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The Load Shedding Impact on the South African Economy: Analyzing Price Inflation and Strategies for Post-Load Shedding Price Reductions



Abstract: - Years of corruption and poor management have left Eskom, the state-owned utility company, with substantial debt, hindering its ability to invest in new infrastructure and maintain existing facilities. As a result, Eskom's generating capacity falls short of meeting the country's rising demand for electricity. South Africa produces approximately 47,000 MW of electricity, yet its installed capacity is 52,000 MW, creating a significant shortfall. To manage this imbalance and protect the national electricity grid, Eskom has implemented voluntary power outages known as loadshedding. These outages have severely affected the country's economic growth, public finances, and political stability. With loadshedding persisting for 15 years, Eskom's reliability has reached its lowest point in 97 years, causing disruptions to businesses and households, and costing the economy between R60 billion and R120 billion in 2019 alone. This study aims to deepen understanding of the policy challenges South Africa faces, particularly the economic downturn and inflationary pressures. Gaining insights into the country's energy sector challenges is key to understanding its business environment and attracting investment for future growth. The research will include a thorough analysis of documents such as regulatory frameworks, policies, and other pertinent reports to explore the impact and complexity of loadshedding, particularly in the economic sector. The recommendations arising from this study will offer valuable guidance for improving governance and policy in this area.

Keywords: Load shedding, "Price inflation, "Affordable and Clean Energy, ", Industry, "Innovation, "Decent work and Economic growth," Poverty and Inequality, "Price Inflation, Price reduction, "Sustainable growth.

I. INTRODUCTION

South Africa has faced numerous challenges with energy generation supply in the past which led to loadshedding. The authorities were foretold of future electricity supply constraints in a 1998 White Paper, the failure of government to take necessary measures to increase South Africa's energy generation capacity culminated in an electricity supply problem in 2007 (Akinbami, Oke & Bodunrin, 2021), manifesting in loadshedding. After years of a consistent supply of energy, South Africa had significant experiences of load shedding for the first time in 2007. This prompted Inglesi (2010) to project that Eskom would experience a long-term lack of capacity in the generation and reticulation of electricity in general. Eskom could no longer satisfy national demand (Inglesi-Lotz, 2022). The Presidency of the Republic of South Africa, (2022), elucidated that loadshedding has been adopted as the measure of last resort to relieve pressure from the electricity grid and prevent nation-wide blackouts. As such, in 2008, the Government announced plans to cut the country's general electricity usage by 10 percent to cover the 4000 MW needed reduction. In order to achieve this target, a three-point plan was used to counter the electricity crisis (World Bank, 2010).

Loadshedding is expressed as a reduction in percentages of demand by the systems operators and ranges from 5% at stage 1 to 30% at stage 6. This is used to minimize demand on the electrical system by momentarily turning off the power in many places at once, according to a rotational schedule (Department of Economic Development and Tourism, 2019). Officially, there are six stages of loadshedding even though Eskom sometimes schedules up to eight stages occasionally. Hence, depending on the degree of inadequate energy generation, loadshedding is scheduled for eight stages with varying intensities. At stage two, there would be 2,000 MW of insufficient supply because each level equals 1,000 MW of load shed (Department of Economic Development and Tourism, 2019). In some municipalities, implementing stage two loadshedding might leave the affected neighbourhoods without electricity for four hours. These levels are implemented depending on how much demand exceeds supply, allowing stage two to happen without stage one first.

The South African economy is severely harmed by load shedding, which decreases service delivery and manufacturing output, erodes investor confidence, lessens opportunities for economic growth, and results in job

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losses. Regular power outages impair people's quality of life while also harming electrical infrastructure and shortening its lifespan. This forms the basis and argument for the research problem.

The implementation of the new regulation has stimulated the countries to embark on the competition with an aim of liberalizing the industry to direct reform actions towards measures

that lack natural monopoly component. This would aid with an assessment of the impact of the governance of the electricity sector on load-shedding. This is to be achieved by providing proven demand side management options capable of mitigating the impact of electricity shortfalls and their applicability in the South African context. The study's ambition is to determine the impact that loadshedding has had on the economic sector, as well as the spillover effects of that to the consumers. The other ambition is to establish if the rapid rise of the prices on goods would return to normal after the loadshedding problem has ended. The ongoing study also argues that the prices should be reduced and normalized with return of the electricity sector to the new normal. Price restoring and overhauling should be some of the considerable solutions towards the betterment of living conditions.

The structure of the study is as follows: Section one provides the review of literature followed by the theoretical standing of the proponent economists. Section two describes the methodology of the research undertaken. The third section discusses the research findings followed by the recommendations and concluding remarks.

II. THE REGULATORY FRAMEWORK FOR THE ENERGY SECTOR

The National Energy Regulator Act (Act No. 40 of 2004) describes load shedding as a regulated strategy used to ensure the stability of the electricity system when demand for energy exceeds available supply. Additionally, it entails alternating outages throughout different geographic locations. It is further elucidated that the reasons for load shedding levels and their execution to change throughout the years include:

- Generation potential: If additional power plants go offline due to protection, failures, or gas shortages, Eskom may wish to increase the level of load shedding to keep the system from collapsing.
- Demand fluctuations: Energy demand changes with the seasons, weather conditions, and even time of day. The predicted demand fluctuations alter from time to time, necessitating timetable adjustments.
- Grid balance: Eskom is continually monitoring the grid's balance. If there is a possibility of the grid becoming unstable, Eskom may increase load and lose ranges with little notice.
- Ad hoc events: Unplanned activities such as breakdowns or crises at energy plants may necessitate unanticipated adjustments to the load loss schedule.

The Electricity Regulation Act (Act No. 4 of 2006) provides a legal framework for the regulation of electricity which has established other electricity bodies such as the National Energy Regulator of South Africa (NERSA). NERSA is the regulatory authority which regulates electricity, piped gas, as well as the petroleum pipeline industries. Other pieces of legislation such as the National Energy Regulator Act (Act No. 40 of 2004) and Electricity Supply Industry Act (Act No. 40 of 1998) are some of the regulatory bodies within the energy sector. The Electricity Supply Industry (ESI) Act (Act No. 40 of 1998) played a crucial role in the restructuring and regulation of the supply industry. Their roles seem parallel in one way or another, however, they are distinct as ESI provides for the generation, transmission, distribution, and trading of electricity. The roles and responsibilities of the various electricity entities such as Eskom, Municipalities, and other independent power producers are determined by ESI. The National Energy Regulator Act (Act No. 40 of 2004) promoted NERSA to be an independent regulatory authority responsible for licencing electricity, determining tariffs, and monitoring compliance across all electricity sectors.

