CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

Our Shared Energy Future: The 2050 Energy Strategy for the City of Cape Town

Executive Summary

Draft for Public Participation
June 2023

Executive Summary

The energy system, globally and locally, is rapidly transforming due to the impacts of technology change, regulatory change, and climate change. These changes are affecting every aspect of how energy is generated, distributed and used. Figure 1 provides a summary description of fundamental changes taking place in the electricity system that include increasing use of distributed energy resources and a greater role for distributors and users of energy. In the South African context, changes in the electricity system are being accelerated due to the severity of load-shedding. Since 2019, there has been an unprecedented escalation in load-shedding. 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. This context calls for the City of Cape Town to actively engage with and appropriately intervene in both mitigating load-shedding as well as navigating the changing energy landscape to the benefit of all in Cape Town.

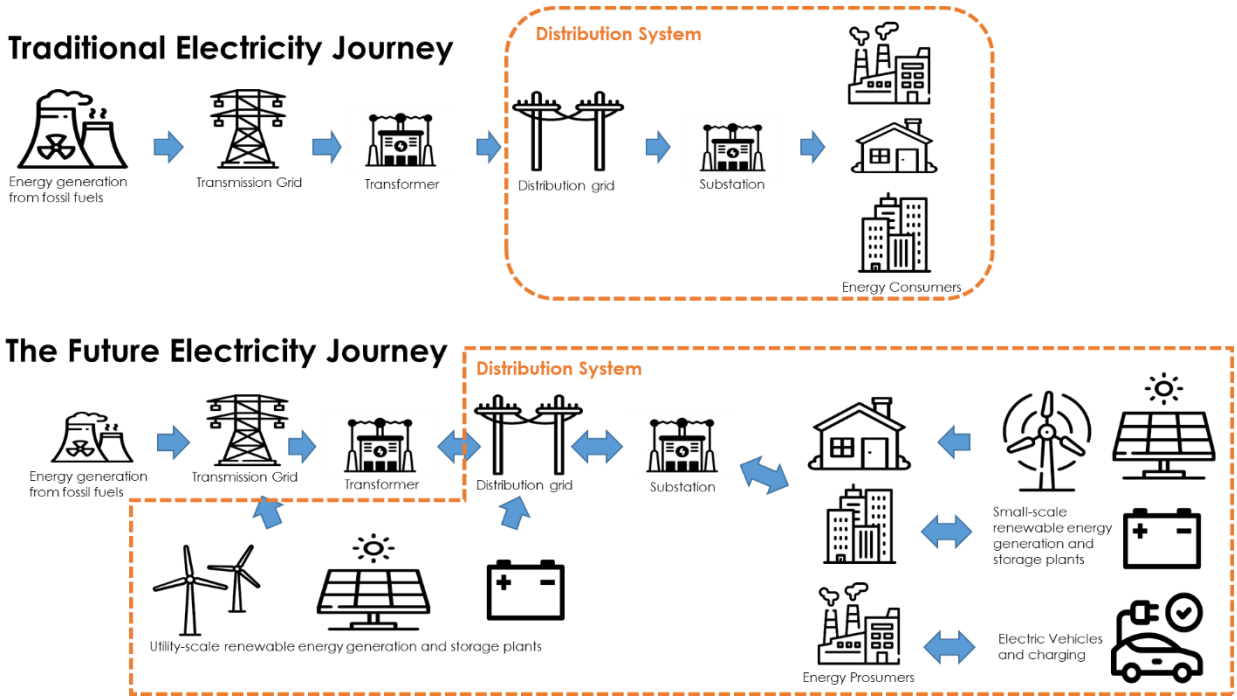

Figure 1: Moving from the traditional electricity system to the future electricity system. Adapted by author from https://www.cleanfuture.co.in/2018/07/03/dso-modernizing-the-power-grid/ using images from Flaticon.com

Energy Strategy Overview

This Energy Strategy therefore sets out a vision and a programme of action to address the current energy supply crisis and to navigate the energy transition to the benefit of residents and businesses. Furthermore, the strategy aims to develop energy systems to 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, whilst also driving and enabling the transformation of the municipal electricity utility and local energy system to sustainably provide Cape Town's residents 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 needs to 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).

