The Impact of Power Shortages on the Financial Performance of Selected South African Manufacturing Firms listed on the JSE

BY

Nokwanda Zulu

(Student number:20721099)

A Research work submitted in fulfilment of the requirement of a Master's in Accounting degree (Management Accounting)

Supervisor

Dr Haruna Maama

March 2023

DECLARATION

I hereby state as such:

1. This research report, which was written and completed by Ms Nokwanda Zulu, Student Number 20721099, satisfies the requirements for the Master of Management Accounting degree in terms of both quality and scope.

2. This thesis has not been submitted to another university for a degree or examination.

3. Unless otherwise noted as being taken from someone, this thesis is entirely my own creation. All information obtained from the literature have been duly referenced.

4. Unless explicitly recognised additional sources have been placed in the reference section, this thesis does not contain any graphs or pictures that have been duplicated from online print.

I hereby certify that the thesis was completed at the Durban University of Technology under my direction.

Ms Nokwanda Zulu		16 August 2023
Name of Student	**Signature**	**Date**

SUPERVISORS DECLARATION

I certify that I have read this thesis entitled: Investigating the Impact of Power Outages on the Financial Performance of Manufacturing Firms Listed on the JSE, written by Nokwanda Zulu (student number 20721099). In my opinion, this thesis meets the requirements for the Master's in Accounting degree (Management Accounting) in terms of quality and scope.

Dr Haruna Maama

Name of Supervisor

Signature

16 August 2023

Date

DEDICATION

The thesis is dedicated to my family, especially my late grandma Mangcobo, my lovely daughter Kuhle'Konke, and my siblings for their unfailing support.

ACKNOWLEDGEMENTS

I want to express my gratitude to everyone who helped me with this research project, both personally and indirectly. I would especially want to thank my research supervisor, Dr Haruna Maama, without whose assistance and availability, this research project would not have been completed. I would also like to thank the Faculty of Accounting and Informatics Research Committee (FRC) and the Durban University of Technology for providing the funding opportunity to conduct the research project. Moreover, I would like to express my gratitude to the Management Accounting Department for giving the essential assistance with attending conferences, drafting reports, and data analysis.

I want to express my sincere gratitude to the following people because this research would not have been completed without them: students of Dr Maama, Prof. Sanja Bauk, Dr Ferina Marimuthu and Mr Mphathisithe Mkhize.

Finally, I want to express my gratitude to everyone who has supported me in whatever form. I say "UKUTHULA MAKWANDE."

TABLE OF CONTENTS

EDITING CERTIFICATE

DR RICHARD STEELE
BA HDE MTech(Hom)
HOMEOPATH
Registration No. A07309 HM
Practice No. 0807524
Freelance academic editor
Associate member: Professional Editors' Guild, South Africa

154 Magenta Place
Gxarha [Morgan Bay]
5292
Eastern Cape

082-928-6208
rsteele@vodamail.co.za

EDITING CERTIFICATE

Re: **Nokwanda Zulu**
For editing DUT Master's dissertation: **Impact of Power Shortages on the Financial Performance of Selected South African Manufacturing Firms Listed on the JSE**

I confirm that I have edited this dissertation and the references for clarity, language and layout. I returned the document to the author with track changes so correct implementation of the changes and clarifications requested in the text and references is the responsibility of the author. The intellectual content of the document is the responsibility of the author. I am a freelance editor specialising in proofreading and editing academic documents. My original tertiary degree which I obtained at the University of Cape Town was a B.A. with English as a major and I went on to complete an H.D.E. (P.G.) Sec. with English as my teaching subject. I was a part-time lecturer in the Department of Homoeopathy at the Durban University of Technology for 13 years and supervised many master's degree dissertations during that period.

Dr Richard Steele
20 March 2023
per email

ABSTRACT IN ENGLISH

For the past 16 years, Eskom has been struggling to supply constant power to consumers, with frequent power disruptions in South Africa. Consumers, such as manufacturing firms, rely on a steady supply of energy in the form of electricity for their production processes, thus, they have been significantly affected by recurring power outages. Therefore, this study sought to determine the effect of power outages on the financial performance of South African manufacturing firms, particularly those listed on the Johannesburg Stock Exchange (JSE). A secondary quantitative research approach was employed in the study, looking at financial data from 107 JSE-listed manufacturing firms for ten years (2012 to 2021). Fixed and random effect regression approaches were used to analyse data. Return on Assets (ROA) and Tobin's Q were selected as the dependent variables. In contrast, average electricity pricing (AEP), total load shedding hours (TLH), size, risk, retention rate (RR), and sales were selected as the independent variables. The AEP and TLH are external business factors, while the remaining four are internal business factors.

The findings suggest that AEP has no impact on ROA and that external factors have no impact on the financial performance of South African listed manufacturing companies. These results contradict the resource-based view (RBV), which states that internal factors rather that external factors are the primary drivers of financial performance. Contrary to the primary declarations of the RBV, the coefficient of total load shedding hours (TLH) to Tobin's Q demonstrates that the external factor in the form of TLH has a substantial impact on the financial performance of manufacturing enterprises in South Africa. This study is significant for two reasons: first, it advances knowledge on the impact of energy scarcity on the manufacturing sector, and second, it contributes to ongoing research on financial performance. It is recommended that the government and the policymakers make more investment and policies on alternative energy sources to enhance the energy mix. The manufacturing companies should consider more ways on how to convert their waste into energy source.

Keywords: Manufacturing Firms, Power Shortages, Average Electricity Price, Total Loadshedding Hours and Financial Performance

ABSTRACT IN ISIZULU

Eminyakeni engu-16 edlule, u-Eskom ubulokhu udonsa kanzima ukuhlinzeka ugesi njalo kubathengi, nokuphazamiseka kukagesi njalo eNingizimu Afrika. Abathengi, njengamafemu akhiqizayo bathembele izinga lamandla okuqhubekayo ngendlela kagesi ezinqumweni zabo zokukhiqiza, ngaleyo ndlela bathinteke kakhulu ngokucisha kukagesi okwenzeka kabusha. Ngakho-ke lolu cwaningo lwalufuna ukuthola umthelela wokunqamuka kukagesi ekusebenzeni kwezimali kwezinkampani ezikhiqizayo zaseNingizimu Afrika, ikakhulukazi lezo ezisohlwini lweJohannesburg Stock Exchange (JSE). Kusetshenziswe indlela yesibili yocwaningo lomthamo ocwaningweni, kubhekwa imininingwane yezezimali evela kumafemu akhiqizayo asohlwini lwe-JSE ayi-107 kusukela esikhathini esiyiminyaka eyi-10 (2012 kuya ku-2021). Izindlela ezilungisiwe nezingahleliwe zokuhlehla komphumela zasetshenziswa ukuze kuhlaziywe idatha. Imbuyiselo ye-Asset (ROA) ne-Tobin's Q zikhethwe njengokuhlukahluka okuncikile, kuyilapho isilinganiso samanani kagesi (AEP), amahora okukhipha ugesi esewonke (TLH), usayizi, ubungozi, izinga lokugcinwa (RR), nokuthengiswa kukhethwe njengokuhluka okuzimele. I-AEP kanye ne-TLH yizici zebhizinisi langaphandle, kanti ezine ezisele ziyizinto zangaphakathi zebhizinisi. Okutholakele kusikisela eziyinhloko ze-RBV, i-coefficient of total load shedding hours (TLH) to Tobins, Q ibonisa ukuthi isici sangaphandle esisesimweni se-TLH sinomthelela omkhulu ekusebenzeni kwezimali kwamabhizinisi okukhiqiza eNingizimu Afrika. Lolu cwaningo lubalulekile ngenxa yezizathu ezimbili: okokuqala, luzothuthukisa ulwazi ngomthelela wokuntuleka kwamandla emkhakheni wezokukhiqiza, futhi okwesibili, luzoba nomthelela ocwaningweni oluqhubekayo mayelana nokusebenza kwezimali.Kunconywa ukuthi uHulumeni kanye nabenzi benqubomgomo batshale imali eningi kweminye imithombo yamandla ukuthuthukisa ingxube yamandla. Izinkampani zokukhiqiza kufanele zicabangele indlela yokuguqula imfucuza yazo ibe umthombo wamandla.

Amagama Abalulekile: Amafemu Okukhiqiza, Ukushoda Kwamandla, Isilinganiso Sentengo Kagesi, Amahora Okukhipha Isamba kanye Nokusebenza Kwezezimali

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AEP:	Average Electricity Price
AFDB:	African Development Bank
DOE:	Department of Energy
ESKOM:	South Africa’s Electricity Power Utility
GDP:	Gross Domestic Product
JSE:	Johannesburg Stock Exchange
MW:	Megawatt
NERSA:	National Energy Regulator of South Africa
NT:	National Treasury
RR:	Retention Rate
SD:	Standard Deviation
SDGs:	Sustainable Development Goals
TLH:	Total Loadshedding Hours
WB:	World Bank

CHAPTER 1: INTRODUCTION

1.1 Introduction

Energy is scarce globally, not just in the developing world (Ciller and Lumbreras, 2020). Many first-world countries have energy shortages, though developing countries are significantly more affected by the lack of energy and consistent electrical supply. These energy and electricity shortages stunt economic growth. Africa is the leading continent regarding power rationing, which is brought on by insufficient electricity reserves. According to studies by According to studies by Milin, Mungiu Pupazan, Rehman, Chirtoc and Ecobici (2022) and Cole, Elliott, Occhiali and Strobl (2022) and Cole et al. (2018), 500 million people in sub-Saharan Africa lack access to enough reliable energy for social advancement, environmental sustainability, and economic expansion (Milin *et al.* 2022). Therefore, capital expansion projects are needed to improve the regional energy supply capacity, for which more funding is required.

South Africa was formerly known as the industrial hub of Africa, with plenty of cheap, reliable electricity, according to the National Energy Regulator of South Africa [NERSA] (2020). Being a member of the Southern African Power Pool (SAPP), South Africa entered into export agreements with other SAPP members. SAPP's primary goal is to help each member nation sell affordable, reliable electricity to each other and this has resulted in the creation of many jobs (Ayamolowo, Manditereza and Kusakana 2022). South Africa exports a significant portion of the electrical reserves to its members in the SAPP group, such as Zambia, Zimbabwe, Namibia, and Mozambique. Despite having a high need for power to serve its own populace, South Africa continues to play a crucial role in exporting electricity to the rest of Africa (Lenoke 2017).

Power outages in South Africa began in 2007, with 2022 having the most annual loadshedding hours, which was 1949 hours which is equivalent to 81 days (Ayamolowo, Manditereza and Kusakana 2022). Energy experts say power rationing is primarily implemented to protect the system from a total blackout (Bowman 2020). The impact of such drastic loadshedding on households and businesses has been severe, as Eskom supplies over 95% of the electricity in South Africa (Goldberg 2015). Moreover, despite the implementation of loadshedding, Eskom has consistently needed business rescue from the

government. By 2020, the company owed over 450 billion rands to the South African Government (Analytica 2020).

Several issues have been identified as contributing to power outages (Eskom 2020). Illegal electricity connections are perhaps the most widely documented amplifiers of power outages. Eskom has lost over 60 billion rands because of illegal connections (Ayamolowo, Manditereza and Kusakana 2022). The illegal connections damage transformers, putting further pressure on Eskom to adopt the load reduction approach (loadshedding) to minimise or avoid total blackout (Analytica 2020). The cost to repair one transformer is between R80 000 and R100 000 (Eskom 2020). The load reduction and poor power reliability impacts households and commercial businesses like manufacturing firms (Parschau and Hauge 2020). It is a well-known fact among scholars that the availability of a constant energy supply boosts the economic growth of a country (Akadırı, Alola and Usman 2021). Moreover, all aspects of life now revolve around a constant and consistent electricity supply; therefore, there has to be greater urgency to find innovative solutions to the current electricity supply issues for the benefit of all citizens and businesses in South Africa.

Statistics show that manufacturing is one of the largest contributors to South Africa's Gross Domestic Product (GDP) (Lawrence 2020). The effective performance of the manufacturing sector is essential for the growth of the South African economy. Aguera *et al.* (2020) suggest that in addition to employing a large amount of unskilled labour, the manufacturing sector is also one of the major recipients of export earnings, an example of raw material export revenue. However, the sustainability of the manufacturing sector is impacted by how the South African electricity problem is handled (Lawrence 2020). The president of South Africa, Mr. Cyril Ramaphosa, announced the creation of an Industrial Revolution Commission to assist the government in utilising the swiftly advancing technology (Analytica 2020). This commission will assist in fast-tracking the implementation of the National Development Plan. One of the strategies of the NDP is to incentivise and assist in the implementation of the fourth industrial revolution (Aguera *et al.* 2020); however, this is impossible without a reliable electricity supply.

Large manufacturing enterprises have become more capital-intensive as a result of the fourth industrial revolution; therefore, there is a greater reliance on the availability of electricity for production (Ateba, Prinsloo and Gawlik 2019). However, poor electricity supply has made it difficult for the local manufacturing industry to satisfy target needs. The constant

power outages have greatly impacted production rates and the inventory turnover ratio. Thus, it has had significant financial effects on the manufacturing sector. Investors use multiple financial ratios to assess a company's financial performance, particularly that of manufacturing firms. Inventory turnover is an element that affects how well manufacturing companies perform (Haralayya 2022). It is a measure of how rapidly a company can sell finished goods from its inventory. Power disruptions impact the inventory level, damage equipment, cause production delays, and slow the system.

Employees are critical to any organisation's success (Parschau and Hauge 2020). Any manufacturing company that wishes to perform well financially must ensure its human capital is well-resourced. When there are power outages, staff performance suffers, which subsequently has an impact on production levels (Haralayya 2022). Once the performance of employees is negatively impacted, there will be a decline in revenue and a delay in the production and delivery of goods. Clients will subsequently be forced to look for alternative suppliers (Adeleke *et al.* 2021). Therefore, local manufacturing companies will no longer have a competitive advantage over their rivals, especially those who import similar goods. Therefore, these companies should be given top priority to sustain South Africa's GDP. When the power supply is unreliable, manufacturing companies are forced to find an alternative power source or lose production time because of ongoing power outages (Ciller and Lumbreras 2020). This has a negative impact on the South African manufacturing industry's financial performance.

The manufacturing firms in South Africa that are listed on the Johannesburg Stock Exchange (JSE) were the focus of the current study. Data from databases like McGregor BFA were processed and used to extract the firms' financial statements. The study was carried out using a quantitative research approach. The data were analysed using statistical analysis and econometric regression models.

1.2 Research Problem

For the past 16 years, loadshedding has been a problem in South Africa. The lack of energy has impacted all South Africans (Eskom 2020). The public and private sectors have both suffered because of the power disruptions. The manufacturing sector is no exception. Power outages cause additional costs, which pushes businesses to improvise or pass those costs along to customers. The following questions then arise: Are these manufacturing companies

feeling the pressure? Or have they created different strategies to compensate for the increased production costs? To determine whether loadshedding influences financial performance, an empirical investigation is required.

Power outages cause production schedules to be delayed, production expenses to rise, equipment damage to increase, and income to decline. However, companies with adequate financial resources can choose alternate forms of energy production. These are extra costs, but the alternative energy capacity helps to provide a competitive advantage. Human capital, work environment, and technology are the three key variables that influence a company's productivity (Afolabi and Laseinde 2019). Reduced work hours during a load-shedding situation will have an impact on labour rates. When the demand for a product declines, the supply follows suit, which has an adverse effect on employee morale and creates an unfavourable work environment with decreased production levels (Andrade *et al.* 2020).

Another important factor is technology. Most big companies listed on the JSE have switched from being labour-intensive to capital-intensive (Akinbami, Oke and Bodunrin 2021). For that transition to occur, however, electrical energy becomes a necessity, and its lack impacts the utilisation of technology for more effective production and performance enhancement(Treasury 2020). In South Africa, the manufacturing industry depends on a steady supply of reliable electricity. However, power shortages are one of the critical issues these manufacturing businesses must deal with (Meles 2020). Firms in this industry must either find alternative energy sources or cease operations during load shedding. Running generators is the common energy alternative, but this incurs additional fuel and maintenance costs (Afolabi and Laseinde 2019). Others decide to cut back on staff or operating hours, particularly during pre-planned power outages. Power outages might result in costly downtime where production must be halted. Other businesses choose to work on the weekends, which increases labour costs. Thus, dependable power sources are essential to manufacturing businesses (Meyer and Habanabakize 2019).

Other embedded expenses associated with alternative energy sources include gas prices, high power consumption, and overtime expenditures (Fakih, Ghazalian and Ghazzawi 2020). Power outages have an impact on the company's overall production costs as well. Power interruptions reduce the company's ability to compete locally and internationally. Power interruptions have an impact on the manufacturing sector's export revenues. The power outages in the South African manufacturing sector raise several significant questions,

including the following. Who pays for loadshedding expenses? Are customers incurring the cost? Do businesses that manufacture things include the cost of power outages in their cost prices? Are these manufacturing companies pass on the additional production costs to customers, preventing the financial loss connected with power outages. The issue that needs to be resolved is whether the performance of manufacturing companies is impacted by the power shortages in South Africa (Fakih, Ghazalian and Ghazzawi 2020).

Numerous research studies have been conducted on the impact of loadshedding throughout the world. However, there is a paucity of research studies on manufacturing enterprises in the setting of South Africa, and none looked specifically at the financial impacts of loadshedding on large manufacturing companies. Regarding the effects of loadshedding on the financial performance of manufacturing firms, there is no consensus in the literature that is currently accessible. The current study aims to close that gap in the literature. Policymakers, scholars, and the government must comprehend how the performance of businesses and the dependability of power suppliers are related in this study; hence the impact of loadshedding on the financial performance of selected South African manufacturing sector is investigated (Akinbami, Oke and Bodunrin 2021). Understanding the influence, if any, or the size of it, will be helpful. The current study looks at how loadshedding affects the manufacturing sector's financial performance in South Africa. The manufacturing companies that are listed on the JSE are of relevance. This will encourage further study of the subject in the future.