There are other generic statutes however such as the Constitution of the Republic of South Africa (1996), the National Development Plan (NDP), the Promotion of Justice Act (Act No. 3 of 2000) the Integrated Resource Plan and others which provide an oversight to the sector indirectly and not specifically to electricity. For instance, the National Development Plan (2013) provides for guidelines on infrastructure development, energy security, sustainable growth and other strategies which protect and influence suppliers and consumers. Most importantly, the NDP influences compliance towards electricity supply policies. The Constitution of South Africa does not overtly provide a discourse on electricity but provides a broad context that underpins the regulation and provision of electricity as a fundamental service particularly on the bill of rights.

Whereas the Integrated resource plan addresses aspects of the country's electricity generation plan which translates into the investment on the circular and renewable energy factors and for new generation factors. The Promotion of Administrative Justice Act (PAJA) (Act No, 3 of 2000) provides administrative strategies on the overall administration of electricity supply involving disputes and challenges from third parties.

These statutes and policy frameworks should be viewed in a wider context within the electricity supply environment as a collective towards providing an ecosystem on load shedding, tariff determination, infrastructure development, and regulatory oversight. Their goal is in essence to achieve reliable, affordable, and sustainable electricity supply across all sectors of the economy and society. The governance framework of the electricity sector is complex. This is because various departments which have varying mandates are involved in South Africa's electricity governance. Targeted sectoral legal regulation (Baldwin et al., 1998) is crucial to establishing a viable renewable energy industry that can contribute sustainably to South Africa's energy mix. It is for this reason that Eberhard et al. (2014) viewed this as a provision of security for guarantees, rights, investments which spurs feed-in tariffs and subsidies for the enablement of a long-term condition towards energy planning. Monopolies would have been prevented and there could have been an evolution of energy markets if there was no focused legal regulation. Essentially, a viable renewable energy industry that have a significant impact to the South African energy mix could have been established.

A. Department of Public Enterprises

The Department of Public Enterprises (DPE) is Eskom's principal shareholder, and its responsibility is to ensure that the entity operates according to the prescripts stipulated in the 2001 Eskom Conversion Act. Whereas the National Treasury is responsible for Eskom's financial exposure.

B. Department of Mineral Resources and Energy (DMRE)

- Under the National Energy Act No. 34 of 2008, the Department of Mineral Resources and Energy (DMRE) is tasked with ensuring the availability of diverse energy resources in sustainable quantities and at affordable prices to support South Africa's economic growth and poverty reduction, while also addressing environmental concerns. The Act assigns the DMRE several key responsibilities, including:
- Promoting the increased generation and use of renewable energy.
- Securing contingency energy supplies.
- Managing strategic energy feedstock and carriers.
- Ensuring adequate investment in the maintenance and accessibility of energy infrastructure.
- Collecting and providing essential data on energy demand, supply, and generation.
- Establishing an institution dedicated to advancing efficient energy generation and consumption, as well as conducting energy-related research and addressing related issues.

III. IMPACT OF ELECTRICITY SHORTAGES

South Africa had a low electrification rate before 1994, at just 36%. To address this, democratic South Africa gave priority to ensuring universal access to energy, resulting in a 2004 commitment (Bekker et al., 2008) whereas (Essex & de Groot, 2019) embellished by stating that this enabled the national electrification rate to reach 90 percent in 2018. Increasingly, electricity was on demand as a result of this to an extent that there were spill-over effects towards rolling blackouts in 2008 and this endured till 2019 and 2020. The energy system within the South African context spurred a dual crisis of inflation with caused rising costs and decreasing performance. The electrical costs in the Household increased by 60% since 2017, and the recent announcement on price increase of 18.7% in 2023/24 financial year exacerbated the burden and hardships on consumers. There was a rise on inflationary trends which had a negative effect on the energy price increase.

However, even though South Africa's demand for electricity had greatly increased between 1991 and 2021, Eskom (the State Utility Company) only constructed one power plant.

Eskom also gained notoriety for failing to maintain its power facilities, incurring high operational expenses, vastly overpaying on the construction of new units, and failing to effectively address supply chain management corruption (Stone, 2021). South Africa is a developing country that has expanded its economy through the conventional energy-intensive industries of manufacturing and mining. South Africa's usage of energy has not been very efficient, despite having some of the cheapest electrical supply. The impact of electricity shortages has many direct impacts on an economy. Today, electricity is viewed as one of the most important technological discoveries ever made. This view stems from the reasoning that the functionality of the modern industrial society is interdependent with electricity. This is also in line with high reliance of South African companies on electricity in their day-to-day operations.

The downturn of the electricity sector's impact on the economy

Between 1988 and 2010, the number of mine employees in South Africa decreased from 180,000 to 35,000 due to the closure of the Free State Goldfields mine. This resulted in the region losing population, the unemployment

rate rising to 53%, the closing of businesses, an increase in building vacancies, a distortion of the housing market, the growth of the informal housing market, the loss of municipal services, ongoing environmental effects, and the patchy success of recovery efforts (Marais, 2013).

Similarly, the 1990s saw the effective collapse of portions of the northern KwaZulu-Natal (KZN) region, which had previously been one of the nation's main coal belts (Nel et al, 2003). Several regions, particularly in the mining sector such as Dundee, Witbank, which are the coal-rim sites have experienced downfalls because of load-shedding. There have been significant constrictions on development and investment, skilled workers migration, and marginalisation by the business community on people, approaching socio-economic destruction (Nel et al, 2003).

With R31.7 billion in earnings, R252.3 billion in total sales, and R1.97 billion in royalties paid in 2022, the coal sector directly employed 90,977 people (Minerals Council South Africa, 2023). The coal industry bought products and services for R61 billion in 2021. In South Africa, the median pay for mineworkers is double that of other workers in the formal sector (Pai et al., 2021). An estimated 170,000 indirect employment are associated with the coal mining sector (Chamber of Mines of South Africa, 2018). The province of Mpumalanga is home to most South Africa's power plants.

