

A balancing act: The City of Cape Town's Energy Strategy as a tool to navigate short term crises in the context of long term transition in the energy sector

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Introduction

The energy system, globally and locally, is rapidly transforming due to the impacts of technology change, regulatory change, and climate change. Additionally, in South Africa, there has been an escalation in the frequency and severity of load-shedding over the past four years. While the City of Cape Town has been able to protect City Supply Area customers from up to two stages of load-shedding, the current levels are severely disruptive to the local economy, its future growth and the broader well-being of Cape Town's residents. Furthermore, at the national level, the changing energy system is being guided by the national framework for the Just Energy Transition (JET), that aims to embed equity and justice at the heart of energy system decision-making.

The combination of these forces has placed unprecedented stress on the municipal electricity utility in South Africa from a regulatory, financial and technical perspective thereby requiring rapid, but also deeply considered action to adapt. There are risks to municipalities that do not adapt to this changing energy system, but there are also numerous risks to those who do act in this time of high uncertainty. The City of Cape Town has taken an active stance in the energy system by intervening in both mitigating load-shedding in the short term as well as navigating the changing energy landscape to the benefit of all in Cape Town in the longer term. Balancing these objectives, along with other strategic priorities laid out in the City's Integrated Development Framework, Climate Change Strategy, and Municipal Spatial Development Framework, to name a few, requires careful consideration of the responses and actions across a range of sectors and over time.

To do so in a structured and a strategic manner, the City of Cape Town has recently developed its 4th Energy Strategy that offers a holistic framework for how the City and other actors in the energy system can contribute to the vision of 'energy security for a prosperous Cape Town'. The value that this strategy offers to both technical and political decision-makers is that of bringing together a wide range of critical issues affecting the energy sector, from alleviating energy poverty to utility reform to diversification of energy supply, under one vision and set of principles. This allows decision-makers to understand how every action taken can contribute to achieving the vision and how these critical focus areas are interdependent. Furthermore, the strategy offers important mechanisms to assist decision-making in a highly complex and fast-changing environment:

- The collaborative approach to its development across the City and with other key stakeholders
- By identifying and communicating both the predictable and uncertain trends that underlie the evidence base and assumptions upon which the Energy Strategy is developed along with a commitment to regularly assess these and update the Energy Strategy to ensure it stays relevant
- By developing a prioritisation framework that aims to make decision-making and trade-offs more transparent to municipal leadership and the public
- Ensuring alignment with the national JET Frameworks in a way that is strategically aligned to City context and priorities

Finally, the Energy Strategy puts forward the City of Cape Town's goals and ambitions for its energy system and aims to chart a course of action in areas where there are current regulatory or strategic gaps in the national energy landscape, thereby supporting a greater level of self-determination for municipal utilities more broadly in South Africa.

This paper is presented in order to promote knowledge sharing and learning amongst municipalities through unpacking the content and structure of the City of Cape Town's Energy Strategy, especially the framework for prioritisation, and then drawing out the relationship between these local actions and the national framework for a Just Energy Transition (JET). Through this paper, it is intended that the City of Cape Town demonstrates the value of undertaking a strategy development process for municipality electricity utilities to proactively engage in balancing their responses to short term crises while staying the course to meet longer term objectives.

Key drivers of change in Cape Town's Energy System

There are a number of key global, national and local trends that influence how the energy system operates in Cape Town, both now and into the future. Figure 1 below summarises critical global trends, while Figure 2 unpacks how these are manifesting in the energy system in Cape Town. Beyond these more predictable trends, there are also trends that have a significant impact, yet how these trends are going to behave over time is highly uncertain. Considering how the energy system will behave over time is important in building a strategy that can withstand and navigate changes and disruptions occurring across the institutional, financial, economic, environmental or technical components of the energy landscape. The City and other stakeholders will

need to navigate both these more predictable and uncertain trends in the energy system in order to deliver, enable, and partner with others to realise reliable, affordable and carbon neutral energy in Cape Town.