1.3 Research Aim

The main aim of this study was to ascertain how power shortages and rising electricity prices impact the financial performance of selected South African manufacturing firms. As a result, the following objectives serve as the foundation for this study.

1.3.1 Research Objectives

The following are the specific objectives of the study.

1. To assess the impact of electricity pricing on the financial performance of manufacturing firms in South Africa.
2. To assess the impact of electricity pricing on the firm value of manufacturing firms in South Africa.

3. To examine the relationship between power outages (hours) and the financial performance of manufacturing firms in South Africa.
4. To examine the impact of the power outages (hours) on the firm value of manufacturing firms in South Africa.

1.4 Research Questions

The current study is guided by the following research questions.

1. What is the impact of electricity pricing on the financial performance of manufacturing firms in South Africa?
2. What is the impact of electricity pricing on the firm value of manufacturing firms in South Africa?
3. What is the relationship between power outages (hours) on the financial performance of manufacturing firms in South Africa?
4. What is the impact of the power outages (hours) on the firm value of manufacturing firms in South Africa?

1.5 Significance of the study

The ongoing economic development efforts in South Africa have attracted much attention. This has further impacted the availability of energy sources, thus, the rise in energy use. Therefore, investigating the impact of power outages on the financial performance of listed manufacturing firms is imperative; the current study tries to fill the gap in the body of literature. This research study attempts to advance our understanding of manufacturing, energy supply, and financial performance. To the best of the researcher's knowledge, no studies have investigated how power outages affect the performance of manufacturing enterprises this way. Therefore, this study aims to close the existing gap by supplying information on better practices for managing power outages to academics, community members, government agencies, business role players, and policy makers in South Africa and other parts of Africa. In a nutshell, the results of this study will be helpful to academics who might be interested in undertaking related or additional research. This study could guide or contribute more to the empirical discussion on how power interruptions affect manufacturing companies' financial performance in South Africa. Furthermore, this study is in response to a call made by Phiri (2018) to conduct a study that has the financial

performance of manufacturing firms as the dependent variable, which can give a clear picture of the welfare of the firms.

1.6 Organisation of the Study

The organisation of the study is made up of five chapters in the following manner.

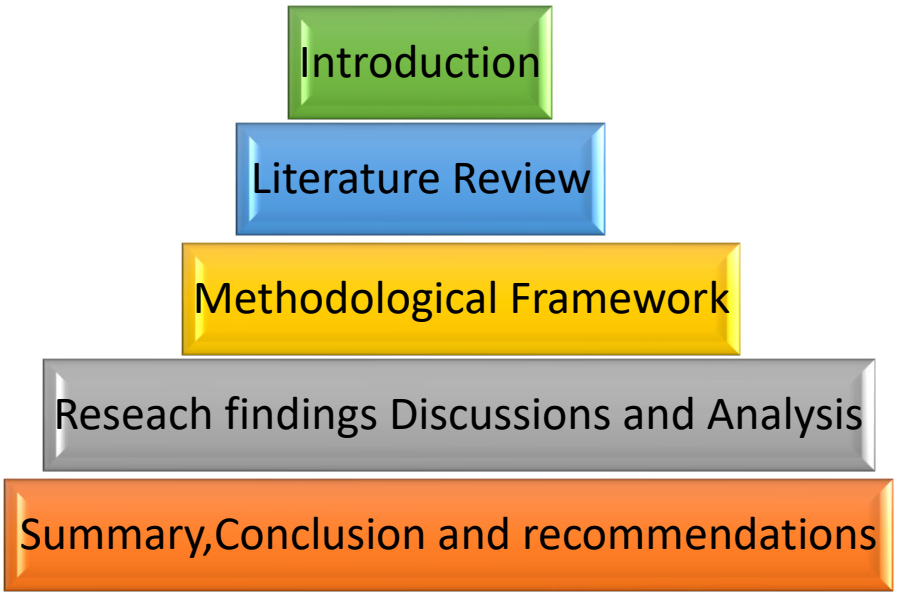

Figure 1-1: Overview of study source (self-generated 2023)

Chapter 1: Introduction

In this chapter, the purpose of the study is related to an outline of the current situation in South Africa. This study investigates how power outages affect the performance of manufacturing companies listed on the JSE. This is explained in this chapter by detailing the background of the study issue, the goals, objectives, and research questions, as well as the importance of the study.

Chapter 2: Review of Literature

To arrive at the theoretical and conceptual framework that underpins the study, the related literature is reviewed and discussed in Chapter 2. This is done to analyse the difficulties of analysing how power outages affect financial performance.

Chapter 3: Methodology

The method and strategy used to accomplish the study's goals are covered in this chapter. This chapter clarifies the data gathering procedure and the study's overall design. The study technique, research design, data collection strategy, and data analysis are all covered in this chapter.

Chapter 4: Research Findings, Discussion, and Analysis

The fixed and random effect technique was used to analyse the current study's results. Using statistical techniques, multiple regression analysis was performed, and the results of the analysis are presented and discussed in this chapter.

Chapter 5: Summary of Findings, Conclusions and Recommendations

This chapter contains a summary of the findings, conclusions, and recommendations arising from the major findings.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The research topic's background, the research problem, and its goals were the main topics of the previous chapter. The current chapter reviews literature available from different scholars about the topic under investigation. Furthermore, the theoretical and conceptual foundation for the study that guided this research project is presented. The chapter is divided into the following sections: the conceptual literature study on load shedding, financial performance, average power pricing, and overall loadshedding hours in South Africa.

2.2 Loadshedding and Electricity Generation in South Africa

Load shedding, often known as power shortages, is the loss of network supplies or electrical power to the end user. Basic supply and demand theory can be used to explain loadshedding (Andrade *et al.* 2020). To prevent system bottlenecks, loadshedding rations the electrical grid. If this is not done, there can be a complete blackout. A blackout is an unexpected lack of electricity that happens in an emergency (Aguera *et al.* 2020). Power outages are planned or unplanned, irrespective of the type of energy loss. Its occurrence destructs energy transmission, distribution, and generation; therefore, mitigation mechanisms need to be applied to avoid a blackout. This loss affects not only the general public but the business community at large (Meles 2020). Power outages often result in equipment failure, damage to power plants, and maintenance concerns. According to Milin *et al.* (2022), power outages are a worldwide phenomenon; hence many nations are seeking alternative energy sources to supplement the current energy supplies. An uninterrupted electricity supply is essential for the livelihood of all countries, organisations, businesses, and people. Power outages significantly affect production, with various economic and social consequences. Electricity is now a valuable resource whose scarcity impacts the livelihoods of all people, in all nations. A stable electricity infrastructure is essential for a nation's ability to transition its industries from being labour-intensive to capital-intensive and for them to continue to grow (Bowman 2020).

Power outages are a problem for South Africa and many other African nations. Eskom has implemented Loadshedding because of energy deficiencies and dilapidated energy infrastructure. This impacts all citizens of South Africa because over 95% of South Africa's

power is produced, transmitted, and distributed exclusively by Eskom (Bowman 2020). The power company utilises loadshedding as a preventative measure to keep the electrical grid from completely collapsing. This rolling black out typically happens when the amount of electricity available is less than needed (Eskom, 2020). The electricity grid is constrained because of this energy shortage. The energy provider then applies load reduction to safeguard the system.

Loadshedding started at the end of 2007 and is still ongoing. Loadshedding is a last resort after all other options have been tried. Another tactic that is commonly utilised for avoiding a complete blackout is power reduction. Such tactics are often necessary during energy shortages because South Africa also exports electricity to neighbouring African nations. (Bowman 2020). Independent power producers supply five percent of the energy. Eskom uses loadshedding and load reduction measures when there is a system restriction in the networks for electricity generation, transmission, or distribution (Styan 2019).

The Reconstruction and Development Programme (RDP) was created in 1994. The RDP was one method of addressing the socioeconomic housing issue brought on by the then-apartheid administration (Bowman 2020). Housing and electricity access was the primary goal of that plan. Twelve million South Africans lacked adequate housing, so the RDP built about 5 million homes just in the period between 1994 and 2001. After that milestone was reached, the next topic on the agenda was electricity access. About 1.75 million additional houses were connected to the national grid due to South Africa's nationwide electrification project (Akadırı, Alola and Usman 2021). Eskom then advised the authorities that due to the strain caused by the newly connected houses on the electricity grid, new capital expansion projects were required for increased capacity to handle the additional consumers. The South African government and Eskom came to an agreement to construct additional power plants and generators. While there was a 36 700 MW (megawatts) demand for electricity, Eskom could only supply 38 500 MW. The above MW appears adequate in theory, but according to international best practices, the company should be able to produce 15% more than required. The generating capacity was nominally 36 208MW, which was insufficient to meet the rising energy demand. Koeberg's construction started in 1976, after that, the first and second unit was integrated on the 4th of April 1984 into the grid as part of a "new plan" to increase the capacity of power generation and transmission (Andrade *et al.* 2020).

Eskom began to expand the national grid's capacity as early as 2008 with two massive projects, Medupi and Kusile power stations. Nkosi and Govender (2022) suggest that they are among the greatest in the world in terms of size and capacity. These projects promised to address the issue of electrical insecurity, causing jubilation throughout the nation when they were announced. The joy, however, was short-lived because it took longer than anticipated for these power plants to be finished. The new building projects not only ran beyond schedule, but they also cost a lot more money. The actual costs were way more than the predicted R163 billion. These expenses have increased to a current anticipated cost of R480 billion.

The two power plants were projected to increase the grid's capacity by 4 800 MW and 4 788 MW, respectively. The two projects were created to relieve strain on the current power plants and allow for their maintenance. The year 2025 is the anticipated year of completion.

Eskom (2020) notes: "the issue of an inconsistent power supply has existed for more than 16 years". There have been up to four phases of loadshedding since it began in 2007. With R480 billion in debt, Eskom depended on government bailouts to stay operational (Analytica 2020). The most recent bailout was announced by the minister of finance, Mr Enoch Godongwane. In his budget speech, he said the National Treasury had approved a bailout of 254bn. Even though South Africa has the highest level of industrialisation in Africa, power outages have impacted the nations so much that unemployment levels have risen to record highs due to rising operational costs and diminished productive capacity, with some companies even having to shut down (Masibi 2015).

2.3 The average Cost of Electricity in South Africa

Every two years, Eskom makes an application to NERSA for a tariff hikess. Historically, South Africa had the world's cheapest electric power. This enticed foreign investors to make investments and create businesses in South Africa. However, the cost of electricity has increased exponentially (Nkosi and Govender 2022). As can be seen from Table 2-1, the average price of electricity in 1994 was 10.44 cents per kilowatt-hour. This increased to R110,93 cents per kilowatt hour by 2020. The cost of electricity dictates how much one can consume at any moment. Increasing the price of electricity was seen as a way to discourage the overconsumption of electricity (Nkosi and Govender 2022). Electricity prices were very low for South Africans from 1994 to 2005. Prices continued to be significantly lower than inflation (Bega 2022). Electricity has historically had an incredibly low selling price

compared to the cost of supply. This fact contributes to loadshedding in part. The tariff cost has never covered the running costs.

The South African National Energy Regulatory Authority [NERSA] governs electricity pricing. NERSA has been interacting with the government and state-owned businesses since 2004. These meetings have focused mainly on passing new legislation or reforming the electrical industry (Bega 2022). Many revisions have since been made through these revisions, most notably with adopting the 2004 Electricity Act. The primary goals of introducing this Act were to advance accountability, openness, and accessibility to increase the electrical sector's commercial viability (Nkosi and Govender 2022). The task of deciding on the tariff for generation, transmission, and distribution has been given to NERSA. Additionally, NERSA is active in the acquisition of power by providing utility services, easing the transmission of electricity between several states, and serving as an arbitrator in times of disagreement. The Electricity Act of 2004 gives NERSA the power to decide on the electricity prices as well as the increase in tariff charges (Andrade *et al.* 2020). The role of NERSA is to ensure that electricity costs are fair and market-related. This makes it possible for manufacturing companies to choose between continuing to purchase energy from utilities and self-generate. However, the electricity rate is raised to close the gap between manufacturing costs and selling prices. The historically low selling price is the cause of the continually rising tariffs (Nkosi and Govender 2022). The average price increased significantly from 19.80 to 25.24 c/kWh from 2007 to 2008 (Nkosi and Govender 2022), which was a 5.44 c/kWh difference in the selling price.

There are three classes of consumers: residential, commercial, and businesses. The cost of power is based on how much electricity is used; the more electricity is used, the more is paid for it (Akinbami, Oke and Bodunrin 2021). A seasonal pricing method is also employed; for example, the cost of electricity is higher for manufacturing enterprises in the winter than in the summer. One contributing cause is that consumers who buy power directly from Eskom see annual tariff hikes in April, whereas customers who buy electricity from municipalities experience price increases in July. At the time of writing (early 2023), the average cost of power is 173.80 cents per kWh. Eskom raises the price of energy annually or twice annually. South Africa's electricity prices from 1994 through 2020 are shown in Table 2-1.

Table 2-1: Eskom electricity tariffs 1994-2020

Year	Average [c/kWh]	Average price increase	Inflation	Inflation-adjusted price [c/kWh]
1994	10.32	7.55%	8.84%	44.75
1995	11.15	8.04%	8.75%	44.18
1996	11.30	1.38%	7.35%	41.88
1997	11.85	4.87%	8.63%	40.28
1998	12.29	3.72%	6.98%	39.12
1999	12.44	1.19%	5.08%	37.81
2000	13.23	6.35%	5.39%	37.91
2001	13.76	4.06%	5.64%	37.47
2002	15.00	9.01%	9.15%	37.22
2003	16.09	7.27%	5.87%	37.96
2004	16.04	-0.03%	1.43%	37.31
2005	17.79	10.15%	3.35%	40.00
2006	18.70	5.10%	4.62%	40.01
2007	19.80	5.90%	7.15%	39.63
2008	25.24	27.50%	10.99%	44.55
2009	33.14	31.30%	7.12%	55.59
2010	41.57	24.80%	4.26%	67.18
2011	52.30	25.20%	4.99%	80.45
2012	60.66	24.80%	5.62%	88.90
2013	65.51	16.00%	5.76%	90.25
2014	70.75	8.00%	6.09%	91.65
2015	76.41	8.00%	4.58%	94.30
2016	82.53	8.00%	6.34%	96.08
2017	89.13	8.20%	5.27%	99.23
2018	93.79	5.20%	4.62%	99.32
2019	106.80	13.90%	4.13%	108.79
2020	110.93	3.90%	2.43%*	110.93

Source: (Bruwer 2021)

Fakih, Ghazalian and Ghazzawi (2020) note that different electricity users pay different tariff rates. The more one uses electricity, the more one must pay for the usage. According to various tariff rates, the electricity producers have categorised the users in terms of pricing. Electricity consumption in the industrial sector is higher than that of residential customers.

An increased energy consumption causes this by the industrial sector during their production processes. Generating power has always been higher than the money made from selling it (Nkosi and Govender 2022). Eskom submits a request for a tariff increase to NERSA every two years. In 2023, Eskom received approval from NERSA to increase the tariff by 18% (NEWS 24 2023). Various stakeholders, including businesses, individuals, and the mining industry, have expressed their displeasure with the ongoing tariff increases. Considering that production output for the manufacturing sector depends on the availability of electricity, that price hike could lead to numerous performance issues because of a failure to meet operational costs (Adeleke *et al.* 2021). The manufacturing sector might then only have two options: the first is to purchase electricity from Eskom and the second option is to seek power from other sources. Alternatives include turning waste into electricity and using generators to produce electricity.

Power outages negatively impact the manufacturing industry because of its great dependency on a reliable power supply. Power outages affect how products are made, can damage equipment, and interrupt internet connectivity. An alternative method used to try and combat the effect of power outages. This most likely impacts the financial performance of various manufacturing industries unless great measures are taken to mitigate and minimise the impact of power shortages. This study attempts to answer several questions, one of which is how electricity pricing impacts manufacturing companies' financial performance.

One of the primary strategies used to lessen the effects of power disruptions is the self-generation of electricity because manufacturing businesses rely largely on a steady, dependable energy supply (Adeleke *et al.* 2021). When the supply of power is interrupted, great losses can be incurred; hence it's a risk that has to be planned for and pre-emptively mitigated and managed. One of the strategies some businesses adopt is to change their production processes (Salehi *et al.* 2022). The main strategy is the usage of generators as alternative power sources (Ciller and Lumbreras 2020). Focusing on other ways to combat load shedding allows manufacturing companies to invest in other lucrative business opportunities. Investing in other lucrative business opportunities assists manufacturing firms a gain a larger return on their investment. Investing in self-generation requires businesses to have more cash on hand for capital expansion (Salehi *et al.* 2022). Additionally, operating costs rise, making Eskom's electricity more affordable to purchase than the cost to produce on-site. However, some reports reveal that contrary to common belief (Adeleke *et al.* 2021)

most businesses that have invested in alternative energy sources suffer fewer losses than those who decided not to do so.