The province is home to about 85,000 jobs in the coal mining and power generation sectors, which account for roughly 19% of the province's GVA (Gross Value Added) and nearly 50% of the GVA of Emalahleni, the municipality most dependent on coal (Strambo et al., 2019; Cobenefits, 2022; Marais et al, 2022). Therefore, the question of how to assist Mpumalanga, which will face the brunt of such changes, will run parallel to fulfilling COP21 commitments through reducing national coal dependence and expanding renewable energy capability. Switching to an energy supply mix with a lower share of coal generation will impact employment in the province and the rest of South Africa is reliant on other economic and policy circumstances, mainly on how the global coal market responds. The coal producing provinces like Mpumalanga were severely affected due to the migration of skilled labour to other provinces. This was caused by the surplus coal resulting from lower domestic demands which could not be readily exported. These required reforms on planning in advance by energy policymakers and urban planners.

Previously, the mines used to provide accommodation to the miners but after the democratically elected government took over, the miners were encouraged by the government to own their own homes. Most miners lost their jobs because of mine closures and in turn lost their homes as they could not afford paying for them and neither not being able to sell them nor rent them out. According to Cloete and Marais (2021), the mines closed in the 1990's and this has led to the evolution and growth of informal settlements with associated risks of poverty and poor municipal services. Marais et al (2018) elucidated that this has affected approximately 80 000 miners and 40 000 power utility workers.

IV. ENERGY SECTOR REFORM INDICATORS

Geddes et al (2020: iv) considered a broader range of indicators which are salient in the context of the energy sector reform debate in South Africa, namely the impact of reform on prices, electricity sector jobs, decarbonization and electricity sector ownership. Intrinsically, Geddes et al (2020) recommended a more sensible attempt to electricity sector restructuring as an adequate measure for South Africa. Some of the considerations for economic efficacy were on price fixing for keeping prices affordable for the underprivileged, susceptible, and small, medium, and micro enterprises (SMMEs), provision of decent jobs, reduction on coal dependency and others. Along these lines, India and Mexico followed a more practical approach and employed alterations where they were expected to be efficient, politically reasonable and accept the status quo in other areas.

Local governments owe a great deal to big companies like mines, which consume a lot of water and electricity (Ledger, 2021), accounting for an average of forty percent of the operating budget in 2021 (StatsSA, 2022b). For instance, hundreds of small businesses depend on the spending of direct and indirect coal workers, and 57% of companies in the Steve Tshwete local municipality provide services to coal mines or coal plants (Semelane et al., 2021), and (Pai et al, 2021). The communities' ability to receive basic services may deteriorate as a result of the closure of coal mines, and municipalities may find it difficult to deal with the resulting loss of revenue.

V. THEORETICAL FRAMEWORK

The discussion in this paper has outlined some of the most important policy frameworks whereas the governance structures were also pinned down for laying a foundation. It is important for this study to base the discussion on the theoretical framework for providing context to the load shedding aspect which typically is reinstated within some considerations and components. The theory of supply and demand was considered to guide the discussion on the

extent of loadshedding towards the economy. Drawing from Marshall's classic theory of supply and demand in modern economics, this paper contends that these principles provide valuable insights into the dynamics of load shedding. Following Marshall's framework, the true "value" of the system emerges only when both "demand" and "supply" factors are examined in tandem. However, unlike Marshall's model, where there is typically a balancing mechanism, this paper focuses more on the demand-side impacts driven by load shedding. While the analysis centers on load shedding's economic effects, similar arguments can also be made regarding its influence on rising commodity prices. Marshall (1920: 348) famously compared supply and demand to a pair of scissors. In a similar vein, drawing on the work of Niklas Luhmann, Vladislav, and Thomson (2019), it could be argued that the same concept applies to the supply and demand within social systems.

The theory of supply and demand which is concomitant with the demand side factors encapsulates the electricity consumption patterns which have a direct influence and implication on the various economic sectors such as the commercial businesses, agriculture, tourism, industrial, and residential. Other considerable factors such as the weather conditions, technological appliances, which also affect supply, need proper management. Notably, loadshedding has a negative bearing on business operations, productivity which led to the closure of businesses which in turn affects the overall economic growth. Another factor which has increased spending patterns because of loadshedding, was the use of alternative energy sources such as the generators, solar panels, which led to the temporary solutions which also affected the economy negatively, leading to some recovery plans such as an increase in prices.

A. Electricity prices

The price of electricity plays a critical role in determining consumption patterns. The government's electricity pricing policy aims to strike a balance between equity, economic growth, and environmental objectives. This balance involves ensuring affordable electricity for households, low-cost electricity for industrial users, and prices that accurately reflect the cost of supply, while also maintaining the financial viability of electricity utilities (Ramokgopa, 2008). Between 2007 and 2020, electricity tariffs in South Africa increased by 512%. In a similar context, Nguyen et al. (2019) show that a 58.3% rise in electricity tariffs in Vietnam led to higher prices in various sectors, including water (11.15%), gas (7.36%), paper products (4.82%), chemicals (4.73%), and entertainment (4.3%), with an overall 4.2% increase in the Consumer Price Index. Nguyen also highlights how lower-income households are disproportionately affected by tariff hikes, as their electricity expenses represent a larger share of their total expenditure compared to wealthier households.

In South Africa, load shedding has exacerbated the rising cost of electricity over time. Economic theory suggests that when demand increases, prices must rise to meet supply, and this is evident in the electricity sector. As the demand for electricity grows, supply shortages lead to load shedding, which, in turn, results in price hikes to address the supply-demand imbalance. Prior to the onset of load shedding in 2007, South Africans enjoyed some of the lowest electricity prices in the world. From 1994 to 2005, electricity prices were consistently below inflation levels (Lekabe, 2022). However, from 2008 to 2012, prices doubled. The rapid increase in electricity costs has significantly raised operational expenses for small businesses, adding to the burden of load shedding. This escalation creates barriers for small entrepreneurs looking to expand or engage in value-added activities that rely on electricity. As a result, high electricity prices contribute directly to poverty and inequality (Ledger, 2024).





Essentially, the theoretical framework for load shedding incorporates a multidimensional approach that encapsulate technological, economic, technical, and social prospects. The energy and economic reform policies are key for contributing towards the global sustainable goals, and the agenda 2063 which are attributable to the long-term energy security, economic growth, and resilience.

