GreenCape

CASE STUDY



Seeding innovation:

Building internal structures and capabilities to enable innovation and foster future thinking in an energy utility

Abbreviations, terms, units and glossary

CCT	City of Cape Town
BESS	Battery Energy Storage System
EGD	Department of Electricity Generation and Distribution
EDI	Electricity Distribution Industry
EE	Energy efficiency
GHG	Greenhouse gas
HVAC	Heating, Ventilation and Air-Conditioning
IDP	Integrated Development Plan
IPP	Independent Power Producer
kWh	Kilowatt hour
MFMA	Municipal Finance Management Act
MVA	Megavolt-Amperes
MW	Megawatt
MWh	Megawatt hour
ODTP	Organisational Development and Transformation Plan
PV	Photovoltaic
SEA	Sustainable Energy Africa
SEM	Sustainable Energy Markets
SSEG	Small-scale embedded generation



1 Overview

This case study explores the rationale, characteristics and role of the City of Cape Town's (CCT) Sustainable Energy Markets (SEM) Department, and its subsequent successes and challenges, in enabling the Energy Directorate to innovate, facilitate energy resilience, decentralisation and a move towards decarbonisation.

About the innovation[1] case study series

South Africa's energy transition is rendering the traditional way of doing things, where municipalities bought bulk power from the centralised utility, Eskom, and sold it on to households and businesses, increasingly obsolete. Local and metropolitan municipalities have been driven towards new responsibilities, taking on the roles of active market facilitators, distribution system operators and administrators of energy democracy. Developing the capabilities to deliver on these roles requires municipalities to pursue innovation and foster future thinking, abilities that are traditionally difficult to embrace when municipalities are fundamentally designed to be risk-averse, highly compliant and stable providers of basic services. There is therefore much to learn from the practical experiences of those proactive in shaping local energy systems.

This case study forms part of a broader series showcasing innovative initiatives undertaken within CCT's Energy Directorate. Whilst the other case studies in this series[2] look at specific projects or initiatives undertaken by CCT, this case study focuses on the SEM Department and the role it has played in enabling these, and other, initiatives in the first place. In particular, it provides an example of how a municipal utility can structure itself and build internal capabilities that enable innovation, support collaboration and foster future thinking.

This case study captures practical lessons from the experience of staff that have worked within, or worked with, the SEM Department

What: This case study examines how CCT created a small, specialised unit designed to function as an innovation incubator (or, a bit like a start-up). In so doing, the SEM Department has been able to build the internal capabilities required to transition the Energy Directorate from its role as a traditional energy utility towards one that is future looking and able to embrace innovation.

Why: The challenges facing the Electricity Distribution Industry (EDI) in South Africa and the changing energy landscape globally, are leading to a decentralised and increasingly unbundled, market driven, distributed energy system which means that an alternative business model for local government utilities needs to be explored and established.

When: The case study focuses on the successes, challenges, enablers and barriers the SEM Department has experienced since its creation in 2017 through to 2026.

What is innovative: In establishing the SEM Department, CCT has created a specialised unit that can think outside of the box and research, develop and test novel ideas and concepts not yet mainstreamed within CCT, or any other South African municipality, without taking staff and resources away from other departments that are constrained by service delivery.

Key contributions: The SEM Department illustrates a mechanism that municipalities, in particular metropolitan municipalities, can use to capacitate themselves to research, test and adopt pioneering or innovative advancements whilst continuing to provide the services they are mandated to deliver. A municipality can go far in achieving its sustainability objectives if it has a dedicated team to do so.

This case study is written for

1. **Municipal utilities** looking for examples of how to capacitate a team to work outside of the typical scope of a utility.
2. **Internal teams** within CCT's Energy Directorate, other utility sectors and other partner CCT departments undergoing transformation.
3. **NGOs** and other organisations that support municipalities.
4. **Academic and research** institutions.

[1] Innovation in CCT is the fostering of a sustainable organisational culture that stimulates creative thinking, risk taking and the implementation of new ideas for optimal service delivery and infrastructure development, aligning with the ISO 56000 definition.