Businesses that cannot afford to purchase and maintain generators change how they operate to lessen the impact of power shortages. One of the ways is to reduce operating hours. Others increase or decrease their labour force hours to prepare for load shedding (Aguera *et al.* 2020). Ef Ii (2021) notes that due to load shedding, small- to medium-sized enterprises have been forced to shut down. Some businesses discontinue mass production and concentrate on a more customer-focused approach (Akinbami, Oke and Bodunrin 2021). When there is load shedding, production lines are affected, which can result in defects and rejects. The strategy used by most manufacturing firms is to align their operational schedules with the unreliable load-shedding schedule (Botha 2019). Understanding how the rise in electricity prices affects the profits on shareholders investments in these manufacturing enterprises was crucial. Additionally, it offered proof to demonstrate how a rise or a drop in the price of electricity could impact the value of these manufacturing firms

2.4 Understanding the Coal Industry of South Africa

Electricity usage is impacted by the quality of coal supplied and used to generate electricity (Treasury 2020). To comprehend the significance of coal supply to power generation, which contributes to load shedding, this component of the study examines the South African coal sector. South Africa is recognised as a low-cost coal producer with the largest coal terminal and an internationally competitive scale for coal exports and production (Shyu 2023). In addition to manufacturing and exporting coal, the nation also significantly consumes coal to generate energy. Coal contributes to 70% of primary energy consumption, 93% of power generation, and 20% of liquid petroleum fuels, indicating the importance of the coal industry to South Africa's economy (Shyu 2023).

With around 36% of the world's electricity produced by basic fuels, coal is currently the most popular fuel globally. Given the rate at which new inventions are occurring, this situation will likely persist until 2030. Since the 1880s, when coal supply contracts were made between the Vereeniging and the Kimberly diamond fields, coal has historically dominated South Africa's energy supply industry. Currently, 77% of South Africa's energy requirements are met by coal supplies and for the foreseeable future, coal consumption is anticipated due to a lack of other energy sources (Nkosi and Govender 2022). South Africa

ranks fifth globally in terms of coal output and is one of the biggest fuel producers. On average, the nation produces approximately 22 million tons of coal annually, of which 25% are sold to the global market (Zuhroh 2019). However, much of this coal powers 53% of the nation's industrial sectors. Because of the role of coal in energy generation, South Africa's coal sector is a significant factor in the country's economic growth (Afolabi and Laseinde 2019).93% of Eskom's electricity is generated by coal (Styan 2019). South Africa is one of the biggest suppliers of coal in the world. The country exports higher-grade coal to foreign nations, while the low-grade coal is used to fuel the nearby power plants.

The process of making electricity from coal begins with the coal being ground into a fine powder in enormous mills before being blown into enormous kettles or boilers (Zuhroh 2019). The coal combusts and burns because of the heat in the boiler, producing heat that causes water to transform into steam. The blades of a turbine, also known as a large fan or propeller, are turned by the steam from the boilers. The magnetic rotor, which is formed of a copper wire coil, is rotated by the turbine. They work as a unit to form the generator. Power lines transport the generated electric current to consumers' residences and workplaces (Thurman 2009). Eskom is primarily supplied with low-quality coal because of the recent increase in coal costs. There are two main fields in South Africa's coal industry: the Waterberg basin and the Mpumalanga basin. The Mpumalanga basin produces about 80% of South Africa's coal and has an expected commercial life of 30 years. However, Waterberg possesses significant reserves in the nation and makes a significant contribution to economic growth and the production of power (Thurman 2009).

Contracts govern Eskom's requirements for coal. Cost-plus contracts, fixed capital/price contracts, and short- to medium-term contracts are examples of these agreements (Fakih, Ghazalian and Ghazzawi (2020). Cost-plus contracts are ones in which Eskom contributes capital and is the sole user of all coal reserves. In fixed-price contracts, coal is sold to Eskom in accordance with the terms of the agreement, and the prices, in this case, are predetermined (Akinbami, Oke and Bodunrin 2021). Eskom is not the sole owner of the coal deposits; thus, if Eskom is dissatisfied for whatever reason, the supplier could be held liable and subject to sanctions. The operating requirements for short- and medium-term contracts are the same as those for fixed-price contracts, which are typically provided to small, emerging mining firms.

2.5 Eskom and its Implementation of Load Shedding

Eskom was founded in 1923 and was formerly known as the Electricity Supply Commission (Styan 2019). It is guided by the Electricity Act No. 42 of 1992 (Goldberg 2015). The power utility was given the responsibility to provide electricity effectively and efficiently based on this legal text. The mandate suggested that Eskom would meet the supply demands of its clients (Afolabi and Laseinde 2019). More laws were changed as the years went on. The name change of the electricity utility to Eskom was one of the important or noticeable modifications. Eskom became the new name for the organisation under the 1987 Electricity Act No.

The phrase "load shedding" was first used in 2007 (Styan 2019). This was caused by a lack of power generation capacity, which almost caused the electricity grid to collapse. There were finger-pointing contests among various structures and agencies involved in producing and distributing electricity. The management of Eskom was at fault, according to the government, which claimed they had not planned for expansion appropriately (Eskom 2009). The administration of Eskom, on the other hand accused the government of failing to provide the resources required for the organisation’s upkeep. According to media records, Eskom Technical Managers informed the government of the limited reserve capacity as early as 1998 (Styan 2019). A request for a new build programme was submitted. The then-government ignored these requests. However, the government apologised in 2007 for missing the critical information obtained in 1998. When South Africa was selected to host the 2010 World Cup, the government and other pertinent parties even suggested that a new electrical power plant be built to handle the increased public demand and additional load needed to stage the event (Afolabi and Laseinde 2019). Kusile and Medupi were the two construction projects that were suggested. Eskom took out a R3.75-billion loan from the World Bank for the two new build projects. However, the recent nationwide blackout is a sign that the power shortages in the national grid have not gone away.

When the energy reserve is 15%, there are power shortages (Meles 2020). The Eskom technical team cited the following causes for power shortages: corruption, improper use of public funds, a technical issue relating to the design and upkeep of the power plants, a lack of technical expertise, a lack of resources, the use of poor-quality coal, and poor and unplanned maintenance (Ateba, Prinsloo and Gawlik 2019). Over 4 000 MW of additional electrical supply have been added since the start of loadshedding until the year 2019 to increase electric supply; however, it was not enough to meet the needs of the South African

populace and industries(Afolabi and Laseinde 2019). For their operations, the general population, enterprises, and the manufacturing sector rely on the availability of a large amount of electricity (Ateba, Prinsloo and Gawlik 2019). It is now estimated that the financial cost of loadshedding over the years is US$65.7 million (Nkosi and Govender 2022).

The various production mixes from South African power stations are depicted in the following chart in Figure 2-1 as a percentage. Coal-fired plants generate 46% of the power; nuclear power plants come next. The 7% is shared by the national grid, wind farms, pumped storage, and open-cycle gas turbines.

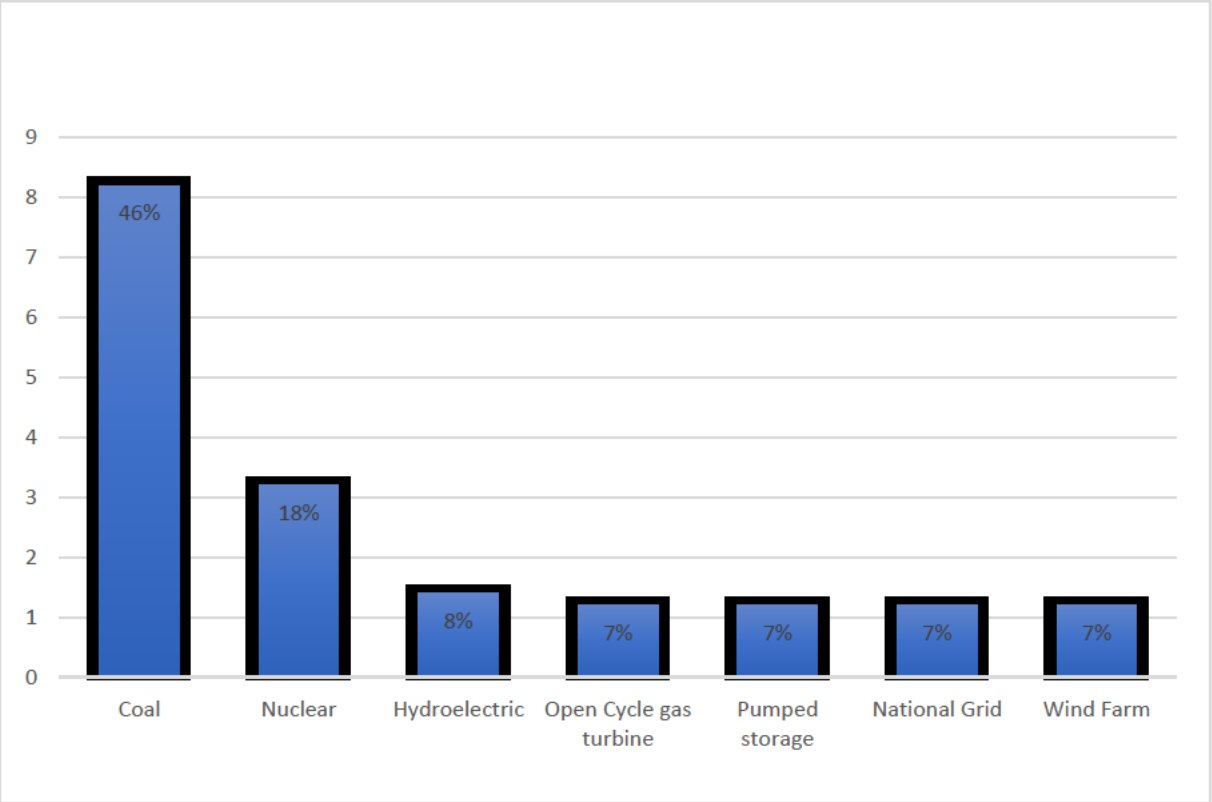

Figure 2-1: South African production mix in different power stations expressed as a percentage
source: (self-generated 2023)

2.6 Stages of Loadshedding

Since 2007 when loadshedding was first implemented to manage power supply shortages. 2022 is the year that experienced the most power outages in terms of hours (Nkosi and Govender 2022). South Africa had 1949 hours of power disruptions in 2022, according to Styan (2019), which is equal to 110.93 cents in terms of cost per kilowatt-hour. The years from 2007 to 2013 had the fewest loadshedding hours per week. Loadshedding is

implemented in six stages. Stage 1 signifies a 1 000 MW power shortage; stage 2, 2 000 MW; stage 3, 3 000 MW; stage 4, 4 000 MW; stage 5, 5 000 MW; stage 6, 6 200MW (Styan 2019). An increase in loadshedding was observed in 2022, reaching stage 6. This cost the nation almost R4 billion. Up to eight stages of power outages are possible; however, South Africa has only gone up to stage 6. The first stage 6 implementation took place in 2019 (Styan 2019). The third and fourth objectives of this study investigated the effects of load-shedding hours on the financial performance and firm value of industrial companies. Stage 6 has becoming more prevalent as of the year 2023. The implementation of stages 7 and 8 has not yet taken place. The hours of load shedding from 2007 to 2021 are shown in Figure2.2

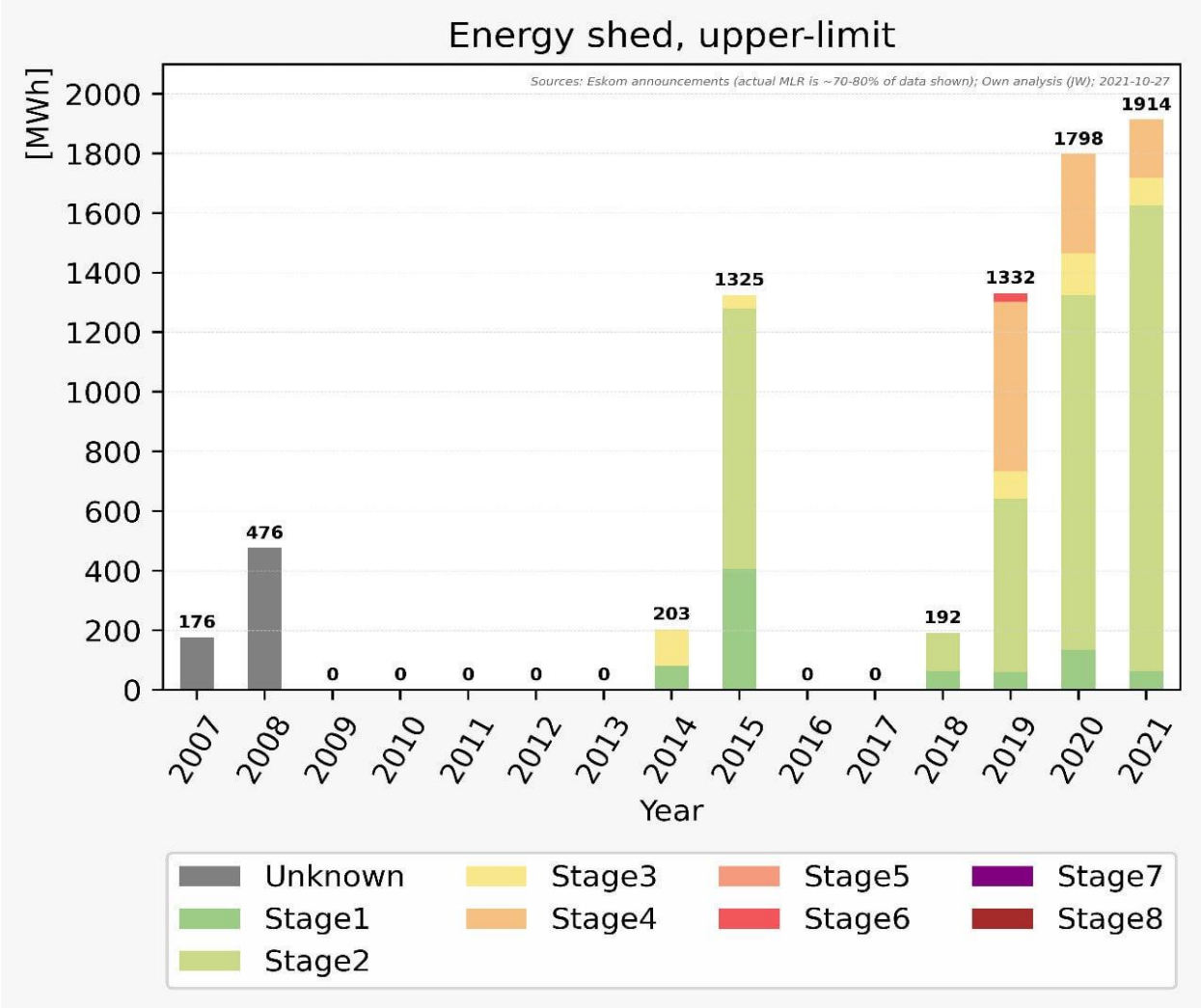

Figure 2-2: Hours of load shedding
Source: (Pierce and Le Roux 2022)

2.7 Financial Performance

Elviana and Ali (2022) describe financial performance as an examination of the financial accounts in their article. To accurately implement effective financial management, there are laws and regulations that must be followed. The four primary financial statements are the Statement of Financial Position, Statement of Comprehensive Income, Profit and Loss Statement, and Cash Flow Statement. The financial performance of the study is analysed using the following ratios: Tobin's Q, sales, size, risk, age and retention rate (RR).

Financial performance is a key metric to measure management performance (Analytica 2020). The financial performance of businesses is of great importance to both internal and external stakeholders. Shareholders are the main internal stakeholders, and investors are among the exterior stakeholders. Investors routinely compare companies in related industries using financial performance statements (Elviana and Ali 2022). Without them, no financial or non-financial choices can be made in an industry, according to Elviana and Ali (2022). Ratio analysis provides information about a company's historical performance that can be used to inform future investment decisions (Haralayya 2022). All listed firms prepare and publicise their financial performance through financial statements in their annual reports, which are used by internal or external users to evaluate the company's overall financial performance. For one to make an informed choice about the performance of the company, several metrics are employed to assess a company's financial performance. Financial ratios, including profitability ratios, liquidity ratios, asset management ratios, solvency ratios, and market ratios, are among these measurements (Haralayya 2022). These measurable metrics must be applied concurrently to assess financial performance effectively.

Stakeholders look to financial performance to make financial and non-financial decisions. They focused on how effectively a business converts its basic materials into profit (Treasury 2020). Some stakeholders are curious about how businesses handle their assets and liabilities. The other component of financial performance is how investors' interests are safeguarded. Different metrics are used to measure a company's financial performance because varied stakeholders have different interests in the organisation's financial performance. Operating income can be used as a proxy for investors interested in margin growth or reducing debt rates.

Businesses use a range of bookkeeping procedures to evaluate how well the company is doing. The effectiveness of the company's use of its assets to generate profit is often examined (Matsoma, Mabandla and Mamaro 2022). Financial performance can be defined as the way a company uses its key resources to generate revenue. Many businesses utilise financial performance to measure how well-managed company resources are. The measurement of financial performance is conducted yearly in most companies to distinguish between financial and non-financial performance. The following indicators are distinguished in the current investigation: RA and Tobin's Q. Retention rate is a non-financial performance. The impact of power outages on the financial performance and value to the market of manufacturing companies listed on the JSE was investigated in the first and third objectives. The literature revealed how other researchers had accounted for or had not accounted for the variable.

2.8 Loadshedding and Manufacturing

Because of its linear production process, the manufacturing sector's value is simple to calculate. A measurable production loss occurs because of load shedding. Manufacturing companies can compare production to the hours of load shedding. Manufacturing companies' production budgets may find value in this information. According to a study by Cole *et al.* (2018), the impact of the different stages of loadshedding may be assessed. For instance, power outages have a different impact on industrial enterprises compared to stage of loadshedding. Planned power interruptions are essential for the manufacturing sector's production schedule to run effectively. However, public and commercial electricity consumers, who are referred to as "end users," claim that loadshedding schedules are unpredictable (Gehringer, Rode and Schomaker 2018). When there is load shedding, labour costs go up since manufacturing enterprises must still pay employee salaries and other fixed costs that cannot be avoided even when work is halted due to loadshedding (Nkosi and Govender 2022). This raises the cost of production per unit. Thus, it is possible to hypothesise that loadshedding and total loadshedding hours are directly related.