Inflation in South Africa has remained elevated, staying above the Central Bank's target range of 6% since May 2022. This persistent inflation has been driven by rising commodity prices and ongoing supply chain disruptions. In response, the South African Reserve Bank was compelled to increase its main policy rate by 350 basis points over the past year, bringing it to 7.75% by the end of March (Ple, 2023). Despite these rate hikes, inflation continued to spread across all sectors of the economy, with a slight acceleration to 7% year-on-year in February. This increase was largely driven by higher food prices (+13.6%) and transportation costs (+9.9%). Inflation is expected to decrease only gradually in the months ahead, leading the Central Bank to maintain its key interest rate at current levels for the remainder of the year. Additionally, due to the rising cost of electricity and the unreliability of Eskom, many businesses in the mining and manufacturing sectors are increasingly relying on small-scale private power generation (World Bank, 2023).

VI. RESEARCH METHODOLOGY

This research employs a qualitative method approach to investigate the impact that loadshedding have on the economy from a social Science perspective. The study collected information from a detailed desk review to collate data on loadshedding schedules of selected municipalities. A practical, "nuts-and-bolts" approach was used to analyse the legislation governing the electricity sector, which led to the implementation of load shedding. The study involved a review of South Africa’s legislative framework, drawing comparative insights relevant to the issues under investigation. As described by Denyer and Tranfield (2009), this legislative review should not be viewed as a traditional literature review but rather as a focused research project that addresses a specific question typically derived from a policy or practical issue by examining existing studies. The goal was to provide decision-makers with a deeper understanding of the intervention and how it can be implemented more effectively. The process included searching for relevant legislative documents, followed by screening and selection. The ultimate aim was to use these identified laws, their components, and their interrelationships to propose solutions and remedies for the challenges posed by load shedding. The secondary data collected helped clarify these critical issues and highlighted the impact of load shedding management.

Table I. Population and sampling

<p>POPULATION</p> <p>Identification</p>		<p>Total records identified through database search. n = 48</p>
<p>Screening</p> <p>SAMPLIE</p>		<p>Total records after duplicates were removed. n = 40</p>
<p>Eligibility</p>		<p>Full text assessed for eligibility. n = 36</p>
<p>Included</p>		<p>Study included: n: 32</p>

VII. RESEARCH FINDINGS

Load shedding, or scheduled power cuts, can have significant negative impacts on an economy in several ways. Study objective 1: to determine the extent which the loadshedding has had on the economic sector, as well as the spillover effects to the consumers. The study results are presented below.

Table II. Research findings

Finding	Discussion	Resources
Impact on housing market	<p>Load shedding can negatively impact the housing market by reducing disposable household income and eroding investor confidence.</p> <p>Load shedding may also drive-up house prices due to rising supply-side costs, such as those associated with the construction sector.</p>	<p>(Adams et al., 2020), (Timilsina & Steinbuks, 2021).</p>
Electricity distribution and transmission losses	<p>Inflation has negative impact on housing market</p>	<p>Adam et al (2020)</p>
Negative impact on economic growth	<p>Loadshedding negatively impacts economic growth</p>	<p>Odhiambo (2009), Phiri & Nyoni (2016) and Nyoni & Phiri (2018)</p>
No impact	<p>There is no impact on economic growth</p>	<p>Dlamini et al. (2015) and Bah & Azam (2017)</p>

Finding	Discussion	Resources
Increased Costs	<p>The need for alternative energy sources such as generators and solar systems during loadshedding can cause businesses to incur extra costs.</p> <p>This could lead to increased production costs and impacting of the price inflation in return.</p>	<p>Govinda & Steinbuks (2021).</p> <p>Walsh, Theron, & Reeders (2021)</p>
	<p>Electricity prices increase production costs</p>	<p>Barteková & Ziesemer (2019)</p>
	<p>Foreign direct investment is affected</p>	<p>Inglesi-Lotz, Ajmi (2021); Walsh et al., (2021); Nedbank (2023)</p>
Limitation on investment prospects.	<p>Investor’s confidence is mostly deterred when there is load shedding in countries.</p> <p>This affects investment negatively due to power shortages leading to a sluggish economic growth.</p>	<p>Alqunun, Guesmi, & Farah (2020)</p> <p>Kanchev, Colas, Lazarov, & Francois (2014)</p>
Slow production Productivity	<p>Businesses which are relying heavily on power supply will experience a diminishing production.</p> <p>The continuous power supply suffer from disrupted production schedules as the optimal operation of the infrastructure will be negatively affected during power outages.</p>	<p>Naidoo (2023).</p> <p>Kpeji, Olasoji, Gaunt, Oyedokun, Awodele & Folly (2020)</p> <p>Anderson & Bell (2012)</p>
Impact on Agriculture	<p>Irregular power supply and outages can affect agricultural production.</p> <p>This is particularly so for crop production which is heavily reliant on irrigation and storage facilities that depend heavily on energy use.</p>	<p>Dewa, van der Merwe, & Matope. (2020)</p> <p>Ruiter (2016).</p> <p>Umar, Chisola, Mushili, Kunda-Wamuwi, Kafwamba, Membele, & Imasiku. (2022).</p>
Unreliable Service Delivery	<p>Many businesses which are service oriented like the hospitality industry, telecommunications, suffer from the power interruptions extensively to an extent that it deters customers and result in probable revenue losses.</p>	<p>Olajuyin (2022).</p> <p>Bhorat, Asmal, Lilenstein & Zee. (2018).</p>
Societal Turbulences	<p>People always blame government for loadshedding. This results in social unrests, protests, which result in a destabilised economy that impact negatively on the investment ecosystem.</p>	<p>Gontsana; Ntongana & Washinyira (2019).</p> <p>Obokoh and Goldman. (2016).</p>
Supply Chain Disruptions	<p>Businesses which are reliant upon logistics experience disruptions in forward and reverse logistics leading to delays and interruptions due to loadshedding and this have a negative implication on the overall efficiency and competitiveness.</p>	<p>Obokoh &, Goldman (2016).</p> <p>Alby, Dethier, & Straub (2012).</p>

Source: Authors compilation

It is imperative to consider ways of addressing these anomalies through policy and governance reforms to ensure a stable and reliable power supply through a substantial investment in infrastructure.