Digitalisation	The digitalisation of energy systems speaks to the use of digital technologies across energy demand, supply, and distribution processes to enhance performance and cost effectiveness of energy, as well as communicate in real-time.
Decentralisation	Decentralisation, especially in electricity generation, in the energy sector has taken place both through shifts in regulation in South Africa and through the emergence of smaller, more modular energy technologies.
Disruptive Technologies	The rapid pace of technological innovation has resulted in the emergence of technologies that radically alter how our energy systems function.
Decarbonisation	The threat that climate change poses to humanity's prosperity and survival on Earth requires urgent efforts to reduce greenhouse gas emissions, while also adapting to the changing climate systems.
Democratisation	There is a growing demand from cities, residents, organisations, and communities to have increased participation in decision-making regarding energy: whether the source of energy, how energy is used, and the business models that govern the energy system.

Figure 1: A summary of global trends

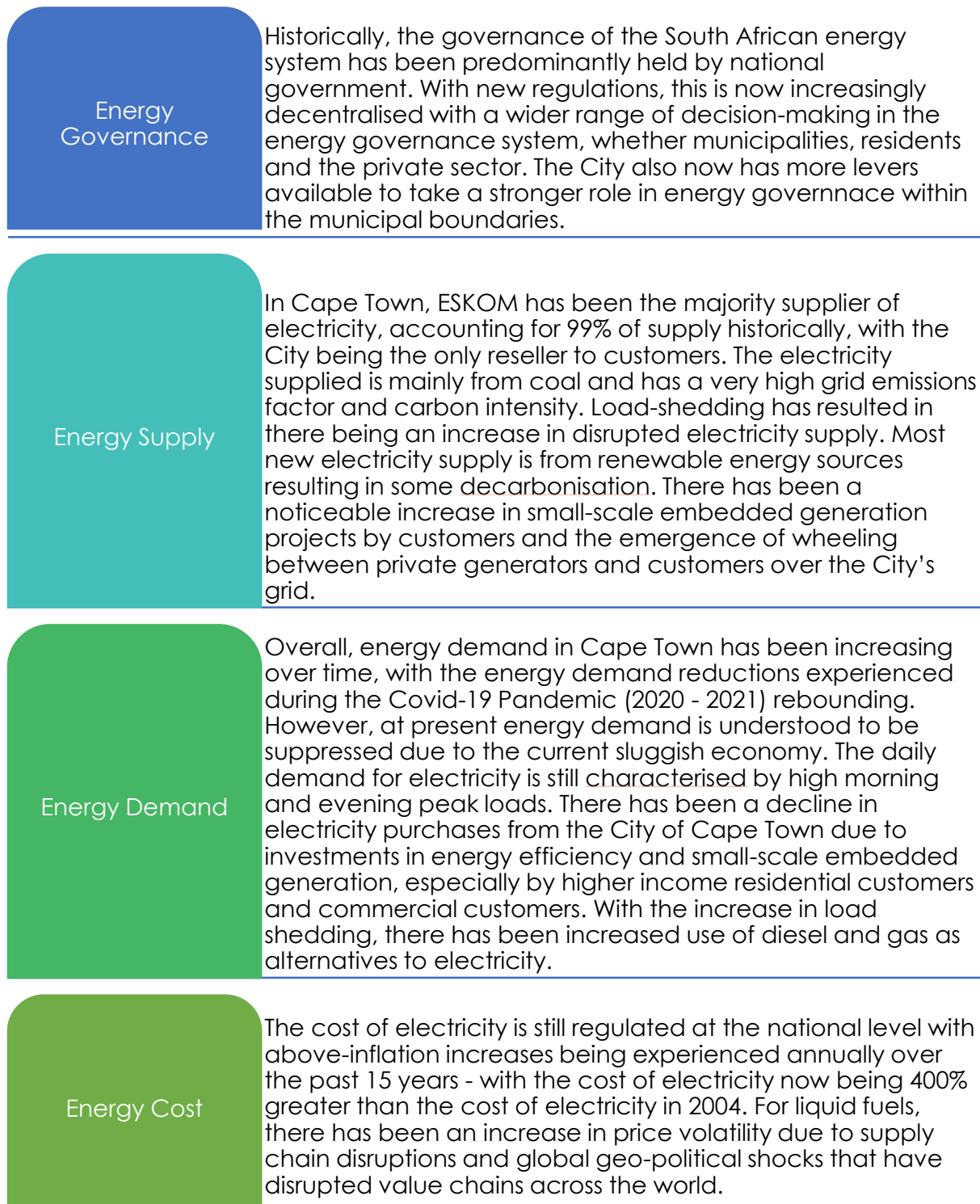


Figure 2: A summary of how trends are impacting the energy system in Cape Town.