According to Tembe and Hlengwa (2022), manufacturing processes are utterly dependent on machinery for their productivity, implying that any electrical supply disruption is bad for a company's production levels. According to a study by Nkosi and Govender (2022), load shedding, whether planned or unexpected, impacts production levels anywhere it happens. For example, the amount of production hours is impacted if a company needs ten hours to

create 100 pairs of shoes; it will be unable to do so during loadshedding because the business will need to factor in idle time. The company's overall output suffers because of the reduction in operating hours. This comparison suggests that businesses should increase production hours whenever they can during load shedding. Staff weariness and overtime will increase as a result. The production of commodities has increased over the last 25 years. Significant growth occurred between 1994 and 2008, but there has not been any progress for the time frame under consideration, which runs from 2008 to 2020 (Laher et al. 2019). This coincides with the loadshedding era in South Africa; thus, it is safe to say that loadshedding may have played a role in the manufacturing sector's slowing growth rate.

2.9 The Manufacturing Sector's Contribution to the South African Market

For a long time, the manufacturing industry in South Africa was booming. The market was prosperous in exporting goods and services (Afolabi and Laseinde 2019). Most workers in the manufacturing industry were from the black population and only a tiny percentage were white skilled workers, therefore, the market was composed of mostly unskilled labour (Fakih, Ghazalian and Ghazzawi 2020). A market war broke out in 1920, causing significant disruption in the economy of the time. This had a great impact on trading and export revenue. However, due in great part to the accessibility of inexpensive power, the South African economy flourished and drew more foreign investment. The manufacturing industry's financial performance benefited greatly from the low cost of electricity.

Globally, technology has made it possible for the manufacturing industry to innovate more. However, this automation has been met with mixed feelings. There are fears from the local job market for job losses due to the global shift in production and manufacturing job markets (Parschau and Hauge 2020). South Africa is the African continent's centre for manufacturing. There is an ongoing shift in the manufacturing industry from labour intensiveness to capital-intensiveness, because of technological advancements (Chiarini, Belvedere and Grando 2020). A shift to a more capital-intensive sector necessitates the development of a new skill set, namely, technologically-oriented skill sets. These skill sets are seemingly limited in South Africa's manufacturing sector. A shift to digital innovations has occurred since the advent of the fourth industrial revolution, driven by the shifting dynamics of the world market. However, the lack of skill sets and reliable supplies needed for these new operating models is perhaps the leading cause of the reported decline in the

performance of the manufacturing industry. This is a big blow to the nation because about 14% of the nation's GDP is produced by this sector (Meyer and Habanabakize 2019).

There are numerous subsectors in the South African manufacturing industry, the largest of which is the food and beverage industry. Approximately 25% of the manufacturing mix comes from this subsector (Fakih, Ghazalian and Ghazzawi 2020). Over the past 25 years, the production of basic chemicals and refined petroleum products has also become a big part of the manufacturing mix (Nkosi and Govender 2022). Production in the petrochemical industry increased from almost R24 billion in 1994 to slightly under R68 billion in 2019 in constant rand values (Nkosi and Govender 2022). Due to this expansion, the share of basic chemicals and refined petroleum products in manufacturing value increased from almost 7% in 1994 to slightly under 12% in 2019. However, while production growth has accelerated, the employment rate has not increased. Reliable employment data shows a consistent or stable trend from 2008 to 2020, with employment averaging around 64 000 for the study period. A summary of the manufacturing industry in South Africa was produced by Statistics South Africa in February 2019 (Piece and Le Roux 2022. The many subsectors of the South African manufacturing industry are summarised in Figure 2-3.

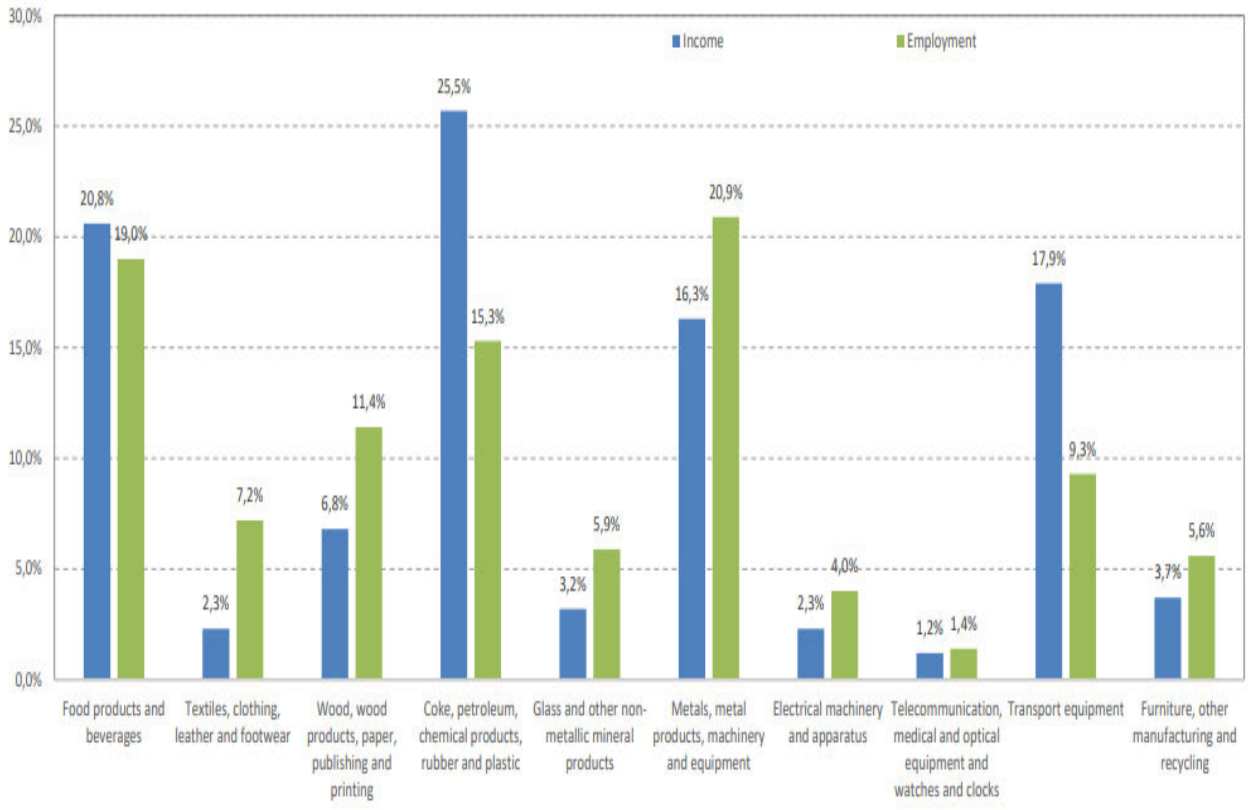

Figure 2-3: The Manufacturing sector contribution value added to South African Market
Source: (Statistics South Africa 2019)

Food products and beverage goods, coke, chemicals and petroleum products, basic iron and steel are the major subsectors of the manufacturing industry, as shown in Figure 2-3. With a combined contribution of 70%, these sectors are the main drivers of the South African manufacturing industry.

2.10 Theoretical Review

The impact of loadshedding and the financial performance of manufacturing are related to the resource-based view (RBV). The RBV provides an excellent explanation for the relationship. To analyse and explain the manufacturing financial data, data analytics has assumed a central role (Dubey *et al.* 2019). The demand to improve industrial companies' financial performance has grown. The business world and academia have expressed an interest in working together to close the gap between electricity supplied and the electricity demanded.

Several hypotheses attempt to explain how power interruptions and financial performance are related. These theories examine relationships from a positive, negative, or neutral perspective. The RBV, according to Barney (1991), emphasises the value of successfully utilising internal resources for formulating future strategic decisions. According to Barney (1991), power outages have a detrimental effect on a company's worth, financial performance, and the firm's value. However, when strategically positioned, a company's unique qualities might provide the company with a competitive advantage over its competitors. This may therefore result in that business having better financial performance than its rivals.

Resources, according to the RBV theory, are any assets, business processes, capabilities, firm attributes, knowledge, or information that a company has. Barney (1991) suggested that these are under a company's control used to understand and carry out strategies to increase effectiveness and efficiency. The resources used by a company can come from both internal and external sources. Some examples of internal sources are research and development capabilities, logistics, brand management, and low-cost procedures. The function of suppliers is an example of an external resource.

The RBV is more focused on the internal resources that the corporation has control over. The idea places little emphasis on outside variables like crime, corruption, and power shortages, among many other external variables (Dubey *et al.* 2019), because there isn't

enough panel data, particularly ones that incorporate internal and external aspects. As a result, this study attempts to add to the body of literature by focussing on external elements, particularly the average electricity price, the total number of hours of load shedding, and power outages in the South African context.

2.10.1 Empirical Literature Review

There is broad agreement among academics regarding the effects of power outages. The public and the corporate sector are affected by power outages equally. This study, however focuses on the impact of power outages on the financial performance of industrial enterprises. Some studies have looked at the impact of load shedding on organisations, such as the study by (Masibi 2015), which examined the effects of loadshedding on information and communication technology (ICT) small medium micro-enterprise (SMMEs) in the Matlosana area. The study was qualitative and provided evidence that suggests that loadshedding has a negative effect on SMMEs in Matlosana and that the brand of the SMMEs suffered because of frequent power outages. Lenoke (2017) conducted a different study in another area of South Africa where the study looked at the effects of loadshedding on the country's economic development. The influence of loadshedding on economic development was examined using the Engle-Granger Cointegration test. According to the results, power and economic growth are directly related. The findings also showed a negative correlation between loadshedding and economic expansion. According to research by Afolabi and Laseinde (2019), loadshedding in South Africa hurts the country's economy and enterprises.

Another investigation by Goldberg (2015) evaluated the effects of an uneven power supply on South African retailers. A mixed methodology approach was employed. The research revealed that numerous retailers had purchased backup generators, spending millions of rands in the process. Based on a study by Grainger and Zhang (2019), who examined the effects of loadshedding on 4 500 Pakistan-based manufacturing firms, the most adverse effects of power supply constraints were experienced by businesses that consumed more energy. Welfolo (2019) established the effect loadshedding has on a construction project, specifically on the time and cost factors during construction. Two case studies and structured interviews were used. The results of this study showed that loadshedding impacted time and cost overruns on the building project and had a negative financial impact on it. Botha (2019) assessed how power outages affected the efficiency of a food shop headquartered in Nelson

Mandela Bay. A quantitative analytical method was employed, and the survey revealed that 93% of the businesses had also invested in alternate power sources and 73% of the enterprises said that power outages negatively influenced their productivity.

In a related qualitative study by Tembe and Hlengwa (2022), loadshedding was seen as a major problem that affected not only local companies but international companies as well that are operating in the region. Two main issues were highlighted: the customer base connected to the power grid compared to the available energy resource is not aligned. It was also discovered that there is limited investment in the capital expansion project and the ageing infrastructure. The recommendations were that alternative energy sources are the way to go if the bed-and-breakfast and guesthouse industry is to survive. The authors also examined how power interruptions affected business sales in various African nations. The results indicated a negative correlation between power interruptions and firm revenue using firm data from 14 countries from the World Bank Enterprise Survey. The data also revealed that businesses without backup power sources, such as generators, were negatively impacted by power outages.

Recurrent load shedding influences the financial performance of manufacturing enterprises, according to the evidence from the research conducted by various scholars. An overview of the results of related studies on this subject is given in Table 2-2. The influence of electricity price deregulation on the coal and coal-fired power industries was the focus of Liu *et al.*'s. (2019) study. The study demonstrated that deregulation may lead to higher electricity prices while coal prices would be lower, comparable to South Africa's situation. South Africa has an abundance of coal, an essential energy resource, yet the cost of electricity is high for South Africans. According to a study by Cole *et al.* (2018), businesses that rely on their generation capacity during power outages are impacted differently than those that do not have access to alternate energy sources. As a result, businesses that use alternative energy sources can keep operating during power disruptions. There will be an extra charge for this. A problem arises when power disruptions are less common where there are no communicated schedules for power outages, which poses a threat since these companies cannot plan for power outages. Those companies that do not possess backup power sources will either stop working or shut down until the power is restored. Kupzig (2022) suggests that the loss of productivity is brought on by the length of time the generators remain idle when there are no power outages. There are no blackouts during these periods as alternative

power outages are used as a substitute. When the loadshedding period is prolonged, this has more impact on the company's financial performance.

A study by Fakih, Ghazalian and Ghazzawi (2020) revealed a favourable and significant correlation between planned power outages and financial performance. The study population was 69 manufacturing companies in Machakos. The result further showed that financial performance and equipment vandalism have a significant negative relationship. Additionally, it was found that there is a positive and significant correlation between the time it takes for power to be restored and the manufacturing companies' financial performance while awaiting power to be restored. Financial performance and repair expenses have a negative and significant relationship.

Table 2-2: Empirical literature review providing information at one glance

Author	Objective	Methodology	Findings
Kupzig (2022)	The impact of power outages on a firm's productivity.	A quantitative approach method was used.	It was revealed that power outages reduce productivity. This then negatively affects the financial performance of these firms
Masibi (2015)	The impact of loadshedding on ICT SMMES in Matlosana area.	The methodology used in this study was qualitative in nature.	The findings of this study showed a negative impact of loadshedding on SMMEs and that the brand was negatively impacted due to load shedding.
Timilsina, Steinbuks and Sapkota (2019)	To what extent does loadshedding impact the value of sales? The target population was firms in various African countries.	The methodology that was adopted was firm level data and the population size was 14 countries extracted from the enterprise survey by the World Bank.	The study found that those firms that do not own alternative energy sources are more affected by unreliable power supply. Furthermore, an inverse link existed between loadshedding and sales.
Phiri (2018)	Investigated the impact of electricity demand and loadshedding on Zambian businesses and entrepreneurship.	The study was conducted by using self-administered questionnaires containing both closed and open questions.	It was established that lack of affordable and reliable energy sources resulting from loadshedding negatively impacted on business growth and entrepreneurship.
Fakih, Ghazalian and Ghazzawi (2020)	The study investigated the link between power outages and financial performance of the manufacturing firms in Machakos	The descriptive research was used in this study and the study was limited to the 69 manufacturing firms in Machakos.	Financial performance has a strong positive association with scheduled maintenance.
Lenoke (2017)	The research examined the impact of loadshedding has on the economic growth in South Africa.	The Engle Granger Cointegration test was utilised.	The findings were that there is a direct correlation between economic growth and electricity consumption. The study also indicated a negative relationship between loadshedding and economic growth.

Goldberg (2015)	The influence of unbalanced power supply on South African retailers.	A mixed method was used. This included both qualitative and quantitative approaches.	The findings were that many retailers invested in backup generators. Billions were invested in backup generators and millions were lost due to unstable power supply.
Grainger and Zhang (2019)	The study looked at firms based in Pakistan and how loadshedding impacted their output.	Qualitative approach looking at 4 500 manufacturing companies.	Companies that are more energy intensive suffer more due to power supply shortages.
Husain and Lean (2015)	The impact of electricity consumed and selling prices in the manufacturing industry in Malaysia	Qualitative approach was used to determine the impact.	Loadshedding had a negative impact on sales growth in the short run.
Elliott, Nguyen-Tien and Strobl (2021)	To estimate the impact of power outages on firms' performance.	Qualitative method using World Bank Enterprise Surveys for the year 2005 - 2015 for Vietnam.	Firms became susceptible to power outages. In the second finding it is evident that reoccurring power outages lead to low productivity.
Welfolo (2019)	To find the impact that loadshedding has on a construction project on the time and cost elements during construction.	Structured interviews and two case studies were employed.	The findings of this study indicated that loadshedding has negative financial effect on a construction project and influence the time.
Botha (2019)	To evaluate the effect of power shortages on the efficiency of food outlets based in Nelson Mandela Bay.	A quantitative approach method was used.	73% of the firms indicated that power outages had a negative impact on productivity and 93% invested in alternative power sources.

Source: (Author's Construct 2023)

The results of numerous studies have shown a connection between loadshedding and business performance. This is because higher prices may have an influence on energy use and become an additional barrier to performance improvement because power is the fundamental input for all manufacturing processes. Using Melitz's theory, a study looked at how energy costs affected global trade(Chan, Manderson and Zhang 2017). The results showed that the high cost of power had a negative impact on a company's performance. It is generally believed that if a business decides to self-generate, they will boost productivity and achieve superior financial performance by lowering their production costs (Chan, Manderson and Zhang 2017). However, the study found that self-generation is more expensive than buying from Eskom. This can be attributed to two factors: the price of oil and gas; and the expense of maintenance, buying alternative energy sources, and repairs.

Abeberese (2017) examined how electricity costs affected business performance between 2001 and 2008 in India and found that manufacturing companies shifted to alternative energy sources as tariff prices rose. This switch turned out to be ineffective, increasing the

amount of money used for electricity usage. This subsequently impacted the firms' financial performance.

Government policy can have an impact on how well businesses perform and how frequently there are power outages, claims Chan, Manderson and Zhang (2017). The government may opt to spend more money on enhancing infrastructure access. The reliability of the energy supply could thus enhance productivity and performance. This implies that businesses can carry their items to their customers and have easy access to the electricity cables.

2.11 Conceptual Framework

The conceptual framework underlying this study, which is the relationship between loadshedding, financial performance, and company value in manufacturing enterprises, is shown in Figure 2-4. Numerous theories, concepts, and empirical data from the literature served as the foundation for the conceptual framework's development. The relationship between power outages and how they affect firm value (measured using Tobin's Q), is shown in the conceptual framework in Figure 2-4. The external elements created by the current study are Total Loadshedding Hours and Average Electricity Pricing. The independent and dependent variables are depicted in the framework below. Econometrics models are used to investigate these variables. The key goal is to investigate how power interruptions affect the firm value of industrial companies listed on the JSE.