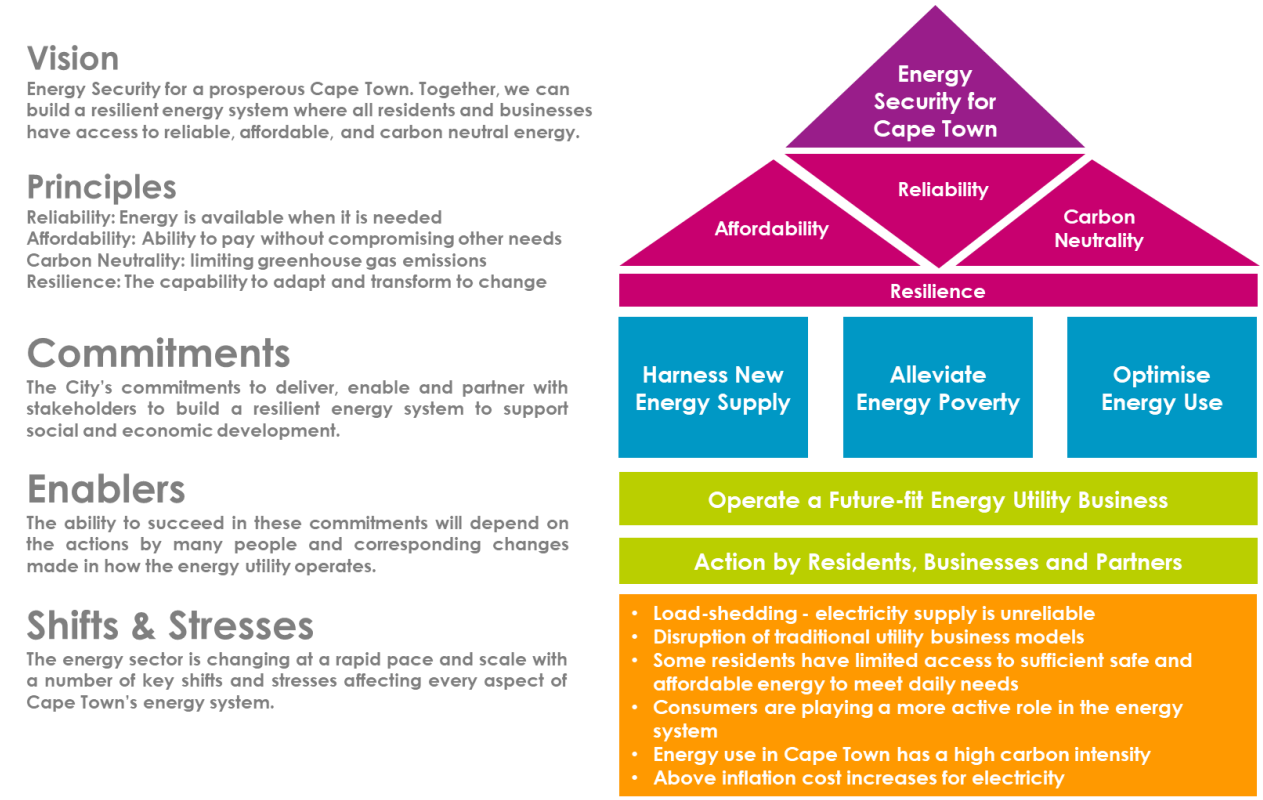

Figure 2: A diagram representing a summary of the structure of the Energy Strategy

As outlined in Figure 2, the Energy strategy answers three key questions:

1. **Where do we want to go?**

   An overarching **vision:** 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 all people 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 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** that each has programmes that unpack the nature of the challenges faced, the opportunities to be harnessed, and the outcome 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.

The majority of the programmes within this Energy Strategy focus on the electricity system due to the City's currently significant role and responsibility in the sale and distribution of electricity to a wide range of customers. In the short term, there are opportunities to further expand this role that

need to be guided by this strategy. There are however a few programmes where the focus goes beyond that of electricity and looks to other energy sources, or the energy system more broadly. In the longer term, as new energy technologies gain traction, it will be possible to take hold of opportunities at the utility scale that make use of alternative energy sources and technologies.