[2] These case studies are available for free download and cover the following topics; the Atlantis solar PV plant project; Connecting utility-scale generators to the grid; and Advancing data analysis and modelling capabilities in an energy utility.

2 Background

For some time, the energy system, globally and locally, has experienced pressure to reform due to the impacts of technology change, regulatory change, and climate change. These changes have affected every aspect of how energy is generated, distributed and used. In responding to these changes, there has been a global push away from fossil fuel-based energy towards renewable energy electrification to enable increased energy efficiency and decarbonisation of the energy sector.

The combination of these factors has placed increased pressure on the electricity sector to proactively plan for, and rapidly adapt to, these changes.

Historically, South African municipal utilities have operated under a highly centralised, single-buyer model, functioning primarily as distributors of electricity purchased from the national utility, Eskom. By 2017, the EDI in South Africa faced a systemic crisis. Municipalities were caught in a fiscal squeeze: declining electricity sales (driven by energy efficiency and private solar PV adoption) combined with escalating tariffs from Eskom. There was growing recognition that utility reform was an imperative for local government.

For CCT, traditional municipal structures were unequipped to handle this shifting landscape. Traditional departments were siloed, inherently risk averse, and legally constrained by rigid supply-chain protocols. To achieve its long-term climate commitments and secure energy diversification, CCT required an institutional vehicle that could legally, technically, and strategically pave the way for a decentralised, unbundled, and market-driven energy system.

In response to this, CCT established the SEM Department through its Organisational Development and Transformation Plan (ODTP) with the intention for SEM to focus on driving the utility towards cleaner, more sustainable energy provision.

This response reflected an important shift in CCT's thinking around energy – moving away from only operating as an electricity distributor towards operationalising sustainability through a dedicated team that could start to explore options to generate and diversify CCT's energy supply, as well as drive innovation within the sector.

SEM's origin story

With political support, SEM was formally established through the ODTP process in April 2017. The new Department brought together experienced staff working in green energy and climate mitigation, primarily from Electricity Services and Environmental Management, into a single team.

Leadership and recruitment focused on building a team that could work flexibly and respond to an evolving energy environment. The initial team included data analysts, engineers, contract and project managers, providing the range of skills needed to deliver SEM's mandate.

The initial mandate given to SEM, informed by CCT's Integrated Development Plan (IDP) 2017 – 2022, was to operationalise sustainability and included the following:

- To work towards energy security and energy diversification and to drive innovation in energy supply in the CCT;
- to address how CCT can provide/support access to energy in low income households; and
- to drive CCT's climate change and transversal work towards the adoption of evidence-based climate action plans.

From the outset, SEM was positioned to work closely with Electricity Generation and Distribution (EGD), supported by enabling departments such as Treasury, Corporate Finance, Legal Services, Procurement, Budgeting and Financial Planning.

Over the past nine years, SEM worked transversally with departments such as Urban Mobility, Grant Units and Development Management, evolving from an experimental innovation incubator into a strategic driver of the City's energy transition of reaching carbon neutrality by 2050 by enhancing energy supply, reliability and security.



Structuring to build internal capabilities

SEM was intentionally designed as a lean, agile unit staffed by highly skilled problem-solvers, innovators, and disruptors. Recognising that true institutional innovation must be culturally driven, the department's leadership focused heavily on psychological safety – inspiring staff to "fail forward" and treat experimental setbacks as critical data points.

People with strong project management skills and the ability to build cases for change to access funding have been identified as critical enablers, whilst strong communication skills are also imperative, especially given the importance of public participation and community collaboration.

A primary insight from the early leadership team was that while technical skills can be taught, an adaptive mind-set cannot. Recruitment strategies shifted to prioritise individuals who demonstrated intellectual curiosity and a willingness to operate outside the confines of rigid, traditional municipal job descriptions.

