

MINI-THESIS

ON

**SOUTH AFRICA'S ENERGY CRISIS AND ITS IMPLICATION FOR TRADE
DYNAMICS**

SUBMITTED BY

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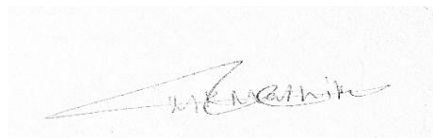
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PLAGIARISM DECLARATION

I, **Miriam Karabo Mathibe**, declare that '**South Africa's Energy Crisis and its Implication for Trade Dynamics**' is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references'.



Miriam Karabo Mathibe

This Mini-Thesis has been submitted for examination with my approval as Supervisor.



Prof. Riekie Wandrag

November, 2024

DEDICATION

This thesis is dedicated to the great women in my life. My mother Dikeledi Matlou Mathibe, my grandmother Mahuhudi Mphela and all the great women who have come before me who have planted seeds of hard work, dedication and resilience. *di thuto tsa lona, di dula lenna ka di nako tsohle*

Di Nare Wee!!!

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“Whatever you do, do it all for the glory of God” – Colossians 3:23 (NKJV)

This research has shown that God knew my path before I was aware of it myself. In this regard, this study, the work that went into it, the purpose behind it and the reason for my existence are all part of his grand design. This reveals that everything I attempt to do should not be done by my own efforts, and these endeavours shouldn't be done for my own benefit.

As scripture indication, God will speak through his people the way he spoke through his servants. Thus, my hope is that this research extends further than academic circles but have a positive impact on people's lives and livelihoods. May this work serve as an instrument for change and inspire those who read it to contribute meaningfully to society.

To my Mother and my Siblings

Thank you for supporting my dreams and always being there for me without fail. Throughout this journey you have been my biggest supporter. Your unwavering and ever constant support and long calls have kept me going, even when things got really tough. Your sacrifices and hard work have shaped me into the woman I am today. I am super great full for all you have done.

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KEYWORDS

Energy crisis

Trade dynamics

Energy policy

Energy security

Trade-intensive industries

Renewable energy transition

International trade

Legal and policy reform

Sustainable energy

ACRONYMS AND ABBREVIATIONS

ESC	Electricity Supply Commission
DME	Department of Mineral Energy
IRP	Integrated Resource Plan
PMI	Purchasing Managers Index
ACI	Agribusiness Confidence Index
GDP	Gross Domestic Product
ERA	Electricity Regulation Act
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
JET-IP	Just Energy Transition Investment Plan
SAREM	South African Renewable Energy Masterplan
NERSA	National Energy Regulator of South Africa
DEA	Danish Energy Agency
REA	Renewable Energy Act
RE	Renewable Energy
ESA	Electricity Supply Act
IPP	Independent Power Producers
R	Rand
H-O	Heckscher Ohlin
PPP	Public-Private Partnership
APDP	Automotive Production and Development Programme
NTT	New Trade Theory
IEA	International Energy Agency
TSO	Transmission System Operator SOC Ltd

ABSTRACT

Sustainable, efficient, and affordable access to energy is fundamental to encouraging, strengthening, and elevating trade-intensive industries, both domestically and internationally. Consequently, this has not been the case for South African industries as they bear the brunt and challenges of unsustainable, inefficient, and expensive energy, as a result of a 15-years plus and counting run of the ever-growing energy crisis. The crisis has proven to stunt growth and undermine the capacity of South African industries to contribute effectively to the nation's economy. This position has made it necessary to explore how the South African legal and policy frameworks in view of the significance of access to stable and affordable energy in relation to stability and competitiveness trade in South Africa.

This study explored the implications of the South African energy crisis on trade dynamics. Investigating the relationship between sustainable and efficient energy and trade, the research seeks the potential benefit of reforming South African law and policies for trade. Using desktop research by gathering information and data from existing sources consisting of literature from primary and secondary sources, the study assessed the correlation between renewable energy policies and their adoption and the reduction of energy sustainability and efficiency. The study revealed that the energy crisis significantly affected trade to the point of economic deterioration. Data analysis demonstrated a reduction in a number of trade intensive sectors and GDP supporting the hypothesis that energy policies need to be reformed in order to have sustainable and stable energy supply. Because Denmark has achieved estimable success its intervention through legal and policy frameworks that promote renewable energy and reduction of fossil fuels usage, the study explored the Danish experience and draws lessons capable of being adapted to South Africa's unique situation. The study suggests that promotion and prioritisation renewable energy may contribute to building sustainable and efficient energy for trade. This finding emphasises on the importance of sustainable, forward-looking energy policies and laws in fostering trade competitiveness not only domestically but also on the global stage.

TABLE OF CONTENTS

DECLARATION.....	II
DEDICATION.....	III
ACKNOWLEDGEMENTS.....	IV
KEYWORDS.....	V
ACRONYMS AND ABBREVIATIONS.....	VI
ABSTRACT.....	VII

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction.....	1
1.2 Problem Statement.....	2
1.3 Research Questions.....	5
1.4 Delimitation of Study.....	6
1.5 Research Methodology	7
1.6 Chapter Outline.....	8

CHAPTER TWO: CONCEPTUALISING THE NEXUS BETWEEN ENERGY AND TRADE

2.1 Introduction.....	9
2.2 Defining the Nexus and the role of Energy in Trade	10
2.2.1 Defining the Nexus	11
2.2.2 Energy a Pillar of Trade	14
2.2.3 Theoretical Framework Linking Energy and Trade.....	15
2.3 Case study of Energy-Trade interdependence.....	18
2.3.1 Japan’s Fukushima Disaster	18
2.3.2 Europe Energy Crisis.....	18
2.3.3 Venezuela’s Energy Collapse	19
2.4 Energy Security and Global Trade competitiveness.....	20
2.5 Energy Policies and Laws Facilitating Trade.....	23
2.5.1 Overview of Energy policies in South Africa and Denmark.....	23
2.5.2 The Role of energy policies in Trade facilitation.....	24
2.5.3 Energy policies and Trade Agreements	25
2.6 Conclusion	26

CHAPTER THREE: SOUTH AFRICA’S ENERGY CRISIS AND ITS IMPLICATION ON TRADE INDUSTRIES

3.1 Introduction.....	28
3.2 Overview of South Africa’s Energy crisis.....	29
3.2.1 Historical context of the crisis.....	29
3.2.3 Current state of the crisis.....	30
3.2.3 Root cause of the energy crisis.....	31
3.3 Challenges in the energy sector and its impact on trade-intensive sectors	33
3.3.1 Sectoral Analysis	34
3.3.1.1 Mining.....	34
3.3.1.2 Manufacturing.....	35
3.3.1.3 Agriculture.....	37
3.3.2 Economic Ramifications.....	39
3.3.3 Impact on energy trade	41
3.4 Analysis of south Africa’s key Energy Policies and Laws.....	42
3.4.1 Integrated Resource Plan (IRP) 2019.....	45
3.4.2 Electricity Regulation Amendment Act.....	47
3.4.3 Judicial Intervention and Policy Gaps	48
3.5 Conclusion.....	51

CHAPTER FOUR: COMPARATIVE ANALYSIS OF INTERNATIONAL APPROACHES TO ENERGY: DENMARK

4.1 Introduction.....	53
4.2 Case study.....	54
4.2.1 Transition to Renewable energy: a model of sustainability and integration.....	54
4.2.2 Legal and policy framework supporting Denmark’s energy trade.....	56
4.3 Lessons for South Africa.....	58
4.3.1 Adapting Danish Strategies	58
4.3.2 Challenges and Opportunities	60
4.4 Conclusion	61

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction.....63

5.2 Summary of findings64

5.3 Recommendations.....66

BIBLIOGRAPY.....69

CHAPTER ONE:

INTRODUCTION AND BACKGROUND

1.1 Introduction

The study examines South Africa's energy crisis and its implication for trade dynamics. There are a number of reasons why such a study is important. Firstly, Trade is a critical and central driver for economic growth and development. It serves as a key ingredient in job creation, an increase in GDP, and a decrease in poverty. Secondly, it simply facilitates the exchange of goods and services, while it encourages productivity and innovation, simultaneously increasing competitiveness within both national and international markets. Thirdly, when it comes to trade, efficiency is crucial factor and essential for countries in order to integrate into the international economy, attract and retain investment, and achieve economic growth that is also sustainable.¹

Nations all over the world face critical energy choices that will have significant implications for many years to come. Vital and fundamental to the success of trade within a country or internationally is the availability, reliability and efficiency of a constant supply of energy. For the manufacturing lines, which are one of the biggest trading sectors in the world for instance,² requiring the consistent supply of energy is critical for operating machinery, maintaining production lines, and making sure there's a smooth functioning of supply chains.³ Reliable access and supply of energy are also but are not limited to supporting the storage, and preservation of goods, reducing spoilage and loss. In international trade, it's the empowering of transport networks, facilitation of logistics, and supporting exports and importation that show the significance of stable energy.⁴ Thus, any inconsistencies or disruptions in the energy supply have far-reaching implications on trade efficiency and domestic economic stability. With the critical nature energy has on trade and issues that follow, it is important more than ever, to understand the implication that come with energy instability in terms of investment, sustainability and efficiency for investors, researchers and policy makers.

¹ World Trade Organization (WTO) Report 2013 - Factors Shaping the Future of World Trade Available at: <https://www.worldbank.org/en/topic/trade/brief/trade-has-been-a-powerful-driver-of-economic-development-and-poverty-reduction>

² 'The 10 Global Biggest Exporting industries' *IBIS WORLD* available at <https://www.ibisworld.com/global/industry-trends/biggest-exporting-industries/>

³ Brown MA & Sovacool BK 'Climate change and global energy security: technology and policy options' (2011)

⁴ Africa Energy Outlook: A Focus on Energy Prospects in Sub-Saharan Africa (2014) *International Energy Agency (IEA)* Available at: <https://www.iea.org/reports/africa-energy-outlook-2014>

This study intends to make the following contributions. Firstly, With the highlighted importance of access to energy to trade, it is of great importance that energy policies and laws in South Africa recognise the intrinsic connection between access to energy and trade activities. This not limited to recognizing the relationship but helping with implementation measures that specifically agree with the need for trade-intensive industries, promote investment in energy infrastructure, and enhance energy efficiency along the value chain.⁵

In view of the significance of access to stable and affordable energy in relation to trade in South Africa, this thesis intends to answer the following interrelated objectives. It firstly conceptualises the energy-trade nexus to further investigate the necessity and role of energy laws and policies in the facilitation and security for trade, and how far they go to address the energy challenges. Secondly how trade intensive industries along with economics factors have been affected by the eminent energy challenges. Thirdly, examine a country that south African can learn and adapt its successful and tailored policies and laws that supports and benefit its trade industry.

1.2 PROBLEM STATEMENT

The Republic of South Africa (RSA), often seen as the “Powerhouse of Africa” is currently facing major energy challenges, such as (un)planned outages, energy shortages, blackouts, high energy tariffs, and many years of underinvestment in power infrastructure.⁶ Crisis, defined as “a time of intense difficulty or danger.”⁷ With the definition in mind the situation in south Africa can be classified as an energy crisis. It is important to note that south Africa has not, since the end of March 2024, experienced any power outages, but there is still uncertainty as to whether or not these outages could return. Because of the lingering uncertainty risks and problems that came with the crisis still remain. In order to understand the depth of the problem, it is important to define what an energy crisis is, “An energy crisis is a significant shortage of energy supply to a certain country or demographic, or the increasing demand of diminishing natural resources so as to sustain the modern-day industrial society”.⁸ In the case of South

⁵ The Republic of South Africa - Integrated Resource Plan (2019) *Department of Energy* Available at: <https://www.energy.gov.za/irp/irp-2019.html>

⁶Pollet BG, Staffell I & Adamson KA ‘Current energy landscape in the Republic of South Africa’(2015) *International Journal of Hydrogen Energy*

⁷ Oxford Languages ‘crisis’ available at <https://languages.oup.com/google-dictionary-en>

⁸ Mashamba E & Skosana A ‘An overview of the global and local energy crisis’ *Question Online* (2023) available at [Questiononline.org.za](https://questiononline.org.za) (accessed 14 April 2024)

Africa, this definition effectively captures the chronic supply limitations, infrastructure constraints, and policy challenges that contribute to this crisis. For instance, in 2022 alone South Africa faced 200 days of electricity outages, leaving many without power for 10 hours a day or even longer,⁹ which was considered the worst blackouts in history.

A significant contributor to the crisis in South Africa is Eskom Holdings SOC Ltd (Eskom), the state-owned national utility that produces 95 per-cent of electricity to the county, as well as a significant share of electricity generated in Africa.¹⁰ Mismanagement including poor maintenance, inadequate investment, and insufficient operation is what has plagued Eskom since 2007, resulting in a strained power supply.¹¹ Moreover, South Africa's heavy reliance on coal has limited diversification in the energy mix because the overdependence on a single source of energy makes it more vulnerable to supply disruptions just like we have seen.¹²

This energy crisis has exposed the inherent weaknesses in South Africa's infrastructure and necessitates urgent solutions. The trade sector, which is a significant contributor to the country's GDP, has been particularly affected by the energy crisis.¹³ Increased costs and uncertainties have had adverse effects on export volumes and market share.¹⁴ The crisis has also had profound economic ramifications, with the rolling power cuts leading to a reduction in GDP by approximately 1 to 1.3 percent since 2007 and costing the country between 1.5 billion and 4 billion rands per day.¹⁵

Eskom, in early 2008, “introduced load-shedding to protect the integrity of the grid”.¹⁶ “Load-shedding”, as defined in the *United Democratic Movement and Others v Eskom* case, is a “process whereby Eskom effectively cuts off the supply of electricity to areas of the country

⁹ GIS Reports - Southern Africa's energy woes available at www.gisreportsonline.com/southeren-africa-energy/ (accessed on 14 April 2024)

¹⁰ Nguyen I 'Understanding the energy crises in South Africa' *Earth.Org* 14 June 2023 available at <https://earth.org/energy-crisis-south-africa/> (accessed 14 April 2024)

¹¹ Nguyen I 'Understanding the energy crises in South Africa' *Earth.Org* 14 June 2023 available at <https://earth.org/energy-crisis-south-africa/> (accessed 14 April 2024)

¹² Nguyen I 'Understanding the energy crises in South Africa' *Earth.Org* 14 June 2023 available at <https://earth.org/energy-crisis-south-africa/> (accessed 14 April 2024)

¹³ Gbadamosi N 'How Africa's energy crises became an economic crisis' *Foreign policy* 17 May 2023 available at <https://foreignpolicy.com/2023/01/25/south-africa-energy-crisis-corruption-anc/r> (accessed on 20 April 2024)

¹⁴ Gbadamosi N 'How Africa's energy crises became an economic crisis' *Foreign policy* 17 May 2023 available at <https://foreignpolicy.com/2023/01/25/south-africa-energy-crisis-corruption-anc/r> (accessed on 20 April 2024)

¹⁵ Gbadamosi N 'How Africa's energy crises became an economic crisis' *Foreign policy* 17 May 2023 available at <https://foreignpolicy.com/2023/01/25/south-africa-energy-crisis-corruption-anc/r> (accessed 20 April 2024)

¹⁶ Eskom - Our Recent Past : 'Shift performance and grow sustainably', available at <https://www.eskom.co.za/heritage/history-in-decades> (accessed on 24 April 2024)

on a rotational and scheduled basis.”¹⁷ It is done on different levels ranging from level 1 to level 8 and is supposedly done to protect the integrity of the national energy grid when the demand for electricity exceeds the capacity generated by Eskom from time to time.¹⁸ Despite some efforts to address the crisis, there is still a persistent energy constraint that hinders economic growth and could possibly intensify trade imbalances which will or are limiting South Africa, from fully taking advantage of on its trade potential.

When examining some of the policies and laws in South Africa there are critical areas that that are concerning with regard to the nexus between energy access and trade. Below are the key areas of failure:

1. There is a lack of acknowledgement of the energy-trade nexus:

South Africa’s energy policies and laws do not sufficiently recognise the connectedness between the reliability and efficiency of energy supply and trade activities, goals and competitiveness. The *Integrated Resource Plan (IRP) of 2019* inherently and largely concentrates on energy generation and supply or the lack of it. It doesn’t address explicitly how these factors have direct or indirect implications for trade and economic activity. Its framework is not clear on the integration energy planning with trade and industrial policies and goals.¹⁹

2. There is a failure to address the impact of load-shedding on trade:

In 2023 there was some ‘judicial intervention’ on the implications of loadshedding in South Africa. The intervention was in the case of *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others*.²⁰ In this case, the Court recognised the effects of “load-shedding” on fundamental rights to health, security, and education. Nevertheless, the Court's focus was on ensuring an uninterrupted energy supply to health establishments, schools, and police stations.²¹ The Court did not address the needs of business and manufacturing sectors in the country, which have negative

¹⁷ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others* [2023] ZAGPPHC 280; 005779/2023 available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

¹⁸ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others* [2023] ZAGPPHC 280; 005779/2023 available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

¹⁹ The Republic of South Africa- *Integrated Resource Plan 2019 Department of Energy* Available at: <https://www.energy.gov.za/irp/irp-2019.html>

²⁰ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others* [2023] ZAGPPHC 280; 005779/2023 available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

²¹ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others* 2023 ZAGPPHC 280; 005779/2023 available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

economic and trade implications, despite the involvement of trade unions in the case. The omission in this regard highlights a possible gap in policy and legal framework as it fails to protect trade activities from any further energy disruptions.

Moreover, the transition to possible renewable energy sources may present a great opportunity in mitigating the crises. Thus, there is a critical need to examine the interplay between South Africa's energy crises and trade dynamics to possibly identify strategies that will address the crisis and promote a transition to a more sustainable supply of energy in the future.

1.3 RESEARCH QUESTIONS

The main research question is:

How can the energy policies and laws of South Africa be reformed to better facilitate energy security for trade?

In order to answer this question, these further sub-questions have to be answered:

1. How does the nexus between energy and trade explain the necessity and role of energy policy and laws in facilitating energy security for trade?
2. What measures can be incorporated into energy policies and laws to enhance energy security for trade?
3. What are the challenges facing South Africa's energy sector and their impacts on trade, and to what extent do South Africa's key energy policies and laws address these challenges?
4. Which country can South Africa look to, that has successfully tailored its energy policies and laws to support trade?