The Energy Strategy takes a 2050 view with key priorities and programmes implemented in a **three-phased approach** to enable and drive change within the energy system over time:

- Short Term (by 2026): Increase capabilities to mitigate up to 4 stages of load-shedding
- Medium Term (by 2031): Reforms implemented to maintain a financially sustainable electricity utility with enhanced operations and asset management practices
- Long term (by 2050): Transforming the energy system to be carbon neutral

Load-shedding Mitigation Strategy Overview

The escalating severity of load-shedding in South Africa is the most pressing issue limiting our ability to achieve energy security in Cape Town at present. For planning purposes, the City of Cape Town has taken a cautious outlook on the national electricity supply constraints and this strategy is built on the assumption that load-shedding will continue at an average of Stage 4 until 2032 and reduce to an average of Stage 2 for a further five years thereafter. The City of Cape Town has set the ambitious goal of protecting City of Cape Town customers from up to 4 stages of load-shedding, for a portion of the day based on technical and financial feasibility, between 06:00 - 22:00 on weekdays by 2026. This strategy contains a set of interventions that will deliver on this goal in order to limit the associated negative economic and social impacts across the city.

In practice, the City will intervene to mitigate the impact of load-shedding across three scales as noted in Figure 3 below:

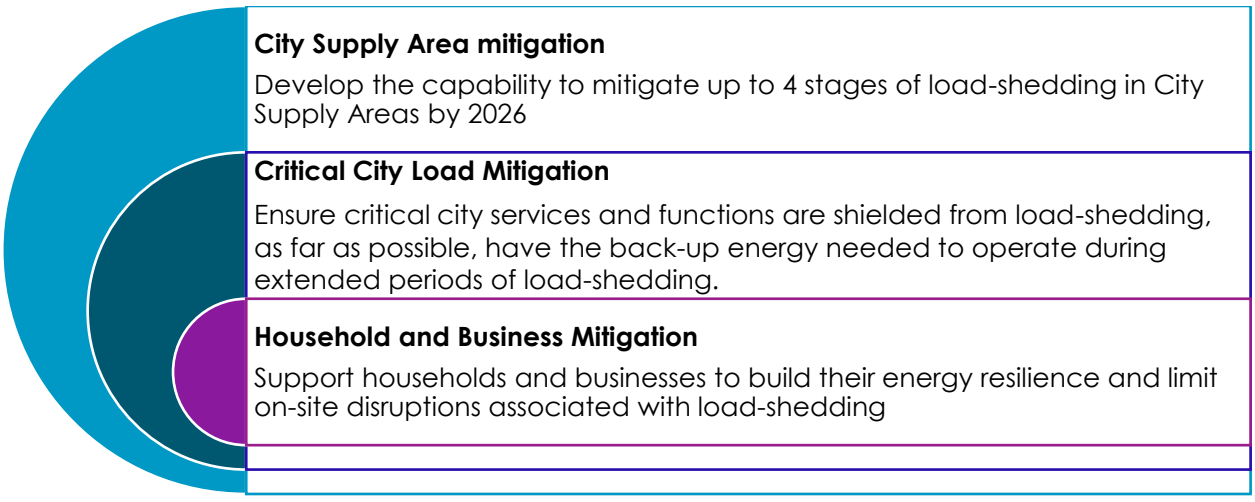

Figure 3: A diagram representing the three scales of intervention for the load-shedding mitigation programme implemented by the City of Cape Town.

Unpacking the Energy Strategy

The tables below provide a summary of the Energy Strategy's commitments and enablers and their related programmes, alongside an indication of the City's role and the status of each programme.

City's role

The Energy Strategy outlines three main roles for the City of Cape Town within the energy system:

- Deliver: The City leads the intervention of activities that will achieve the desired outcome.
- Enable: The City provides support to the stakeholders who lead the implementation of the interventions that will achieve the desired outcome.
- Partner: The City works closely with other stakeholders to jointly implement the interventions that will achieve the desired outcome.

Status of Programme

- New (concept): The programme is being investigated and conceptualised, with options being tested and analysed to inform the City's investments in the future.
- New (in planning): The programme is in the process of being planned in detail, with budget and resources for planning activities allocated.
- Expansion of existing programme: The programme is currently being implemented but will be expanded or scaled up, with budget and resources for implementation allocated.
- Implementation in progress: The programme is currently being put into effect, with budget and resources for implementation allocated.

Commitment 1: Harness New Energy Supply

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.