SEM's innovative approach was reflected not only in its projects, but also in how its distinctive capabilities were built around three mutually reinforcing strengths:

- **Institutional agility:** SEM combined the technical flexibility of a green-energy think tank with the statutory authority of a municipal department. This enabled the Department to develop policy instruments, such as the Energy Strategy 2050, for formal adoption by the City Council.
- **Research and data capability:** SEM strengthened the City's energy research and data transparency through initiatives such as the State of Energy and Carbon Report. By tracking electricity, transport and waste data, the Department developed analytical and forecasting capabilities to support energy planning.
- **Multidisciplinary expertise:** SEM recruited beyond traditional electrical engineering roles to include energy economists, designers, scientists, policy and data analysts, and carbon accountants. This diverse expertise supported complex work involving policy development, financial and deal structuring, data analysis, carbon reporting and legal considerations.

Ultimately, SEM's success stems from a rare institutional alignment: strong political backing, intentional team building, a clear mandate to explore unproven frontiers, and an internal culture that actively rewards outside-the-box thinking.

An innovative funding model for SEM

An early challenge in designing SEM was how to fund a department tasked with transforming the market that traditionally sustains municipal electricity operations. Most municipal energy functions are tariff-funded and depend on electricity sales. This creates a fundamental tension: when initiatives such as rooftop solar and energy efficiency succeed, electricity sales decline, placing pressure on the revenue funding the work.

By funding SEM through property rates, supplemented by project-specific grants and loans, the City freed the Department from reliance on electricity sales. This innovative model enabled SEM to advance energy innovation, market development and carbon reduction while delivering broader benefits for climate resilience, energy security and economic development.

The model may, however, be difficult for municipalities with smaller or less diversified revenue bases to replicate.

As South Africa's electricity market evolves, SEM's funding model may need to adapt to changing municipal roles and revenue opportunities. The central principle should nevertheless remain: SEM must be able to advance energy reform without becoming financially dependent on the electricity sales that its work is intended to transform.



3 Key project and success stories

SEM's establishment has enabled the Energy Directorate to effectively develop and deliver on CCT's ambitious 2050 Energy Strategy. SEM provides the essential policy development, economic modelling, and strategic data tracking required to implement this long-term framework.

The Department's cross-cutting initiatives are designed to directly advance the strategy's three core commitments: harnessing new energy supply, alleviating energy poverty, and optimising energy use across Cape Town. Through this targeted work, SEM is playing a central role in transforming the metro's energy ecosystem into a resilient, decentralised, and carbon-neutral network.

Over the last nine years, SEM, led by these commitments, has achieved several pioneering milestones that have changed the local government landscape. In all cases, SEM has initiated and managed the projects, collaborating across departments whilst conducting research, focusing on project development, feasibility studies and implementation planning. These initiatives represent pioneering action, with SEM critical in paving the way for other departments to action activities that would otherwise be out of reach.

There have been several significant achievements, some of which are subsequently discussed in more detail, including:

1. Small-scale embedded generation (SSEG) streamlining

2. Atlantis hybrid PV and BESS project

3. Independent Power Producer (IPP) procurement

4. Municipal energy efficiency retrofit projects

5. Electrifying the municipal fleet

6. Energy poverty alleviation

1. SSEG streamlining

CCT has emerged as a pioneer in supporting SSEG, driving renewable energy adoption, job creation, investment, and energy resilience. Whilst CCT's work in this space predated the establishment of SEM, several significant milestones have been achieved in the intervening period, with SEM a key part of the team who developed the introduction of a streamlined, customer-centric SSEG authorisation process in 2021. This coincided with a significant proliferation of SSEG applications, spurred on by the national energy crisis.

In 2023, CCT introduced SSEG standardisation. By standardising all new SSEG systems as grid-tied, this simplified the regulations and ensured uniform safety and technical standards. Additionally, clearly defined policies and streamlined approval processes have encouraged active customer engagement and participation in the process. This was a significant step in curbing the threat of unauthorised systems, which pose a risk to the grid, from proliferating.