A. Loadshedding impact on the long-term prospects for South African economy

Power outages pose a significant obstacle to a country's long-term economic growth. The economic impact of load shedding includes not only direct revenue losses but also the redirection of limited resources into mitigation measures, such as the purchase of generators, as well as a decline in consumer confidence (Timilsina & Steinbuks, 2021).

B. Loadshedding impact on production costs

Power interruptions reduce the company's ability to compete locally and internationally. Power interruptions have an impact on the manufacturing sector's export revenues. Mabunda et al. (2023) highlighted that load shedding severely disrupts production, particularly for small businesses that lack access to alternative energy sources. As a result, they are unable to operate essential machinery, such as electric beaters, and face challenges in executing business strategies. This disruption also impacts their financial stability and increases operational costs, particularly those related to running diesel or petrol-powered generators. Furthermore, load shedding affects communication and information sharing, reduces business revenue, and hampers service delivery. Small businesses may lose customers due to their inability to meet customer demands, while inventory can be damaged. Additionally, the disruption extends to staffing issues and the functionality of key operational resources, such as security systems.

C. Impact on foreign direct investment

Numerous theoretical and empirical studies on foreign direct investment (FDI) suggest that countries use FDI as a means to enhance their technological development (Fowowe & Shuaibu, 2014; Iwasaki & Sukanuma, 2015). Foreign investors typically introduce advanced technologies, technical expertise, and best practices to the host country, facilitating the transfer of knowledge and skills. This process significantly boosts the industrial and technological capabilities of the host nation, ultimately improving its productivity and competitiveness. This often leads to the transfer of knowledge and skills, which significantly promote the host country's industrial and technological capabilities. Furthermore, this enhances the productivity and competitiveness of the host country. This process significantly boosts the industrial and technological capabilities of the host nation, ultimately improving its productivity and competitiveness. This often leads to the transfer of knowledge and skills, which significantly promote the host country's industrial and technological capabilities. Furthermore, this enhances the productivity and competitiveness of the host country. Availability of electricity provides a sign for investors for continuous provision of an important factor of production. However, high costs of electricity impacts on business ability to generate and maximize profit through its effect on the costs of production. Barteková and Ziesemer (2019) found that net FDI is highly depended on electricity cost an important component of production costs. They demonstrated that electricity costs are a key factor in attracting foreign direct investment (FDI), alongside unit labour costs and the availability of skilled labour, which is influenced by the quality of secondary education. Over the long term, frequent power outages undermine investor, consumer, and business confidence, which can significantly hinder both national and regional economic growth (Walsh et al., 2021; Nedbank, 2023). Edwards (2012) argues that higher electricity tariffs can drive innovation in production processes and prompt businesses to invest in self-generation. However, Fisher-Vanden et al. (2013) found that despite power shortages, Chinese firms in South Africa in the early 2000s did not exhibit a significant increase in self-generation capacity.

VIII. DISCUSSION OF RESULTS

Study objective 2: The other ambition for this paper is to establish if the rapid rise of the prices on goods would return to normal after the loadshedding problem has ended. The ongoing study also argues that the prices should be reduced and normalized with return of the power supply sector to a new normal. Price fixing and overhauling should be some of the considerable solutions towards the betterment of living conditions. The discussion below ponders on the benefits which could potentially be brought by normalizing the electricity sector which is witnessed currently since April 2024. Stimulating economic activities which could as well increase competitiveness could be some of the considerable factors which could be considered for a reverse and circular economy. The benefits would therefore be along the lines of reducing energy costs leading to an increased production the resultant factor of which could be on the lowering of goods and services prices. Competition in power suppliers could also have a significant impact on the lowering of prices and could have a stimulation on the overall economic activities across various business sectors for encouraging growth and investment.

Akpeji et al. (2020) found the loss to the South African economy of about R54, 536 million over a 24-hour period of loadshedding or the equivalence of 27 days of continuous stage 1 loadshedding.

A. *Impact of economic growth*

Studies on the impact loadshedding on economic growth by Odhiambo (2009), Phiri and Nyoni (2016) and Nyoni and Phiri (2018) found that loadshedding had an adverse effect of decreased electricity consumption / production on growth, whereas the studies of Dlamini et al. (2015) and Bah and Azam (2017) found no impact of electricity consumption/production on growth. This study does not support Dlamini et al. (2015) and Bah and Azam (2017)'s arguments but remain firm on the findings that loadshedding has a negative impact on the economic growth supported by the broad literature consulted. The stance of the paper supports the findings by Odhiambo (2009), Phiri & Nyoni (2016) and Nyoni & Phiri (2018); Govinda & Steinbuks (2021); Walsh, Theron, & Reeders (2021); Barteková & Ziesemer (2019); Inglesi-Lotz, Ajmi (2021); Walsh et al., (2021); Nedbank (2023); Alqunun, Guesmi, & Farah (2020);, Kanchev, Colas, Lazarov, & Francois (2014) others.

B. *Impact on the housing market*

Load shedding can negatively impact the housing market by reducing disposable household income and eroding investor confidence (Adams et al., 2020), leading to adverse demand-side effects. On the other hand, load shedding may also drive-up house prices due to rising supply-side costs, such as those associated with the construction sector (Timilsina & Steinbuks, 2021).

Lowering energy prices can have a significant social impact and can improve living standards and reduce inequality by making essential services more affordable for all segments of society. Some of the considerable factors and potential solutions would be financial sustainability, policy and regulatory framework, investment in infrastructure, balancing supply and demand, public perception and confidence, consumer impact and investment in an efficient renewable energy. Financial sustainability can be achieved through investing in infrastructure, human capacity, drastic reductions in prices without compromising quality. Whereas grid modernization and institutionalization of energy efficiency measures can have crucial benefits towards long-term sustainability and resilience. The policy frameworks need to be regulated to ensure fair pricing within the supply and demand dynamics.

Price reduction has a potential to alleviate financial burdens on consumers and businesses, particularly after periods of economic hardship caused by unstable electricity supply following after country lockdowns due to Covid 19. This can have significant progress on economic recovery. The price adjustment reform can be beneficial in winning customer confidence as well as maintaining public trust. The regulatory framework should be robust enough towards the alleviation of financial burdens and adapt to changing market. A conducive energy regulatory environment on renewable energy could have long-term sustainability and achieve environmental goals.