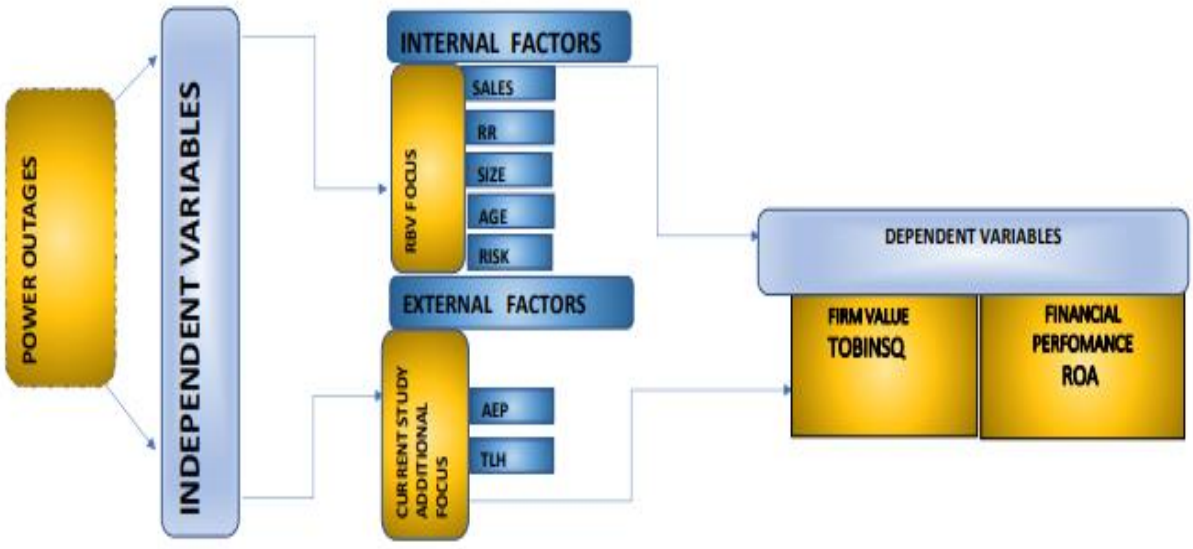

Figure 2-4: Conceptual framework of the study
Source: (Self-generated 2023)

The lack of electricity impacts the whole performance of manufacturing companies. This conceptual framework was influenced by the literature that has been discussed. The return on assets has been used to measure financial success. Tobin's Q was used to calculate the firm's value. Power interruptions are thought to have negative impact on the financial performance of manufacturing companies. Although various studies have looked at the impact of power outages on the financial performance of manufacturing firms, there is a minimum of research on how does the combination of total loadshedding hours (TLH) and Average electricity pricing (AEP) as independent variables impact the financial performance and the firm value of manufacturing firms. This is the gap that is filled by the current study. Furthermore, the current study used ROA and Tobin's Q as dependent variables.

There are other studies that have looked at financial performance and firm value. However, these studies differ to the current study in the following ways, firstly they focus on either one of the above variables or more. Moreover, there studies focused in research in the context outside of South Africa. Abebe and Abera (2019), focused on the factors that influence financial performance in the Ethopian insurance companies. Their study used (ROA) and (ROE) and the panel data on nine insurances companies over six-year period.

The internal factors were capital adequacy, liquidity, size, age, loss, and leverage. These research gaps limit our understanding on the impact of power outages on the financial performance of listed manufacturing firms. Therefore, this study aims to explore how the above factors impact the financial performance and firm value. The primary goal of the current study is to ascertain how load-shedding affects the financial performance of listed manufacturing firms in the context of South Africa. The rich data set of 10 years is also vital to provide evidence of the impact.

2.12 Summary of Chapter

The literature on load shedding and its effects on the financial performance of manufacturing enterprises was evaluated in this chapter. This was based on a variety of literature sources that discussed the problems that either directly or indirectly affect how certain businesses perform. The research approach employed in the current study will be examined in the chapter that follows, which will affect how the study turns out.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

A reliable power supply is essential for the manufacturing industry's production processes, which is one of the industries with the biggest contributions to South Africa's GDP. As a result, the manufacturing industry is severely impacted by a disruption in the power supply (Meyer and Habanabakize 2019). Power outages have been happening quite often in South Africa. The conceptual framework, theoretical analysis, and literature assessment of loadshedding were covered in the preceding chapter. To shed light on how loadshedding affects the financial performance of manufacturing enterprises, the RBV was applied. This provided an overview of the study's background, but more information based on statistical approaches is needed to fully meet the requirements of the current investigation. As a result, the main goal of the current chapter is to go through the methodology, sampling strategy, population size, sample size, data collection method, research design, and research approach that was used in this study. The impact of power outages and the financial performance of the manufacturing enterprises were analysed using a quantitative approach. The financial statements of manufacturing companies that are listed on the JSE were used to collect panel data. Using(McGregor 2013), these financial statements were extracted. The current analysis is based on a 10-year period starting in 2012 and ending in 2021. The research design, research approach, target approach, sampling method, data collecting, ethical consideration, data validity and reliability, data analysis, and econometrics model are presented.

3.2 Research Design

To respond to research questions, a study design is essential. The study design used to address the research issues is depicted in clear model form in Figure 3-1. Although various stages are connected, each stage was developed and explored separately. Finding the issue that needed to be solved was the first step. The reading of the literature on power outages and manufacturing companies in South Africa was then followed by a discussion of the study's methodology. Following a description of the approach, the data collection, analysis, and evaluation period started using various statistical techniques. Once the fixed and random effects were identified, the validity of the acquired data was examined. Finally, the study's findings and conclusions are summarised, and recommendations are proposed.

The research design outlines participants' intended responses to the subject, how the study should address the research questions, and the study's overall goal (Grover and Lyytinen 2015). Additionally, the study design must always be considered to guarantee the validity of the research result (Gray 2013). According to Chan, Manderson and Zhang (2017), research design specifies how to gather pertinent data. This guarantees that the investigation will yield reliable results. The study methodology makes sure that the conclusions are accurate and free of prejudice. The research is structured by the study design, which also serves as a framework for the data collection and analysis process (Creswell and Creswell 2017). The research design for this study entailed identifying the research topic and objectives, collecting data, and analysing that data to accomplish the research objectives. The study first recognised a general issue, then explained the issue, followed by the objectives and research questions, and then discussed the study's importance. The three types of study are exploratory, descriptive, and explanatory Ritchie (2003). According to Saunders, Lewis and Thornhill (2003), descriptive studies should provide a scenario or picture of how objects should interact.

Additionally, a descriptive research design is a research methodology that offers the most precise description of the population or current phenomenon being studied (Ritchie 2003). Exploratory research is carried out by scouring the pertinent literature or speaking with experts on the topic. Explanatory research design is a style of research methodology which focuses on the causes of certain phenomena to help expand the researcher's understanding of the scant material on the subject and make predictions about what will happen in the future. The descriptive research design was selected as the best option considering the goals and research questions of the current study.

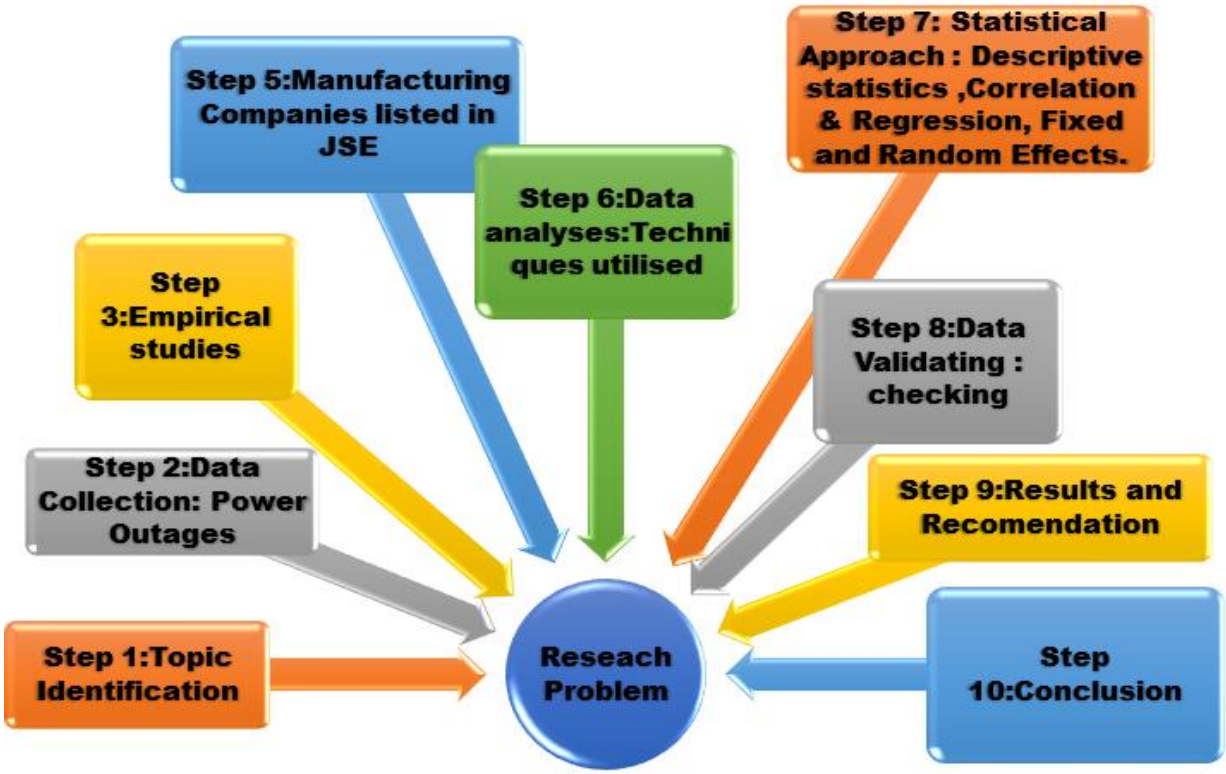

Figure 3-1: Research design diagram overview
source: (self-generated 2023)

3.3 Research Approach

A research approach is a framework that directs the research study. In addition, the researcher is led by a predetermined set of attitudes, assumptions, and beliefs. The three main research methods used to collect data are qualitative research methodology, quantitative research methodology, and mixed method research methodology. This study determined that a quantitative descriptive and inferential research approach was most suited for the current problem.

As a result, the current study's goals were supported using the quantitative approach and the Multiple Panel Linear Regression Analysis Model as the research approach analysis method. Regression analysis gives a bird's-eye view of whether power disruptions affect manufacturing enterprises' financial performance. According to Deerfield (2019), a regression analysis can show whether an association exists between the independent and dependent variables. When significant conversations and decisions are required, linear regression analysis can offer a comparative study of the empirical literature (Schorr and Lips 2018). A motive can therefore be utilised to drive a linear relationship between the variables

under consideration. However, according to Kuan (2018), several equations and regression analysis equations do not replicate the association between the independent and dependent variables. When compared to the influence of power outages on firm value using Tobin's Q as a response variable. In contrast, Zou *et al.* (2019) recommended using linear regression analysis to examine the association between two quantitative variables. It is clear from the empirical literature that quantitative data is easy to study and interpret. In section 3.9 below, regression analysis is examined in detail.

Data analysis was done using the Stata analysis software package (version 17). Literature review and statistical data were taken from (McGregor 2013), while empirical data for the study was taken from the company website. The World Bank, Statistics South Africa, and the Eskom website were used to calculate the external indicators. Utilising secondary data from the financial statements of manufacturing companies, the firm-level variables were interpreted. The study's ability to assess financial performance depended on external variables like ROA and Tobin's Q. The main goal was to calculate how power disruptions may affect the financial performance of the 107 significant manufacturing companies listed on the JSE over ten years, from 2012 to 2021.

The model's dependent and independent variables and their measurements were identified. Data gathering, reduction, and coding were then completed. The next step was to perform a quantitative linear regression analysis. In conclusion, the findings were evaluated focusing on the South African context, followed by a discussion and suggestions for additional fieldwork.

3.4 Target Population

The entire group in which a researcher is interested can be called the target population (Bryman and Bell 2011). These can be categorised as a specific class of people, businesses, or things (Brooks 2019). These must possess specific qualities that the researchers are interested in. The study's target demographic was the 201 manufacturing companies in South Africa listed on the Johannesburg Stock Exchange (JSE). The period of interest was from 2012 through 2021. The period was chosen because it coincided with South Africa's load-shedding hours during that month. Companies or businesses that engage in manufacturing and rely on energy for production are those that have been included in the current study.

3.5 Sampling Method

The current study analysed 201 manufacturing companies listed on the JSE following Cresswell and Cresswell (2003). The focus of the study was on load shedding impact. A random purposive sample of 107 large industrial companies was selected based on inclusion and exclusion criteria, ensuring they were listed on JSE, rely on electricity for production, and were affected by constant power outages. These randomly selected 107 firms were selected based on the availability of secondary data. The year 2012 was chosen because load shedding intensified in the year 2012. This was after the 2010 world cup where the mandate was to provide electricity at all cost. The cut of period was 2021 as period of interest was 10-year period.

3.6 Data Collection

The study used a variety of data collection methods and techniques. According to Amaratunga et al. (2002), data collection is the gathering of information from which conclusions can be derived. Based on the current investigation, secondary data methods were employed because the public financial statements contained the conveniently accessible and readily available data for the study. Secondary data is defined as information that has been gathered from readily available sources. When a researcher collects data using historical data, this is known as retrospective statistics (Garza-Ulloa 2018). To gather the secondary data needed for the current study, an empirical literature review was used. This was in reference to data on power outages and the financial accounts of the study's chosen manufacturing companies. Numerous pieces of literature were consulted to support the current investigation based on the information in Chapter 2.

The most recent publications were used to gain insight on the current thinking about the effects of power outages and identify potential directions for future research on the subject. The McGregor BFA database were used to obtain the data. Particularly, the financial information for the companies was gathered from McGregor BFA, and information on the total number of loadshedding hours and average electricity prices was found online. Microsoft Excel was utilised to capture the data. Ten years of data, from 2012 to 2021, were used in the study. There were 1070 firm year observations based on the 107 firms in the sample. Because of missing data, 916 firm year observations were used.

3.7 Delimitation of Scope

This study focused on the impact of power shortages on the financial performance of selected South African manufacturing firms listed on the JSE. Therefore, this study will not focus on all the firms in the manufacturing sector nor will it include SMMEs in manufacturing sector.

3.8 Limitation of Scope

The study is limited to selected South African large manufacturing firms listed on the JSE. The study focused on only those firms that depended on the supply of electricity by Eskom. Those firms were affected by the constant power outages. A sample of the population was used. The findings of this research, therefore, might not be a true reflection of all the manufacturing firms in South Africa. Generalisation must be exercise with caution.

3.9 Ethical Considerations

The financial performance of selected manufacturing enterprises was examined in this study in relation to the effects of power shortages and electricity pricing using both quantitative and secondary data. Data derived from sources owned by commercial firms or studies involving both humans and animals should have ethical clearance (Botha 2019). Giving due acknowledgement to the source is sufficient if the information is ready and easily accessible online, such as manufacturing firms that are listed on the JSE. In this study, there was no ethical approval requirement because the firms' financial data were easily accessible and readily available. Additionally, data on loadshedding's operating hours and electricity costs were gathered from sources that were open to the public. There was no fabrication or falsification of data in the current study to affect a certain outcome. To make the current study as ethical as feasible, this was done. The references have been given acknowledgement. The Durban University of Technology's rules and regulations regulating the conduct of research were also adhered to aside from this.

3.10 Data Validity and Reliability

In general, a research tool's validity is determined by how well it captures the data it is intended to capture. According to Meeker, Escobar and Pascual (2022), information is reliable if it is presented objectively. The authors define reliability as a method of data collection that guarantees the conclusions are consistent. High reliability assures that the same result should be obtained if the same sample is used repeatedly. Because secondary

data were used in this investigation, data validity was guaranteed. Since the data were primarily derived from audited records, there were no concerns about their validity or reliability. In addition, the supervisor, as well as independent staff members with extensive expertise and experience in the field of econometric model research and the subject area examined the data analysis models that had been adopted from the literature.

3.11 Data Analysis

Two statistical models are necessary in order to comprehend and describe inconsistencies (Garza-Ulloa 2018) accurately. Because the current study is based on financial performance, it was essential to use statistics to understand any potential relationships between the many variables covered in the study.

Data analysis is the process of depicting analyses and evaluating data systematically using statistics and logical procedures (Garza-Ulloa 2018). The Stata statistical package, version 17, was used in this research to analyse the data. To analyse the data's trends, descriptive statistics were used. Descriptive statistics included the mean, standard deviation, and maximum and minimum values for all the variables. To evaluate the multiclonality among the variables, a correlation analysis was performed. Finally, the study used the random and fixed effect panel modelling approaches to examine the effects of the identified factors of financial performance and company value. These models are described in more detail in the following section.

3.12 Econometric Model

An econometric model is an analytical tool used to evaluate the relationship between the variables (Brooks 2019). Econometric models were used to estimate the impact of power outages on the financial performance and the manufacturing firms' value. Panel data regression analysis method was employed for the current investigation because it is primarily concerned with establishing a link between a single dependent variable and multiple other factors (Salehi *et al.* 2022). According to the Hausman test, the significance threshold is 0.05, which means that if the p-value is greater than 0.05, there is a significant link between the discussed variable and the other variables. To fit the regression models, either the random effect or fixed effect estimation methods should be utilised.

For all the models, equations (1), (2), (3), and (4) (Table 3-1) were used. The Ohlson (1995) test was employed to develop the models. The Ohlson model states that the way information is presented to investors affects their judgements (Ohlson 1995). The impact of average electricity pricing (AEP) on firm value (Tobin's Q) or financial performance (ROA) of manufacturing firms, respectively, are the focus of Objectives 1 and 2, which are addressed by models 1 and 2. The impact of Total Loadshedding Hours (TLH) on firm value (Tobin's Q) or financial performance (ROA), respectively, is examined in Objectives 3 and 4 using Models 3 and 4. Two response variables, Tobin's Q and ROA, have been identified based on the results of the current study.