Then, in 2024, CCT launched an online application system via CCT's e-Services portal. Moving to the e-Services platform has had numerous benefits, such as safeguarding personal information, linking to existing customer data, and providing opportunities for internal software development. It has also reduced application processing times and increased transparency for the customer, building further trust in the CCT's authorisation process.

The SSEG framework has successfully attracted between R1.7 – R2.6 billion in private capital investment over the last decade, and has supported between 713 and 1 140 full-time equivalent green jobs within Cape Town. By June 2025, CCT's SSEG enabling initiatives resulted in approximately 13 398[3] authorised grid-tied SSEG systems (representing 251.6 MVA), unlocking substantial renewable energy potential and adding generation capacity to the grid during unprecedented loadshedding and rapid population growth.

A full timeline and description of the initiatives implemented through this work stream are depicted in a case study of the CCT's pioneering in SSEG.

[3] https://www.itweb.co.za/article/cape-town-reaps-rewards-of-green-energy-push/mQwkoq6YD3XM3r9A



2. Atlantis hybrid PV and BESS project

The Atlantis hybrid PV plant signifies a landmark renewable energy initiative, where CCT pioneered by clearing the legal challenges, and becoming one of the first local municipalities in South Africa to build and connect its own utility-scale generation system to the distribution grid. Throughout the project there were many challenges and obstacles, and SEM's role has been instrumental in coordinating and leading cross-department collaboration.

Ultimately, one of the key outcomes of this project is that CCT has been able to absorb key learnings from the project and scale towards the larger proposed 70MW solar PV plant project at Paardevlei. In addition to this outcome, the project has delivered a number of key achievements for CCT and residents (particularly those in Atlantis) alike.

A full write up of this project is available here.

Project achievements (as of July 2026):



3. IPP procurement

One of SEM's most profound impacts has been shifting the Energy Directorate from a passive buyer of electricity from Eskom toward an active municipal utility that strategically procures energy from diverse sources. SEM laid the foundational technical, financial, and legal groundwork that allowed CCT to challenge national procurement bottlenecks in a landmark court process, ultimately opening up municipal tenders to buy electricity directly from IPPs.

Connecting these utility-scale renewable energy generators to the municipal network has, however, introduced unprecedented technical and structural hurdles. This also includes own-build projects such as the Atlantis solar PV plant. CCT has had to navigate complex grid integration constraints, manage intermittent power injections, and redesign traditional wheeling and billing frameworks. The vital institutional lessons learned through solving these bottlenecks have subsequently been documented in the comprehensive case study: A new frontier: Connecting utility-scale generators to the grid.



"One of the key outcomes of this project is that the CCT has been able to absorb key learnings from the project and scale towards the larger proposed solar PV plant project at Paardevlei."

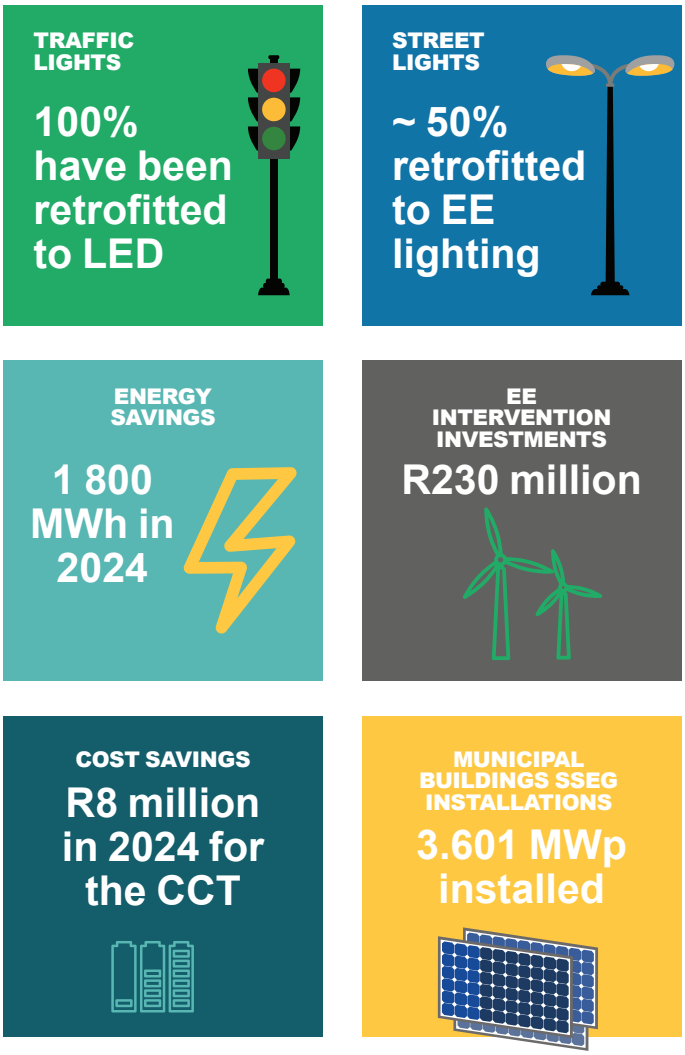
4. Municipal energy efficiency retrofit projects