Within the electricity sector in particular, these global and local trends are manifesting in significant changes to how the electricity system operates. The traditional electricity network, as seen in Figure 3, is built for a one-way flow of electricity from large, centralised power plants, to customers and assumes that customers would only consume electricity provided by the grid, known as a more passive role. Within this traditional energy system, there is a low level of monitoring and control as most issues are assumed to be dealt with in the design and planning stage. The future electricity network, however, should be able to accommodate a two-way flow of electricity at certain points, where a customer is both a producer and consumer of electricity, known as a prosumer and plays a more active role in energy management. This future network requires far greater levels of real-time monitoring and control with active system management as more issues are expected to arise during operations and must be responded to quickly.

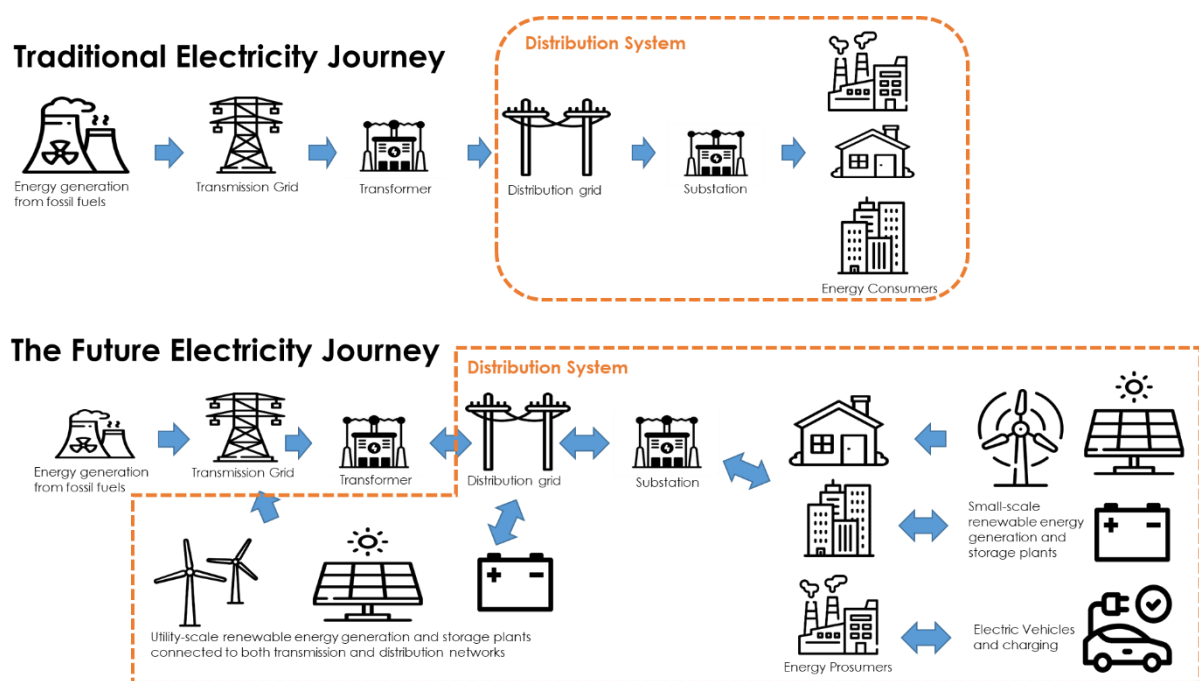


Figure 3: Moving from the traditional electricity system to the future electricity system. Adapted by author from <https://www.cleanfuture.co.in/2018/07/03/dso-modernizing-the-power-grid/> using images from Flaticon.com