Most importantly, the reduction and normalization of prices as the sector stabilizes is feasible and potentially beneficial for consumers and the economy. The price monopoly is seen even after the electricity situation has stabilised. Proper planning, coordination with stakeholders, and adherence to regulatory principles to ensure financial sustainability and continued reliability is necessary. Since loadshedding has ended in April 2024, the prices remain hiked. It also hinges on variables such as the state of existing infrastructure, the pace of bringing new power sources online, the rate of economic growth, and energy demand trends. The President's statement on ending of the loadshedding has been realized, although there is still scepticism on whether it will be sustainable or not. A detailed analysis of the status of energy projects and the challenges currently faced would still be necessary. It is critical to establish the margin used on price increase on all goods and services.

IX. CONCLUSIONS AND RECOMMENDATIONS

The growing frequency and duration of load shedding have had severe consequences, directly contributing to rising levels of poverty and inequality. The significant increase in electricity losses due to load shedding in 2023 has intensified these negative effects on the economy, with estimates suggesting that load shedding reduced GDP growth by a cumulative 15 percentage points from 2020 to 2023. The manufacturing sector has been particularly hard hit (Daily Investor, 2023). Mabunda et al. (2023) report that load shedding causes small businesses to lose customers, experience reduced income, suffer from lower productivity, and incur higher operational costs, as they are forced to invest in backup systems. To mitigate these effects, there is a need to explore and expand the use of smart grid technologies, energy storage systems, and demand-response programs as alternatives or complements to traditional load shedding practices, in order to better prepare for the future.

Considering operational strategies such as load forecasting, real-time monitoring, and emergency response protocols to improve grid reliability and resilience are essential. It is crucial to learn and adapt to the best international comparisons and best practices through drawing insights from other countries' experiences with

managing electricity supply challenges, including approaches to grid management, energy diversification, and regulatory frameworks. Identifying best practices in load shedding management and adapting them to local contexts and conditions is a significant step towards normalising the country's energy supply.

REFERENCES

- [1] S. Adams, F. Atsu, E. Klobodu, L. Richmond, "Electricity transmission, distribution losses and economic growth South Africa", *Heliyon.*, vol. 6, no. 11: e05564, 2020.
- [2] O. M. Akinbami, S. R. Oke, M. O. Bodunrin, "The State of Renewable Energy Development in South Africa": An Overview, *Alexandria Engineering Journal.*, vol. 60, no.6, pp 5077–5093, 2021.
- [3] K. Akpeji, A. Olasoji, C. Gaunt, D. Oyedokun, K. Awodele, K. Folly, "Economic impact of electricity supply interruptions in South Africa", *SAIEE Africa Research Journal*, vol. 111, no 2, pp 73-87, 2020.
- [4] P. Alby Dethier J, S. Straub, "Firms operating under electricity constraints in developing countries". *The World Bank Economic Review.*, 27: 1-24. <https://doi.org/10.1093/wber/lhs018>, 2012.
- [5] K. Alqunun, T. Guesmi,, A. Farah, "Load shedding optimization for economic operation cost in a microgrid. *Electr Eng.*, vol. no. 102, pp779–791. <https://doi.org/10.1007/s00202-019-00909-3>, 2020.
- [6] G.B. Anderson, M.L. Bell, "Lights out: Impact of the August 2003 power outage on mortality in New York", *NY" Epidemiology.*, vol. 23, pp 189-193, Available at: DOI: <https://doi.org/10.1097/EDE.0b013e318245c61c>, 2012.
- [7] E. Barteková, T.H.W. Ziesemer, "The impact of electricity prices on foreign direct investment: evidence from the European Union". *Applied Economics.*, vol. 51. No. 11, pp 1183–1198. <https://doi.org/10.1080/00036846.2018.1524983>, 2019.
- [8] B. Bekker, A. Eberhard, T. Gaunt, A. Marquard, "South Africa's rapid electrification programme: policy, institutional, planning, financing and technical innovations". *Energy Policy.*, vol. 36, pp 3125–3127, 2008.
- [9] H. Bhorat. Z. Asmal K, Lilenstein, K. Zee, "SMMES in South Africa: understanding the constraints on growth and performance". *Development Policy Research Unit Working Paper.*, 201802, 2018.
- [10] BusinessTech Staff Writer, "Business Tech. "Energy: Double trouble – South Africa heading for a new load shedding record", 19 September, Available at: <https://businesstech.co.za/news/energy/719596/double-trouble-south-africa-heading-for-a-new-load-shedding-record/> (accessed on 04 October 2023).
- [11] J. Cloete, & Marais, L. 2021. "Mine housing in the South African coalfields: the unforeseen consequences of post-apartheid policy". *Housing Studies.*, Vol. 36: pp 1388–1406, 2023a.
- [12] COBENEFITS "Making the Paris Agreement A Success for the Planet and for South Africa". Available online at: <https://www.cobenefits.info/wp-content/uploads/2021/10/COBENEFITS-South-Africa-COP26-Briefing.pdf> (accessed on 8 October, 2023), 2021.
- [13] Daily Investor. 800, 000 "South Africans lose their jobs to loadshedding". Available at: <https://dailyinvestor.com/energy/39636/800000-south-africans-can-lose-their-jobs-due-to-load-shedding/> (accessed on 22 July 2024), 2023.
- [14] D. Denyer, D. Tranfield, "Producing a systematic review" in *The Sage handbook of organizational research methods*, ed. D. A., Buchanan & A., Bryman (Sage Publications Ltd), vol. 671, pp 689, 2009.
- [15] Department of Public Enterprises (DPE), "National Energy Regulator Act 40 of 2004, Pretoria, 2019.
- [16] Department of Economic Development and Tourism, "Load Shedding Fact Sheet", Available at: https://www.westerncape.gov.za/110green/files/atoms/files/Load_shedding_FAQ_202019_FINAL_2.pdf (accessed on 4 October 2023), 2019.
- [17] Department of Energy, *Integrated Resource Plan*, Government Printers. Pretoria, 2018.
- [18] Department of Forestry, Fisheries, and the Environment, "National GHG inventory report South Africa 2017", Available at: <https://www.dffe.gov.za/sites/default/files/docs/nir-2017-report.pdf>. (accessed on 6 October 2023), 2021.
- [19] Department of Justice and Constitutional Development, "The Promotion of Administrative Justice Act (PAJA) ", Act No. 3 of 2000. Government Printers. Pretoria, 2000.
- [20] Department of Mineral Resources and Energy (DMRE). 2020-2021 "Annual Performance Plan", Pretoria, 2021.
- [21] Department of Public Enterprises of the Republic of South Africa, *Roadmap for Eskom in a Reformed Electricity Supply Industry*". Pretoria: Department of Public Enterprises, 2019.
- [22] M. Dewa, A. van der Merwe, S. Matope, "Production scheduling heuristics for frequent load-shedding scenarios: A knowledge engineering approach" *SAJIE* 31 Available at: DOI: <https://doi.org/10.7166/31-3-2422>, 2020.
- [23] J. Dlamini, M. Balcilar, R. Gupta, R. Inglesi-Lotz, "Revisiting the causal relationship between electricity consumption and economic growth in South Africa: a bootstrap rolling window approach", *International Journal of Economic Policy in Emerging Economies.*, vol. 8, no. 2, pp 169-190, 2015.
- [24] A. Eberhard, J. Kolker, J. Leigland, "South Africa's renewable energy IPP procurement program: Success factors and lessons, Public-Private Infrastructure Advisory Facility", World Bank, Washington DC, 2014.
- [25] T. Edwards, 'China's Power Sector Restructuring and Electricity Price Reforms'. *Asia Paper.*, vol. 6. No. 2, pp 509-523, 2012.
- [26] S. Essex, J. de Groot, "Understanding energy transitions: the changing versions of the modern infrastructure ideal and the 'energy underclass' in South Africa", 1860–2019. *Energy Policy.*, vol. 133, 110937, 2019.
- [27] K. Fisher-Vanden, E. Mansur, Q. Wang, "Costly Blackouts? Measuring Productivity and Environmental Effects of Electricity Shortages". *NBER Working Paper 17741*. Cambridge, MA: NBER, 2013.
- [28] B. Fowowe, M.I. Shuaibu, "Is foreign direct investment good for the poor? New evidence from African countries, *Economic Change & Restructuring*"., vol. 47, pp 321–339, 2014.