SEM has played a leading role in delivering renewable energy and energy efficiency projects across the City, providing specialist project management and engineering expertise to turn strategic objectives into measurable results.

Through funding secured in part from the Energy Efficiency Demand Side Management Programme, SEM delivered a multi-year programme to improve energy performance across City operations and infrastructure. Initiatives included energy audits, smart meter installations, upgrades to lighting and Heating, Ventilation and Air-Conditioning (HVAC) systems in municipal buildings, retrofit of street and traffic lighting with energy-efficient technologies, and the installation of solar PV systems at municipal facilities.

Beyond delivering the technical interventions, SEM coordinated implementation across multiple departments, managed funding, and provided oversight from planning through to delivery. Facility manager training and occupant awareness programmes helped embed energy-conscious practices and maximise long-term benefits. This integrated approach enabled the City to achieve measurable energy savings, lower operating costs, reduced carbon emissions, increasing resilience across municipal operations.

Project achievements (as of July 2026):



5. Electrifying the municipal fleet

CCT's Climate Change Action Plan (CCAP) states that CCT should show clear leadership by gathering real-world data from electric vehicle (EV) pilot programmes - specifically through the installation of publicly accessible demonstration chargers and the procurement of EVs for the municipal fleet. SEM played a critical initial role in this work, securing and managing the public PV charging stations pilot. SEM also undertook the initial cost benefit analysis and made the financial business case that enabled Corporate Fleets to procure the first five EVs as a pilot.

More broadly, SEM has played a leading role in facilitating interdepartmental coordination, leveraging the Department's expertise in new tech and data analysis to create the testing ground for the pilot.

Moving forward, SEM will support Fleets in their procurement strategy and in their ambitious goals of fleet transition to new electric vehicles. The definitive findings of this pilot project demonstrated a clear, viable business case for transitioning municipal fleets to EVs, provided that the chosen models are strictly fit for purpose and achieve capital price parity with existing internal combustion engine (ICE) alternatives.

6. Energy poverty alleviation

By creating a team dedicated to understanding and responding to the needs of low-income households, informal settlements and backyard communities, the City elevated energy poverty from a service-delivery concern to a strategic priority linked to resilience, inclusion and climate action.

SEM has leveraged its institutional flexibility to research and pilot alternative energy solutions for communities where households cannot legally or practically be connected to the electricity grid. This is often the result of hazardous locations, environmental constraints, or unresolved land tenure and ownership issues.

A recent solar-powered public lighting pilot project in the Marikana informal settlement in Philippi East combined research and implentation. While the City's acquisition of the land has created a pathway towards longterm electrification, the pilot provided an interim solution to improve access to safe and reliable energy services while broader infrastructure plans are being implemented.