In the short to medium term, the focus is increasing the supply and storage of electricity from a range of public and private sources in response to the current scarcity of electricity supply due to load-shedding. In the longer term, the focus is exploring the use of new energy sources, whether for direct use or for power generation.

Goals to be achieved within the next 5 years

Where an earlier date is targeted for these goals, this is stated.

- Facilitate increased access to electricity from alternative sources to meet up to 35% of maximum notified demand in City Supply Areas. This equates to approximately 650 MW of energy from small-scale embedded generation, city-owned generation, wheeling arrangements and purchases from Independent Power Producers (IPPs).
- Develop an online registration form for Small-scale Energy Generation (SSEG) applications to streamline the process for customers by the end of 2024.
- Contribute to mitigating load-shedding across City Supply Areas by up to 4 stages through making available a range of dispatchable energy supply options by the end of 2026,
- Mitigate impact of load-shedding at critical city loads through the provision of on-site power generation and/or onsite energy storage.
- Implement wheeling through the establishment of the required systems and processes for these new City energy services.
- Implement systems and related technical requirements to make it easier for Small-scale Energy. Generation (SSEG) prosumers to feed electricity in to the grid by the end of 2024.
- Contracting and design of the refurbishment of Steenbras Hydro Pumped Storage Scheme.
- Decommission and plan for the repurposing of the Athlone Power Station Site.

Programmes	Outcomes	City Role	Status
1.1 City-initiated Energy Generation	The City buys power from the private sector, develops its own generation plants and drives the adoption of innovative energy technologies to facilitate the bulk supply of lower carbon, cost-effective and reliable energy.	**Deliver**	**Implementation in progress**
1.2 Utility-scale Energy Storage	The City mitigates the impact of load-shedding by optimising the use of the Steenbras Hydro Pumped Storage Scheme and installing new battery energy storage systems at critical City services. In the longer term, the City explores the development of new energy storage solutions that provide ancillary services to enhance distribution system functionality and manage distributed and embedded energy resources.	**Deliver**	**Expansion of existing programme**
1.3 Private Sector Embedded Generation	Residents and businesses are empowered to generate their own electricity and sell their excess supply, with distributed energy resources integrated safely into the grid.	**Enable**	**Implementation in progress**
1.4 Wheeling and Trading	Customers and aggregators are able to wheel and trade electricity across the City's distribution network as made possible through the adoption of the necessary contractual and technological arrangements, and the application of cost reflective use-of-system charges.	**Enable**	**New (in planning)**

Commitment 2. Alleviate Energy Poverty

Indigent households and communities in informal settlements are supported to access a range of safe and cost-effective energy services to meet their daily needs for improved well-being and increase economic participation.

Goals to be achieved within the next 5 years

- Continue to uphold high electrification rate of informal settlements, where permissible.
- Establish robust datasets to inform targeting of grid enhancements and subsidy reform.
- Free Basic Alternative Energy Policy and Implementation Design.
- Pilot alternative public lighting solutions for unelectrified informal settlements.

Programmes	Outcomes	City Role	Status
2.1 Energy Subsidy Reform	An optimised energy subsidy regime that has a sustainable source of funding and allows unelectrified households to access safe and clean non-grid-connected energy sources.	**Deliver**	**Expansion of existing programme**

2.2 Informal Settlement Electrification	In line with informal settlement upgrading processes, eligible unelectrified settlements and backyard dwellings on public land across Cape Town have access to grid-supplied electricity.	**Deliver & Partner**	**Expansion of existing programme**
2.3 Informal Settlement Public Lighting	Sufficient and cost-effective public area lighting is provided in both electrified and unelectrified informal settlements to improve safety and security.	**Deliver**	**Expansion of existing programme**
2.4 Energy Service Innovations for Backyard Dwellings	Opportunities for improved energy access in informal backyard dwellings across Cape Town are explored and harnessed, contributing towards improved quality and safety of affordable rental accommodation in Cape Town.	**Partner**	**New (concept)**

Commitment 3. Optimise Energy Use

Businesses, households, and municipal services use energy efficiently and are supported to manage the demand for electricity to allow for greater use of renewable energy and contribute to balancing the electricity distribution grid.

Goals to be achieved within the next 5 years

Where an earlier date is targeted for these goals, this is stated.