There have been significant shifts in the national energy policy landscape in South Africa over the past few years, both in response to changing energy markets and the ongoing negative impact of load-shedding. This includes amendments to the Electricity Regulation Act, the Just Energy Transition Framework and Investment Plan, and the Renewable Energy Master Plan, to name a few. It is important to note that

the National Integrated Resources Plan of 2019 is also currently under review and will have a bearing on the national energy market and the opportunities available to the City of Cape Town to diversify and decarbonise energy supply, as well as influence the way in which it operates its distribution system. Common features of these national plans and policies include:

- Increased support for a competitive energy supply market with greater private sector participation
- The regulatory framework for the unbundling the national utility, Eskom
- Shifts to decarbonise energy supply
- The localisation of energy value chains for job creation
- Seeking to harness the economic and energy security benefits of new energy technologies, such as electric vehicles and hydrogen
- Support for reskilling of workers in fossil fuel-based industries

In developing the Energy Strategy, it was necessary to establish a set of assumptions for the critical uncertainties¹ that will be tracked and, where data indicates that the underlying trends have changed, the City will adapt the pace and prioritisation of the programmes outlined in this strategy, harnessing opportunities and limiting risks where it can. The critical uncertainties include:

Electricity Supply

- Availability of electricity from Eskom
- Price trajectory and structure of Eskom electricity tariffs
- Cost and availability of embedded energy supply

Electricity Demand

- Total energy demand
- Proportion of customers receiving subsidised electricity
- Proportion of non-technical losses

Electricity Governance

- Market structure and governance arrangements

¹ For the purposes of the Energy Strategy, critical uncertainties are defined as those trends that have a high impact, yet have a high degree of uncertainty.

Energy System

- Petroleum fuel and gas price and availability
- International and local response to carbon intensity of Cape Town's economy

Through providing this deeper understanding of both the predictable and uncertain trends affecting the energy system in Cape Town, the Energy Strategy aims to be transparent about the evidence-base and assumptions upon which decisions have been made and outcomes have been designed. Importantly, this also helps to be transparent and communicate to municipal leadership and the public why there may be adjustments in how the Energy Strategy is implemented over time as the trends shift or assumptions no longer hold true.

Overview of the City of Cape Town's Draft Energy Strategy

The Energy Strategy sets out the City of Cape Town's vision and a programme of action to address the current energy supply crisis while navigating the energy transition to the benefit of residents, businesses, and the environment for future generations in the longer term. Furthermore, the strategy aims to develop energy systems that propel Cape Town's economic growth, achieve enhanced well-being and poverty alleviation for its residents; to be a City of Hope. It provides a pathway to increase capabilities to mitigate load-shedding in the short term, while also driving and enabling the transformation of the municipal electricity utility and local energy system to sustainably provide Cape Town's residents and businesses with reliable, affordable and carbon-neutral energy in the long term.

The Energy Strategy aligns with the Integrated Development Plan (2022-2027) and other key City strategies. It is informed by an evaluation of the existing state of the energy system and an assessment of the energy needs of residents, businesses, and the City. These help identify the challenges that the City of Cape Town must address in order to achieve 'End load-shedding in Cape Town over time' (IDP objective 3) and 'Well-managed and modernised infrastructure to support economic growth' (IDP objective 4).

Vision

Energy Security for a prosperous Cape Town. Together, we can build a resilient energy system where all residents and businesses have access to reliable, affordable, and carbon neutral energy.

Principles

Reliability: Energy is available when it is needed
Affordability: Ability to pay without compromising other needs
Carbon Neutrality: limiting greenhouse gas emissions
Resilience: The capability to adapt to change and disruption

Commitments

The City's commitments to deliver, enable and partner with stakeholders to build a resilient energy system to support social and economic development.