1.4 DELIMITATIONS OF STUDY

This study aims to analyse the inner connectedness between South African energy policies and laws, and their impact on trade dynamics. In order to maintain a controllable and focused scope, the following delimitation has been set:

- 1.4.1 **Geographical Boundaries:** this research will be confined to the setting of South Africa, which will exclude details of the analysis of other countries except for those in the comparative study. The comparative case study of Denmark will be used as the standard.
- 1.4.2 **Time frame:** the study will consider data, policies, and events primarily from the period 2007 to 2024. This period is chosen due to the significant developments and challenges in the South African energy sector throughout these years.
- 1.4.3 **Focus on trade-intensive and energy intensive sectors:** this research will focus on trade-intensive industries in South Africa, most importantly those most affected by the energy crises and the issues that come with it, such as manufacturing, agriculture, and mining.
- 1.4.4 **Primary and secondary sources:** this study will use a desktop research methodology. It will review primary and secondary sources. It will include South African energy policies, legislation, and case law for primary sources and the use of journal articles, research reports, and books relevant to the research as secondary sources.
- 1.4.5 **Exclusion of certain factors:** Even though the study will address a transition to renewable energy, it will not explore as deep into the technical aspects of RE and its technologies. Instead, the research will focus on the possible policy implications and the impact on trade.
- 1.4.6 **Case study limitation:** the comparative study will be limited to examining the energy policies and laws of Denmark. This nation has successfully integrated energy security with trade facilitation. Therefore, it will provide lessons that are applicable to South Africa.

By setting this delimitation, the study will provide a focused, clear, and concise evaluation of the energy policies and laws in South Africa and how they can be reformed to enhance security, efficacy and sustainability for trade without being too broad. These boundaries will make sure the research stays concentrated on its objectives and provides actionable understanding and vision specific to South African issues.

1.5 RESEARCH METHODOLOGY

The Nature of this mini-thesis is a desktop study. The main research question of this mini-thesis will be answered by means of legal research consisting of literature from primary and secondary sources. The primary sources will include international policy, legislation, and case law. The secondary sources include journal articles research reports, blogs from the internet, and books. It is envisioned that this approach will assist the researcher in concluding whether, if possible, how South African energy policies and laws can be reformed to better facilitate energy security for trade. It will further assist in proposing recommendations in the effort to protect and facilitate energy security specifically for trade.

This mini-thesis will also conduct a comparative case study of a country that has tailored energy policies and laws for trade. We will compare thesis findings from Denmark. This will be done by identifying the similarities, differences, and potential areas of improvement for the South African legal framework.

1.6 CHAPTER OUTLINE

This study is divided into five chapters which includes the following:

- Chapter 1: Background and Introduction
- In this chapter, the background for this research will be outlined and research reasons will be deliberated. The method of research will be explained and justified.
- Chapter 2: This chapter aims to conceptualise the nexus between energy and Trade. Explain the necessity and role of energy policy and laws in facilitating energy security for trade. It also aims to highlight some measures that can be incorporated into the energy policies and laws to facilitate energy security for trade.
- Chapter 3: This chapter aims to demonstrate an overview of SA's energy crises and the challenges of the sector, including the impacts this is having on trade. It will also examine SA's key energy policies and laws to examine the extent to which they acknowledge the nexus between access to energy and trade.
- Chapter 4: A case study of a country that has tailored energy policies and laws for trade; possible lessons for SA from the case study country.
- Chapter 5: Conclusion and recommendations

CHAPTER TWO: CONCEPTUALIZING THE NEXUS BETWEEN ENERGY AND TRADE

2.1 Introduction

The shared connection between energy and trade is one that is fundamental to understanding the forces at work when it comes to global activity. Trade is driven by traditional influencing factors, such as economics, supply and demand, and technology.²² The sufficiency and availability of energy is not only critical to the production of goods and services but is also a great enabler of trade itself, from the basics of powering industrial procedures to major projects such as fuelling transportation networks. The availability, cost, and sufficiency of energy influences a country's trade competitiveness.²³ In today's highly connected world, the role of energy in facilitating trade has become greatly substantial and significant, especially as countries go all-out to make sure their energy is secure while they striving to multiply their export markets.

Energy policies are a set of principles and guidelines that govern the production, distribution, and consumption of energy,²⁴ and thus play a key role in the shaping of trade outcomes in the said country. These policies will either enhance or limit the ability of a nation to compete in the international markets. For example, countries that have invested highly in their energy efficiency and moved towards the prioritisation of green energy sources have often experienced increased competitiveness in their energy-intensive industries.²⁵ This can be said to have led to a balance in trade that is more favourable to that country's trade balance. On the contrary, nations that face energy scarcities, constrains or high energy tariffs are more likely to find their trade activities disadvantaged.²⁶

In the hope to provide a clear and useful look at how the energy trade nexus can be conceptualized, theoretical frameworks are looked at. These frameworks included Heckscher-Ohlin Model, among others, which underlines the value and importance of 'factor

²² Zhang H, Wang Y, Yang C & Guo Y 'The impact of country risk on energy trade patterns based on complex network and panel regression analyses' (2021) *Energy* Page 2

²³ Löschel A Energy 'Prices, Energy Cost & Industrial Competitiveness' Department of Environmental and Resource Economics (2014) *Environmental Management Centre for European Economic Research (ZEW) Brussels. Mannheim*

²⁴ Kanna V 'Encyclopaedia of Renewable Energy, Sustainability and the Environment' Volume 1 (2024) Pages 9-20 *Energy Policies and Standards*

²⁵ World Energy Outlook *International Energy Agency (IEA)* (2022) Paris available at <https://www.iea.org/reports/world-energy-outlook-2022>

²⁶ World Energy Outlook *International Energy Agency (IEA)* (2022) Paris available at <https://www.iea.org/reports/world-energy-outlook-2022>

endowments' in the determination of trade patterns.²⁷ This model has suggested that the countries that don't require a lot to produce their good and services or have cheap factors of production will prioritise the export those goods and services, in this instance would be energy as a factor of production, but they will import goods and that require a lot to produce and expensive in factors of production.²⁸ In this context, it is important to understand the role of sustainable, affordable and constant energy as a critical factor in trade and it is necessary for policymakers who are aiming to enhance their country's trade performance and competitiveness.

A number of global studies further illustrate the link between energy policies and trade outcomes. For example, Denmark's strategic investment in renewable energy has not only ensured sustainable and secure energy but has also positioned Denmark as a leader when it comes to the export of green energy technology.²⁹ This success story contrasts with countries, like South Africa, which rely heavily on fossil fuels, where energy-related trade challenges may be more prominent. By examining examples of this cases below, valuable lessons can be drawn to in order to inform the advancement of South Africa's energy framework.

In this chapter, the nexus between energy and trade will be explored by examining the role of energy in trade facilitation. It will then discuss how energy policies influence trade outcomes. Followed by a review of theoretical frameworks with focus on the Heckscher-Ohlin Model theoretical framework. Through this analysis, this chapter aims to lay a foundation for understanding how the energy challenges that are currently plaguing, South Africa can be better navigated in order to improve performance for trade.

2.2 Defining the Nexus and the role of energy on Trade

Energy, a component of modern economies, plays a critical role when it comes to the facilitation of trade by serving as an input across all stages of production, distribution, and transportation of goods and services. The availability, cost, and reliability of a nation's energy supply have a great influence when it comes to a counties trade competitiveness. It affects most

²⁷ Krugman PR 'International Economics: Theory and Policy', 11th edition Published by *Pearson* (2021)

²⁸ Krugman PR 'International Economics: Theory and Policy', 11th edition Published by *Pearson* (2021)

²⁹ 'Denmark's Energy Transition: Leading the Way to a Low Carbon Future' (2021) *Danish Energy Agency (DEA) Copenhagen: DEA* Available at <https://ens.dk/en>

factors from manufacturing outputs to agricultural output to how efficient the supply chains end up being, amongst other issues.³⁰

2.2.1 Defining the Nexus

The nexus between electricity(energy) and trade can be defined by several interconnected concepts. These concepts include energy security, trade efficiency and economic growth.

2.2.1.1 Energy security

Energy security is one of the main concepts when it comes to designing and implementing energy policies. It doesn't really have a fixed definition or has been clearly defined. Which makes it rather hard to measure against policy objectives. As said by Loschel et al.: "The concept of 'security of energy supply', or in short form 'energy security', seems to be rather blurred".³¹ These sentiments are evidently echoed by other authors as different definitions of these concepts have been formulated. In this regard, the definition that this paper leans toward are by Patricia Guevara, which is derived from the International Energy Agency (IEA) definition. She defines Energy security as "The capability to establish an efficient, sustainable, and affordable energy system that meets the demands of people's lives and their daily activities."³² This will be the definition this study will follow.

2.2.1.2 Trade efficiency

Trade efficiency "refers to how effectively goods can be exchanged between parties, usually measured by factors such as speed, cost-effectiveness, reliability, and ease of transactions."³³

³⁰ Brewis T, Desai D & Oliver J 'Surviving the impact of the electricity crisis on food production' Cliffe Dekker Hofmeyr available at <https://www.cliffedekkerhofmeyr.com/news/publications/2024/Sector/Agriculture/agriculture-aquaculture-fishing-alert-24-April-surviving-the-impact-of-the-electricity-crisis-on-food-production#>

³¹ Löschel A, Moslener U & Rübbecke DT 'Indicators of energy security in industrialised countries' (2010) *Energy policy*

³² Guevara P 'understanding energy security' *Safety culture* 27 June 2024 available at <https://safetyculture.com/topics/energy-security/>

³³ 'Trade Efficiency definition from AP world history' *Library fiveable* available at <https://library.fiveable.me/key-terms/ap-world/trade-efficiency>

Löschel, Moslene & Rübhelke suggest that trade efficiency can be either a necessary condition to economic efficiency or it will result in economic efficiency, meaning more efficiency in growth leads to more efficiency in trade.³⁴ They further explained, that if trade is efficient enough, it will eventually contribute to production input and innovation. As a result, this will provide new and increased demand that will increase potential market opportunities, while creating additional business and jobs.³⁵

2.2.1.3 Economic growth

In terms of EconLib,³⁶ “Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It can be measured in nominal or real terms, the latter of which is adjusted for inflation.”³⁷

It has been said that inherently trade efficiency is motivated by a number of factors, which include the quality of education, efficiency of goods, financial markets, developed labour markets, domestic and foreign markets and the ability to benefit from present technologies as a result of a country's efficient economy.³⁸ From the ‘A causal relationship between trade efficiency and economic efficiency: evidence from dynamic simultaneous equations models’ study Rasekhi et al. found that the relationship between trade and economic efficiency relies on one of the facts “better performance in trade can guarantee and strengthen an effective growth strategy and vice versa.”³⁹

³⁴ Rasekhi S, Sheidaei Z & Asadi SP ‘A causal relationship between trade efficiency and economic efficiency: evidence from dynamic simultaneous equations models’ (2017) *The Journal of International Trade & Economic Development*

³⁵ Rasekhi S, Sheidaei Z & Asadi SP ‘A causal relationship between trade efficiency and economic efficiency: evidence from dynamic simultaneous equations models’ (2017) *The Journal of International Trade & Economic Development*

³⁶ Econlib - The Library of Economics and Liberty available at <https://www.econlib.org>

³⁷ ‘Definition of economic growth’ *Econlib - The Library of Economics and Liberty* available at <https://www.econlib.org/library/Topics/College/economicgrowth.html>

³⁸ Rasekhi S, Sheidaei Z & Asadi SP ‘A causal relationship between trade efficiency and economic efficiency: evidence from dynamic simultaneous equations models’ (2017) *The Journal of International Trade & Economic Development*

³⁹ Rasekhi S, Sheidaei Z & Asadi SP ‘A causal relationship between trade efficiency and economic efficiency: evidence from dynamic simultaneous equations models’ (2017) *The Journal of International Trade & Economic Development*

2.2.1.4 Energy as a good/ service in trade

Energy is conceptualised as a commodity in trade, meaning it has the ability to be bought and sold in a market.⁴⁰ The energy market is huge as it covers several products under fossil fuels and renewable energy. The global energy demand is anticipated to reach approximately 660 quadrillion British thermal units.⁴¹ Basically, energy can be classified as a good and as a service in the context of international trade.⁴² A good is a tangible or physical product that has the ability to be purchased. Meaning in terms of energy, tangible commodities such as oil, gas and coal which can be stored or traded can be classified as goods.⁴³ For instance, South Africa's exporting of coal, which is classified as a tangible commodity.

Conversely, when energy is delivered continuously as a utility, it can be classified as a service. A service is intangible and includes properties where the receiver does not obtain anything tangible or forms of ownership.⁴⁴ And again South Africa as an example where the generation and supply of electricity is considered a service.⁴⁵

This dual classification can be said to have great trade implications, as physical trade of commodities involves export and import regulations, and the provision of energy is subject to regulatory oversight. Thus, it is important to note how important it is to distinguish these modes of energy supply especially for countries like South Africa, for a more nuanced trade and regulatory framework design for policy makers.

⁴⁰ Selivanova Y 'Trade in Energy: Challenges for International Trade Regulation' *World Trade Organisation research & Analysis* available at

https://www.wto.org/english/res_e/publications_e/wtr10_forum_e/wtr10_11june10_e.htm

⁴¹ Energy demand: Three drivers' 28 August 2019 *Exxonmobil* available at:

<https://www.exxonmobil.co.uk/energy-and-environment/looking-forward/outlook-for-energy/energy-demand>

⁴² Richards TJ & Herman L 'Relationship between International Trade and Energy' *World Trade Organisation research & Analysis* available at

https://www.wto.org/english/res_e/publications_e/wtr10_richards_herman_e.htm

⁴³ Study.com 'Definition of goods and services' available at: <https://study.com/academy/lesson/goods-services-definition-examples.html#:~:text=Goods%20and%20services%20are%20two,be%20physically%20touched%20or%20stor>

[ed](https://study.com/academy/lesson/goods-services-definition-examples.html#:~:text=Goods%20and%20services%20are%20two,be%20physically%20touched%20or%20stor)

⁴⁴ Study.com 'Definition of goods and services' available at: <https://study.com/academy/lesson/goods-services-definition-examples.html#:~:text=Goods%20and%20services%20are%20two,be%20physically%20touched%20or%20stor>

[ed](https://study.com/academy/lesson/goods-services-definition-examples.html#:~:text=Goods%20and%20services%20are%20two,be%20physically%20touched%20or%20stor).

⁴⁵ The Electricity Act 41 of 1987 and the Electricity Regulation Act 4 of 2006

2.2.2 Energy as a Pillar of Trade

Energy is one of the biggest requirements and is fortified as an essential element with regards to activities in manufacturing, industrial production, and logistics, making it the cornerstone and foundation of modern trade.

In manufacturing and industrial production, energy is required without a doubt. There is the powering of machinery and automated systems, which when there is load-shedding, which is a lack of energy, these systems end up being shut down as a result.⁴⁶ This means all operations of manufacturing end up being shut down completely resulting in increased downtime depending on the current level of supply.⁴⁷ This ends up causing a huge decrease in production and at times has caused damage to the manufacturing equipment itself.⁴⁸ For small and medium enterprises, it has been rather hard to invest in generators or alternative power supply for their businesses. Finding alternative ways to generate energy for their businesses is a task they cannot afford owing to the limited income they generate.⁴⁹ Even if they were able to afford the alternative energy supply it is not cost-effective for the High productivity levels and the cost of production.

The South African manufacturing sector consumes approximately 46 percent of the power generated in the country, making the industry the highest and most affected when load-shedding occurs.⁵⁰ According to Trading Economics “Manufacturing production in South Africa plunged by 5.2 per-cent year-on-year in June 2024, after an upwardly revised 1.2% fall in the prior month and more than an expected 0.9% decrease”.⁵¹ It is also mentioned that the overall industrial production in the south had fallen by 5.2 per-cent in 2024.⁵²

Even though load-shedding cannot be directly linked to the suffering of the manufacturing and industrial sectors, it cannot be ignored that it is a major contributor to the suffering of these

⁴⁶ Dewa MT, Van Der Merwe AF & Matope S ‘Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach’ (2020) *South African Journal of Industrial Engineering*

⁴⁷ Dewa MT, Van Der Merwe AF & Matope S ‘Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach’ (2020) *South African Journal of Industrial Engineering*

⁴⁸ Dewa MT, Van Der Merwe AF & Matope S ‘Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach’ (2020) *South African Journal of Industrial Engineering*

⁴⁹ Dewa MT, Van Der Merwe AF & Matope S ‘Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach’ (2020) *South African Journal of Industrial Engineering*

⁵⁰ ‘South Africa Manufacturing production’ *Trading Economics* available at <https://tradingeconomics.com/south-africa/industrial-production>

⁵¹ ‘South Africa Manufacturing production’ *Trading Economics* available at <https://tradingeconomics.com/country-list/industrial-production>

⁵² ‘South Africa Manufacturing production’ *Trading Economics* available at <https://tradingeconomics.com/country-list/industrial-production>

sectors. For instance, the South African automotive industry at a glance, which accounts for 4,3 per-cent of the country's GDP and under the Automotive Production and Development Programme Phase 2 (APDP2)⁵³ comprises 15,7 per-cent of South Africa's total trade GDP, reflected a decline of R3,4 billion from the year 2022 to 2023.⁵⁴ This cannot be perceived as a coincidence that during what can be said to be the peak of load-shedding is when automotive components exports had declined from steadily increasing during the years.

It is evident that the stability of supplying energy is crucial to maintaining the integrity of South African industries. Disruption just leads to major economic losses. Therefore, looking at the stats above it is evident that energy is not merely just a utility but an intentional and often calculated asset that can either enhance or undermine a country's trade performance. The lack of sustainable electricity just sets a dangerous domino effect, when one falls the rest will automatically follow, resulting in dire and unbecoming results for industries, the workforce, trade, and just the dignity of the country itself.

2.2.3 Theoretical Framework Linking Energy and Trade

The relationship between energy and trade is best understood through the Lens of a couple of economic theories or models that interpret the aspects of comparative advantage, factor endowments, and the interchange between energy security, trade, and economic performance. This section will investigate the underlying theoretical links between energy and trade. The focus will be on the Heckscher-Ohlin Model, with a brief discussion of the Ricardian Model, and the New Trade theory to provide a wider context.

The Heckscher-Ohlin model and factor endowments

The Heckscher-Ohlin model has been said to be one of the foundational and most influential theories in international trade and economics.⁵⁵ This theory was developed in 1977 by two Swedish economists, Eli Heckscher and Bertil Ohlin.⁵⁶ This theory emphasises on the interplay between the proportions of production that are available in

⁵³ APDP Phase 2 (APDP 2) Regulations (2021) International Trade Administration Commission of South Africa available at <https://www.itac.org.za/upload/APDP%20Phase%202%20Regulations%202021.pdf>

⁵⁴ Lamprecht N 'Automotive Trade Manual' (2024) released by NAAMSA available at <https://www.autoforum.co.za/View-News-Article.aspx?News=automotive-trade-manual-2024-released-by-naamsa-24-33-10>

⁵⁵ Krugman PR Obstfeld M. International Trade: Theory and policy (2018) *Boston: Pearson 11th Edition*

⁵⁶ Krugman PR Obstfeld M. International Trade: Theory and policy (2018) *Boston: Pearson 11th Edition*

different countries that produce the same goods, these are called factors of production.⁵⁷ It suggests that countries should export goods that are abundant in their nations, and import those that they lack.⁵⁸ In the context of energy and trade, this model would suggest that countries with a constant sustainable and abundant supply of energy, that is also inexpensive will possibly lean toward specializing in the export of energy-intensive goods or services, while countries with limited and costly energy will possibly import said goods and/or services. The same good or service will cost less to produce in a country that has a cost-effective energy supply.