- [29] T. Govinda, S. Jevgenijs, “Economic costs of electricity load shedding in Nepal, *Renewable and Sustainable Energy Reviews*”. 146. <https://doi.org/10.1016/j.rser.2021.111112>, 2021.
- [30] M. Gontsana, T. Ntongana, T. Washinyira, “Small businesses hard hit by load-shedding”. *News24*, 16 February: 1-5. <https://m.news24.com/SouthAfrica/News/small-businesses-hard-hit-by-load-shedding-20190216>, 2019.
- [31] A. Geddes, R. Bridle, M. Mostafa, J. Roth, L. Sanchez, V. Garg, L. Scholtz, S. Fakir, “Rethinking Eskom: Lessons from electricity sector reform in India and Mexico”, *The International Institute for Sustainable Development*, Manitoba, Canada, 2020.
- [32] R. Inglesi-Lotz, A.N. Ajmi, “The impact of electricity prices and supply on attracting FDI to South Africa”, *Environmental Science and Pollution Research*. 28:28444–28455. <https://doi.org/10.1007/s11356-021-12777-1>, 2021.
- [33] R. Inglesi-Lotz, “Exploring the impact of institutional quality to South Africa’s transition to renewables”. *Energy Sources, Part B: Economics, Planning, and Policy.*, vol. 19, no. 1, pp 2291433, 2024.
- [34] Inglesi, R. “Aggregate electricity demand in South Africa: Conditional forecasts to 2030”, *Applied Energy.*, vol. 87, no. 1, pp 197-204, 2010.
- [35] S. Inoua, V. Smith, “The classical theory of supply and demand”. arXiv preprint arXiv:2307.00413, 2023.
- [36] I. Iwasaki, K. Suganuma, “Foreign direct investment and regional economic development in Russia: an econometric assessment, *Economic Change & Restructuring*”, Vol. 48: pp 209–255, 2015.
- [37] H. Kanchev, F. Colas, V. Lazarov, B. Francois, “Emission reduction and economical optimization of an urban microgrid operation including dispatched PV-based active generators”. *IEEE Trans Sustain Energy.*, vol. 5, no. 4, pp 1397–1405, 2014.
- [38] T. Ledger, “Rapid Electricity Supply Diversification in Municipalities is the Key to Economic Recovery, Municipal Financial Sustainability and an Early End to Load Shedding”. *Policy Brief. Public Affairs Research Institut.*, Johannesburg, 2024.
- [39] T. Ledger, “Broken promises: Electricity for low-income households: good policy intentions, bad trade-offs and unintended consequences”. Available at: <https://pari2.wpenginepowered.com/wp-content/uploads/2021/04/broken-promises21-04-21c.pdf> (accessed on 12 October 2023), 2021.
- [48] T. Lekabe, “Eskom’s 9.6% tariff hike a huge blow for struggling citizens” - EFF, DA : The Citizen. 25 February. Available at: <https://www.citizen.co.za/news/south-africa/politics/eskoms-9-6-tariff-hike-25-february-2022/> (accessed on 22 July 2024),
- [49] M. V. Mabunda, R. M. Mukonza, L. R. Mudzanani, “The effects of loadshedding on small and medium enterprises in the Collins Chabane local municipality”. *Journal of Innovation and Entrepreneurship*, vol. 12, no. 1, pp 57. <https://link.springer.com/article/10.1186/s13731-023-00327-7>, 2023, 2022.
- [50] L. Marais, “The impact of mine downscaling on the Free State Goldfields”, in *Urban Forum*, vol. 24 (Cham: Springer): pp 503–521, 2013.
- [51] L. Marais, “The Social Impacts of Mine Closure in South Africa: Housing Policy and Place Attachment”. London: Routledge, 2023.
- [52] A. Marshall, “1890/1920 Principles of Economics”, 8th ed., Macmillan, London, 1920.
- [53] Minerals Council South Africa, “Facts & Figures Pocketbook 2022”. Johannesburg, 2023.
- [54] C. Naidoo, “The Impact of Load Shedding on the South Africa Economy”. *Journal of Public Administration*”, Vol. 58, no. 1, 2023.
- [55] Nedbank. “Impact of load-shedding on small businesses in the township economy”. Available at: <https://personal.nedbank.co.za/content/dam/nedbank/pdfs/Nedbank-Impact-of-Loadshedding-onSMMES.pdf> (accessed on 22 July 2024), 2023.
- [56] E.L. Nel, Hill, T.R. K.C. Aitchison, S. Buthelezi, “The closure of coal mines and local development responses in coal-rim cluster”, northern KwaZulu-Natal, South Africa, *Development Southern Africa.*, vol. 20, pp 369-385, 2003.
- [57] N.T. Nguyen, T.T Nguyen, V. Hoang, C. S. Wilson, S. Managi, “Energy transition, poverty and inequality in Vietnam”, *Energy Policy.*, vol 132, pp 536-548, 2019.
- [58] L. Obokoh Goldman G. “Infrastructure deficiency and the performance of small- and medium-sized enterprises in Nigeria’s Liberalised Economy”. *Acta Commercii*, 16(1): 1-10. <https://doi.org/10.4102/ac.v16i1.339> 20, 2016.
- [59] N. Odhiambo, “Electricity consumption and economic growth in South Africa: a trivariate causality test”, *Energy Economics.*, vol. 31, no. pp 635-640, 2009.
- [60] O. Olayide, “Effects of Load-Shedding on The Performance Of Small, Medium And Micro Enterprises In Gqeberha”, *South Africa. Management and Economics Research Journal.*, vol 8, no. 4 pp 8. DOI:10.18639/MERJ.2022.1716925, 2022.
- [61] S. Pai, M.M. Allen, K. O’Hare, I. Barlow, H. Searight, R. Madhu-sudanan, M. Ward, “Understanding just transitions in coal-dependent communities: Case studies from Mpumalanga, South Africa”, and Jharkhand, India. Center for Strategic and International Studies (CSIS) and Climate Investment Funds (CIF). <https://justtransitioninitiative.org/understanding-just-transitions-in-coal-dependent-communities/>, 2021.
- [62] A. Phiri, “Asymmetric pass-through effects from monetary policy to house prices in South Africa, *Managing Global Transitions*”, vol. 16, no. 2, pp 123-140, 2018.
- [63] Phiri, A. B. Nyoni, “Re-visiting the electricity-growth nexus in South Africa”, *Studies in Business and Economics*, vol. 11. No. 1, pp 97-111, 2016.
- [64] L. Ple, “South Africa: an economy paralysed by loadshedding”. PNB Paribas. Available at: <https://economic-research.bnpparibas.com/html/en-US/South-Africa-economy-paralysed-load-shedding-4/14/2023,48476> (accessed on 22 July 2024), 2023.