Enablers

The ability to succeed in these commitments will depend on the actions by many people and corresponding changes made in how the energy utility operates.

Shifts & Stresses

The energy sector is changing at a rapid pace and scale with a number of key shifts and stresses affecting every aspect of Cape Town's energy system.

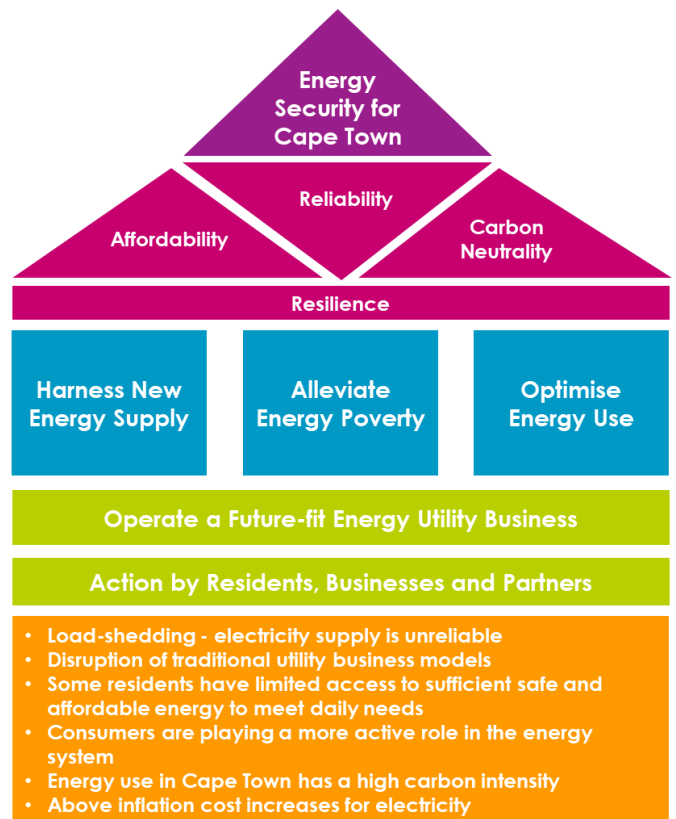


Figure 4: A diagram representing a summary of the structure of the Energy Strategy

As outlined in Figure 4, the Energy Strategy answers the following key questions:

1. Where do we want to go?

An overarching **vision for 2050: Energy Security for a prosperous Cape Town**. This vision is underpinned by **four principles** that describe the kind of energy system Cape Town needs – a **resilient** energy system that can provide **reliable, affordable** and **carbon-neutral** energy to everyone living and working in Cape Town.

2. Where are we now?

Grounded in understanding the current state of the energy system, how we got here and how it's changing, the Energy Strategy outlines a number of **key shifts and stresses** to be navigated, amongst a range of critical certain and uncertain trends that inform decision-making.

3. How are we going to get there?

The vision is implemented through **three commitments** and **two cross-cutting enablers**. Each commitment and enabler has a number of programmes that analyse the nature of the challenges faced, the opportunities to be harnessed, the risk of inaction, and

the outcome that all energy system stakeholders can work towards. The Energy Strategy then further details how the City will deliver, enable and partner with stakeholders to build a resilient energy system and improve energy security over time.