For instance, Denmark, a nation that is copious with renewable energy (RE) resources, wind energy in particular, which has allowed the nation to specialise in the production and export of said green energy along its products and technologies.⁵⁹ This specialisation can be said to have given Denmark a comparative advantage in the market of wind energy and green technology. Thus, aligns with the sentiments of the H-O model thereof.

On the contrary, South Africa, which has faced significant energy constraints and challenges for several years now,⁶⁰ finds itself at a disadvantage as evidently mentioned in the previous section, when it comes to production of energy-intensive goods competitively. The frequent power cuts and high cost of energy have evidently constrained industrial productivity,⁶¹ and if these problems persist, they will definitely make it challenging for the nations industries to compete on a global scale in the context of energy intensive industries.

The Ricardian Model and Comparative Advantage

While the Heckscher-Ohlin model focuses more on the factor of endowment, The Ricardian model on the other hand is one that emphasises the role of comparative advantage.⁶² This model states that a country will have a comparative advantage if “the

⁵⁷ Krugman PR Obstfeld M. *International Trade: Theory and policy* (2018) *Boston: Pearson 11th Edition*

⁵⁸ Krugman PR Obstfeld M. *International Trade: Theory and policy* (2018) *Boston: Pearson 11th Edition*

⁵⁹ ‘Denmark 2023 Executive Summary Report’ *International Energy Agency (IEA)* (2023) available at <https://www.iea.org/reports/denmark-2023/executive-summary>

⁶⁰ ‘South Africa energy Summary’ *International Energy Agency (IEA)*, available at <https://www.iea.org/countries/south-africa/electricity>

⁶¹ Dewa MT, Van Der Merwe AF & Matope S ‘Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach’ (2020) *South African Journal of Industrial Engineering*

⁶² Krugman PR Obstfeld M ‘*International Trade: Theory and policy*’ (2018) *Boston: Pearson 11th Edition*

opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries”.⁶³ With that in mind, in terms of sustainable and constant energy generation nations with more efficient energy generation gain comparative advantage in industries that are energy-intensive, irrespective of their general energy sources.

New Trade Theory

The new trade theory (NTT) “introduces economies of scale and network effects as the determinants of comparative advantage in international trade.”⁶⁴ According to NTT, “companies gain economies of scale through early entry into the market, therefore developing efficiencies in the production process along the way”.⁶⁵ In the context of energy efficiency, industries that are heavily reliant on a significant amount of energy input that is reliable and readily available will use this opportunity to increase production levels, and in turn reduce the cost of the product per unit. The influence that comes with scaling up production will most definitely enhance the competitiveness in the global markets, especially in energy-intensive industries.⁶⁶ An example of a scaling effect or economies of scale, is Denmark’s wind energy and how it reinforces comparative advantage.⁶⁷

The Heckscher-Ohlin Model as seen above provides a framework that is powerful for analysing the role of energy in not just shaping international trade patterns but also in predicting those patterns, especially knowing how important predictability is with regards to trade.⁶⁸ With the

⁶³ Krugman PR Obstfeld M ‘International Trade: Theory and policy’ (2018) *Boston: Pearson 11th Edition* Chapter 3 page 48

⁶⁴ Krugman PR Obstfeld M ‘International Trade: Theory and policy’ (2018) *Boston: Pearson 11th Edition* (2018) Chapter 3 page 47

⁶⁵ ‘Barriers to Entry in Economics – definitions, types and examples Corporate Finance Institute’ available at <https://corporatefinanceinstitute.com>

⁶⁶ Krugman PR Obstfeld M ‘*International Trade: Theory and policy*’ (2018) *Boston: Pearson 11th Edition* (2018) Chapter 3

⁶⁷ ‘From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible’ available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

⁶⁸ Di Ubaldo M & Borchert I ‘Trade preferences need predictability’ *CEPR* 11 January 2021 available at <https://cepr.org/voxeu/columns/trade-preferences-need-predictability>

H-O focusing on factor endowments, the model demonstrates its ability to explain how countries like Denmark are able to utilise their rich renewable energy resources to gain a comparative advantage. While other models like the Ricardian model and NTT have offered more insight into factors such as productivity and economies of scale, in this instance the H-O Model remains fundamental to understanding the energy-trade nexus wholly, thus being the preferred theory for this study.

2.3 Case Studies of Energy-Trade Interdependence

Energy disruptions have had a profound impact on global trade for several nations, this has influenced their economic stability and trade competitiveness with other countries. Below are some key examples of countries where energy disruption significantly affected trade.

2.3.1 Japan's 2011 Fukushima Disaster (2011)

In 2011, a town in Japan, Fukushima was struck with a nuclear disaster causing a shutdown of almost all the town's nuclear reactors. These reactors were said to supplied almost 30 percent of the country's electricity. This abrupt and unexpected loss of power led to Japan importing an increased number of fossil fuels, this action led to the driving up the cost of energy, the cost of production for Japanese products and ultimately the nation's trade deficits.⁶⁹ As a result, the competitiveness of Japan's exports may have decreased due to the rising costs of production. "Japan's merchandise exports to the world fell by 14.5 per-cent in volume terms and 13.3 per-cent in value terms in the two months following the March 2011 disaster".⁷⁰ Moreover, the energy shortage caused by the disaster disrupted industry output, affecting the supply chains that were reliant on Japanese products.⁷¹

⁶⁹ Tara Collins 'Great East Japan Earthquake: economic and trade impact' *Australian Government Department of Foreign Affairs and Trade* available at <https://www.dfat.gov.au>

⁷⁰ Tara Collins 'Great East Japan Earthquake: economic and trade impact' *Australian Government Department of Foreign Affairs and Trade* available at <https://www.dfat.gov.au> (see chart 4 and 5)

⁷¹ Tara Collins 'Great East Japan Earthquake: economic and trade impact' *Australian Government Department of Foreign Affairs and Trade* available at <https://www.dfat.gov.au>

2.3.2 European Energy Crisis (2021-2022)

The war between Russia and Ukraine caused by geopolitical tension had caused a European energy crisis that led to severe energy shortages across the continent.⁷² “Political crises led to sharp fluctuations in the energy market and global recessions.”⁷³ Russia being one of the major gas supplies in Europe reduced exports between 2021-2022 causing energy prices to skyrocket.⁷⁴ The war had impacted industries across Europe increasing the cost of production and possibly reducing trade competitiveness. In the end, a involuntary energy diversification was forced on European countries, the war fast-tracked the EU’s plan toward energy autonomy and the green transition.⁷⁵

2.3.3 Venezuelans’ Energy Collapse (2010-Present)

Venezuela, a nation that was once an oil rich, still currently experiencing an energy crisis, marking just under 14, due many years ago mismanagement of national funds and underinvestment in their energy infrastructure.⁷⁶ The nations deterioration in oil production, paired with power grid failures, impacted Venezuela's ability to export oil, which totalled roughly 96% of their export revenues.⁷⁷ This crisis led the country into what could be called economic turmoil. This evidently disrupted trade relations and even led to a shortage of basic goods.⁷⁸ Additionally, Venezuela's energy crisis eventually led global oil markets to decline, triggering fluctuations in oil costs.

⁷² ‘EU action to address the energy crisis’ *European Commission* available at https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/eu-action-address-energy-crisis_en

⁷³ Zhang H, Wang Y, Yang C & Guo Y ‘The impact of country risk on energy trade patterns based on complex network and panel regression analyses’ (2021) *Energy* Page 2

⁷⁴ ‘EU action to address the energy crisis’ *European Commission* available at https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/eu-action-address-energy-crisis_en

⁷⁵ ‘The energy leap :How EU countries weathered a Russia-induced crisis and are reshaping energy supply’ *Council of the European Union* 14 October 2024 available at <https://www.consilium.europa.eu/en/energy-leap-how-eu-countries-russia-crisis-supply/>

⁷⁶ ‘Venezuela crisis: Facts, FAQs, and how to help’ *World Vision* available at <https://www.worldvision.org/disaster-relief-news-stories/venezuela-crisis-facts>

⁷⁷ Mgijima N ‘Country Market Study: Venezuela’ *International Trade Department of Agriculture* (2015) *Forestry and Fisheries* page 2

⁷⁸ ‘Venezuela crisis: Facts, FAQs, and how to help’ *World Vision* available at <https://www.worldvision.org/disaster-relief-news-stories/venezuela-crisis-facts>

The case studies above have demonstrated and exemplified how involved the interdependence between energy and trade is. These examples emphasise the significant economic consequences of energy disruptions for both national and international markets.

2.4 Energy Security and Global Trade Competitiveness

As discussed previously, energy security refers to the capability to establish an efficient, sustainable, and affordable energy system that meets the demands, in addition to maintaining environmental sustainability.⁷⁹ Energy security and the capability to compete on global markets have inherently been treated as parallel goal in energy policy,⁸⁰ as well as influencing the ability to compete at an international level, according to researchers.⁸¹ If this logic is followed, energy is seen as the determinant in shaping the ability of nation to compete successfully in the international markets. This phenomenon was referred to as “energy competitiveness”.⁸² In the context of electricity, and using the definition at hand, electricity security will refer to stable, efficient, and cost-effective, while still ensuring there is a capability of supplying the electricity for current and potential demand. For countries that participate in global trade activities, energy will always play a fundamental role as a determinant of competitiveness, particularly in energy-intensive industries like mining and manufacturing.⁸³

This chapter so far has made it clear that energy security is not just about uninterrupted supply but also includes aspects of efficiency, affordability, environmental impact, and sustainability of the energy sources.⁸⁴ Countries that have included these aspects in their energy sources and supply, according to the International Energy Agency (IEA), are better positioned to maintain and improve their trade links, while those who face instability with their energy supply and high prices may be at a competitive disadvantage.⁸⁵

⁷⁹ Guevara P ‘understanding energy security’ *Safety Culture* 27 June 2024 available at <https://safetyculture.com/topics/energy-security/>

⁸⁰ Nyga-Lukaszewska H & Chilimoniuk E ‘Modelling Energy Security and International Competitiveness: The Export Perspective’ (2017) *Entrepreneurial Business & Economics Review*

⁸¹ Nyga-Lukaszewska H & Chilimoniuk E ‘Modelling Energy Security and International Competitiveness: The Export Perspective’ (2017) *Entrepreneurial Business & Economics Review*

⁸² Nyga-Lukaszewska H & Chilimoniuk E ‘Modelling Energy Security and International Competitiveness: The Export Perspective’ (2017) *Entrepreneurial Business & Economics Review*

⁸³ Yergin D ‘The new map: Energy, climate, and the clash of nations’ (2020) *Penguin UK*

⁸⁴ Guevara P ‘understanding energy security’ *Safety Culture* 27 June 2024 available at <https://safetyculture.com/topics/energy-security/>

⁸⁵ World Energy Outlook (2022) *International Energy Agency (IEA Paris)* available at <https://www.iea.org/reports/world-energy-outlook-2022>

The connection between energy security and trade competitiveness can be demonstrated by using a number of factors, but in this context, it will be assessed using the contrast between South Africa and Denmark.

Denmark has become an impeccable example and leader in how to invest in its energy security, they did so by heavily investing in RE,⁸⁶ and removing their reliance on fossil fuel sources. The Danish experience offers a blueprint in the promotion of energy efficacy and RE especially for countries who wish to make their energy systems more sustainable and less dependent on fossil fuels.⁸⁷ By doing so they created an energy sector that offers stability, security, and sustainability in its supply for their nation, and in turn were able to maintain and increase their competitive advantage in the global markets. Since 1990 the industrial sectors in Denmark, characterised by SMEs,⁸⁸ have improved significantly and have benefited highly from mere stability, reliability, and predictability, which help ensure consistency in production, a reduction in costs, and attracting FDI respectfully.⁸⁹ Furthermore, Denmark in recent years has emerged as an exporter of their green energy, as they have capitalised on their knowledge on RE technology and its production, thus enhancing their global reach and trade position.⁹⁰

South Africa, on the other hand, as discussed before has struggled a great deal with energy insecurity for several years now. This insecurity has been characterised by frequent outages, frequent rising energy costs, and a heavy reliance on fossil fuels. Fossil fuels account for 86 percent total source of electricity generation.⁹¹ The challenges have had dire consequences on the country's trade competitiveness. If industrial sectors are also examined in this regard, these sectors have experienced production disruptions because of these energy shortages, which have led to product delays and the non-fulfilment of export contracts or increased costs for buyers.⁹² And consequently, South Africa's global trade competitiveness has suffered, with

⁸⁶ Denmark 2023 Executive Summary Report International Energy Agency [IEA], 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

⁸⁷ Danish Energy Agency 'Energy policy Toolkit on energy efficiency in industries: experiences from Denmark' available at https://ens.dk/sites/ens.dk/files/Globalcooperation/ee_in_industries_toolkit.pdf

⁸⁸ Danish Energy Agency 'Energy policy Toolkit on energy efficiency in industries: experiences from Denmark' available at https://ens.dk/sites/ens.dk/files/Globalcooperation/ee_in_industries_toolkit.pdf

⁸⁹ Denmark 2023 Executive Summary Report International Energy Agency [IEA], 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

⁹⁰ Denmark 2023 Executive Summary Report International Energy Agency [IEA], 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

⁹¹ Krugman PR, Obstfeld M. *International economics: Theory and policy* (2018) Boston: Pearson 11th Edition

⁹² Dewa MT, Van Der Merwe AF & Matope S 'Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach' (2020) *South African Journal of Industrial Engineering*.

energy insecurity being one of the greatest barriers to its trade expansion, especially with the negative impact it has on productivity.⁹³

Another factor that needs to be considered in terms of trade and competitiveness is the cost of energy. Pricing is a critical component that has a direct impact on trade competitiveness. According to quantitative study by Zachmann and Cipollone,⁹⁴ energy prices are not a determining factor in whether a country has competitive advantage as an exporter, but it does have influence on which sectors in that country will become a competitive exporter.⁹⁵ Countries, like Denmark, with lower and stable energy costs are able to predict and reduce the cost of production, making their prices more competitive in international markets. On the contrary, those with high and unpredictable energy pricing can face an erosion in their competitive advantage.⁹⁶

Denmark's energy policy has focused on reducing the price of energy costs through diversification of the energy mix and expansion of renewable energy.⁹⁷ This resulted in their industries benefiting from low energy costs. Moreover, because they have predictability when it comes to their energy prices, they are able to manage their business costs effectively. In contrast, in South Africa where energy prices have been increasing yearly by almost 653 per cent since 2006,⁹⁸ making business relations with them less predictable thus South Africa being less competitive in international markets.

Looking at the above, it can be clearly said that energy security has impact on international trade competitiveness. It has shown that among the variables available that are used to model energy security stability, affordability, predictability, and efficiency proved to be the dependable variables in creating energy security. And central to the shaping of a country's ability to compete on an international level. It is evident that Denmark's leadership in heavily invested in their energy sector, so it ultimately includes these variables, while south Africa

⁹³ 'South Africa: World Bank Backs Reforms to Advance Energy Security and Low Carbon Transition' *World Bank Group* 25 October 2023 available at <https://www.worldbank.org/en/news/press-release/2023/10/25/south-africa-afe-world-bank-backs-reforms-to-advance-energy-security-and-low-carbon-transition>

⁹⁴ Zachmann, G., & Cipollone, V. 'Energy competitiveness. In R. Veugelers, Manufacturing Europe's future' (2013) Brussels: Bruegel Blueprint Series XXI. Page 139

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⁹⁶ World Energy Outlook (2022) *International Energy Agency (IEA) Paris* available at <https://www.iea.org/reports/world-energy-outlook-2022>

⁹⁷ Denmark 2023 Executive Summary Report *International Energy Agency [IEA]*, 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

⁹⁸ 2022 Update :Eskom tariff increases vs inflation *Power Optimal* available <https://poweroptimal.com/2021-update-eskom-tariff-increases-vs-inflation-since-1988/>

lacked in them, thus ultimately having opposite results in terms of functionality and the sustainability of their energy sector and eventually trade competitiveness. As global trade continues to evolve, energy security will remain a key factor in determining which countries are likely to thrive in international market.

2.5 Energy policies and laws facilitating trade

2.5.1 Overview of energy policies in South Africa and Denmark

Energy policies are one of the most important factors in shaping the production, distribution, availability, cost, and sustainability of electricity,⁹⁹ which will ultimately have an impact a country's trade performance. There are several energy policies available that address different aspects of production distribution and consumption of energy. The main types of energy policies include renewable energy standards, energy efficiency standards, carbon pricing, energy market regulations and energy security policies, to name a few.¹⁰⁰ Equally, Denmark and South Africa have developed quite different energy policies that show their unique resources, economy, and environmental priorities.

South Africa's energy policies have mostly and inherently been focused around fossil fuels. With a legacy of abundant coal reserves, South Africa has historically been reliant on coal,¹⁰¹ and with it has come numerous challenges. These challenges include, but are not limited to environmental damage concerns, high greenhouse emissions, and the most relevant one, overreliance on coal.¹⁰² In recent years it can be said that South Africa has made an effort towards diversification of its energy mix by trying to introduce renewable and nuclear energy to the mix,¹⁰³ but progress has been rather slow

⁹⁹ Kanna V 'Energy Policies and Standards, Module in Earth Systems and Environmental Sciences' *Science Direct* (2023) available at <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/energy-policy#chapters-articles>

¹⁰⁰ Kanna V 'Energy Policies and Standards Module in Earth Systems and Environmental Sciences' *Science Direct* (2023) available at <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/energy-policy#chapters-articles>

¹⁰¹ 'The South African Energy Sector Report 2023' *Directorate: Energy Economics And Statistics* available at <https://www.dmre.gov.za/Portals/0/Resources/Publications/Reports/Energy%20Sector%20Reports/SA%20Energy%20Sector%20Report/2023-South-African-Energy-Sector-Report.pdf>

¹⁰² South Africa energy Summary *International Energy Agency [IEA]* available at <https://www.iea.org/countries/south-africa/electricity>

¹⁰³ 'The South African Energy Sector Report 2023' *Directorate: Energy Economics And Statistics* available at <https://www.dmre.gov.za/Portals/0/Resources/Publications/Reports/Energy%20Sector%20Reports/SA%20Energy%20Sector%20Report/2023-South-African-Energy-Sector-Report.pdf>

due to a number of reasons like the lack aging infrastructural, financial constraints and bureaucratic problems.¹⁰⁴

Denmark alternatively, positioned themselves as leaders in RE on the international stage.¹⁰⁵ Denmark is said to have comprehensive and proactive energy policies that have facilitated the Danish move towards a low-emission carbon economy, while still prioritising energy efficiency and sustainability.¹⁰⁶ Their policies have not only ensured affordability but stability and predictability in its supply.¹⁰⁷ These policies have put Denmark on the map as a leading nation in green technology and expertise.¹⁰⁸

2.5.2 The role of Energy Policies in trade facilitation

When it comes to the facilitation of trade, policy plays a key role in influencing the reliability and cost of energy. These are significant factors in industrial production and international trade.