Table 3-1: Econometric Equations used

ROA_{it} =	$\beta_0 + \beta_1 AEP_{it-1} + \beta_2 Sales_{it} + \beta_3 RR_{it-1} + \beta_4 Size_{it} + \beta_5 Age_{it} + \beta_6 Risk_{it} + \varepsilon_{it}$	(1)
$TobinQ_{it}$ =	$\beta_0 + \beta_1 AEP_{it-1} + \beta_2 Sales_{it} + \beta_3 RR_{it-1} + \beta_4 Size_{it} + \beta_5 Age_{it} + \beta_6 Risk_{it} + \varepsilon_{it}$	(2)
ROA_{it} =	$\beta_0 + \beta_1 TLH_{it-1} + \beta_2 Sales_{it} + \beta_3 RR_{it-1} + \beta_4 Size_{it} + \beta_5 Age_{it} + \beta_6 Risk_{it} + \varepsilon_{it}$	(3)
$TobinQ_{it}$ =	$\beta_0 + \beta_1 TLH_{it-1} + \beta_2 Sales_{it} + \beta_3 RR_{it-1} + \beta_4 Size_{it} + \beta_5 Age_{it} + \beta_6 Risk_{it} + \varepsilon_{it}$	(4)

The variables used in the current study are explained below, along with a description of how they were measured.

3.12.1 Dependent Variables

In this study, ROA and Tobin's Q were the dependent variables used to quantify business value and performance. The paragraphs that follow offer explanations for these factors.

Return on Asset (ROA): ROA is a financial statistic that measures a firm's profitability in relation to its total assets. Investors typically use ROA to judge how successfully and efficiently a firm uses its assets to produce a profit (Sunrowiyati et al., 2022). Net income to total assets is used to calculate ROA. Furthermore, it is the dependent variable based on the current investigation. Many academics concur that ROA is a reliable indicator of a company's profitability (Pantow, Murni and Trang, 2015), partly because a firm's financial leverage is considered when calculating ROA.

Tobin's Q: The Q ratio is another name for Tobin's Q ratio. It is calculated using the assets' actual market value and replacement value (Salehi *et al.* 2022). Companies determine their financial success using Tobin's Q ratio. The ratio of the market value of equity and the book

value of all liabilities minus the book value of all assets is the calculation for Tobin's Q. Salehi *et al.* (2022) state that using Tobin's Q to measure firm value is commendable because it is not affected by practices in the accounting space and also performs better than other accounting ratios. When the ratio is greater than one, it signifies that the company's market value is greater than its total assets, and the company may thus be overvalued (Ishaq, Islam and Ghouse 2021). A Tobin's Q value below 1 indicates that the company is undervalued.

3.12.2 Internal Factors

Retention Rate (RR): The retention rate is the percentage of net income kept on hand to expand the manufacturing business. The term "plough back" is another name for the retention ratio. The other option is to distribute the income in the form of dividends. This ratio helps decision-makers understand how much cash the organisation is holding back to reinvest in the enterprise. The researcher was curious to learn if these manufacturing companies had decided to reinvest in the business based on the findings of the current investigation. This might be an indication that companies were investing more in alternative energy sources to address the problem of power interruptions rather than giving dividends to shareholders.

Average Energy Price (AEP): The AEP (measured in rands) refers to the average electricity cost businesses pay. To compare the unit price of power that these manufacturers paid for the period of the study, the rand value was converted using the c/kWh unit of measurement. The calculation was performed by taking the average energy price stated in rands from the websites of Eskom and the Department of Energy.

Total Loadshedding Hours (TLH): The TLH refers to the number of hours for the length of power outages. Kilowatt-hours were used to measure the loadshedding time. The loadshedding hours were obtained from the websites of Eskom and the Department of Energy and classified according to the various load shedding stages, from stage 1 to stage 6.

Sales (in billions of rands): Sales is the amount of revenue a company has generated. Using McGregor BFA, the sales of the manufacturing companies were retrieved for a ten-year period. According to Shawar and Siddiqui (2019), sales have been widely used to measure financial performance. This view is consistent with those of Panda (2015) and Cole *et al.* (2018), who note that most academics have selected sales as one of the top influencers of a

firm's performance. As a result, the current study has chosen sales as a metric for assessing the factors that influence the financial performance of manufacturing firms.

Age: Age is a measure of how long a company has existed since its establishment.

Risk: Risk gauges how vulnerable a business is to outside financial influence and control. The debt-to-equity capital ratio was used to calculate risk.

Size: Size has been used as an independent variable in related research. Size is measured as the natural logarithm of the total asset of the company (Salehi *et al.* 2022). The size of a company has a significant impact on the profitability of companies. Many scholars utilise firm size to calculate the firm's performance (Salehi *et al.* 2022). Size is based on how far these manufacturing companies can manufacture their products. Meles (2020) suggests that a company's financial performance increases with size. The financial performance is positively and significantly impacted by firm size.

3.12.3 Random and Fixed Effect

To conduct a study, a researcher must decide whether to employ a fixed effect (FE) model or a random effect (RE) model. The Hausman test is one method for determining whether to use a FE model or a RE model for panel data. The Hausman specification test, commonly called the Hausman test, is used to identify predictor variables in a regression model. In other words, the FE model should be used if the null hypothesis, $Cov(i,Xit) = 0$, is false and the RE model should be used if the null hypothesis is true. The fixed effect model assumes that the explanatory variables have a fixed or constant relationship with the response variable across all observations. The FE model argues that the factors do not alter over time for a certain person. On the other hand, a RE model also presupposes that the relationships between the explanatory variables and the response variables are constant across all observations. When the p-value of a Hausman test is less than 0.05, a FE estimation technique is adopted; otherwise, a RE technique is adopted.

3.13 Summary of the Chapter

The chapter discussed the research's method to guarantee that the goals and objectives outlined in the first chapter were met. A clearer understanding of how data was acquired was created using the after-research graphic. More attention was paid to analysing the rationale for choosing the quantitative technique to meet all the requirements of the research standard. The chapter further described the research methodology's many components. The

design of the investigation's nature and target population were described. How the sample was chosen from the target demographic was presented. The methods used for data collecting and analysis as well as the research's ethical considerations, were described. The effect of loadshedding on the performance of industrial enterprises was quantified using the descriptive quantitative research method. The 107 manufacturing companies that are listed on the JSE make up the study's sample. To support the study, panel regression analysis was performed. Further explanation was provided about the equations that were used.

CHAPTER 4: DATA ANALYSIS, INTERPRETATION, AND DISCUSSION

4.1 Introduction

The methodology of the study was covered in detail in the preceding chapter. The current chapter focuses on presenting and analysing results to complete the study's main aim and objectives. The results are then discussed in relation to the evaluated impact of power outages on the performance of manufacturing companies listed on the JSE. A description of the econometrics analysis' findings, which cover evaluations of the descriptive statistics, the multicollinearity test, and regression analysis, is provided.

4.2 Descriptive Statistics

The goal of the descriptive statistics in this part is to summarise the data that has been analysed. These comprise the mean, standard deviation, minimum and maximum values for each of the following variables: ROA, Tobin's Q, AEP, TLH, Sales, RR, Size, Age, and Risk. The results of the descriptive test are shown in Table 4.1 below.

Table 4-1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA (%)	916	6.83	25.41	-176.75	47.22
Tobin's Q	916	1.36	1.87	0.26	12.04
AEP (cents)	916	99.33	8.49	88.9	113.85
TLH (hours)	916	249.01	340.08	0.00	859.00
Sales (billions of rands)	916	1.75	8.99	0.13	35.86
RR (%)	916	85.16	13.62	13.70	100.00
Size (billions of rands)	916	0.77	73.46	0.16	47.93
Age (years)	916	40.00	27.00	12.00	128.00
Risk (%)	916	47.72	14.56	9.87	518.30

Source: (Author's computation 2023)

As stated in Chapter 3 of this study, 107 listed manufacturing enterprises were covered. As a result, Table 4-1 shows that the mean AEP is 99.33 cents, indicating that from 2012 to 2021, manufacturing enterprises spent an average of 99.33 cents on electricity. The TLH is 249.01 hours, suggesting that over ten years, businesses lost an average of 249 hours per

year. The loadshedding is responsible for this loss. Sales are R1.75 billion, ROA is 6.83%, and Tobin's Q is 1.36. Furthermore, according to the current study, manufacturing enterprises preferred to keep the earnings instead of paying out dividends to shareholders, with a retention percentage of 85.16%. Table 4-1 also shows that the firms' average score for size was 0.77, their average age was 40 years, and their risk percentage was 47.72. The gap between all the mean scores and the maximum reveals that the firms did not demonstrate particularly strong financial success over the course of the past ten years.

4.3 Multicollinearity Test

Regression analysis should only be performed following the development of a correlation matrix to examine the degree of correlation between the independent variables (Alabi *et al.* 2020). This study needed to perform a multicollinearity test to ensure no significant collinearity among the variables, mainly because high levels of collinearity among the variables can produce false results. The findings of the multicollinearity between the independent variables are shown in Table 4-2.

Table 4-2: Correlation results

	AEP	TLH	Sales	RR	Size	Age	Risk
AEP	1.000						
TLH	0.333	1.000					
Sales	-0.014**	-0.010	1.000				
RR	0.004*	-0.018***	0.019**	1.000			
Size	-0.020	-0.008**	0.569*	-0.003	1.000		
Age	0.006***	-0.005	0.091***	0.0278	-0.018**	1.000	
Risk (%)	-0.021	-0.056*	0.039	0.036***	-0.015	-0.036*	1.000

Note: *** = significance at 0.01; ** = significance at 0.05; * = significance at 0.1
Source: (Author's Computation 2023)

The results in Table 4-2 show no multicollinearity problems because the results show co-efficiencies below 0.70 which is the accepted standard to quantify the correlation between independent variables. Meles (2020) claims that correlation analysis is a statistical tool that may be used to evaluate the relationship between two or more variables. Other factors that were taken into consideration have weak connections. Since there have been no significant issues with the variables' correlations, the researcher is now allowed to continue the investigation.

4.4 Panel Data Regression Analysis

4.4.1 The Impact of Electricity Pricing on Financial Performance

The first objective of the study was to assess the impact of electricity pricing on the financial performance of manufacturing firms in South Africa. The result of the study is reflected in Table 4-3.

Table 4-3: The impact of electricity pricing on financial performance

ROA	**Random Effect**			**Fixed Effects**		
Variables	**Coeff.**	**t-stats**	**p-value**	**Coeff.**	**t-stats**	**p-value**
AEP	0.0118	0.14	-0.889	-0.0353	-0.43	0.666
Sales	-0.0058	-2.11	0.013	0.0227	2.39	0.009
RR	0.1559	7.82	0.000	0.1354	6.38	0.000
Size	-0.7934	-1.47	0.143	-0.0158	-0.19	0.845
Age	0.0000	1.97	0.018	0.0001	1.96	0.028
Risk (%)	-17.3217	-4.35	0.000	-4.3178	-2.36	0.009
Constant	151.2823	4.09	0.000	38.6605	2.41	0.004
Observations	916			916		
R-squared (R^2)	0.9062			0.8892		
Adjusted R^2	0.8752			0.8301		
F-stats	97.272			102.55		
Prob. > F-stats	0.000			0.000		
Prob. Of Hausman Test	0.015			0.015		
Durbin-Watson stats.	1.826			1.983		

Source: (Author's computation 2023)

To estimate the variables in the econometric model, a multi-linear regression with both dependent and independent variables assigned was used to evaluate the link. The measuring of business financial performance utilised return on assets. The results in Table 4-3 indicate that the Hausman test has a probability of 0.015. This result suggests that the fixed estimation model should be considered for assessing the association between the variables under investigation since the Hausman test significance threshold is greater than 0.05.

The coefficient of AEP is -0.0353 in Table 4-3, along with a p-value> 0.05, which demonstrates the negative and insignificance nature of the link between the two variables. These findings suggest that AEP has no significant effect on ROA and that external influences have no bearing on the financial performance of South African manufacturing

companies that are publicly traded. The negative and insignificant relationship between the variables is consistent with the RBV, which emphasises internal factors more than external ones in determining and influencing financial performance. The negative relationship further suggests that a rise in the cost of electricity can hamper financial performance. Loadshedding results in high electricity costs, which have an impact on the manufacturing company's profit margins. The results are not unexpected because high electricity price poses such a danger to businesses in the manufacturing industry that it has an impact on their spending.

The study's findings are contrary to those of Panda (2015), who found that high electricity prices and the availability of alternative energy sources at manufacturing companies had a negative impact on the financial performance of those companies. Similarly, in a study by Kupzig (2022), who was more interested in the effect of power costs on the firm productivity, more attention was given to the effect on those who own generators and revealed no evidence that self-generation reduces productivity due to the time the generators remain unused. In support of these findings, it is advised that a complete analysis of the cost of power in South Africa be carried out. This will lower the cost of electricity for the general people as well as the business and industry sectors.

A coefficient of 0.0227 and a p-value of 0.009 were found for sales. The relationship between the two variables is positive and significant, suggesting that increasing sales result in an increasing ROA and falling sales lead to a falling ROA. A coefficient of 0.13 and a p-value of 0.000 was recorded for the retention ratio. This result suggests that the association between the two variables is both positive and significant. These findings suggest that a rise in the RR leads to an increase in ROA. Retention happens when manufacturing firms decide to reinvest their earnings rather than provide dividends to shareholders. This suggests that retained earnings make resources available to the firms to undertake further investment opportunities. This will also help them invest in alternative power sources, thus decreasing the production stoppage incidence. This can result in an increased income and, consequently an increased profit.

The risk variable has a coefficient of -4.3178 and a p-value of 0.009. This result shows an inverse relationship between the variables, suggesting that a decrease in risk (leverage) leads to a rise in ROA, as demonstrated by the risk variable's coefficient of and p-value. The outcome shows that industrial companies will perform better financially if they have less risk (leverage) because of the uncertainties of load shedding. Therefore, the higher price of

power increases the danger to the financial performance of listed manufacturing enterprises. Electricity price hikes put manufacturing companies at risk because this leads to a reduction in production operations. When debt levels are high, manufacturing companies must borrow money to finance their operations.

Age also has a coefficient of 0.0001 and a p-value of 0.028, showing a positive and significant relationship between age and ROA. This result implies that businesses with a longer track record may have superior financial performance. Because they have been in business for a while, these manufacturing firms have developed coping mechanisms for loadshedding and rising electricity costs. Therefore, it is crucial for manufacturing companies to reduce risks to a manageable level by including backups like generators and solar power to maintain production at a manageable level of confidence.

The post-estimation test results attest to the model's and the variables' reliability. The R^2 for the regression model is 0.8892, indicating that the independent variables are responsible for about 88.92% of the variance in the financial performance of manufacturing firms. The model is significant and valid at 0.000 according to the F-statistics test, which has a value of 102.55. The Durbin-Watson analysis yielded a value of 1.983, showing no evidence for autocorrelation.

4.4.2 The Impact of Electricity Pricing on Firm Value

The second objective of the study was to assess the impact of electricity pricing on the firm value of manufacturing firms in South Africa. The result of the study is presented in Table 4-4.

Table 4-4: The impact of electricity pricing on firm value

Tobin's Q	**Random Effect**			**Fixed Effects**		
Variables	**Coeff.**	**t-stats**	**p-value**	**Coeff.**	**t-stats**	**p-value**
AEP	-0.0157	-1.90	0.054	-0.0006	-0.10	0.924
Sales	0.0036	1.98	0.048	0.0033	0.85	0.396
RR	0.0028	2.05	0.041	0.0022	1.64	0.103
Size	-0.0078	-1.07	0.286	-0.2154	-5.73	0.000
Age	0.0001	1.30	0.193	0.0000	1.87	0.062
Risk (%)	0.0404	2.18	0.008	-0.3577	-2.04	0.021
Constant	2.6906	1.60	0.110	12.7472	4.70	0.000
Observations	916			916		
R-squared (R^2)	0.8619			0.8194		
Adjusted R^2	0.8201			0.7638		
F-stats	92.671			87.311		
Prob. > F-stats	0.000			0.0000		
Prob. Of Hausman Test	0.082			0.082		
Durbin-Watson stats.	2.527			2.169		

Source: (Author's Computation 2023)

The results relating to the impact of electricity pricing on the firm value of manufacturing firms in South Africa are presented in Table 4-4. The Hausman Test of the model is insignificant ($p > 0.05$); hence the results emanating from the random effect model was used for the discussion. Tobin's Q is used in Table 4.4 to investigate how power pricing affects company value. The findings show that AEP has a coefficient of -0.0157 and a p-value of 0.054. This demonstrates a weak and negative association between the two variables. These findings suggest that a rise in AEP has little influence on company value. The amount of power used by these industrial enterprises during the study period had a negligible effect on the company's worth. As a result, the AEP's findings are consistent with the RBV theory, which places a greater emphasis on internal variables like sales. This finding is inconsistent with the findings of Salehi *et al.* (2022), who examined how power prices affect business sales in various African nations. The results revealed a link between power prices and business revenue. The results also demonstrated that businesses without backup generators or other alternate power sources were negatively impacted. This result indicates that investors should feel confident enough to invest in the industry since loadshedding has little impact on business value increases.