Commitment 1: Harness New Energy Supply
Outcome: Cape Town's energy demand is met by a reliable and cost-effective supply of increasingly carbon-neutral energy from multiple energy suppliers, with new energy sources introduced to the benefit of residents and businesses.
Programmes: 1.1 City-initiated Energy Generation 1.2 Utility-scale Energy Storage 1.3 Private Sector Embedded Generation 1.4 Wheeling and Trading
Commitment 2: Alleviate Energy Poverty
Outcome: Indigent households and informal settlement communities are supported to access a range of safe and affordable energy services to meet their daily needs for improved well-being and increased economic participation.
Programmes: 2.1 Energy Subsidy Reform 2.2 Electrification for Informal Settlements and Backyarders on Public Land 2.3 Informal Settlement Public Lighting 2.4 Energy Service Innovations for Backyard Dwellings
Commitment 3. Optimise Energy Use
Outcome: Businesses, households, and municipal services use energy efficiently and are supported to manage energy demand to allow for greater use of renewable energy and alternative fuel sources while contributing to balancing the electricity distribution grid.
Programmes: 3.1 Energy-efficient City Services 3.2 Improved Private Building Energy Performance 3.3 Enhanced Demand Response 3.4 Support Uptake of Electric Vehicles
Enabler A. Operate a Future-fit Energy Utility Business

Outcome: A municipal electricity utility with enhanced asset management of energy infrastructure that adapts its business model and systems to provide financially sustainable energy services in an increasingly competitive and distributed energy system.

Programmes:

A.1 Institutional and Workforce Reform

A.2 Tariff and Financial Reform

A.3 Infrastructure & Technology Reform

A.4 City-level Energy Planning

Enabler B. Action by Residents, Businesses and Energy Services Sector

Outcome: All stakeholders in the energy system have the knowledge needed and are supported to take action that contributes to the achievement of energy security in Cape Town.

Programmes:

B.1 Awareness & Engagement

B.2 Energy Data Access

B.3 Energy Services Industry Support

B.4 Advocacy and Inter-governmental Collaboration

Energy Strategy's Prioritisation Framework

The Energy Strategy takes a 2050 view on enabling, navigating, and driving changes within the energy system. The changes occurring in the different parts of the energy landscape will start to have an impact on the energy system as a whole, with the City of Cape Town's direct intervention in this transformation being achieved over three time horizons. Making use of a consistent set of principles over time, as described in the vision statement, ensures that short-term priorities are implemented in such a way as to achieve, and not undermine, longer-term objectives. For example, the City is increasing electricity supply from alternative sources, predominantly renewable energy, to meet up to 35% of maximum electricity demand in City Supply Areas by 2028. This represents a significant investment towards a carbon-neutral energy system for Cape Town even in the short term, while also contributing to mitigating load-shedding.

Short Term (by 2026): Increase capabilities to mitigate against up to 4 stages of load-shedding

Due to the current severity and frequency of load-shedding and the devastating impact this is having on the economy, it is necessary to prioritise interventions and investments that will directly contribute to stabilising electricity supply in the short term.

Medium Term (by 2031): Reforms implemented to maintain a modernised and financially sustainable electricity utility

In the medium term, a financially resilient and operationally efficient electricity utility is critical to ensure the long term provision of core utility services, such as network service provision and the continued provision of the energy social package to economically vulnerable households.

Long term (by 2050): Transforming the energy system to be carbon-neutral

In line with global, national, and local climate commitments for carbon neutrality by 2050, it is critical that the carbon intensity of the energy system is reduced, as a major contributor to greenhouse gas production. This not only speaks to the sources of energy used, but also ensuring that the systems and value chains are in place to support a carbon neutral energy system.

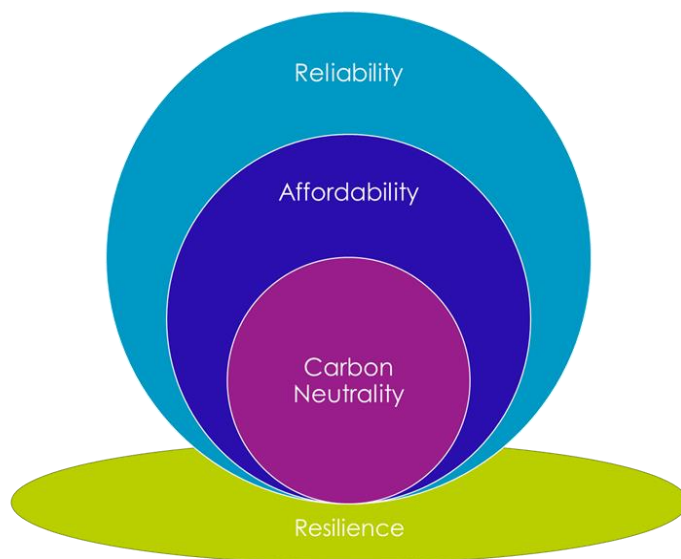


Figure 5: A diagram indicating the prioritised implementation of the Energy Strategy's four guiding principles.