South Africa's outages and constantly and unpredictable escalating energy costs may have hindered South Africa's trade performance, especially in the context of energy intensive industries. The country's reliance on coal-fired power plants and now on alternative ways to power production during load shedding has in turn,¹⁰⁹ increased the cost of production, leading an increase in the pricing of products exports to be less competitive in the markets. Furthermore, the instability too has affected the production

¹⁰⁴ 'South Africa's Energy Transition : An Overall Analysis' (2023) *Academy of Science of South Africa (ASSAf)* available at <https://research.assaf.org.za/assafserver/api/core/bitstreams/cd282f34-7f25-4e61-bcbf-dc87b704fdbe/content#:~:text=These%20challenges%20include%20ageing%20and.and%20maintenance%20activities%2C%20delays%20in>

¹⁰⁵ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]*, 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹⁰⁶ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]* 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹⁰⁷ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]* 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹⁰⁸ From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible available at : file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

¹⁰⁹ Dewa MT, Van Der Merwe AF & Matope S 'Production scheduling heuristics for frequent load-shedding scenarios: a knowledge engineering approach' (2020) *South African Journal of Industrial Engineering*

processes and supply chains, also leading to lagging production, undermining production, and increased costs for exporters.¹¹⁰

On the contrary, when analysing Denmark's energy policies, these have facilitated trade by ensuring a cost-effective and stable energy supply. At a glance it can be seen that they have invested greatly into their RE,¹¹¹ in turn, it has positioned them in a way that they didn't have to rely on or depend on fossil fuels.¹¹² It has set them as the net exporter of energy during peak production periods.¹¹³ Denmark's trade competitiveness, especially in energy and trade intensive industries lies in its predictability, stability and reliability of its energy generation and consumption.

2.5.3 Energy Policy and Trade Agreements

Energy policies often intersect with trade agreements, having an influence on the terms of the trade agreement. For example, Denmark's commitment to RE has evidently been incorporated into their trade agreements therefore allowing them to export their green energy to other countries that are also looking into an energy transition.¹¹⁴ The alignment they have with their policies, trade objectives and trade goals has created trade opportunities, improved market access and positioned them as a desirable partner in international markets.

In South Africa, energy policies have not been as successful in being integrated into trade agreements, comparatively due to the energy crisis and the insecurity that comes with it. However, in recent years, there have been efforts to incorporate renewable and nuclear energy projects into their trade discussions.¹¹⁵ These efforts aim was to attract

¹¹⁰ 'Boost supply chain resilience despite load shedding' (2024) *FunxionO* available at <https://www.funxiono.co.za/boost-supply-chain-resilience-despite-load-shedding/#:~:text=Manufacturers%20rely%20on%20timely%20deliveries,built%20on%20trust%20and%20reliability>.

¹¹¹ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]*, 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹¹² 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]*, 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹¹³ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]* 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹¹⁴ 'Denmark 2023 Executive Summary Report' *International Energy Agency [IEA]* 2023 available at <https://www.iea.org/reports/denmark-2023/executive-summary>

¹¹⁵ Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* Page 41

foreign direct investment (FDI) and technological transfer into South Africa. These efforts are important as the nation aims for 'just energy transition' and trade expansion.

The above demonstrates how instrumental energy policies are in shaping a country's trade environment, it does this by influencing the availability, the cost, and the reliability of the energy. This study above has shown how Denmark has been progressive in their energy policies and how they facilitate trade by ensuring they have a sustainable and cost-effective energy supply, while South Africa's imminent challenges can be said to have hindered its trade competitiveness. The inter-connection between trade and energy policy agreements further emphasises the importance of consistent, rational, and progressive energy strategies in advancing and promoting international trade.

2.5 Conclusion

In this chapter, the study examined interconnectedness between energy and trade as a critical aspect of the modern economy and in shaping international competitiveness. As explored, energy is not merely a utility but a strategic asset that influences aspects in trade, from manufacturing to supply chain efficiency. The availability, costs, reliability, and predictability of energy play a significant role in determining a country's ability to compete in the trade competitively.

The theoretical frameworks that were discussed, particularly the H-O Model, showed the significance of factor endowments like energy in shaping and predicting trade patterns. It was also highlighted that countries like Denmark which have access to sustainable and affordable energy sources were better positioned in their energy-intensive industries, to the point where they had the opportunity to specialize in those industries too, by leveraging their energy advantages. On the other hand, countries that face energy challenges, in this regard, South Africa, will often face sectoral challenges in their energy-intensive industries. These challenges often lead to a disadvantage in local and global trade.

A glance towards Denmark's energy policies and laws, which will be discussed in detail in chapter 4, showed how the nations offered a compelling case study of how commitment to moving towards energy sustainability and moving away from fossil fuel energy dependence. The country's commitment towards a proactive regulatory environment has positioned them as

a leader and net exporter of green energy sources and green technology. This is in contrast to South Africa, where energy insecurity still prevails. This prevalence has in turn stifled the growth and productivity of industries and weakened their trade competitiveness because the African regulatory framework is still general and lacks comprehensive and streamlined frameworks for industries that are greatly affected by the lack of sustainable and affordable energy.

Ultimately, the analysis in this chapter emphasizes the importance of acknowledging the connectedness of trade and energy. It also examined the importance of coherent and forward-looking energy policies and laws, that not only address current energy problems but are able to pre-empt future energy needs, while addressing local energy needs but while also enhancing global trade performance.

Looking ahead, the next chapter will explore how South Africa found itself in an Energy Crisis of this magnitude, with a focus on three specific sectors that were highly affected by the energy instability. Additionally, it will analyse key policies and laws that govern the South African energy sector and will also examine the comparative advantage that will possibly be gained through strategic policy and legal reforms. By doing so, the next chapter aims to provide an understanding of the sectoral and economic consequences of the South African energy crisis.

CHAPTER THREE:

SOUTH AFRICA'S ENERGY CRISIS AND ITS IMPLICATION ON TRADE INDUSTRIES

3.1 Introduction

South Africa's energy sector has a long history of being a huge factor of economic foundation and has a strong effect on the GDP, affecting sectors like the industrial, mining, and manufacturing. These sectors amount to a big portion of the GDP of South Africa.¹¹⁶ A nation that was one if the however, over the years South Africa has been involved in a severe energy crisis. From electricity shortages and rolling black-outs to the frequent increase of domestic electricity prices leading to the disruption of the citizens' daily lives and contributing to the stifling of the economy, the nation stands at the precipice of a major economic crisis.¹¹⁷ In the middle of this crisis is the near collapse state-owned utility, Eskom, responsible for the supply of almost 90 per-cent of the country's electricity supply.¹¹⁸ Eskom for many years, has been inundated by the mismanagement of funds, corruption, and unkept and deteriorating infrastructure.¹¹⁹ This situation has raised a number of concerns, one of them being the country's energy security and its implication as a trading partner.

The energy crisis has come with a number of consequences. These consequences do not only affect the nations domestic economy but have weakened South Africa's ability to trade competitively globally. There are so many industries that are heavily reliant on stable and affordable electricity supply, but these recurring energy problems have made conducting business in the country rather difficult and unpredictable. The recurring outages have disrupted production processes, have increased business operational costs and with that has somewhat diminished South Africa's export competitiveness.¹²⁰ These challenges, accompanied by a decline in foreign direct investment and skyrocketing unemployment, point out the insistent

¹¹⁶ Maia J 'The interface between the mining and manufacturing sectors on South Africa' industrial development corporation available at

https://www.tips.org.za/files/interface_between_mining_and_manufacturing_-_j_maia_.pdf

¹¹⁷ Kamanzi B 'The Crisis In South Africa's Energy Sector: Towards a just transition centring job creation and social ownership' Working Document No. 3' Tricontinental: Institute for Social Research available at

https://thetricontinental.org/wp-content/uploads/2021/04/Eng_working-document-SA-Electricity.pdf

¹¹⁸ Eskom Holdings SOC LDT 'Eskom Company Information' available at <https://www.eskom.co.za/about-eskom/company-information/>

¹¹⁹ Steyn G, Burton J & Steenkamp M 'Eskom's financial crisis and the viability of coal-fired power in South Africa: Implications for Kusile and the older coal-fired power stations' (2017) *Cape Town: Meridian Economics*.

¹²⁰ Baker L 'The Political Economy of Energy Transition in South Africa: The Renewable Energy Independent Power Producer Programme'(2020) *Journal of Energy Research & Social Science* 70

need for thorough improvements that will alleviate South Africa's energy supply and efficiency in order to protect its future.

This chapter will explore a detailed historical overview of South Africa's energy crisis, examine the root cause of the crisis, and analyse its direct and indirect effect on trade activities. Furthermore, it will examine the challenges that come with the crisis, particularly how this crisis has affected key sectors of the economy and how it has negatively affected trade capacities and economic performance during the peak of the crisis. Through this analysis, the chapter aims to shed some light on fundamental and deep-rooted issues that come into play and offers a critical assessment of South Africa's policies and laws.

3.2 Overview of South Africa's energy crisis

3.2.1 Historical context of the crisis

South Africa's energy crisis is one that certainly did not develop overnight, but one that stems from decades of negligence, maladministration, underinvestment, and the gradual deterioration of the energy infrastructure. Post-apartheid government had to deal with the expansion of supplying electricity not to just the privileged but also the ordinary South Africans, back when only 36 per-cent had access to electricity, who wouldn't have had electricity during apartheid. In the middle of the crisis is the State-owned utility, Eskom, which is responsible for the generation and supply of electricity to most of the country.¹²¹ Eskom was established in 1923, under the original name Electricity Supply Commission before it was changed in 1978, one that reflected dependability in its supply of significant energy generation capacity, through coal-powered stations.¹²² These coal-powered power plants have historically accounted for approximately 90 per-cent of South Africa's energy production.¹²³

However, the early 2000s birthed cracks that began to appear in the utility's capability to meet South Africa's energy demand. The lack of investment in new infrastructure, in addition to delayed maintenance of the power plants, had led to a great but steady

¹²¹ 'Eskom – Heritage' available at <https://www.eskom.co.za/heritage/> (Accessed 5 September 2024)

¹²² 'Eskom – Heritage' available at <https://www.eskom.co.za/heritage/> (Accessed 5 September 2024)

¹²³ 'Eskom – Heritage' available at <https://www.eskom.co.za/heritage/> (Accessed 5 September 2024)

decline in generation capacity.¹²⁴ This was intensified by poor governance and allegations of corruption within Eskom’s ranks, which contributed to the utility’s financial mismanagement and operational inadequacies.¹²⁵

The biggest turning point with regards to energy supply was introduced in 2008 when Eskom failed to meet the national electricity demand, which led to widespread outages. This year birthed what is called “Load-shedding”.¹²⁶ As defined in chapter one , “loadshedding is a process whereby the national utility effectively cuts off the supply of electricity to areas of the country on a rotational and scheduled basis.” The implementation of load-shedding led to the exposure of the fragility of the nations energy infrastructure. The implementation of load-shedding had since persisted for several years, with Eskom implementing these recurrent blackouts to prevent the national grid from a total collapse .¹²⁷ As a result, South Africa’s once stable and vibrant energy sector has become a representation of national decline, thus considerably affecting the nation’s economic and trade performance.

3.2.2 Current state of the crisis

While 2023 was marked as the worst year on record with approximately 289 days of load-shedding in a year, which severely disrupted economic activity, the first 6 months of 2024 marked an improvement. So far 2024 has delivered more than 200 days without load-shedding.¹²⁸ This is because of a reduction in unplanned issues in Eskom and some relief provided by independent power producers, as well as the implementation of Eskom’s Generation Recovery Plan., which was said to have improved the electricity outages by 8.6 per-cent and energy availability factor by 7 per-cent.¹²⁹

¹²⁴ Nguyen I ‘Understanding the energy crises in South Africa’ available at <https://earth.org/energy-crisis-south-africa/> (Accessed 10 September 2024)

¹²⁵ ‘Eskom - Our Recent Past: ‘Shift performance and grow sustainably’ available at <https://www.eskom.co.za/heritage/history-in-decades> (Accessed 10 September 2024)

¹²⁶ ‘Eskom - Our Recent Past: ‘Shift performance and grow sustainably’ available at <https://www.eskom.co.za/heritage/history-in-decades> (Accessed 10 September 2024)

¹²⁷ ‘Eskom - Our Recent Past: ‘Shift performance and grow sustainably’ available at <https://www.eskom.co.za/heritage/history-in-decades> (Accessed 10 September 2024)

¹²⁸ South Africa: Load shedding likely to occur regularly through at least late 2024 update 4 *Crisis24* 25 June 2024 available at <https://crisis24.garda.com/alerts/2024/06/south-africa-load-shedding-likely-to-occur-regularly-through-at-least-late-2024-update-> (Accessed 7 September 2024)

¹²⁹ South African News Agency ‘Eskom records 200 consecutive days of no load shedding’ *SA News* 13 October 2024 available at <https://www.sanews.gov.za/south-africa/eskom-records-200-consecutive-days-no-load-shedding>

South Africa is still to this day likely to remain susceptible to regular load shedding beyond 2024 since any additional short-term solutions are unlikely to materialise, as seen over the years as the crisis became worse.¹³⁰ This is mostly due to the aging infrastructure that is operating beyond its lifespan with planned maintenance and unplanned breakdowns regularly dropping the maximum supply of energy below its demand.¹³¹ The severity and duration of breakdowns have been accentuated by criminal sabotage and corruption, hampering rehabilitation efforts and the construction of newer power plants. Eskom had also announced, in early 2024, the possibility of the load-shedding levels moving beyond level 8, which is unscheduled power cuts, but the utility had assured that the risk of a total blackout is unlikely.¹³²

Even though currently there is no sign of load-shedding, a recent article by the business, from an advisory firm, day predict a possibility of the return of loadshedding in January 2025.¹³³

3.2.3 Root cause of the energy crisis

The root cause of the energy crisis in South Africa is one that is multifaceted, involving a mixture of mismanagement, corruption, underinvestment, and overreliance on fossil fuels among others.¹³⁴ But underlying these multifaceted issues lies a deeper economic predicament that had caused the energy crisis. This predicament stems from failed post-apartheid reforms that should have addressed the damaged economic, social, and political impact of colonialism, exploitation, and resource extraction.¹³⁵ A few years

¹³⁰ South Africa: Load shedding likely to occur regularly through at least late 2024 update 4 *Crisis24* 25 June 2024 available at <https://crisis24.garda.com/alerts/2024/06/south-africa-load-shedding-likely-to-occur-regularly-through-at-least-late-2024-update->

¹³¹ South Africa: Load shedding likely to occur regularly through at least late 2024 update 4 *Crisis24* 25 June 2024 available at <https://crisis24.garda.com/alerts/2024/06/south-africa-load-shedding-likely-to-occur-regularly-through-at-least-late-2024-update->

¹³² South Africa: Load shedding likely to occur regularly through at least late 2024 update 4 *Crisis24* 25 June 2024 available at <https://crisis24.garda.com/alerts/2024/06/south-africa-load-shedding-likely-to-occur-regularly-through-at-least-late-2024-update->

¹³³ Slabbert A 'Expect load-shedding from January, financial advisory firm predicts' *Business Live* 9 December 2024 available at <https://www.businesslive.co.za/bd/national/2024-12-09-expect-load-shedding-from-january-financial-advisory-firm-predicts/#:~:text=Load%2Dshedding%20may%20return%20as%20early%20as%20next%20month%20but.financial%20advisory%20firm%20Cresco%20shows.>

¹³⁴ Kamanzi B 'The Crisis In South Africa's Energy Sector: Towards a just transition centring job creation and social ownership Working Document No. 3' *Tricontinental: Institute for Social Research* available at https://thetricontinental.org/wp-content/uploads/2021/04/Eng_working-document-SA-Electricity.pdf

¹³⁵ Kamanzi B 'The Crisis In South Africa's Energy Sector: Towards a just transition centring job creation and social ownership Working Document No. 3' *Tricontinental: Institute for Social Research* available at https://thetricontinental.org/wp-content/uploads/2021/04/Eng_working-document-SA-Electricity.pdf

into democratic South Africa, the Department of Minerals and Energy, released a white paper addressing the energy policies for post-apartheid South Africa. This paper stated that by 2007 electricity demand would have increased given the demand and the demand would certainly exceed the supply if no further action was taken to increase power generation to meet future demand.¹³⁶ In the early 2000s, the government also indicated that supply should be opened up to others, but since then no rival power producers have been allowed to emerge¹³⁷ essentially leaving Eskom as a monopoly.

Conversely, on another level, a deeper structural economic crisis that stems from Eskom's management has been stained by inefficiencies, political intrusion, and allegations of state capture.¹³⁸ It has been said that decision-makers had been influenced by private interests to the detriment of Eskom's operational effectiveness¹³⁹

It's also great to note that when the South Africa government realised that coal powered stations might be coming to an end of their lifespan they tried to migrate toward the usage of nuclear energy. But the plan to migrate has been nothing short of multiple setbacks over the years. From South Africa's Pebble Bed Modular Reactor development in the early 2000s, which was intended to be the forefront of advanced nuclear technology in the country, to the project being abandoned 12 years later after extensive research and development.¹⁴⁰ The same happened with the 2008 project to tender two new nuclear power plants but had to be halted due to the fact that bid could not be financed.¹⁴¹ It is clear that South Africa's journey towards its expansion into nuclear energy has failed because it's troubled by financial limitations, procedural and technical missteps among other issues. Even with the setbacks throughout the decades,

¹³⁶ Naidoo C 'The impact of load shedding on the South Africa economy' (2023) *Journal of Public Administration*, page 7

¹³⁷ Naidoo C 'The impact of load shedding on the South Africa economy' (2023) *Journal of Public Administration*, page 8

¹³⁸ 'The Crisis In South Africa's Energy Sector: Towards a just transition centring job creation and social ownership Working Document No. 3' *Tricontinental: Institute for Social Research* available at https://thetricontinental.org/wp-content/uploads/2021/04/Eng_working-document-SA-Electricity.pdf

¹³⁹ Phalatsé S 'Eskom: The roots of a crisis and avenues forward' (2020) *Institute of Economic Justice* page 30

¹⁴⁰ 'Why nuclear power would be a bad option for South Africa' World Economic Forum available at <https://www.weforum.org/stories/2015/06/why-nuclear-power-would-be-a-bad-option-for-south-africa>

¹⁴¹ 'Why nuclear power would be a bad option for South Africa' World Economic Forum available at <https://www.weforum.org/stories/2015/06/why-nuclear-power-would-be-a-bad-option-for-south-africa>

the south African government seem remain committed to including nuclear into the energy mix in the future.¹⁴²

Another key factor that could form part of the root cause of the crisis is South Africa's energy policies and its rather complex regulatory environment. South Africa's energy policies have inherently depended on fossil fuels as the primary source of electricity generation.¹⁴³ Fossil fuels account for approximately 80 per-cent the used energy sources, because of the abundance of coal, South Africa relies on it as their single source.¹⁴⁴ In turn, this decision has made the country vulnerable to disruptions caused by decay in infrastructure and environmental regulations. Because of the dependence on coal, diversification in the energy sector has been stringent and lacked development throughout the years, thus delaying a sustainable transition in new energy sources and energy mix.