These findings, which align with those of Pantow, Murni and Trang (2015) demonstrate that sales impact the firm's value. The sales variable has a p-value of 0.048 and a coefficient of 0.0036. The two variables show a positive and significant relationship, suggesting that rising sales are accompanied by rising Tobin's Q. These findings suggest that if an investor chooses to invest in one of these businesses, their money may be safe and well-cared for, which will boost investor trust. Additionally, RR has a coefficient of 0.0028 and a p-value of 0.041. This link demonstrates a favourable and strong correlation between the two factors. These findings suggest that a rise in the RR resulted in a rise in Tobin's Q. Similar to the earlier reason, a high RR would mean that the firms have more resources for expansion projects which would essentially increase the value of the firm. In addition, a high RR would enable the firms to invest in other energy sources so that the negative impact of loadshedding on their operations would be minimised.

Additionally, the risk variable exhibits a coefficient of 0.0404 and a p-value of 0.008, indicating a positive and significant relationship between risk (leverage) and firm value. The positive and significant relationship between risk (leverage) and firm value suggests that an increase in risk associated with loadshedding leads to a rise in the value of manufacturing firms. A reason for this relationship is that during loadshedding, a firm may obtain favourable bank loans or credit terms from its external fund providers, which may have a favourable impact on their value. These findings are inconsistent with the RBV theory's predictions that power outages expose businesses to risk and uncertainty, which negatively impacts the market value of the manufacturing companies under study.

The relationship between firm size and firm value is positive and insignificant, as shown by the size's coefficient of 0.0404 and p-value of 0.286. The result suggests that firm size has a positive and insignificant impact on its value. The finding is consistent with those of previous studies. Research by Salehi *et al.* (2022) and (Zuhroh 2019) demonstrated that firm size had a favourable and significant impact on the firm's value. However, the finding contradicts the findings of a study conducted by Shawar and Siddiqui (2019), who concluded that business size has a detrimental impact on firm value. These findings show that investors should not base their investment decisions on a company's or firm's sales and size because those factors do not always indicate how well or efficiently a business operates. This could lead to wrong decisions, which might have an adverse effect on their choices.

The age of these companies and the company value are positively correlated, as indicated by the coefficient of age being 0.0001 and the p-value greater than 0.05. Despite being positively related, this relationship is not significant. The result indicates that the longevity of the manufacturing firms has no bearing on their value. No matter how long they have been in business, all businesses are at par with newly established competitors in terms of their value growth opportunities.

Based on the aforementioned results, the R-square is 0.8619, which indicates that the sales, RR, risk, age, AEP and size (independent variables) predicted the dependent variable, Tobin's Q, up to about 86.19%. These variables have a high predictive power based on the used model. The F-statistics test result of the model is 92.671, which is significant and valid at 0.000. This result emphasises the validity of the model and its variables. Similarly, the Durbin-Watson analysis yielded a value of 2.527, showing no evidence of autocorrelation.

4.4.3 The Impact of Power Outages (Hours) on Financial Performance

The third objective of the study was to examine the relationship between power outages (hours) and the financial performance of manufacturing firms in South Africa. The result of the study is reflected in Table 4-5.

Table 4-5: The impact of power outages (hours) on financial performance

ROA	**Random Effect**			**Fixed Effects**		
Variables	**Coeff.**	**t-stats**	**p-value**	**Coeff.**	**t-stats**	**p-value**
TLH	-0.0118	-3.74	0.000	-0.0042	2.07	0.039
Sales	-0.0058	-0.11	0.913	-0.0214	-0.37	0.709
RR	0.1559	7.82	0.000	0.1392	6.60	0.000
Size	-0.7934	-1.47	0.143	-0.0257	-0.32	0.752
Age	0.0000	1.97	0.043	0.0000	2.35	0.012
Risk (%)	-17.3217	-4.35	0.000	-4.1292	-1.59	0.112
Constant	151.2823	4.09	0.000	33.0528	1.82	0.069
Observations	916			916		
R-squared (R^2)	0.8492			0.8965		
Adjusted R^2	0.8107			0.8528		
F-stats	172.825			164.07		
Prob. > F-stats	0.000			0.000		
Prob. Of Hausman Test	0.106			0.106		
Durbin-Watson stats.	2.291			1.683		

Source: (Author's computation 2023)

The effects of power outages (hours) on the manufacturing firms' financial performance (ROA) are shown in Table 4-5. The analysis of multiple linear regressions is used to present the results. The RE model was used to estimate the link between the variables under investigation, according to the Hausman test probability of 0.106. Contrary to the primary statements of the RBV, Table 4-5 shows a coefficient of total loadshedding hours (TLH) of -0.0118 with a p-value of 0.000 which demonstrates that the external factor in the form of TLH has a sizeable impact on the financial performance of manufacturing enterprises in South Africa. This outcome demonstrates the negative and strong link between the two variables. This finding suggests that the severity of power outages matters, regardless of how frequently they occur. The corporation will suffer more the higher the stage is. Companies that use alternative energy sources are also impacted by the higher input costs associated with employing alternative energy sources. These findings suggest that an increase in TLH causes a drop in ROA. The financial health of these enterprises would be impacted by how long the power disruptions last. Alternative energy sources are more expensive to operate, impacting these businesses' labour costs. During power outages, production must either cease or the firms must increase investment in alternative energy sources. The results of this study contrast with those of Quantec (2019), in which the researcher's conclusions demonstrated a favourable and substantial relationship between total load-shedding hours and financial performance. The difference between the two studies may be the methodology and research approaches used.

The sales variable has a p-value of 0.913 and a coefficient of -0.0058. The relationship between the two variables is negative and insignificant, suggesting a drop in sales has little effect on ROA. The continual power outages have a detrimental impact on these companies' sales, ultimately impacting their financial success. For example, if a company cannot manufacture due to load shedding, it cannot sell either. The RR variable also has a 0.1559 coefficient and a p-value of 0.000. The two variables show a strong and significant association with one another. These findings suggest that a rise in the RR leads to an increase in ROA. The findings are in line with those of studies by (Sasidharan, Ranjith and Prabhuram 2022) and (RMSS and DMRU 2021), but they are at odds with those of Banerjee and Majumdar (2018), who discovered that the RR had no effect on ROA.

Additionally, the risk variable displays a -17.3217 coefficient and a 0.000 p-value. This demonstrates that reducing risk-related variables leads to an increase in ROA, showing that the lesser the risk and uncertainties caused by loadshedding, the better the financial

performance of manufacturing enterprises. Therefore, manufacturing companies must reduce risks to a manageable level.

The age of the enterprises has no bearing on ROA. The age variable has a coefficient of 0.0001 and a p-value of 0.043. The conclusion suggests that organisations with a long history are well known, and greater reliance is placed on their resources and goodwill to drive the company's performance. The longer these companies have been in business, the more profitable they become. The prediction ability of the model is displayed by the R-squared (R^2). The R^2 of the model is 0.9247, suggesting that the independent variables can predict the dependent variable up to 92.47%. This demonstrates the model's strong predictive ability. The F-statistics test and the p-value of the model are 172.825 and 0.000, respectively. This result suggests that the model is and significant.

4.4.4 The Impact of Power Outages (Hours) on Firm Value

The impact of power outages on the value of manufacturing firms in South Africa was the study's fourth goal. The study's findings are presented in Table 4-6.

Table 4-6: The impact of power outages (hours) on firm value

Tobin's Q	**Random Effect**			**Fixed Effects**		
Variables	**Coeff.**	**t-stats**	**p-value**	**Coeff.**	**t-stats**	**p-value**
TLH	-0.0002	-1.47	0.141	0.0001	0.32	0.748
Sales	0.0037	0.91	0.365	0.0033	0.85	0.395
RR	0.0028	1.99	0.046	0.0022	2.16	0.009
Size	-0.0092	-1.25	0.211	-0.2170	6.22	0.000
Age	0.0000	1.41	0.159	0.0000	1.85	0.065
Risk (%)	0.0501	2.23	0.021	-0.3536	-2.22	0.022
Constant	1.1468	3.72	0.000	12.8381	4.71	0.000
Observations	916			916		
R-squared (R^2)	0.9018			0.8891		
Adjusted R^2	0.8702			0.8517		
F-stats	107.29			137.21		
Prob. > F-stats	0.000			0.000		
Prob. Of Hausman Test	0.217			0.217		
Durbin-Watson stats.	2.194			2.378		

Source: (Author's Computation 2023)

Tobin's Q is used in Table 4-6 to analyse the impact of the power outages (hours) on firm value. The analysis of multiple linear regressions is used to present the results. The random effect model was used to estimate the variables under investigation since the Hausman test probability was 0.217. The coefficient of TLH in Table 4-6 is -0.0002 with a p-value > 0.05. This finding demonstrates a negative and significant association between the two variables. According to this finding, a drop in TLH would lead to an increase in Tobin's Q.

The latest study's practical implications add to the body of knowledge already in existence. This helped to clarify the effect of power interruptions on the financial results of a publicly traded manufacturing company in South Africa, resulting in a deeper comprehension of the various factors and their impact on the financial performance and firm value of listed manufacturing businesses in South Africa. The study's findings provide a sizeable contribution to the corpus of knowledge. This is accomplished by conducting an empirical analysis of the effects of load-shedding on the financial performance of industrial enterprises in the past and present. Manufacturing organisations can use the study's findings to assess how they might improve their financial performance or coping skills during the ongoing power outages. Goldberg (2015), who looked at the effects of power outages on South African stores, supports this conclusion.

Sales has a coefficient of 0.0037 and a p-value of 0.365. The two variables have a positive but insignificant correlation, suggesting that rising Tobin's Q accompanies rising sales. The RR also has a coefficient of 0.0028 and a p-value of 0.046. These findings suggest that a rise in the retention rate results in a rise in Tobin's Q. The RR refers to the percentage of manufacturing firms' profit reinvested rather than distributed to shareholders. Additionally, the risk variable exhibits a p-value of 0.009 and a coefficient of -4.3178. This finding suggests that a decrease in risk leads to an increase in Tobin's Q and that there is a negative and substantial association between the two variables. The findings of Abebe and Abera (2019), who discovered that risk has a significant negative impact on Tobin's Q, confirm the conclusion, implying that the financial performance of manufacturing enterprises is better the lower the risk. Therefore, manufacturing companies must reduce risks to a manageable level.

Size has a coefficient of -0.00092 and a p-value> 0.05, indicating an insignificant but negative link between the size of these manufacturing enterprises and their value. The findings of this study concur with the conclusions of Zuhroh (2019), who reported that the

size of firms was negative and insignificantly related to their value. The result suggests that the size of such a manufacturing firm decreases with the amount of its assets. These findings imply that when the company's total assets decline, the value of the company is not much affected. Similarly, the age of the manufacturing firm has a positive and significant coefficient. The post-estimation test results attest to the model's and the variables' reliability. The R^2 for the regression model is 0.9018, indicating that the independent variables are responsible for about 90.18% of the variance in the value of the manufacturing firms. The model is significant and valid at 0.000 according to the F-statistics test, which has a value of 107.29. Based on the above the following hypothesis has been developed for the above objectives.

4.5 Summary of the Chapter

The findings from the various analytical techniques employed in the investigation were provided in this chapter. The results were that AEP had a negative and insignificant relationship with ROA, suggesting that AEP has no significant effect on ROA and that external influences have no impact on the financial performance of South African manufacturing companies. Similarly, the result demonstrates that AEP had a negative and insignificant relationship with firm value (Tobin's Q), suggesting that AEP has no significant effect on the value of the firms. The analysis also discussed the impact of power outages on the financial performance and value of the firms. The results showed a negative and insignificant relationship between a power outages and ROA, suggesting that power outages do not significantly impact ROA. In addition, the study found that power outages had a negative and insignificant impacts on firm value.

The research indicates that power interruptions negative impacts the financial results of publicly traded manufacturing enterprises. The study's findings in the context of South Africa largely support RBV because one of the three models' external components (TLH) was shown to be important. According to the findings of this study, whenever there is a power outage, businesses suffer significantly. The importance of the power outage variable suggests that policymakers should find strategies to increase energy supply and generation. A poor and irregular supply of electricity increases expenses, which in turn limits how well management companies can operate. In conclusion, businesses incur enormous expenses because of a severe electricity shortage in the manufacturing sector. The next chapter is Chapter 5, which discusses the summary of the study and the conclusions in detail.

CHAPTER 5: FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The previous chapter's focus was on the presentation and analysis of results to complete the study's main aim and objectives. After that, the discussion of results concerning the evaluated impact of power outages on the performance of manufacturing companies listed on the JSE was presented. Lastly, a description of the econometrics analysis' findings, which covered evaluations of the descriptive statistics, the multicollinearity test, and regression analysis, was also provided. The current chapter focuses on the findings based on the main aims and objectives. After that, the findings synthesis, conclusions, recommendations, and future research prospects will be discussed. Furthermore, the implication of the findings and recommendations to reduce the impact of power outages will be presented. Finally, this chapter recommends further studies that could be conducted to provide different elements regarding the subject.

5.2 Summary of Findings

It cannot be over emphasised how electricity is a key input in the production processes of manufacturing firms. Manufacturing machinery and equipment run with electricity. The current study examined how power interruptions impact the financial performance of manufacturing companies that are listed on the JSE. The literature review suggested that recurrent loadshedding influences the financial performance of manufacturing enterprises. An overview of the results of related studies on this subject was given in Table 3.1. The influence of electricity price deregulation on the coal and coal-fired power industries was the focus of Liu *et al.*'s (2019) study. It was evident that deregulation may lead to higher electricity prices even though coal prices may be lower, comparable to South Africa's situation.

Based on the literature review, it was acknowledged that one of the most common factors that contribute to power outages is bad historical decisions that were taken. Based on the current situation, it is evident that the issues of power outages are here to stay; this can only be rectified if there is sufficient emphasis on investment to increase the capacity of the power plant to avoid loadshedding in the long run. The fixed and random effect regression

approaches were used to analyse data. The return on asset (ROA) and Tobin's Q were selected as the dependent variables. In contrast, average electricity pricing (AEP), total load shedding hours (TLH), size, risk, retention rate (RR), and sales were selected as the independent variables. The study was conducted to achieve four specific objectives. The major findings of each objective are summarised below.

1. The first objective was to assess the impact of electricity pricing on the financial performance of manufacturing firms in South Africa. The findings are that there is a negative and insignificant link between electricity pricing and financial performance. This finding suggests that AEP had no significant impact on ROA and that external influences did not influence the financial performance of listed South African manufacturing companies.
2. The second objective assessed the impact of electricity pricing on the firm value of manufacturing firms in South Africa. The findings show that AEP has a coefficient of -0.0157 and a p-value of 0.054. This result demonstrates a weak and negative association between the two variables. These findings suggest that a rise in AEP had relatively little influence on company value. The amount of power used by these industrial enterprises during the study period had a negligible effect on the value of the company. As a result, the findings were consistent with the RBV theory, which emphasises internal variables like sales.
3. The third objective examined the relationship between power outages (hours) and the financial performance of manufacturing firms in South Africa. The results demonstrated that TLH negatively and significantly impacted the financial performance of manufacturing enterprises in South Africa. This finding suggests the severity of power outages.
4. The fourth objective examined the impact of power outages (hours) on the firm value of manufacturing firms in South Africa. Contrary to the primary declarations of the RBV, the coefficient of total load shedding hours (TLH) to Tobin's Q demonstrated that the external factor in the form of TLH had a significant impact on the financial performance of manufacturing enterprises in South Africa. This also affects export earnings as production continues to drop due to extended power outages.

Based on the research findings, the study comes to the following conclusions: The TLH has a negative relationship with financial performance. The high AEP influences how these manufacturing enterprises run by altering their operating budget or how much they spend on energy. The results of this study demonstrate the need for a long-term solution to the energy crisis and the necessity of acting to increase access to and affordability of electricity.

The study's findings suggest that increasing AEP impacts the firm value and financial performance of the firms. Financial risk increases with TLH, which can impact Tobin's Q and ROA. This costs money that could have been allocated to other business areas and forces the provision of alternative energy sources.

5.3 Recommendations

The following suggestions are formulated to help decrease the impact of loadshedding on the performance of firms in South Africa.

The results demonstrates that power outages have a negative impact on manufacturing companies' productivity. The development of the nation's economy and the creation of jobs are both significantly influenced by manufacturing enterprises. These results suggest that more alternative energy sources need to be added to the energy mix.

In addition, Adeleke *et al*. (2021) observed that South Africa is one of the top countries for waste collection. Waste has the potential to be used as an energy source to alleviate the issue of power outages in South Africa. It is therefore recommended that large manufacturing firms should consider how to convert the waste they generate into electricity.

Power outages and load shedding produce significant losses for manufacturing companies. The time it takes to respond when the electricity goes out also affects manufacturing companies. It is recommended that the South African government should coordinate its efforts and increase its financial investments in modernising the nation's existing power plants, which will increase the sale of these industrial businesses and stimulate economic growth.

These are a few different techniques that these manufacturing companies can use to reduce power interruptions or the impact thereof:

1. The use of solar panels to supplement and complement the supply of electricity from Eskom
2 Investment in alternative energy sources. Several businesses have abandoned the grid altogether, which is an expensive option.
3 Using backup generators, which have a large fuel cost, is another option.
4 Adopt energy-saving measures: Power outages will continue for an extended period; thus, a new strategy is needed to provide the companies with a competitive edge over their rivals. The manufacturing companies must make investments in storage technology and other energy sources. Manufacturing businesses can put energy-saving measures in place to cut storage and on-site generation costs, specifically smart power and equipment upgrades.

5.4 Overall Conclusion

Energy is imperative for economic growth and for the production processes of manufacturing firms. Furthermore, investigating the company's financial performance is imperative for the management of the company, researchers, and investors. For management measuring performance is imperative as it is linked to their compensation strategies and for investors financial performance is imperative for their return on their investment. For researcher's it important as source of evidence for empirical studies. For the companies anything that impact the availability of energy and further impacts their financial performance is not acceptable. The main objective of the study was about the impact of power outages on the financial performance of manufacturing firms listed on the JSE. The findings suggest that Contrary to the primary declarations of the RBV, the coefficient of total load shedding hours (TLH) to Tobin's Q demonstrates that the external factor in the form of TLH has a substantial impact on the firm value of manufacturing enterprises in South Africa. Furthermore, to reduce the impact of power outages more emphasise should be put on real-time monitoring technologies for improving decision making emergency situations. Manufacturing companies should be encouraged to get more involved in demand side management examples are emergency demand response. The findings further suggest that although these variables are not within management control. There is a clear need for

management to understand the impact of load shedding in order to plan for more ways to mitigate the impact of power outages.