The prioritisation framework also provides guidance on the structured application of the four energy principles, as shown in Figure 5. Currently, due to the energy supply crisis, pursuing a reliable supply of energy is the primary driver for investments as the energy system fails without this. Then, within the context of a sufficiently reliable energy supply, more affordable and carbon-neutral energy become the primary drivers of investment decisions in the energy system. The principle of resilience remains constant and ensures that no decision compromises the ability of the energy system to adapt to changes and to continue to deliver services over time.

Framing the Draft Energy Strategy in the context of the National Just Energy Transition Framework

Globally, the Just Energy Transition (JET) is a framework to implement the change needed to reduce greenhouse gas emissions in carbon-intensive energy systems in such a way as to 'leave no one behind' and ensure the benefits of this energy transition are experienced by society at large. That is, to ensure that the benefits of the transition support those most vulnerable to the transition risks, such as job losses whether direct or indirect. At present, the JET discussions at a national level in South Africa through the work of the Presidential Climate Change Commission (PCCC) and the Department of Mineral Resource and Energy (DMRE) have primarily been focused on national policy, Eskom as the national energy utility, and communities in the Mpumalanga Province as those most directly affected by the transition away from a coal-based energy economy.

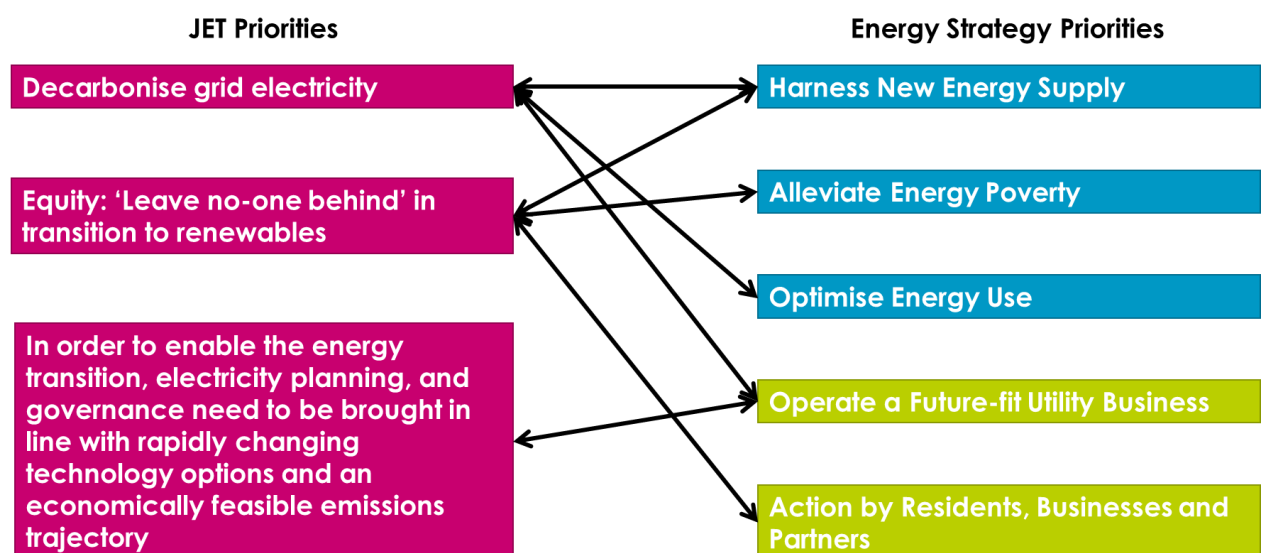


Figure 6: Alignment of the PCCC JET Priorities and the City of Cape Town's Energy Strategy