Conversely, policy inconsistencies and weak or no implementation and financial complications may have also contributed to this energy crisis. While there had been a number of energy policies that were introduced to improve the situation, such as the Integrated Resource Plan IRP, the progress had not been significant enough to stop load-shedding. The lack of progress from these policies can be said to have been hindered by bureaucratic inefficiencies, political conflict, and regulatory challenges.¹⁴⁵ As a result, attracting investment for the modernization of the energy infrastructure and the introduction of new energy sources in South Africa became a struggle, thus prolonging the cycle of energy instability, uncertainty and unpredictability.

3.3 Challenges in the energy sector and their impact on trade

The protection of trade at large is the protection of industries, the most significant way to protect the industries and enterprises is to offer sustainable and stable energy for the running

¹⁴² Reuters 'South Africa's Koeberg nuclear plant refit boosts power supplies' 31 December 2024 <https://www.reuters.com/business/energy/south-africas-koeberg-nuclear-plant-refit-boosts-power-supplies-2024-12-31>

¹⁴³ Mauger R & Barnard M 'Addressing fragmentation in the South African renewable energy governance effort-lessons to be learnt from France'(2018) *Journal of Energy in Southern Africa*. Page 1

¹⁴⁴ Mauger R & Barnard M 'Addressing fragmentation in the South African renewable energy governance effort-lessons to be learnt from France' (2018) *Journal of Energy in Southern Africa* (2018) Page 1

¹⁴⁵ 'The Crisis In South Africa's Energy Sector: Towards a just transition centring job creation and social ownership Working Document No. 3' *Tricontinental: Institute for Social Research* available at https://thetricontinental.org/wp-content/uploads/2021/04/Eng_working-document-SA-Electricity.pdf

of their establishments. As discussed in the section before this has not been the case, as South Africa’s energy instability has severely affected its trade capacity. The effects of the nation's trade capacity can be analysed and demonstrated with a sectoral analysis of the three most affected trade-intensive and energy-reliant industries.

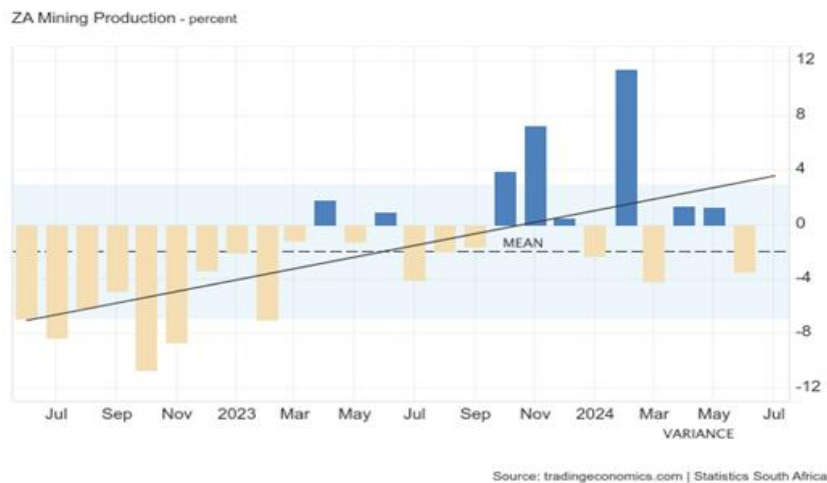
3.3.1 Sectoral analysis

The great impact of South Africa’s energy crisis has been felt across various sectors and industries. Key trading sectors such as mining, manufacturing, and agriculture, are all heavily reliant on energy and are big export industries, could be said where the most affected by the crisis. Below is an analysis of these sectors and the broader economic implications on trade.

3.3.1.1 Mining sector

As previously noted, mining is one of the hardest-hit sectors during peak blackouts. South Africa’s economy is heavily dependent on the mining sector, and a leading exporter of gold, platinum, and coal.¹⁴⁶ Export data shows that the mining sector amounts to almost 60 per-cent of the total export in South Africa,¹⁴⁷ also contributing 5 per-cent towards the country’s GDP.¹⁴⁸

Figure 1 (Mining production in South Africa from July 2022 to July 2024)¹⁴⁹



¹⁴⁶ ‘South Africa Minerals and Mining’ *South African Embassy in the Netherlands* available at <https://zuidafrika.nl/trade-investment/ks-minerals-and-mining/> (accessed 15 September 2024)

¹⁴⁷ ‘SA Mine 2023: Adapt to thrive’ *PwC South Africa* available at <https://www.pwc.co.za/en/assets/pdf/sa-mine-2023-v3.pdf> (Accessed 17 September 2024)

¹⁴⁸ ‘South Africa Minerals and Mining’ *South African Embassy in the Netherlands* available at <https://zuidafrika.nl/trade-investment/ks-minerals-and-mining/> (accessed 15 September 2024)

¹⁴⁹ ‘South Africa GDP From Mining’ *Trading Economics* available at <https://tradingeconomics.com/south-africa/mining-production> (Accessed 17 September 2024)

During the peak of the power crisis, that is in 2023, mining production in South Africa shrank by 1,9 per-cent from the previous month in September, and a 2 percent drop in the previous month (figure 1).¹⁵⁰ This had marked the third consecutive month of receding mining activity as can be seen in the graph above. Trading Economics stated that the decline of one of the country's pillar industries is due to a few factors. These factors include “currency fluctuations, high inflation, power blackouts, and logistical issues in mineral exports due to the deterioration of infrastructure”.¹⁵¹ This shows that even if power blackouts are not the only reason for a decline in mining outputs it is still part of the fundamental reasons for the decline.

3.3.1.2 Manufacturing

The manufacturing sector, a sector that includes a number of industries such as the automotive, which was discussed in the previous chapter, textiles, and chemicals have been incredibly affected by energy instability. The sector historically contributed 23 per-cent of the GDP at its height in the 1980s and has been on a decline since.¹⁵² Currently, the manufacturing sector contributes 12.92 percent of the GDP.¹⁵³ Manufacturing is one of those industries that is interconnected and linked to other industries with a variety of suppliers and supporting industries, in particular the mining and agricultural sectors.¹⁵⁴

According to the Purchasing Manager Index (PMI) conducted by Trading Economics, illustrates how the Manufacturing PMI has mostly remained below 50 points from March 2023 to March 2024 (figure 2),¹⁵⁵ “The headline PMI is a number from 0 to 100. A PMI above 50 represents an expansion when compared with the previous month. A

¹⁵⁰ ‘South Africa GDP From Mining’ *Trading Economics* available at <https://tradingeconomics.com/south-africa/gdp-from-mining> (Accessed 17 September 2024)

¹⁵¹ ‘South Africa GDP From Mining’ available at <https://tradingeconomics.com/south-africa/gdp-from-mining> (Accessed 17 September 2024)

¹⁵² ‘South African Manufacturing -A situational analysis’ *South African Reserve Bank* (2020) available at <https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2020/10410/OBEN.pdf>

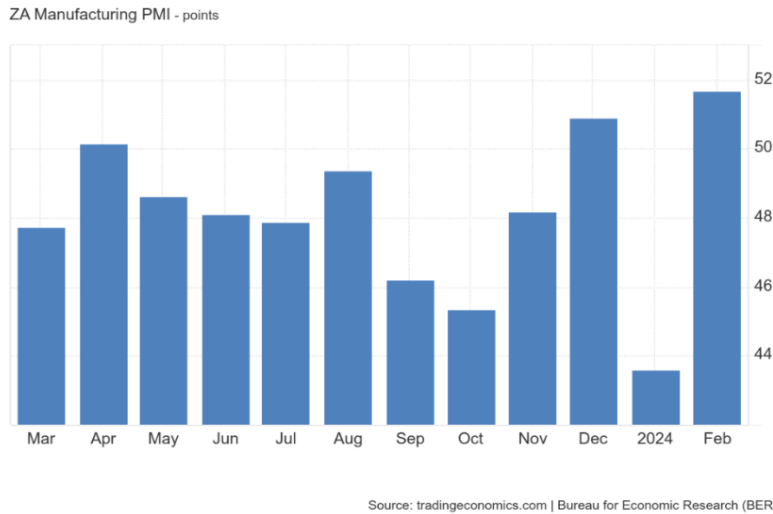
¹⁵³ ‘South African Manufacturing- a situational analysis’ *South African Reserve Bank* (2020) available at <https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2020/10410/OBEN.pdf> (Accessed ...)

¹⁵⁴ ‘South African Manufacturing -A situational analysis’ *South African Reserve Bank* (2020) available at <https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2020/10410/OBEN.pdf>

¹⁵⁵ ‘South Africa GDP From Manufacturing’ *Trading Economics* available at <https://tradingeconomics.com/south-africa/gdp-from-manufacturing> (Accessed 18 September 2024)

PMI reading under 50 represents a contraction while a reading at 50 indicates no change”.¹⁵⁶

Figure 2: South Africa Purchasing Manager Index¹⁵⁷



The year 2023 being the height of load-shedding, can be further backed with the stats above (figure 2), as it illustrates how the manufacturing sector has been heavily impacted by the constant power instability, as it remained under 50 points for most of the year, as indicated by figure 2.

South Africa has one of the most advanced manufacturing sectors in the continent but has failed in developing and developing technology intensity.¹⁵⁸ With that in mind, it can be seen that from 1995 to 2017 manufacturing added value declined from 32 per-cent to 24 per-cent, thus the energy crisis can be said to be worsening an already bad situation and suggesting a decline in trade competitiveness.¹⁵⁹

¹⁵⁶ Purchasing Managers' Index (PMI) Definition and how it works *Investopedia* available at <https://www.investopedia.com/terms/p/pmi.asp#:~:text=The%20headline%20PMI%20is%20a,at%2050%20indicates%20no%20change>.

¹⁵⁷ South Africa Manufacturing PMI available at <https://tradingeconomics.com/south-africa/manufacturing-pmi>

¹⁵⁸ 'South African Manufacturing A situational analysis' *South African Reserve Bank* (2020) available at <https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2020/10410/OBEN.pdf>

¹⁵⁹ 'South African Manufacturing A situational analysis' *South African Reserve Bank* (2020) available at <https://www.resbank.co.za/content/dam/sarb/publications/occasional-bulletin-of-economic-notes/2020/10410/OBEN.pdf>

3.3.1.3 Agriculture

The agricultural sector, which could be assumed to be less energy-intensive in comparison to mining and manufacturing, has been said to have also been affected by South Africa's Energy crisis. Roughly half the country's farming income comes from the heavy users of power.¹⁶⁰ Persistent load-shedding continued to pose a significant threat to the food supply chain and agricultural production.¹⁶¹ "Power cuts affect irrigation schedules, heating, fruit and wine processing, milling, bakeries, abattoirs, cold chain logistics, and exports".¹⁶² Irregular changes to load-shedding stages have been said to have resulted in instances where farms and processors having to discard their produce.¹⁶³ The reported losses from farmers were between 30 to 50 per-cent.¹⁶⁴ These losses came from fruits and vegetables that needed constant and uninterrupted cold storage but because of the blackouts, the product would ripen or even rot overnight.¹⁶⁵ Another one was stringent agricultural export market rules regarding temperature control, which evidently were not adhered to because of the blackouts.¹⁶⁶

All the above in the end led to an increase in costs and extensive financial and job losses. Not only the farmers were affected but the ordinary South Africans who had to buy the product and an exorbitant price.¹⁶⁷

¹⁶⁰ ADAMA : The Impact of Load-shedding on Agriculture available at <https://www.adama.com/south-africa/en/sustainability/impact-load-shedding-agriculture> (Accessed 11 September 2024)

¹⁶¹ Brewis T, Desai D & Oliver J 'Surviving the impact of the electricity crisis on food production' *Cliffe Dekker Hofmeyr* available at <https://www.cliffedekkerhofmeyr.com/news/publications/2024/Sector/Agriculture/agriculture-aquaculture-fishing-alert-24-April-surviving-the-impact-of-the-electricity-crisis-on-food-production#> (Accessed 13 September 2024)

¹⁶² Brewis T, Desai D & Oliver J 'Surviving the impact of the electricity crisis on food production' *Cliffe Dekker Hofmeyr* available at <https://www.cliffedekkerhofmeyr.com/news/publications/2024/Sector/Agriculture/agriculture-aquaculture-fishing-alert-24-April-surviving-the-impact-of-the-electricity-crisis-on-food-production#>:

¹⁶³ Brewis T, Desai D & Oliver J 'Surviving the impact of the electricity crisis on food production' *Cliffe Dekker Hofmeyr* available at <https://www.cliffedekkerhofmeyr.com/news/publications/2024/Sector/Agriculture/agriculture-aquaculture-fishing-alert-24-April-surviving-the-impact-of-the-electricity-crisis-on-food-production#>

¹⁶⁴ Brewis T, Desai D & Oliver J 'Surviving the impact of the electricity crisis on food production' *Cliffe Dekker Hofmeyr* available at <https://www.cliffedekkerhofmeyr.com/news/publications/2024/Sector/Agriculture/agriculture-aquaculture-fishing-alert-24-April-surviving-the-impact-of-the-electricity-crisis-on-food-production#>

¹⁶⁵ ADAMA : The Impact of Load-shedding on Agriculture available at <https://www.adama.com/south-africa/en/sustainability/impact-load-shedding-agriculture>

¹⁶⁶ ADAMA : The Impact of Load-shedding on Agriculture available at <https://www.adama.com/south-africa/en/sustainability/impact-load-shedding-agriculture>

¹⁶⁷ ADAMA : The Impact of Load-shedding on Agriculture available at <https://www.adama.com/south-africa/en/sustainability/impact-load-shedding-agriculture>

In the “Re-estimating the Economic Cost of Load Shedding in South Africa”¹⁶⁸ report, which investigated the relationship between GDP growth and load-shedding, they came to the conclusion that the agricultural sector was the most affected sector in South Africa in terms of the after-effects of load-shedding.¹⁶⁹ As of 2024, the agricultural sector contributes around 12 per-cent to South Africa's Total GDP, that is if the whole value chain is taken into account.¹⁷⁰ According to the South African Reserve Bank and Investec analysis, year-on-year hit for agriculture, forestry, and fishing was close to 10%”.¹⁷¹

According to the Daily Maverick, the agricultural sector’s growth in 2022, contracted by 3.3 percent in the last quarter.¹⁷² The first quarter of 2023 saw the worsening of these blackouts and in turn, saw a decline in the South African agribusiness confidence index (ACI).¹⁷³ ACI declined four points in the last quarter of 2022 and a further five points in the first quarter of 2023, which was the lowest it had been since the 2020 COVID-19 lockdown.¹⁷⁴ The ACI has recovered since the second quarter of 2024 but the points are still under the 50 neutral mark,¹⁷⁵ thus implying the South African Agribusinesses remains rather a concern, further illustrating how the energy crisis negatively affected the agricultural sector.

¹⁶⁸ Walsh K, Nel J & Kiln J ‘Re-estimating the Economic Cost of Load Shedding in South Africa’ *Nova Economics* available at

https://cms.novaeconomics.co.za/wpcontent/uploads/2023/10/Updated_Eskom_CoLS_ESSA_presentation_2024.pdf (Accessed 11 September)

¹⁶⁹ Walsh K, Nel J & Kiln J ‘Re-estimating the Economic Cost of Load Shedding in South Africa’ *Nova Economics* available at

https://cms.novaeconomics.co.za/wpcontent/uploads/2023/10/Updated_Eskom_CoLS_ESSA_presentation_2024.pdf

¹⁷⁰ Government Communication and Information System (GCIS) *Department of Agriculture Forestry and Fisheries*

Available at

<https://www.gcis.gov.za/sites/default/files/docs/resourcecentre/pocketguide/2012/03%20Agriculture.pdf>

¹⁷¹ ‘SA’s load shedding constraint and its impact on different economic sectors’ *Investec* 2 March 2024

available at https://www.investec.com/en_za/focus/economy/sa-s-load-shedding-how-the-sectors-are-being-affected.html

¹⁷² Van der Rheede C ‘Load shedding threatens us with food shedding, and that means tough times ahead’ *The Daily Maverick* available at <https://www.dailymaverick.co.za/opinionista/2024-03-12-why-did-sa-agriculture-underperform-in-2023-and-what-should-we-expect-in-2024/>

¹⁷³ Agribusiness Confidence *Agbiz* available at <https://www.agbiz.co.za/content/economic-research?page=agribusiness-confidence>

¹⁷⁴ Agribusiness Confidence *Agbiz* available at <https://www.agbiz.co.za/content/economic-research?page=agribusiness-confidence>

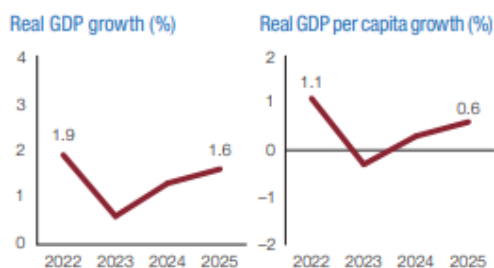
¹⁷⁵ Agribusiness Confidence *Agbiz* available at <https://www.agbiz.co.za/content/economic-research?page=agribusiness-confidence>

3.3.2 Economic Ramifications

From the sectoral analysis above it can be clearly seen that the South African economy has been immensely affected by the crisis. This crisis did not only affect the industries discussed but resulted in many other industry shutdowns, a decline in productivity, unemployment, and negatively affected healthcare and education.¹⁷⁶ This section of the paper will shed some light on the devastating impact of the energy crisis on the South African economy at the surface level.

The crisis has had a devastating effect on the ordinary lives of South African citizens coupled with a vast struggle and complete shutdown of businesses and industries. There are a few economic models that have been developed to illustrate the impact of the rolling blackouts in South Africa. The estimated amount for one full day of blackouts cost the country's economy around R54 536 million.¹⁷⁷ Figure 3 below, from the Macroeconomic and Financial Development, illustrates how South Africa's Real GDP growth slowed down from 1.9 per-cent in 2022 to 0.6 per-cent in 2023.¹⁷⁸ They mention that this deceleration is partly due to 'persistent electricity shortages'.¹⁷⁹ It is important to note that in the report it is also mentioned how agriculture and mining are the key sectors that contributed to the deceleration of the South African economy in 2023.