- Residential demand response programme contracted by 2024.
- Rapidly expand the municipal services energy efficiency programme in buildings and industrial facilities.
- Increase the amount of interruptible supply derived from the existing commercial demand response programme.
- Establish energy performance baseline per occupancy class for all privately owned buildings in Cape Town.
- Energy training material and related communications for micro-developers to build energy efficient, affordable rental accommodation.

Programmes	Outcomes	City Role	Status
3.1 Energy efficient City Services	Municipal service continuity and cost-effectiveness is enhanced through investments in energy efficiency and energy demand reduction in buildings and facilities.	**Deliver**	**Expansion of existing programme**
3.2 Improved Private Building Energy Performance	Property owners and developers are supported and enabled to optimise their building's energy performance through energy efficiency and enhanced building energy management systems.	**Enable**	**Implementation in progress**

3.3 Enhanced Demand Response	Effective commercial and residential demand response programmes are implemented so that the City can efficiently balance electricity supply and demand through the distribution network and mitigate load-shedding.	**Partner**	**Expansion of existing programme**
3.4 Support Uptake of Electric Vehicles	Cape Town is a leading Electric Vehicle-friendly city in South Africa, with the City proactively introducing EVs into the public sector over time and enabling EV charging infrastructure to develop in support of the industry.	**Partner**	**New (in planning)**

Enabler A. Operate a Future-fit Energy Utility Business

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.

Goals to be achieved within the next 5 years

Where an earlier date is targeted for these goals, this is stated.

- By 2026, operate the distribution system so as to harness dispatchable energy supply and curtailment programmes to allow the City of Cape Town to mitigate up to 4 stages of load-shedding in City Supply Areas between 06:00 - 22:00 on weekdays.
- Implement systems and processes to improve access to the grid to enable the connection, operation and management of distributed energy resources.
- Design of electricity tariff restructure to enable improved cost recovery for fixed distribution system costs.
- Design of enhanced distribution grid communications network and increased functionality as a distribution system operator.
- Implement required institutional and financial reforms to enhance the separation of the electricity business units – generation, grid services and retail.
- Investigate avenues for retaining and growing revenue streams for utility, including wheeling, EV charging and hydrogen, to name a few, and mechanisms for growing the customer base.

Programmes	Outcomes	City Role	Status
A.1 Institutional and Workforce Reform	A restructured and capacitated electricity utility department that is agile and viable within a changing energy system and has the skills to respond to the changing needs of customers and the energy system more broadly.	**Deliver**	**New (in planning)**
A.2 Tariff and Financial Reform	A financially sustainable utility department that encourages private sector participation in energy supply, safeguards the provision of subsidised energy access to indigent households, and ensures that the cost of providing and maintaining electricity infrastructure is fairly distributed across customers.	**Deliver**	**New (in planning)**

A.3 Infrastructure & Technology Reform	Enhance utility operations through proactive infrastructure maintenance and leveraging digital technologies to ensure safe and cost-effective distribution grid services, enhanced system operator functionality, and to support the integration of more distributed energy resources on the grid.	**Deliver**	**Expansion of existing programme**
A.4 City-level Energy Planning	The utility makes use of detailed and accurate data sets in system-wide planning and modelling to optimise the functioning and investment in the local electricity system, as supported by the digital and spatial representation of electricity infrastructure systems.	**Deliver**	**Expansion of existing programme**

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

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.

Goals to be achieved within the next 5 years

Where an earlier date is targeted for these goals, this is stated.

- Annual publication of updated energy data on City Open Data Portal.
- Revised State of Energy and Carbon Report published.
- Energy Festival to engage citizens on energy innovations.
- Energy services industry support roadmap.

Programmes	Outcomes	City Role	Status
B.1 Awareness & Engagement	Residents and businesses are capacitated to make informed energy decisions which support the achievement of key energy priorities in Cape Town	**Deliver**	**Implementation in progress**
B.2 Energy Data Access	Up-to-date and comprehensive energy datasets and related analysis are made available to applications and are accessible by all energy system stakeholders to enable evidence-based decision-making.	**Deliver**	**Expansion of existing programme**
B.3 Energy Services Industry Support	Leveraging existing support programmes in the City, empower entrepreneurs, youth, and job seekers to take hold of opportunities offered by a growing energy services sector to increase economic participation and support a thriving energy market in Cape Town.	**Partner**	**New (concept)**