduct my research at your organisation. The permission letter should be on your organisation's headed paper, signed and dated, and specifically referring to me by name and the title of my study.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,

Khumoetsile Khumalo
Cell: 082 3103626
Email: 459511@students.wits.ac.za

Dr Diran Soumonni (supervisor)
diran.soumonni@wits.ac.za.

APPENDIX 3: Participant Consent form

The following consent form will be signed by interview participants:

Consent Form

Title of the Project: Energy policy innovation and dynamic capabilities in renewable electricity firms in South Africa

Name of the Researcher: Khumoetsile Kotelo

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

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that direct quotations from my interview may be used by the researcher in their research report	YES	NO
I agree that other researchers may use the information I provide in my interview(depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on	YES	NO

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