Figure 3 (GDP growth stats 2022-2024)



¹⁷⁶ United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 280; 005779/2023 available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

¹⁷⁷ Naidoo C 'The impact of load shedding on the South Africa economy' (2023) *Journal of Public Administration* page 9

¹⁷⁸ 'Driving Africa's Transformation The Reform of the Global Financial Architecture' *African Economic Outlook* (2024) page 231 available at https://www.afdb.org/sites/default/files/2024/06/06/aeo_2024_-_country_notes.pdf

¹⁷⁹: 'Driving Africa's Transformation The Reform of the Global Financial Architecture' *African Economic Outlook* (2024) page 231 available at https://www.afdb.org/sites/default/files/2024/06/06/aeo_2024_-_country_notes.pdf

A 2018 study by Schoeman and Saunders reported that around 90 per-cent of businesses in South Africa deemed electricity as an essential and fundamental part of the functioning of their businesses.¹⁸⁰ Out of that 70 per-cent , 37 per-cent of the business owners said to have experienced damage to their business properties as a result of the load-shedding.¹⁸¹ This is particularly bleak because 40 per-cent of businesses in South Africa are SMMEs, which contribute approximately 36 per-cent to the country's economy, and definitely cannot afford to constantly replace damaged equipment.¹⁸²

As discussed previously, because of the negative effects of the crisis, it is likely the impact on the South African labour market has also faced dire consequences faced by the affected industries. Business Tech conducted a study on how load-shedding affected the South African job market and found that load-shedding could be associated with a nearly 17 per-cent lower employment rate in the manufacturing sector, which is about 6 times more than other industries.¹⁸³ Their model suggests that working hours were fewer when power was cut. Currently, the unemployment rate sits at 32.9 per-cent,¹⁸⁴ and it is partly because of the energy crisis. In the South African Reserve Bank analysis of load-shedding and economic activity, their results showed, “as the intensity of load shedding increases, South Africa's real GDP growth decreases by a statistically significant amount.¹⁸⁵ This further proves how negatively affected the economy was by the energy crisis.

¹⁸⁰ Schoeman T & Saunders M ‘The impact of power outages on small businesses in the City of Johannesburg’ *10th international conference on education, business, humanities and social sciences studies* (2018) Page 330

¹⁸¹ Schoeman T & Saunders M ‘The impact of power outages on small businesses in the City of Johannesburg’ *10th international conference on education, business, humanities and social sciences studies* (2018) page 332

¹⁸² Naidoo C ‘The impact of load shedding on the South Africa economy’ *Journal of Public Administration* (2023) page 9

¹⁸³ ‘How load shedding killed jobs and salaries in South Africa’ *Business tech* available at <https://businesstech.co.za/news/business/774719/how-load-shedding-killed-jobs-and-salaries-in-south-africa/> (accessed 09 Sep 2024)

¹⁸⁴ ‘Quarterly Labour Force Survey (QLFS)’ *Statistics South Africa* (2024) <https://www.statssa.gov.za/publications/P0211/Presentation%20QLFS%20Q1%202024.pdf>

¹⁸⁵ ‘Box 1 Electricity load shedding and economic activity *South African Reserve Bank*’ available at <https://www.resbank.co.za/content/dam/sarb/publications/quarterly-bulletins/boxes/2019/9517/Electricity-load-shedding-and-economic-activity.pdf>

3.3.3 Impact on Energy Trade

As discussed in chapter 2 ,energy is a good and a service which can be sold and transferred. Thus, South Africa's energy crisis has not only negatively impacted domestic industries as discussed above but has had some consequences for the country's energy trade. This is in the context of electricity exports and possible missed opportunities in the trade of renewable energy. South Africa is a leader in energy production in the Southern African region with a diminished ability to participate effectively in regional and global energy markets because it struggles with energy supply.

Historically, there has been a complex market for African energy trade, at the centre of which is South Africa. South Africa has been a key exporter of electricity within the Southern African Power Pool¹⁸⁶ member countries, namely Mozambique, Botswana, Malawi, Angola, Lesotho, Namibia, DRC, Swaziland, Tanzania, Zambia, and Zimbabwe.¹⁸⁷ Because South Africa generated almost three times more power than any other country in the southern region, the grid ended up exporting a significant amount of power through bilateral agreements in addition to SAPP.¹⁸⁸

Now with the current crisis, South Africa's inability to generate enough electricity for its own nation's demand is proof that it does not have the capability to meet export demand, thus leading to a decline in electricity exports. In terms of the South African trade report 2023, South Africa saw a decrease in the total exported electricity compared to 2022 and 2021,¹⁸⁹ thus showing a decline in electricity export. South Africa has also increased imports of diesel to power backup power generation, between the 2022 and 2023 financial years. A study showed that diesel usage increased by 19 per-cent.¹⁹⁰

¹⁸⁶ Southern Africa Power Pool (SAPP) Available at: <https://www.sapp.co.zw/> (Accessed 14 October 2024)

¹⁸⁷ 'South African Energy Trade Report' *Directorate Energy Economics And Statistics* (2022) Available at: https://www.dmre.gov.za/Portals/0/Energy_Website/files/media/explained/2022-South-African-Energy-Trade-Report.pdf (Accessed 18 September 2024)

¹⁸⁸ Metivier M 'Alternating Current: Southern Africa's Issue with Load Shedding' *Crisis24* 27 March 2023 Available at : <https://crisis24.garda.com/insights-intelligence/insights/articles/alternating-current-southern-africas-issue-with-load-shedding> (Accessed 18 September 2024)

¹⁸⁹ 'South African Energy Trade Report' *Directorate Energy Economics And Statistics* (2023) Available at: <https://www.dmre.gov.za/Portals/0/Resources/Publications/Reports/Energy%20Sector%20Reports/SA%20Energy%20Trade%20Report/2023-South-African-Energy-Trade-Report.pdf>

¹⁹⁰ 'How load shedding affects food prices – through diesel' *SAICA* 22 February 2024 Available at : <https://www.saica.org.za/news/how-load-shedding-affects-food-prices-through-diesel> (Accessed 20 September 2024)

It can be said the decrease in exports and increase in imports has strained the nation's trade balance. The year-to-date (01- 31 January 2024) preliminary trade balance deficit is R9.4 billion, and in 2023 had a R24. 4 billion trade balance deficits.¹⁹¹ Even though there has been a significant improvement in the trade balance, it's still a deficit, nonetheless. Running on a deficit will later hurt job creation and economic growth.¹⁹²

This growing reliance on energy imports to offset or compensate for the energy shortages has highlighted the broader economic and trade cost of the energy crisis.

3.4 Analysis of South Africa's key energy Policies and laws

South Africa's energy crisis has highlighted the urgent need to give attention to the development of a robust and forward-thinking energy regulations because of their impact on the economy, environmental security, and society. "Law is an important social, regulatory, and economic tool that can be applied to influence and manage development".¹⁹³ Currently, it can be said that South Africa does not have a specific policy document that outlines in detail the thinking ahead to the decline of export markets in the context of coal.¹⁹⁴ The current Plan merely outlines the vision for a transition towards cleaner energies.¹⁹⁵ At the core of addressing these challenges are key policies like the Integrated Resource Plan (IRP) and the Renewable Energy Independent Power Producer Procurement Programme, along with legislation such as the National Energy Act.

¹⁹¹ 'Trade statistics for 2024 Media Release' *South African Revenue Services* 29 February 2024 available at <https://www.sars.gov.za/wp-content/uploads/Docs/TradeStats/2024/Jan4125/Media-Release-January-2024.pdf> (Accessed 20 September 2024)

¹⁹² 'Trade Deficit: Advantages and Disadvantages' *Investopedia* 21 August 2024 Available at <https://www.investopedia.com/articles/investing/051515/pros-cons-trade-deficit.asp> (Accessed 20 September 2024)

¹⁹³ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in South Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* 2021 Latvia University of Life Sciences and Technologies page 234

¹⁹⁴ Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* Page 41

¹⁹⁵ Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* Page 41

Below are key policies and legislation that govern the shaping of energy in South Africa (table 1).

Key energy legislation and policies in South Africa (table 1)

year	Legislation / Policy	
1998	White paper on Energy policy	Original policy document that stipulates the objectives of the South African energy sector.
2003/4	White paper on Renewable Energy	It introduces the uptake of RE in the South African economy. It also identifies the various forms of RE sources that could work in South Africa. It identified biogas, biomass, hydropower, landfill gas, solar and wind energy.
2006/7	Electricity Regulation Act (ERA)	This document was established to create a national regulatory framework for the electricity supply industry and make the National Energy Regulator the custodian and enforcer of the national electricity regulatory framework amongst other objectives. ¹⁹⁶
2024	Electricity Regulation Amendment Act	This regulation aims to amend the ERA of 2006, commencement will be the 1 st of January 2025
2008	National Energy Act	Was introduced to ensure there is the availability of diverse energy resources
2019	Integrated Resource Plan (IRP2019) Adoption of revised plan	This “living plan” ¹⁹⁷ , that was introduced to promote and regulate infrastructure development for energy supply and demand based on least cost electricity. ¹⁹⁸

The current energy situation is unlikely to change significantly in the next 10 years due to the challenges related to the cost, political climate, environmental issues, and the country's

¹⁹⁶ Electricity Regulation Act 28 of 2007 available at: https://www.saflii.org/za/legis/consol_act/era2006251/

¹⁹⁷ Integrated Resource Plan (IRP2019)

¹⁹⁸ ‘Review of the Integrated Resource Plan 2019 (IRP 2019) Policies’ *international Energy Agency (IEA)* available at <https://www.iea.org/policies/6502-integrated-resource-plan-2019-irp-2019#:~:text=The%20IRP%20is%20an%20electricity,negative%20emissions%20and%20water%20usage>

baseload needs, to name a few. These challenges, notwithstanding, several national policies mandate a shift from fossil fuels to a low-carbon energy sector.¹⁹⁹ The original legal mandate of the move toward renewable energy was in the White Paper on the Energy Policy of the Republic of South Africa of 1998, with the subsequent White Paper on Renewable Energy of 2004. This particular white paper set a renewable energy target for 2013, but this target was not reached partly due to poor policy settings and implementation, which in turn discouraged investment towards the white paper deal.²⁰⁰ The two policies paved the way for the National Energy Act 34 of 2008,²⁰¹ which highlights the need for an integrated and sustainable energy plan that will focus on energy security, economic and universally available, international commitments, and the environment among other issues, as stated in Section 6 of the act.

It can be said that the basis of these laws and policies above is the introduction and promotion of renewable energy, with the legal mandate to increase generation, as well as somewhat promising environmental protection.²⁰² South Africa still has policies and regulations that were developed around a monopoly provider.²⁰³ Despite these policies and laws having the potential to shape and improve South Africa's energy future and trade competitiveness, they have been faced with obstacles that have failed to align energy security with trade goals. The global trend towards reforming and improving energy policy, not just for trade, is finding a way to shape renewable energy development, which is by promoting renewable energy and removing barriers to the development and implementation of RE.²⁰⁴ This could be said to be what these policies were trying to do. However, the current state of South Africa's energy legal regulations and policy framework raises some concerns.

¹⁹⁹ Mauger R & Barnard M 'Addressing fragmentation in the South African renewable energy governance effort-lessons to be learnt from France' (2018) *Journal of Energy in Southern Africa* page 2

²⁰⁰ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in south Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies page 237

²⁰¹ National Energy Act 34 of 2008 available at:
https://www.gov.za/sites/default/files/gcis_document/201409/316381263.pdf

²⁰² Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in South Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* (Latvia) Latvia University of Life Sciences and Technologies page 235

²⁰³ Smarte Anekwe IM, Akpasi SO, Mkhize MM et al 'Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review'(2024) *Science Progress*

²⁰⁴ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in south Africa'(2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies. Page 234

3.4.1 Integrated Resource Plan (IRP) 2019

The Integrated Resource Plan, being the latest adoption towards the rescue of South Africa from the trenches of load-shedding, is South Africa's roadmap aimed at identifying generation technology that is required to meet demand by 2030.²⁰⁵ The IRP was first introduced in 2010 with the idea of revision and updating every two years, but the 2013 and 2016 versions were not adopted until the 2019 version. This sets a gap of 9 years since the policy was adopted, thus creating a sense of uncertainty toward commitments of energy diversification.²⁰⁶ The plan includes objectives such as affordability, reduced emissions, and diversification of energy sources.²⁰⁷ This plan's inherent aim is to target South Africa's over-reliance on fossil fuels and increase the energy sectors' focus on renewable energy sources. However, despite its promise, this plan has encountered numerous obstacles, particularly regarding policy coherence and implementation.

It sets an ambitious goal to decarbonise the energy sector while addressing energy insecurity. This is particularly great as it is the only part that aligns with global environmental standards that in turn directly influence international trade. But the excitement is short-lived because even with these ambitious goals, The IRP does not mention the idea of a "just transition plan", this has the possibly still justifying the continuous use of fossil fuel sources.²⁰⁸

The fragmentation of South Africa's energy regulation, defined by Murombo as the "lack of coordination and synchronisation of the legislation, institutions, and sectors that ideally should be intertwined"²⁰⁹ This is an important view, especially in the context of the IRP and trade as the most recent policy. This comes across as a significant shortfall because of the absence of clear acknowledgment of the connectedness between energy security and trade competitiveness, especially when the National Act under

²⁰⁵ The Republic of South Africa: Department of Energy - Integrated Resource Plan 2019. Available at: <https://www.energy.gov.za/irp/irp-2019.html>

²⁰⁶ Nene & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in South Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies page 236

²⁰⁷ The Republic of South Africa: Department of Energy - Integrated Resource Plan 2019 available at : <https://www.iea.org/policies/6502-integrated-resource-plan-2019-irp-2019>

²⁰⁸ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in south Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies page 237

²⁰⁹ Murombo T 'Regulating energy in South Africa: Enabling sustainable energy by integrating energy and environmental regulation' (2015) *Journal of Energy & Natural Resources Law*

section 6(3)(a) literally states that the IRP has to take trade amongst other factors into account in its plans. Especially how it is illustrated throughout the study that how energy security, economic stability, and trade are interconnected and mutually reinforcing. Even though the IRP's focus is not singular, its lack of explicit consideration of trade dynamics results in a disconnection between energy planning, national trade goals, and industrial policies. The plan can be said to have a rather narrow focus as it mostly prioritises socio-economic and political challenges, rather than how the energy sector can play a role in achieving economic policy developments, being industries and/or sectors that contribute heavily to the country's economy.²¹⁰ It further does not address energy efficiency measures across industries, as energy efficiency could be better when it comes to the cost-effectiveness of reducing emissions, and thus should be integrated more prominently in the Plan. The socio-economic and political challenges are important to confront but a refocus or/and an addition towards the broader economic sustainability could be better suited for South Africa at large. An additional focus on a framework that can link the stabilisation of energy supply with the performance of export sectors can further improve the reach of the IRP, which will in turn improve trade efficiency both domestically and internationally and eventually lead to sustainable economic growth, that is if implemented effectively. Moreover, the IRP still largely focuses on coal capital and labour rather than more significant national policy obligations,²¹¹ it can be said that to be short-sighted in this regard.

Implementation has been rather 'hurdlesome' in South Africa, especially with the IRP 2030 plan looming. South Africa's coal export industry is already facing a prospect of long term decline, especially with major export markets showing signs of a transition away from coal, meaning there is limited growth potential that could affect the industry.²¹² With the rising demand for sustainable energy in international trade and many of South Africa's trading partners adopting stringent environmental and energy standards, South African energy frameworks still lack sufficient provisions for the

²¹⁰ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in south Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies page 237

²¹¹ Nene S & Nagy H 'Legal regulations and policy barriers to development of renewable energy sources in south Africa' (2021) *In Engineering for Rural Development. Proceedings of the International Scientific Conference* Latvia University of Life Sciences and Technologies page 237

²¹² Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* Page 31

synchronisation of energy and environmental sustainability, especially in the context of international trade. Because of this, South Africa may risk being left behind if it does not transition toward greener sources. The IRP does not provide a clear implementation path for reducing South Africa's carbon footprint, which at the end of the day will leave South Africa at risk of trade barriers and penalties risking market access.

Prior to the plan being issued in 2010, it was stated that it would be a “living plan”, that would be revised and updated every two years, as stated formerly.²¹³ However, it can be pointed out that this has not been done, and the delay in updating the plan raises some concerns about South Africa's commitment towards sustainable energy. This is one of the reasons why the South African energy mix may have failed to meet the constantly changing demand of the country and another reason why it does not reflect current technological advancement in the energy sector on a global scale. It is currently 2024 and 2019 is the latest version that is relied on, this is particularly bleak because South Africa may be missing out on international tech advancement and opportunities. Accordingly, a need for revision and revisit of the IRP is needed so it can align with current realities and long-term goals.

3.4.3 Electricity Regulation Amendment Act 2024

In August 2024, the South African president signed into law the Electricity Regulation Amendment Act,²¹⁴ repealing the previous ERA act of 2006. The act has been proclaimed to commence on the 1st of January 2025.²¹⁵ This act is expected to alter or transform South Africa's energy sector. Moving to from a vertically integrated model dominated by utility Eskom to a more hybrid market structured model.²¹⁶

²¹³ Department of Mineral Resources ‘introduction-DMRE’ available at [https://www.dmre.gov.za/mining-minerals-energy-policy-development/integrated-resource-plan/introduction#:~:text=The%20Integrated%20Resource%20Plan%20\(IRP,as%20necessitated%20by%20changing%20circumstances.](https://www.dmre.gov.za/mining-minerals-energy-policy-development/integrated-resource-plan/introduction#:~:text=The%20Integrated%20Resource%20Plan%20(IRP,as%20necessitated%20by%20changing%20circumstances.)

²¹⁴ Electricity Regulation Amendment Act 38 of 2024 available at https://www.gov.za/sites/default/files/gcis_document/202408/51100electricityregamendmentact38of2024.pdf

²¹⁵ South African Government : official information and services available at [https://www.gov.za/documents/acts/electricity-regulation-amendment-act-38-2024-english-isizulu-20-aug-2024#:~:text=1%20January%202025%20\(Gazette%2051778%20of%2018%20December%202024\)](https://www.gov.za/documents/acts/electricity-regulation-amendment-act-38-2024-english-isizulu-20-aug-2024#:~:text=1%20January%202025%20(Gazette%2051778%20of%2018%20December%202024))

²¹⁶ Electricity Regulation Amendment Act ‘transformational’ for South Africa *Pinsent Masons* available at <https://www.pinsentmasons.com/out-law/analysis/electricity-regulation-amendment-act-south-africa>

Key provision from the act:

1. The act mandates a launch of a transmission system operator within five years of promulgation, that will manage system operations, market operators, transmitters and purchasing agencies to overlook the competition of the south African energy market.²¹⁷
2. The act gives NERSA the power of regulatory oversight during this transition, granting them further and broader oversight when it comes to amending, withdrawing, suspending and the revocation of licenses.²¹⁸
3. The act also aims to open access to the electricity market allowing competitive trading. This will be done by promoting third party access and transparency facilitated by TSO mentioned previously.²¹⁹

This act's amendment has posed potential transformation for the energy sector. With at least three overseeing the south African energy sector before, which clearly slowed down implementation of energy reforms, the idea of only minister overseeing the sector this time will hopefully lead to better implementation for these envisaged reforms.²²⁰ This act has great potential to grant the South Africa's energy sector and take it to great magnitude and even somewhat resolve this longstanding energy crisis. But as we know nothing comes without challenges, thus success of the act should be anchored by government willingness to carry the reforms and implementation which the country has struggled with through out the years.