5.5 Future Prospects for Research

For further research, it would be interesting to do a study once the unbundling process has been fully implemented. Future research can focus on the effects of load shedding on different industries and other variables and aspects that were not considered in the current study. A mixed-method approach can also be used to understand the various strategies employed to mitigate the impact of load shedding. Alternatively, another element can be a study that collects primary data using a qualitative approach to show how power outages affect the performance of firms. Other future studies can focus on systematic review which will be aimed at understating how load shedding may affect society. Furthermore, research on smart devices that can schedule electricity use may prevent power outages.

REFERENCES

Akinbami, O. M., Oke, S. R. and Bodunrin, M. O. 2021. The state of renewable energy development in South Africa: An overview. *Alexandria Engineering Journal*, 60(6): 5077-5093.

Analytica, O. 2020. Ramaphosa's vows will do little to calm investor fears. *Emerald Expert Briefings*, Article ID(oxan-es).

Andrade, J. V., Salles, R. S., Silva, M. N. and Bonatto, B. D. 2020. Falling consumption and demand for electricity in South Africa-a blessing and a curse. In: Proceedings of *2020 IEEE PES/IAS PowerAfrica*. IEEE, 1-5.

Ateba, B. B., Prinsloo, J. J. and Gawlik, R. 2019. The significance of electricity supply sustainability to industrial growth in South Africa. *Energy Reports*, 5: 1324-1338.

Ayamolowo, O. J., Manditereza, P. and Kusakana, K. 2022. South Africa power reforms: The path to a dominant renewable energy-sourced grid. *Energy Reports*, 8: 1208-1215.

Abebe, A. K. and Abera, M. T. 2019. Determinants of financial performance: evidence from Ethiopia insurance companies. Article ID.

Abeberese, A. B. 2017. Electricity cost and firm performance: Evidence from India. *Review of Economics and Statistics*, 99 (5): 839-852.

Adeleke, O., Akinlabi, S. A., Jen, T.-C. and Dunmade, I. 2021. Sustainable utilization of energy from waste: A review of potentials and challenges of Waste-to-energy in South Africa. *International Journal of Green Energy*, 18 (14): 1550-1564.

Afolabi, A. and Laseinde, O. 2019. Manufacturing sector performance and economic growth in Nigeria. In: Proceedings of *Journal of Physics: conference series*. IOP Publishing, 032067.

Akadırı, S. S., Alola, A. A. and Usman, O. 2021. Energy mix outlook and the EKC hypothesis in BRICS countries: a perspective of economic freedom vs. economic growth. *Environmental Science and Pollution Research*, 28: 8922-8926.

Alabi, O. O., Ayinde, K., Babalola, O. E., Bello, H. A. and Okon, E. C. 2020. Effects of Multicollinearity on Type I Error of Some Methods of Detecting Heteroscedasticity in Linear Regression Model. *Open Journal of Statistics*, 10 (4): 664-677.

Amaratunga, D., Baldry, D., Sarshar, M. and Newton, R. 2002. Quantitative and qualitative research in the built environment: application of "mixed" research approach. *Work study*, 51 (1): 17-31.

Bruwer, J.-P. 2021. South African Residential Electricity Price Increase between 2013 and 2020: An Online Desktop Study. *Available at SSRN 3896552*, Article ID.

Bryman, A. and Bell, E. 2011. Ethics in business research. *Business research methods*, 7 (5): 23-56.

Banerjee, R. and Majumdar, S. 2018. Impact of firm specific and macroeconomic factors on financial performance of the UAE insurance sector. *Global Business and Economics Review*, 20(2): 248-261.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of management*, 17(1): 99-120.

Bega, M. 2022. Eskom's 9.6% tariff hike a huge blow for struggling citizens - EFF, DA ArticleID:1.Available:https://app.bibguru.com/p/122c834b-e010-4995-a91e639e2de40c10 (Accessed on March 2023).

Botha, T. 2019. The impact of 'load-shedding' within the Nelson Mandela Bay restaurant industry. Research report, The Independent Institute of Education. Available at http://iiespace.iie.ac.za:80/handle/11622/323 (Accessed March 2022).

Bowman, A. 2020. Parastatals and economic transformation in South Africa: The political economy of the Eskom crisis. *African Affairs*, 119(476): 395-431.

Brooks, C. 2019. *Introductory econometrics for finance*. Cambridge university press.

Chan, H. R., Manderson, E. and Zhang, F. 2017. Energy prices and international trade: incorporating input-output linkages. *World Bank Policy Research Working Paper*, Article ID(8076).

Chiarini, A., Belvedere, V. and Grando, A. 2020. Industry 4.0 strategies and technological developments. Exploratory research from Italian manufacturing companies. *Production Planning & Control*, 31(16): 1385-1398.

Ciller, P. and Lumbreras, S. 2020. Electricity for all: the contribution of large-scale planning tools to the energy-access problem. *Renewable and Sustainable Energy Reviews*, 120: 109624.

Cole, M. A., Elliott, R. J., Occhiali, G. and Strobl, E. 2018. Power outages and firm performance in Sub-Saharan Africa. *Journal of Development Economics*, 134: 150-159.

Creswell, J. W. and Creswell, J. D. 2017. *Research design: Qualitative, quantitative, and mixed methods approach*. Thousand Oaks, CA: Sage publications.

Deerfield, A. 2019. Quantile regression analysis of cooperative learning effects. *International Review of Economics Education*, 30: 100132.

Dubey, R., Gunasekaran, A., Childe, S. J., Blome, C. and Papadopoulos, T. 2019. Big data and predictive analytics and manufacturing performance: integrating institutional theory, resource-based view, and big data culture. *British Journal of Management*, 30(2): 341-361.

Ef Ii, P.-P. 2021. The impact of electricity insecurity on the performance of small and medium size enterprises-The case of Cameroon. Master's dissertation, The Arctic University of Norway. Available at https://munin.uit.no/handle/10037/22567 (in June 2022).

Elliott, R. J., Nguyen-Tien, V. and Strobl, E. A. 2021. Power outages and firm performance: A hydro-IV approach for a single electricity grid. *Energy Economics*, 103: 105571.

Elviana, E. and Ali, H. 2022. Determination of financial distress and stock prices: The effect of financial performance and sales growth (financial management review literature). *Dinasti International Journal of Economics, Finance & Accounting*, 3(3): 241-252.

Eskom. 2020. *illigal connections.*Available at: Eskom Holdings SOC Ltd (Acessed https://www.eskom.co.za/ March 2023)

Eskom, G. 2020. *ILLIGAL CONNECTIONS*

Fakih, A., Ghazalian, P. and Ghazzawi, N. 2020. The effects of power outages on the performance of manufacturing firms in the MENA region. *Review of Middle East Economics and Finance*, 16(3).

Gehringer, C., Rode, H. and Schomaker, M. 2018. The effect of electrical load shedding on pediatric hospital admissions in South Africa. *Epidemiology*, 29 (6): 841-847.

Goldberg, A. 2015. The economic impact of load shedding: the case of South African retailers.MBA mini dissertation, University of Pretoria. Available at http://hdl.handle.net/2263/52398 (July 2021).

Grainger, C. A. and Zhang, F. 2019. Electricity shortages and manufacturing productivity in Pakistan. *Energy Policy*, 132: 1000-1008.

Grover, V. and Lyytinen, K. 2015. New state of play in information systems research. *MIS Quarterly*, 39(2): 271-296.

Garza-Ulloa, J. 2018. Methods to develop mathematical models: Traditional statistical analysis. *Applied Biomechatronics Using Mathematical Models, 1st ed.; Garza-Ulloa, J., Ed*, Article ID: 239-371.

Haralayya, B. 2022. Impact of ratio analysis on financial performance in Royal Enfield (Bhavani Motors) Bidar. *Iconic Research and Engineering Journals*, 5(9): 207-222.

Ishaq, M., Islam, Y. and Ghouse, G. 2021. Tobin's Q as an indicator of firm performance: empirical evidence from manufacturing sector firms of Pakistan. *International Journal of Economics & Business Administration,* 9(1): 425-441.

Kuan, J. 2018. Regression analysis estimation of stature from foot length. *Cognitive Systems Research*, 52: 251-260.

Kupzig, N. 2022. Power outages, firm productivity, and generator ownership in East Africa. *Journal of African Business*, 29, 1-21.

Kuan, J. 2018. Regression analysis estimation of stature from foot length. *Cognitive Systems Research*, 52: 251-260.

Kupzig, N. 2022. Power outages, firm productivity, and generator ownership in East Africa. *Journal of African Business*, 29, 1-21.

Lawrence, A. 2020. Energy decentralization in South Africa: why past failure points to future success. *Renewable and Sustainable Energy Reviews*, 120: 109659.

Lenoke, M. 2017. The impact of load shedding on the economic growth of South Africa. Master's dissertation, North-West University. Available at https://repository.nwu.ac.za/handle/10394/35217 (Accessed October 2022).

Liu, H., Zhang, Z., Chen, Z.-M. and Dou, D. 2019. The impact of China's electricity price deregulation on coal and power industries: two-stage game modeling. *Energy Policy*, 134: 110957.

Lawrence, A. 2020. Energy decentralization in South Africa: why past failure points to future success. *Renewable and Sustainable Energy Reviews*, 120: 109659.

Lenoke, M. 2017. The impact of load shedding on the economic growth of South Africa. Master's dissertation, North-West University . Available at https://repository.nwu.ac.za/handle/10394/35217 (Accessed May 2022).

Liu, H., Zhang, Z., Chen, Z.-M. and Dou, D. 2019. The impact of China's electricity price deregulation on coal and power industries: two-stage game modeling. *Energy Policy*, 134: 110957.

Masibi, K. B. 2015. The impact of load shedding on ICT enterprises in Matlosana. Master's dissertation, North-West University, Mafikeng. Available at https://repository.nwu.ac.za/bitstream/handle/10394/17665/Masibi_KB.pdf?sequence=1&isAllowed=y (Accessed November 2021).

Matsoma, N. L., Mabandla, N. Z. and Mamaro, L. P. 2022. An empirical study of factors that influence the profitability of South African retail firms listed on the Johannesburg Stock Exchange. *Acta Universitatis Danubius: Oeconomica*, 18(6).

Meeker, W. Q., Escobar, L. A. and Pascual, F. G. 2022. *Statistical methods for reliability data*. New York, NY: John Wiley & Sons.

Meles, T. H. 2020. Impact of power outages on households in developing countries: Evidence from Ethiopia. *Energy Economics*, 91: 104882.

Meyer, D. F. and Habanabakize, T. 2019. An assessment of the value of PMI and manufacturing sector growth in predicting overall economic output (GDP) in South Africa. *International Journal Of eBusiness and eGovernment Studies*, 11(2): 191-206.

Milin, I. A., Mungiu Pupazan, M. C., Rehman, A., Chirtoc, I. E. and Ecobici, N. 2022. Examining the relationship between rural and urban populations' access to electricity and economic growth: a new evidence. *Sustainability*, 14(13): 8125.

Masibi, K. B. 2015. The impact of load shedding on ICT enterprises in Matlosana. Master's dissertation, North-West University, Mafikeng. Available at https://repository.nwu.ac.za/bitstream/handle/10394/17665/Masibi_KB.pdf?sequence=1&isAllowed=y (Accessed April 2022).

Matsoma, N. L., Mabandla, N. Z. and Mamaro, L. P. 2022. An empirical study of factors that influence the profitability of South African retail firms listed on the Johannesburg Stock Exchange. *Acta Universitatis Danubius: Oeconomica*, 18(6).

Meeker, W. Q., Escobar, L. A. and Pascual, F. G. 2022. *Statistical methods for reliability data*. New York, NY: John Wiley & Sons.

Meles, T. H. 2020. Impact of power outages on households in developing countries: Evidence from Ethiopia. *Energy Economics*, 91: 104882.

Meyer, D. F. and Habanabakize, T. 2019. An assessment of the value of PMI and manufacturing sector growth in predicting overall economic output (GDP) in South Africa. *International Journal Of eBusiness and eGovernment Studies*, 11(2): 191-206.

Milin, I. A., Mungiu Pupazan, M. C., Rehman, A., Chirtoc, I. E. and Ecobici, N. 2022. Examining the relationship between rural and urban populations' access to electricity and economic growth: a new evidence. *Sustainability*, 14(13): 8125.

Nkosi, N. and Govender, K. K. 2022. Electricity price increases and energy demand: the case of an electricity supplier in South Africa. *International Journal of Energy Economics and Policy*, 12(5): 138-145.

Nkosi, N. and Govender, K. K. 2022. Electricity price increases and energy demand: the case of an electricity supplier in South Africa. *International Journal of Energy Economics and Policy*, 12(5): 138-145.

Panda, D. 2015. Growth determinants in small firms: drawing evidence from the Indian agro-industry. *International Journal of Commerce and Management*, 25(1): 52-66.

Pantow, M. S. R., Murni, S. and Trang, I. 2015. Analisa pertumbuhan penjualan, ukuran perusahaan, return on asset, dan struktur modal terhadap nilai perusahaan yang tercatat di indeks lq 45. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi*, 3 (1).

Parschau, C. and Hauge, J. 2020. Is automation stealing manufacturing jobs? Evidence from South Africa's apparel industry. *Geoforum*, 115: 120-131.

Phiri, J. 2018. *Electricity demand and load shedding: impact on Zambian business: a case study of selected Solwezi based businesses*. Saarbruecken, Germany: LAP LAMBERT Academic Publishing.

PIERCE, W. and LE ROUX, M. 2022. Statistics of utility-scale power generation in South Africa. Article ID.

Ritchie, J. 2003. The applications of qualitative. *Qualitative research practice: A guide for social science students and researchers*, 34: 24.

RMSS, R. and DMRU, D. 2021. Determinants of Non-Performing Loans: Evidence from Sri Lanka. *Available at SSRN 4117462*, Article ID.

Rathnayake, R. M. S. S. and Dissanayake, D. M. R. U. 2020. Determinants of Non-Performing Loans: Evidence from Sri Lanka. *South Asian Journal of Finance, 2(1), 14–27*.

Salehi, M., Zimon, G., Arianpoor, A. and Gholezoo, F. E. 2022. The impact of investment efficiency on firm value and moderating role of institutional ownership and board independence. *Journal of Risk and Financial Management*, 15(4): 170.

Sasidharan, S., Ranjith, V. and Prabhuram, S. 2022. What determines the financial performance micro or macro antecedents: a case of Indian general insurance. *Journal of Corporate Accounting & Finance*, https://doi.org/10.1002/jcaf.22592

Schorr, A. and Lips, M. 2018. Influence of milk yield on profitability—A quantile regression analysis. *Journal of Dairy Science*, 101(9): 8350-8368.

Shyu, C.-W. 2023. Lessons from the World Bank's solar home system-based rural electrification projects (2000–2020): Policy implications for meeting Sustainable Development Goal 7 by 2030. *Energy Reports*, 9: 2820-2838.

Styan, J.-B. 2019. Deconstructing Eskom. *Finweek*, 2019(1): 32-35.

Sasidharan, S., Ranjith, V. and Prabhuram, S. 2022. What determines the financial performance micro or macro antecedents: A case of Indian general insurance. *Journal of Corporate Accounting & Finance*, Article ID.

Saunders, M., Lewis, P. and Thornhill, A. 2003. Research methods forbusiness students. *Essex: Prentice Hall: Financial Times*, Article ID.

Shawar, K. and Siddiqui, D. A. 2019. Factors affecting financial performance of insurance industry in Pakistan. *Shawar, K. and Siddiqui, DA (2019). Factors Affecting Financial Performance of Insurance Industry in Pakistan. Research Journal of Finance and Accounting*, 10 (5): 29-41.

Tian, Z. and Shen, K. 2019. Logistic regression model optimization and case analysis. In: Proceedings of *2019 IEEE 7th international conference on computer science and network technology (ICCSNT)*. IEEE, 135-139.

Tembe, Z.N. and Hlengwa, D. C. 2022. Strategies used by B&Bs and guesthouses to mitigate the impacts of load Shedding in South Africa. *Strategies*, 11(3): 1020-1037.

Thurman, C. 2009. Load shedding: writing on and over the edge of South Africa. *English Studies in Africa*, 52(1): 116-121.

Timilsina, G., Steinbuks, J. and Sapkota, P. 2019. Economy-wide Cost of Electricity Load Shedding in Nepal. Article ID.

Treasury, N. 2020. Budget review -National Treasury 2030. online.

Tian, Z. and Shen, K. 2019. Logistic regression model optimization and case analysis. In: Proceedings of *2019 IEEE 7th international conference on computer science and network technology (ICCSNT)*. IEEE, 135-139.

Zuhroh, I. 2019. The effects of liquidity, firm size, and profitability on the firm value with mediating leverage. Article ID.

TURNITIN REPORT

The Impact of Power Shortages on the Financial Performance of Selected South African Manufacturing Firms listed on JSE. BY Nokwanda Zulu

ORIGINALITY REPORT

13%	11%	6%	6%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	mybroadband.co.za Internet Source	1%
2	www.multiresearch.net Internet Source	1%
3	repository.nwu.ac.za Internet Source	1%
4	www.researchgate.net Internet Source	1%
5	erepository.uonbi.ac.ke Internet Source	<1%
6	Submitted to Durban University of Technology Student Paper	<1%
7	vital.seals.ac.za:8080 Internet Source	<1%
8	hdl.handle.net Internet Source	<1%