- [65] B. Ramokgopa, "Tariff History 2002 to 2007", available at: http://www.eskom.co.za/content/Tariff_History_2007_Edited_Draft.pdf (accessed on 25 July 2024), 2008.
- [66] Republic of South Africa, Constitution of the Republic of South Africa [No. 108 of 1996]. Pretoria: Government Printers, 1996.
- [67] Republic of South Africa. National Development Plan 2030. Pretoria: Government Printers, 2013.
- [68] C. Ruiter "Doomed by Dumsor? Impacts and implications of Ghana's load shedding crisis Potential": *Journal of International Affairs.*, 2016.
- [69] S. Semelane, N. Nwulu, N. Kambule, H. Tazvinga, "Evaluating available solar photovoltaic business opportunities in coal phase-out regions" -An energy transition case of Steve Tshwete local municipality in South Africa. *Energy Policy.*, vol. 155, pp. 112333. doi: 10.1016/j.enpol.2021.112333, April 2021.
- [71] G. Semieniuk, E. Campiglio, J.F. Mercure, U. Volz, N.L. Edwards, "Low-Carbon Transition Risks for Finance". *Wiley Interdisciplinary Reviews: Climate Change*, doi:10.1002/wcc.678, 2020.
- [72] Statistics South Africa, Quarterly Labour Force Survey: Quarter 2:2022. Statistical Release P0211. Statistics South Africa, Pretoria. 2022. Available at: <https://www.statssa.gov.za/publications/P0211/P02112ndQuarter2022.pdf> (accessed on 13 October 2023), 2022a.
- [73] S. Stone, "Supply Chain Officials are Under Siege' from Corrupt Officials". *City Press*, 13 March 2021. Available online at: <https://www.news24.com/citypress/news/supply-chain-officials-are-under-siege-20210313> (accessed on 09 October 2023), 2021.
- [74] C. Strambo, J. Burton, A. Atteridge, "The End of Coal? Planning a "just transition" in South Africa". Stockholm: Stockholm Environment Institute, 2019.
- [75] W. Sweiger, "City of Tshwane is sinking deeper into debt", *Moneyweb*, 7 February. Available at: <https://www.moneyweb.co.za/news/south-africa/city-of-tshwane-is-sinking-deeper-into-debt/> (accessed on 27 February 2024), 2024.
- [76] The Presidency of the Republic of South Africa, "The Electricity Regulation Act (Act No. 4 of 2006)". Government Printers. Pretoria, 2006.
- [77] The National Energy Regulator Act (Act No. 40 of 2004), Government Printers. Pretoria, 2004.
- [78] G. Timilsina, J. Steinbuks, "Economic costs of electricity loadshedding in Nepal, *Renewable and Sustainable Energy Reviews*", 146. e111112, 2021.
- [79] B.B. Umar, Chisola, M.N., Mushili, B.M., Kunda-Wamuwi, C.F., Kafwamba, D., Membele, G., Imasiku, E.N.S. 2022. "Load-shedding in Kitwe, Zambia: Effects and implications on household and local economies"" *Development Southern Africa* 39 354 371 Available at: DOI: <https://doi.org/10.1080/0376835X.2020.1870934>.
- [80] V.L. Vladislav, S. Thomson, "The supply and demand of social systems: towards a systems theory of the firm". *Institute of Agricultural Development in Transition Economies.*, vol 48, no. 3, pp 570-585, 2019.
- [81] K. Walsh, R. Theron, C. Reeders, "Estimating the Economic Cost of Load Shedding in South Africa". Paper submission to Biennial Conference of the Economic Society of South Africa (ESSA) 2021.
- [82] World Bank, Africa Overview: Development News, Research, Data 2023, available at: <https://www.worldbank.org/en/region/afri/overview>. (accessed on 22 July 2024), 2023.
- [83] World Bank "Eskom investment support project – Implementation completion and results report". Washington DC: World Bank, 2022.