3.4.3 Judicial intervention and policy gaps

South Africa's energy crisis has not only been shaped by operational, governance, and policy shortcomings but also by critical judicial intervention or lack thereof. These judicial interventions wanted to address some governance issues within Eskom and the broader energy sector. Despite the role of the judiciary intervention in holding Eskom accountable for its involvement in the energy crisis and trying to resolve issues that

²¹⁷ Electricity Regulation Amendment Act 38 of 2024, Section 2 & Section 30

²¹⁸ Electricity Regulation Amendment Act 38 of 2024, Section 5 amends Section 7 & Section 6 amends Section 9

²¹⁹ Electricity Regulation Amendment Act 38 of 2024, Section 8 inserts Chapter IIIA into principal Act & Section 31

²²⁰ Electricity Regulation Amendment Act 'transformational' for South Africa Pinsent Masons available at <https://www.pinsentmasons.com/out-law/analysis/electricity-regulation-amendment-act-south-africa>

come with the crisis, there remains a significant gap in the address of the broader implications of the crisis.

The courts in South Africa have played a role in addressing and holding Eskom accountable for its poor management of the energy sector. This is notable in the case of *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 1949*,²²¹ where the court held that the utility's failure to take paramount actions which led to the current energy crisis had amounted to the violations of constitutional rights.²²² The court further directed the Minister of Electricity to ensure there is a sufficient supply of electricity to public establishments.²²³ This included all public health establishments, public schools, and police stations.²²⁴ This had to be done by the end of January 2024. The ruling pointed out the responsibility of Eskom to ensure stable access to electricity irrespective of its issues.

As said above protection of social issues is good and all but not having actionable solutions creates a gap in South Africa's legal framework because it shows a lack of regulatory enforcement. It is understandable that the judiciary is for the people and their constitutional rights, but because the energy crisis has affected the industries and in turn severely affected the economy, which is basically the workforce and the livelihoods of the South African people. At the end of the day, a person who cannot work for themselves and feed his or her children ends up feeling like they lack dignity.²²⁵ Dignity is the most fundamental right in the South African constitution. This further causes an imbalance, which risks exacerbating the economic hit and undermines broader economic development. This shows that even if trade dynamics are not seen as important as social issues, but the suffering of industries in trade end up creating said social issues in the long run.

While Court rulings compel the parties involved in the action, in this regard it lacks enforceability in rather practical terms. The court's directive to the minister was “to take

²²¹ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 280; 005779/2023* available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

²²² *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 280; 005779/2023* available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

²²³ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 280; 005779/2023* available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

²²⁴ *United Democratic Movement and Others v Eskom Holdings SOC Ltd and Others [2023] ZAGPPHC 280; 005779/2023* available at <https://www.saflii.org/za/cases/ZAGPPHC/2023/280.html>

²²⁵ Constitution of the Republic of South Africa, 1996 - Chapter 9, section (10)

all reasonable steps”, which does not really translate to effective solutions for the crisis. Therefore, even if broader sectors were not included in this intervention, the lack of specific solutions somewhat left industries in a risky position without relief.

As mentioned above, fragmentation in the regulatory frameworks in South Africa is quite evident. The fragmentation in the regulatory environment can be seen with the multiple policies and acts like the ERA²²⁶ and the REIPPPP²²⁷ for instance, these frameworks govern different aspects of energy supply. This idea is also the same with regard to the JET-IP implementation framework, the South Africa Renewable Energy Masterplan (SAREM), and the Green Hydrogen Commercialisation strategy. The fragmentation issues that come with these bodies and policies, may include multiple regulatory bodies, dependency on Eskom, and qualification criteria amongst other issues. These issues have a possibility to create challenges, because of overlapping responsibilities, that may lead to inconsistencies and delays in implementation.

It is great to note that the national regulator of South Africa (NERSA), which is designated by ERA, is responsible for “regulating the price of pipeline gas and petroleum, reducing monopoly in the energy sector, improving competition and boosting economic growth”.²²⁸ But NERSA has failed to enforce compliance in any of these challenges, which in turn has allowed Eskom to continue operating with constant operational failures without consequences, leaving industries and consumers to bear the brunt of power cuts and rising costs. There has been a concern about NERSA’s lack of clear performance targets which has made it difficult to assess its past performance and future plans.²²⁹ Thus granting NERSA more power as they did in the new Electricity act poses a risk. This lack of accountability undermines industries that depend on energy supply and regulatory oversight. Thus, without measurable goals, it is hard to see if there is progress in addressing the energy crisis.

²²⁶ Electricity Regulation Act 28 of 2007 available at: https://www.saflii.org/za/legis/consol_act/era2006251/

²²⁷ ‘The South African Renewable Energy Independent Power Producer Procurement Programme (REIPPPP): tender process that was launched to facilitate private sector investment into grid-connected renewable energy generation’ *Department of Mineral Resources and Energy* available at: <https://www.dmre.gov.za/energy-resources/reipp-programme>

²²⁸ National Energy Regulator Of South Africa - *Department of Mineral Resources and Energy* <https://www.dmre.gov.za/energy-resources/energy-sources/electricity/nersa#:~:text=Ogrowth>

²²⁹ Parliament Media Statement: Nersa and Sanedi Unveil Annual Performance Plans and Budgets for 2024/25 available at: <https://www.parliament.gov.za/press-releases/media-statement-nersa-and-sanedi-unveil-annual-performance-plans-and-budgets-202425> (accessed 28 September 2024)

3.5 Conclusion

The complexities of the South African energy crisis have revealed the deep-seated issues that go beyond just energy supply and efficiency. Over the past decades, mismanagement, corruption, and an overreliance on outdated, fossil-fuel-centred infrastructure have left South Africa in a vulnerable position, hindering its economic growth and trade competitiveness. As discussed in this chapter, the energy crisis through frequent blackouts named load-shedding has created a ripple effect throughout key industries and the economy. These heavy energy-dependent industries are heavily reliant on energy supply to maintain production levels, meet demand domestically and internationally, and compete in global markets.

The response to the emerging energy problem was through the IRP of 2019, among others, which acknowledges the need for energy diversification and the reduction of coal dependence. However, the Plan falls short of addressing the link between energy security, energy efficiency, and trade performance. The absence of a framework that integrated energy planning with industrial and environmental policies can be seen as a flaw in the strategy. Without acknowledging that energy security, efficiency and sustainability directly reduces trade capacity in terms of capacity, quality, and the ability to attract investment, South Africa's efforts at a reform remain inadequate in this instance.

Judicial intervention had sought to address the crisis at large; however, the ruling has been largely mechanical and has done little to address the deeper organisational and operational inefficiencies of the South African energy sector. While judicial oversight is of importance, it cannot substitute wide-ranging reforms at policy, legal and operational levels. The reforms are of great importance, especially with regards to fostering a transition to renewable energy sources that are critical for the growth of trade as a whole.

From the chapter, it can be said that the nation's fragmented framework may be the cause of the energy regulatory and implementation challenges and delays and Eskom's monopoly. It could be said to have prevented the rapid scaling up of RE projects, thus prolonging dependence on fossil fuel sources and worsening the challenges that come with the dependence. As international trade partners shift towards greener solutions, South Africa risks isolation and possibly inaccessibility from emerging markets that prioritize sustainability. To restore its energy security and trade competitiveness, South Africa has to address the gaps in its framework. This includes integrating industrial strategies with energy planning and environmental policies and laws. These reforms are important not only for stabilising the

energy supply but also for positioning South Africa as a competitive partner in the global economy, especially as international markets increasingly demand environmentally sustainable energy solutions.

The next chapter will explore an international case study of Denmark, a nation that navigated through energy challenges by integrating energy reforms and prioritising the promotion of renewable energy sources with its trade goals. This chapter will examine how Denmark's policies and legal framework could offer South Africa lessons in terms of aligning energy planning and trade opportunities. Through this analysis, this chapter will propose actionable solutions for South Africa's energy crisis based on global best practices.

CHAPTER FOUR:

COMPARATIVE ANALYSIS OF INTERNATIONAL APPROACHES TO ENERGY AND TRADE: DENMARK

4.1 Introduction

This chapter shifts towards a focus on a comparative analysis and exploration of Denmark's successful integration of energy reform to the betterment of their energy sector in order to have energy security. This chapter is divided into three sections. The first section features Denmark's transition towards RE and how the nation became a model of sustainability and integration. The second section showcases Denmark's legal and policy framework that supports energy and trade. While the last section draws lessons applicable to the growth of South Africa.

Denmark offers a powerful case study of how a country that relied heavily on fossil fuels, and imports was able to resolve its energy crisis and wean itself off its dependence on fossil fuels while enhancing energy security and promoting trade competitiveness. Across nations, policymakers and regulators among others, grapple with the challenge of how to transition from a power system that is heavily based on fossil fuels to a sustainable renewable-based one. Despite Denmark not having hydroelectric or nuclear energy, they have consistently been able to maintain their rank as top 3 in the World Energy Council's Energy Trilemma Index. This council assesses a country's performance based on three factors, which include energy equity, environmental sustainability, and energy security.²³⁰

Denmark's transition so far has not only led to cleaner energy but has encouraged a focus on RE as a growing sector. The Danish Model has shown that through persistent forward-looking and cost-effective energy policies that support technical innovation and industrial development it is possible to sustain significant economic growth and energy security, simultaneously weaning the country's fossil fuel dependency.²³¹ By examining Denmark's transition, even with the hiccups it had along the way, the role of its legal framework, and how these measures have reinforced its global trade position, even making it a leader too, this chapter aims to draw lessons from Denmark's policies that can be adapted to South Africa's energy and trade sector.

²³⁰ From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf (Accessed 02 October 2024)

²³¹ Danish Energy Agency https://ens.dk/sites/ens.dk/files/Globalcooperation/the_danish_energy_model.pdf

4.2 Denmark Case study

4.2.1 Transition to Renewable Energy: A model of sustainability, integration and trade

Denmark's transition into renewable energy can be regarded as one of the most successful transitions on the global stage. Transitioning from a reliance on fossil fuels and fossil fuel imports to being a leader in renewable energy has been a journey for Denmark, especially as they focused on wind energy. A transition that was fuelled by the need to reduce its reliance on imported energy as well as environmental concerns.²³²

Historically Denmark's energy consumption using fossil fuels, specifically oil, amounted to around 92 per-cent, which in turn caused an energy crisis, when the price of oil exponentially increased in price in 1973, causing the nation's economy and energy supply to be severely affected.²³³ Because of the crisis, the Danish Energy Agency created the Danish Energy Policy of 1976. This policy had the aim of reducing the country's dependence on oil, increasing the diversification of supply, reducing energy consumption as a short-term goal, and including utilisation of renewable RE sources, even though the initial measure was to move to coal from oil power stations.²³⁴

Denmark is seen as the global frontrunner when it comes to the making and implementation of their energy policies, that was inclusive and benefit the nation's economy and welfare. In recent years, Denmark was named the first country in the world to announce its goal to achieve 100 per-cent complete independence from fossil fuel sources by the year 2050,²³⁵ and currently remains in track to achieving this

²³² 'From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible' available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

²³³ 'From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible' available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf (Accessed 02 October 2024)

²³⁴ 'From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible' available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

²³⁵ International Energy Agency (IEA) 'Denmark Energy Strategy 2050-policies' available at <https://www.iea.org/policies/5122-energy-strategy-2050#:~:text=The%20main%20goal%20of%20the,33%25%20between%2009%20and%202020.>

remarkable goal.²³⁶ The shift towards renewable energy in Denmark can be said to be driven by both environmental concerns and the desire to reduce greenhouse gas emissions and reliance on imported energy sources. For instance, the 2012 Danish Energy Agreement, established the framework for climate and energy policy until the year 2020 and outlines the direction that Denmark will take in order to achieve the 2050 goal of independence from fossil fuels.²³⁷ The agreement ultimately laid out the targets to reduce emissions and increase renewable energy mix share in the national grid.

Denmark generated almost 50 per-cent of its electricity from wind energy by the year 2020 and continues to be pioneer in its offshore wind farms development since 1991.²³⁸ The Danish government has illustrated its support for moving towards a 100 per-cent renewable energy nation by institutionalising it. This was done through the setting of legally binding targets and policies such as the promotion of the Renewable Energy Act and the Electricity Act. The Renewable Energy Act, which is the foundational law that aimed to decrease emissions and increase Denmark's energy mix and target by 40 percent by 2020.²³⁹ It is great to note that this target was reached and achieved ahead of schedule. One thing that stands out in particular about this law is the fact that it is amended several times a year in order to reflect new global developments and duly adjusted to the most recent technology.²⁴⁰ The Electricity Supply Act stands out in the context of promoting renewable energy, as it mandates that the purchase of power be from renewable sources.²⁴¹ These frameworks can be said to have been greatly instrumental in ensuring a smooth transition and integration of renewable energy into the nation's energy supply system, which is a contrast to the regulatory barriers faced in South Africa.

²³⁶ Hunter L 'Overview : Denmark's climate policies and latest progress to net zero' *The Copenhagen Post* 7 October 2024 available at <https://cphpost.dk/2024-10-07/news/climate/overview-denmarks-climate-policies-and-latest-progress-to-net-zero/>

²³⁷ 'IEA Danish Energy Agreement for 2012-2020 ban on fossil fuels' *International Energy Agency* available at : <https://www.iea.org/policies/606-danish-energy-agreement-for-2012-2020-ban-on-fossil-fuel-based-heating#:~:text=The%20agreement%20establishes%20a%20framework,from%201st%20January%202013%20onwards.>

²³⁸ Danish Energy Agency 'Offshore Wind Development' June 2022 available at https://ens.dk/sites/ens.dk/files/Vindenergi/offshore_wind_development_final_june_2022.pdf

²³⁹ Promotion of Renewable Energy Act No. 1392 of 27 December 2008 available at: https://ens.dk/sites/ens.dk/files/Vindenergi/promotion_of_renewable_energy_act_-_extract.pdf

²⁴⁰ Climate Change Laws - Law on the Promotion of Renewable Energy available at: <https://climate-laws.org/document/law-on-the-promotion-of-renewable-energy-no-1392-2008-and-legislative-decree-1288-2016-2244> (Accessed 03 October 2024)

²⁴¹ 'Denmark - Electricity Supply Act Policy and Measures Database' *International Energy Agency* 12 May 2014 available at <https://prod.iea.org/policies/3921-electricity-supply-act>

Denmark's success has also been attributed to its ability to align energy policies with its trade goals. Looking at the Renewable Energy Act, this particular act does not only focus on increasing the nation's energy security but has also positioned its domestic companies as leaders in the green energy sector.²⁴²

4.3. Legal and policy framework supporting Denmark's energy trade

The fundamental component of Denmark's success is its comprehensive legal framework that was and still is able to integrate energy supply goals and trade strategies. As discussed above, the Renewable Energy Act, which was passed in the early 2000s, provided a legal foundation for the nation's renewable energy projects, which made certain that RE received priority treatment and access into the country's national grid.²⁴³

The act also includes provisions that incentivise renewable energy production, especially in the electricity sector, this is done by providing premium tariffs and bonus payments, and subsidies for green energy projects.²⁴⁴

In contrast, even though South Africa's energy policy tries to mandate the to move towards renewable energy and the reduction of emissions, South Africa's hasn't been able to make as great strides as Denmark. Because South Africa is a signatory of the Paris Agreement, it is imperative that reduction of emission goals are met. The Paris agreement is "an international treaty that aims to reduce greenhouse gas emissions and limit global warming". It is good to not that there are no direct implications with regards to trade when it comes to the Paris agreement but rather indirect implications and potential opportunities.²⁴⁵ Focussing on opportunity, abiding by the agreement nations have the opportunity for trade related green

²⁴² 'From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible' available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

²⁴³ Promotion of Renewable Energy Act No. 1392 of 27 December 2008 available at

https://ens.dk/sites/ens.dk/files/Vindenergi/promotion_of_renewable_energy_act_-_extract.pdf

²⁴⁴ Promotion of Renewable Energy Act No. 1392 of 27 December 2008 available at

https://ens.dk/sites/ens.dk/files/Vindenergi/promotion_of_renewable_energy_act_-_extract.pdf

²⁴⁵ Cosbey A 'The Paris Agreement: what implications for trade?' (2026) Common Wealth Trade hot topics issue 123 available at

<https://www.thecommonwealthibrary.org/index.php/comsec/catalog/download/43/40/256?inline=1>

goals, and protection against the downside of unilateral climate action, amongst others.²⁴⁶ While there's a strong presence of legislative frameworks for renewable energy, in comparison to Denmark, it can be said that South Africa's frameworks are not as binding. The existence of a strong foundational legal framework that is binding and solid in its direction even when there is a change in government, leadership, or political priorities. When analysing the nature of legislation of both countries, it can be seen that from above, Denmark's foundational legislation is clear and binding in its framework. Thus, policies like the energy strategy 2050 and the Danish energy agreements are built on a strong and firm foundation. Conversely, in South Africa, the policies serve as a guideline rather than a legislative and binding document. Even though it outlines targets for renewable capacity, there is a lack of enforceability that comes with a non-binding foundational document. Another fact is that these policies still support the dominant energy source which makes it rather difficult for RE to penetrate the market share effectively.²⁴⁷ This can be seen in the current low implementation of RE in the country, thus amending these existing policies and regulations is necessary to develop the RE systems.²⁴⁸

Because Denmark's energy policies are supported by a strong legislative framework, these policies easily support trade and industrial strategies. Looking at the Danish Trade policy strategy for instance, which places renewable energy in the country as a key exporter, it states that, "Denmark's green transition is not just an environmental necessity but also a significant economic opportunity, with renewable energy accounting for 11% of total exports".²⁴⁹ This approach has ensured Denmark meets its energy needs but has also placed them as a global leader in green energy export.²⁵⁰

²⁴⁶ Cosby A 'The Paris Agreement: what implications for trade?' (2026) Common Wealth Trade hot topics issue 123 available at

<https://www.thecommonwealthlibrary.org/index.php/comsec/catalog/download/43/40/256?inline=1>

²⁴⁷ Smarte Anekwe IM, Akpasi SO, Mkhize MM et al. 'Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review' (2024) *Science Progress*

²⁴⁸ Smarte Anekwe IM, Akpasi SO, Mkhize MM et al. 'Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review' (2024) *Science Progress*.