As the PCCC JET Framework charts a course for South Africa's energy transition in the longer term, beyond the current electricity supply crisis, there is a need to understand the implications of the JET for the City of Cape Town and to identify the risks to mitigate and opportunities to harness. These implications are bi-directional; with consideration needed for how Cape Town's energy objectives will be impacted, but also to understand how Cape Town's action and energy objectives will impact the national JET framework and trajectory. The Energy Strategy embeds the primary JET imperatives of decarbonisation, equity, justice, and energy planning and governance

reform throughout the three commitments and two enablers, as summarised in Figure 6. This a preferred balanced approach to direct application of the JET Framework in Cape Town as it means the interpretation of the JET is strategically driven and takes in to account the unique context of Cape Town's energy system.

The key areas of alignment include:

- Decarbonisation of electricity is evidenced through the City of Cape Town's delivery and support of new renewable energy sources (whether owned or procured by the City or from the private sector) to reduce the local grid emissions factor. This is then supported by the corresponding upgrade of the distribution network to accommodate a greater proportion of variable and distributed embedded generation, and shifts in energy demand that support greater use of renewable energy, such as peak shifting, electrification of the transport sector, and demand response.
- The principles of equity and justice are implemented through making energy poverty alleviation a central pillar of the strategy, through support for a wider range of stakeholders to make energy-related decisions and directly manage their own supply and demand, and through reducing the barriers to entry by streamlining the administrative processes required to participate in the energy system.
- The priority to see energy planning and governance reform is implemented in the Energy Strategy through the key areas of distribution utility reform notably institutional unbundling, tariff and financial reform and infrastructure enhancements through harnessing digital technologies for energy and network management.

Considering how the Energy Strategy embeds the JET Framework provides a helpful 'sense-check' to ensure alignment between national and local ambition. This is critical as the energy system in Cape Town does not operate in isolation from the broader South African energy system and the results of the energy transition are more likely to be beneficial to all with this alignment. Importantly, with advocacy being an important component of the Energy Strategy, it is also recommended that a similar process be undertaken at national level to ensure that the JET framework remains relevant to local governments and municipal utilities as critical partners in the transition.

Conclusion

Municipalities in South Africa have a constitutional obligation to deliver services that meet both short term objectives, while also being positioned to meet longer term goals. Within a rapidly changing context, such as the energy system that local governments now find themselves in, the ability to **balance** these short and long term objectives in a manner where one does not undermine the other becomes critical to supporting a thriving economy and the well-being of residents over time. Furthermore, this balance is becoming increasingly important within the context of a constrained local and national fiscal environment, where investments made must be leveraged to their full capacity and not leave stranded or underutilised assets.

This paper has sought to share how the City of Cape Town used the Energy Strategy as a valuable tool to bring together a wide range of commonly isolated energy issues in a way that is cognisant of these two timelines of action. An example of this being to navigate short term crises such as load-shedding in a way that does not undermine long term objectives such as carbon neutrality. Critical to the Energy Strategy's intention to do this has been through:

- The collaborative approach to its development across the City and with other key stakeholders
- By identifying and communicating both the predictable and uncertain trends that underlie the evidence base and assumptions upon which the Energy Strategy is developed along with a commitment to regularly assess these and update the Energy Strategy to ensure it stays relevant
- By developing a prioritisation framework that aims to make decision-making and trade-offs more transparent to municipal leadership and the public
- Ensuring alignment with the national JET Frameworks in a way that is strategically aligned to City context and priorities

Municipal utilities are critical actors and decision-makers within the energy transition. The pace and complexity of change requires proactive engagement by municipal utilities to ensure risks are mitigated and opportunities are harnessed in the ways that make sense within each unique local context. One way that municipal utilities can take greater control of their energy futures is through the development of an energy strategy, either as a separate document or embedded within the Integrated

Development Plan, that appropriately balances short term needs and longer term objectives.