²⁴⁹ Obadia S 'Denmark's energy policy built on renewables' *Construction21* 7 February 2024 driven by wind' available at <https://www.construction21.org/articles/h/denmark.html>

²⁵⁰ From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf (Accessed 09 September 2024)

4.4 Lessons for South Africa

To echo the need for a reform, A number of authors have also reiterated how South Africa's approach towards RE, has been that it comes across as fragmented and lacks the support it needs to support its promotion of and its use in the country.²⁵¹²⁵² South Africa's n geographical location make the nation a location that has a greater selection range of REs, which includes biomass, wind, and solar energy.²⁵³ Looking to Denmark as an example to draw lessons, mechanisms and pioneering strategies from, because of the nation's successful transition from fossil fuel reliance towards RE and integration of their energy policies with its trade objectives. South Africa has the opportunity to adopt some elements and strategies to its context in order to improve energy security and efficiency while concurrently increasing its trade competitiveness.

4.4.1 Adapting Danish Strategies

One of the most valuable lessons South Africa can learn from Denmark's approach to getting energy security and weaning themselves of over-reliance on fossil fuels while positioning themselves as the biggest traders of green energy, is the integration of energy and trade goals.

It can be said that Denmark has an umbrella legislation that provides an overarching legal framework, this would be the Electricity Supply Act (ESA) in this instance. This act has undergone several amendments and adaptation throughout the years in order to adapt to the changing energy needs and promote RE sources more effectively.²⁵⁴ Because of this foundational framework, Denmark was able to place themselves in a position of advantage, allowing them to use the excess energy as an export asset. If South Africa would adopt a similar approach, having an umbrella legislative framework that includes legal provisions relating to the promotion of RE, it could provide South Africa with a more coordinated and structured environment for RE development. These

²⁵¹Smarte Anekwe IM, Akpasi SO, Mkhize MM et al. 'Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review' (2024) *Science Progress*

²⁵² Akinbami OM, Oke SR & Bodunrin MO 'The state of renewable energy development in South Africa: An overview'(2021) *Alexandria Engineering Journal* (general reading)

²⁵³ Smarte Anekwe IM, Akpasi SO, Mkhize MM et al Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review'(2024) *Science Progress*

²⁵⁴ Denmark Energy Supply Act (No. 1329 of 2013) abstract available at: <https://www.ecolex.org/details/legislation/energy-supply-act-no-1329-of-2013-lex-faoc128906/> (Accessed 12 October2024)

provisions are found in Denmark's ESA, which includes renewable priority access,²⁵⁵ green certificates, and feed-in tariffs,²⁵⁶ as financial incentives to encourage investments.²⁵⁷ Including this provision in a foundational legislative framework could help wean the country off fossil fuel usage by ensuring renewables are used before coal. Including provisions for tariffs and green certificates can help encourage investment into RE technology and the sector as a whole, thus not only increasing investment into the country but also increasing capacity and lowering the cost of energy. As seen in Denmark, over a period of time energy prices were reduced because of the contribution of RE.²⁵⁸

Because ESA provides a clear framework that is streamlined,²⁵⁹ it allows efficiency for project implementation, development, and progress tracking. Thus, South Africa having a legal framework as cohesive as ESA as the backbone of energy of the country may be able to help with bureaucratic delays which are quite prevalent in the country. This means that streamlining the process of deployment will be quicker and help alleviate and address the need for additional energy capacity.

The above provisions also work in terms of developing public-private partnerships in South Africa. The REIPPPP is already a great step towards involving private parties in energy production. However, this procurement process has been said to be riddled with delays caused by bureaucratic complications, which has caused delays in the implementations of RE projects.²⁶⁰ In order to replicate Denmark's example successfully these need to be reduced by applying the above provisions. That is

²⁵⁵ Section 8: Denmark Energy Supply Act (No. 1329 of 2013) available at: <https://www.ecolex.org/details/legislation/energy-supply-act-no-1329-of-2013-lex-faoc128906/> (Accessed 14 October 2024)

²⁵⁶ Section 9: Denmark Energy Supply Act (No. 1329 of 2013) available at: <https://www.ecolex.org/details/legislation/energy-supply-act-no-1329-of-2013-lex-faoc128906/> (Accessed 14 October 2024)

²⁵⁷ Section 9: Denmark Energy Supply Act (No. 1329 of 2013) available at: <https://www.ecolex.org/details/legislation/energy-supply-act-no-1329-of-2013-lex-faoc128906/> (Accessed 14 October 2024)

²⁵⁸ From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible available at : file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

²⁵⁹ Section 6: Denmark Energy Supply Act (No. 1329 of 2013) available at: <https://www.ecolex.org/details/legislation/energy-supply-act-no-1329-of-2013-lex-faoc128906/> (Accessed 14 October 2024)

²⁶⁰ Eberhard A & Naude R 'The South African renewable energy independent power producer procurement programme: A review and lessons learned' (2016) *Journal of Energy in Southern Africa*

strengthening the IPP through legislated incentives and priority access. If applied, similar to Denmark, these provisions have the opportunity to improve South Africa's energy capacity, energy security, and trade competitiveness.

Additionally, Denmark has focused on building a RE export market,²⁶¹ this shows the significant potential South Africa has in developing its own RE export sector, a green market, placing South Africa as one of its kind in the global south. South Africa has the advantage of being in the position to export energy to its neighbouring countries, through SAPP.²⁶² This strategy has the potential to open a new trade avenue and place South Africa, similar to Denmark as an African leader in green energy export.

4.4.2 Challenges and Opportunities

While Denmark might be the model example to South Africa, and provide them with a number of opportunities, the country still needs to face the unique challenges that come with implementing and adapting these strategies. South Africa's 200 years' worth of coal reserves²⁶³ and around 100,000 people employed in the coal mining sector,²⁶⁴ and the continued investment in fossil fuels and nuclear power investment still remain high, amounting to around 100 million Rand for the construction of coal plants and other energy generation facilities.²⁶⁵ Thus adopting Denmark's model could make it hard and pose a significant barrier toward a transition and sustainable energy supply, while trying to move towards a low-carbon economy, even with how RE has been proven to be a cost-effective option.²⁶⁶ Denmark moved from being a net energy importer to being an

²⁶¹ Climate Change Laws - Law on the Promotion of Renewable Energy available at: <https://climate-laws.org/document/law-on-the-promotion-of-renewable-energy-no-1392-2008-and-legislative-decree-1288-2016-2244>

²⁶² Southern Africa Power Pool (SAPP) Available at: <https://www.sapp.co.zw/> (Accessed 14 October 2024)

²⁶³ Eskom – Coal in South Africa available at: <https://www.eskom.co.za/wp-content/uploads/2021/08/CO-0007-Coal-in-SA-Rev-16.pdf> (Accessed 14 October 2024)

²⁶⁴ Sadek M 'We need to talk about South Africa's 2050 Net Zero Carbon Emission Deadline' *BDO* 27 June 2022 available at: <https://www.bdo.co.za/en-za/insights/2022/natural-resources/we-need-to-talk-about-south-africas-2050-net-zero-carbon-emission-deadline> (Accessed 14 October 2024)

²⁶⁵ Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* (The) Page 41

²⁶⁶ Nalule V & Acheampong T 'Energy Transition Indicators in African Countries: Managing the Possible Decline of Fossil Fuels and Tackling Energy Access Challenges' (2021) *Journal of Sustainable Development Law and Policy* (The)Page 41

exporter of RE,²⁶⁷ so unlike Denmark South Africa has to move from being a big exporter of coal, which makes it a challenge because of its dependence on coal for energy generation and export revenue. Given this challenge, can it sometimes, or in the case of South Africa be advisable to justify the continued use of fossil fuel resources? Can it be said that the disposition of RE should be embraced but not at the sacrifice of fossil fuels, especially for countries dependent on them? Should these countries be given the chance to develop their nations using fossil fuels the way developed nations have to achieve economic success?

Despite these challenges and uncertainties, South Africa has a chance and clear opportunities. The transition towards RE presents an opening for not only the diversification of its energy source but also entering a new export market and possibly becoming a leader in green export energy too. By aligning its trade strategies and goals with its reformed energy policies, like Denmark's, South Africa may be able to create new industries along with employment opportunities while reducing unserved electricity demand. Like Denmark, South Africa has a vast potential in wind energy in addition to its solar potential,²⁶⁸ thus giving it a competitive advantage in RE production, especially in comparison to other African countries.

4.5. Conclusion

In conclusion, it can be seen that Denmark provides a valuable roadmap for an energy transition. South Africa seeks to overcome the energy crisis, improve energy supply and cost for key industries, and increase its trade competitiveness simultaneously. Key lessons for overcoming the crisis and reaching these goals lie in understanding what industries in South Africa need, which is a constant supply of energy. The way to move towards a sustainable energy supply is through the promotion, prioritisation and implementation of RE. The way to do so in the context of South Africa is by drawing lessons from the energy transition of

²⁶⁷ From black to green – a Danish sustainable energy growth story : A case study of how an energy utility can transition from fossil fuels to renewable energy and the enabling regulatory framework that made it possible available at :

file:///C:/Users/karabo%20mathibe/HP/Downloads/sog_fromblacktogreenreport_210x297_v08_web_spreads.pdf

²⁶⁸ Smarte Anekwe IM, Akpasi SO, Mkhize MM et al. 'Renewable energy investments in South Africa: Potentials and challenges for a sustainable transition-a review' (2024) *Science Progress*.

Denmark. The lesson is integrating energy policies and trade goals, promotion of PPP, and investing in RE as an economic driver of growth and sustainability.

Adoption of these strategies comes with its own struggles; thus, they need to carefully be tailored to South Africa's distinctive perspective. This can be done by paying attention to challenges that come with the over-dependence on coal, regulatory inefficiencies that need reforming, and institutional challenges. By addressing these challenges and issues, South Africa may be able to create a further balanced and competitive economy that leverages RE for long-term growth, using Denmark as the prime example.

The next chapter will summarise the findings from the study, draw conclusions and finally make recommendations.

CHAPTER 5:

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this study, the thesis investigated South Africa's energy crisis and its implications on trade dynamics. As mentioned previously, although the energy crisis has received much attention, issues related to energy and trade interconnectedness have been largely ignored. Throughout this research, it has been highlighted and emphasised how incredibly fundamental the role energy security, efficiency, and sustainability play in shaping a nation's trade competitiveness, especially in the setting of South Africa's energy crisis. From the study, a number of findings have arisen, Denmark is used as an example for a comparative study on a transition towards RE to South Africa's eminent challenges amongst other issues.

This chapter concludes the thesis and make recommendations. This chapter is separated into two sections, namely summary of findings for the first section and recommendations for the second section. The summary of findings mainly relates to the results from the three discussion chapters and research questions described in chapter one. The questions of each reiterated as follows:

1. How does the nexus between energy and trade explain the necessity and role of energy policy and laws in facilitating energy security for trade?
2. What measures can be incorporated into energy policies and laws to enhance energy security for trade?
3. What are the challenges facing South Africa's energy sector and their impacts on trade, and to what extent do South Africa's key energy policies and laws address these challenges?
4. Which country can South Africa look to, that has successfully tailored its energy policies and laws to support trade?

The second section of this chapter will outline the study's recommendations. These recommendations aim and hope to resolve the main research question, which is: How can the energy policies and laws of South Africa be reformed to better facilitate energy security for trade?

5.2 Summary of Findings

In the aim to conceptualise the connection between energy security and trade, chapter two made a case and illustrated that energy is not just a mere utility but a significant, even primary asset that influences many aspects of the trade,²⁶⁹ from manufacturing to the efficiency of supply chains. It showed how the availability, cost, and reliability of energy play a huge role in the determination and effect on a nation's ability to compete in the global market. The chapter used the theoretical frameworks with an emphasis on the H-O model,²⁷⁰ which provided and quantified a powerful framework for analysis of the role of stable energy in shaping and predicting trade patterns and used the same model to help leverage in gaining competitive advantage.²⁷¹ The chapter has made it clear that there cannot be an argument as to the benefit and cost of affordable, efficient, sustainable, and constant energy, especially in the context of energy-intensive industries and simultaneously their export market. Ultimately chapter two answered the first sub-question as it emphasised the importance of energy in trade. In answering the first sup-question the study concluded that trade and energy even though they are not interchangeable in their connectedness proved to be mutually reinforcing.

In addressing the main research objective and further illustrating and supporting the findings of Chapter 2, chapter 3 revealed the deep-seated issues in South Africa that go beyond energy supply. From corruption, mismanagement, overreliance on coal, etc. These issues created a ripple effect that was felt in key industries and ultimately the South African economy. In response to the emerging problem, since the dawn of load-shedding, among others was the main policy, the IRP19.²⁷² This policy acknowledged the need for diversification of the country's energy sources. It found that the policy did not acknowledge the link between energy supply dynamics and trade. Another issue the policy was introduced as a living policy but since its introduction in 2010 it has only been updated 3 times and adopted once, the last time being 2019.²⁷³ This showed a lack of progress tracking. This chapter found that the nature of the South African legal and policy framework is fragmented is one of the fundamental reasons the nation has struggled with the transition towards RE, its regulation and implementation

²⁶⁹ Chapter 2, Paragraph 2.2.2.6

²⁷⁰ Chapter 2, Paragraph 2.2.2.1

²⁷¹ Chapter 2, Paragraph 2.2.2.1

²⁷² Chapter 3, Paragraph 3.4.1.1

²⁷³ Chapter 3, Paragraph 3.4.1.1

challenges together with the de-monopolisation of the national utility, Eskom. It also found that if South Africa does not fix these regulatory issues and decentring coal as the main energy source, the country risks isolation.²⁷⁴ The chapter has highlighted the importance of reform in this context, not just to stabilise the energy supply but to use the newfound stability to position itself as a competitive partner in the global economy. This chapter ultimately answered the third research question in this regard.

In addressing one of the research questions, namely “*Which country can South Africa look to, that has successfully tailored its energy policies and laws to support trade?*”, it was found that using and adapting Denmark as the source for a comparative study can provide valuable and beneficial roadmap and lessons for South Africa to enable it to overcome its energy crisis. In analysing Denmark’s legal and policy framework, it was seen how it influenced the growth of RE, and ended an energy crisis, while leveraging the excess green energy as a trade asset.²⁷⁵ The study of Denmark illustrated in the assessment of both chapters 3 and 4 that it is likely that the barriers inhabiting the implementation and prioritisation of RE is the fragmented nature of the South African legal and policy frameworks as discussed in chapter 3. Another issue that is a critical contributing factor, is the coal reserves and export revenue from coal. This particular issue raised questions with regard to fairness in the context of the continued use of fossil fuels to develop its nation in order to achieve economic success in comparison to Western and developed nations.²⁷⁶

By analysing and comparing the Danish and South African frameworks, a number of key findings were made:

5.2.1 Evidence was found that supports the existence of a legal and policy framework that is favourable in its influence on support, growth, and introduction of a new export industry. This is demonstrated in Denmark’s framework and them becoming leaders in green energy exports, where their frameworks exist.

5.2.2 It also found evidence that the fragmented, scattered, and inadequate legal and policy frameworks on prioritisation of renewable energy have a hand in South Africa's inferior performance in stabilising the country’s energy problems. It is found that even

²⁷⁴ Chapter 3, Paragraph 3.4.1.4

²⁷⁵ Chapter 4, Paragraph 4.1.1

²⁷⁶ Chapter 4, Paragraph 4.4.2.2

with the existence of RE frameworks they lacked a more streamlined and coordinated environment for RE prioritisation.

5.2.3 Evidence was also found that the South African framework has not been updated frequently enough through the years in order to adapt to changing energy needs. These needs will allow efficiency for project implementation, development, and progress tracking, which currently lacking in the South African context.

5.2.4 Evidence has also shown that South Africa has great potential in developing RE, wind and solar in particular, as an export trade asset. This potential remains untapped in this regard. Looking at adapting Denmark's approach, it was seen that South Africa has the opportunity to become a regional leader in green energy export within the SAPP.

The study's argument and findings are not intended to support that legal and policy reform toward the prioritisation of renewable energy are the only ways that the energy crisis can be solved for trade but to understand that energy is a multifaceted issue, especially in the context of South Africa. Like sticking to fossil fuels comes with its limitation so is moving a country towards prioritisation as mentioned in Chapter 4. This being the case, the proposed solution cannot be projected to be a cure-all effect to solving South Africa's energy problems and its aftereffects on industries. Instead, the favoured conclusion is that reforming the legal and policy framework of South Africa for prioritisation of RE compliments the goal of acquiring energy efficiency and sustainability while it creates new trade avenues for the nation.

5.3 Recommendations

Given the above findings, the study makes the following recommendations towards reforming South Africa's legal and policy framework for trade. This will be done by building on the findings from Denmark's successful energy transition and the challenges that had been identified.

1. One of the complex problems highlighted in the study is the function of updating the IRP every two years consistently. Because of the complexities of updating it, which includes analysis of technology and economics which is needed for scenario modelling, the energy department should find a way for the plan to actualize as a living document,

as it was meant to be, even if it means moving it to an independent body within the department so the job can be done.

2. In updating the IRP, what should be taken into account is the synchronisation and coordination of the plan with legislation, institutions and sectors. In Thus, being explicit in its consideration of industrial policies and trade goals so that they are not disconnected from the countries energy planning.
3. From the discussion it was seen that the regulatory environment is fragmented, as there are quite a number of policies and bodies that govern different and often interacting aspects if the energy sector. Thus reducing, compacting or integrating them may reduce overlapping responsibilities that had led to inconsistencies and delays in implementation .
4. Legal reform is needed in order to create a stable environment for RE investments. One of the recommendations is creating a new act or amending an existing one that will prioritise and guarantee renewable energy access in the national grid. That is having an umbrella legislative framework that will include legal provisions relating to the promotion of RE, which will provide South Africa with a more coordinated and structured environment for RE development. This will not only prioritise green energy sources but will also greater competition from IPPs while reducing the monopoly held by Eskom.
5. In creating that umbrella legislative framework, it needs to be clear and streamlined, to allow efficient project implementation, project development and progress tracking, in addition to building a green export economy on a solid legislative framework.

The recommendations above are made based on the arguments and evidence presented in the chapters above. The research presented in this study has demonstrated that South Africa needs a comprehensive, well-rounded forward-looking, and coordinated approach to its energy reform. This reform be treated as an urgent matter as loadshedding is predicted for as return at the beginning of the new year. This approach includes the integration of energy policies with trade goals, and legal frameworks that are streamlined and coordinated with industrial

development. By learning about a nation like Denmark and its transition to RE, South Africa has the opportunity to address energy instability while reducing its dependence on fossil fuel sources and possibly position itself as a leader in green energy trade in the region.

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