Community engagement was central to the project's success, helping to build local support, inform project design and reduce the risk of theft and vandalism. The experience highlighted the importance of strong communication and collaborative problem-solving, demonstrating that effective energy poverty interventions require not only appropriate technology, but also meaningful engagement with the communities they are intended to serve.

4 Enablers and barriers to SEM

In addition to what this case study has already covered, there are several additional enablers, barriers and lessons that municipalities and interested parties should be aware of if attempting to replicate SEM.

Lessons from the practical experience of SEM

SEM's experience shows that municipal energy innovation depends not only on good ideas, but also on the institutional conditions needed to develop, test and implement them. Several factors enabled SEM's work, while others created constraints that the Department had to navigate. The following should be highlighted as key enablers:

- **A clear mandate and sustained leadership support:** Political and administrative backing gave SEM the authority and institutional space to explore new approaches and pursue long-term energy objectives.
- **Dedicated capacity for innovation:** Establishing SEM separately from day-to-day electricity operations created space for research, experimentation and project development with competing directly with immediate operational priorities.
- **An innovative funding model:** Funding SEM's core operations through property rates reduced its dependence on electricity sales, allowing it to support energy efficiency, rooftop solar and other changes affecting the traditional municipal revenue model.
- **Multidisciplinary capabilities:** Combining engineering expertise with economics, policy, data, carbon accounting, design and project management enabled SEM to address the interconnected technical, financial, regulatory and social dimensions of energy reform.
- **Evidence-based decision-making:** Strong research, data and modelling capabilities helped SEM build credible business cases, inform policy, monitor progress and improve the bankability of projects.
- **Transversal collaboration:** Close working relationships with EGD and other City departments enabled SEM to draw on the operational, financial, legal and procurement expertise required to move projects from concept to implementation.
- **External partnerships:** Collaboration with organisations such as GreenCape, C40, GIZ and Sustainable Energy Africa expanded access to specialist knowledge, emerging practices and external funding opportunities.

The following factors, on the other hand, generally **constrained progress**:

- **Municipal processes were not designed for experimentation:** Supply chain, budgeting, legal and approval processes appropriately prioritise accountability and control, but can make it difficult to test unfamiliar technologies or delivery models quickly.
- **Cooperation dependencies across departments**: SEM could initiate and coordinate change, but implementation often relied on departments with different mandates, priorities, resources and risk tolerances.
- **New projects raised unfamiliar legal and commercial questions:** Initiatives such as municipal generation, IPP procurement, wheeling and embedded generation required the City to develop new contractual, tariff and governance arrangements.
- **Operational capacity remained limited:** A small specialist team could provide focus and agility, but the growing scale and complexity of SEM's portfolio placed pressure on its capacity and increased reliance on transversal support.

Overall, SEM's experience demonstrates that successful municipal innovation depends on creating the right institutional conditions for new ideas to move from experimentation into sustained implementation. Innovation must remain closely connected to operational realities, supported by a clear institutional mandate. Progress should be grounded in reliable data, feasibility studies and sound business cases, with ownership, funding and operational arrangements considered from the outset. Effective reform also requires sustained collaboration across municipal functions and a funding model suited to local circumstances, particularly one that does not rely solely on revenues that the transition may reduce or transform.





5 Concluding thoughts

The CCT's SEM Department demonstrates that municipal utilities need not simply react to a changing energy landscape. By deliberately structuring an internal department dedicated to future-thinking, recruiting diverse capabilities, and aggressively confronting regulatory barriers, SEM has successfully moved the CCT closer to energy resilience. As utilities across developing economies face similar disruptions, the SEM department stands as a case study in structural and operational agility.

This case study was made possible thanks to the support of the City of Cape Town.

GreenCape and the CCT would also like to thank all the stakeholders who contributed information and insights towards the production of this case study.

Images: Bruce Sutherland (City of Cape Town), Energy Strategy 2050 Report CCT and Nicholas Fordyce.

For more information and support contact:

GreenCape: info@greencape.co.za
021 811 0250

City of Cape Town: SustainableEnergyMarkets.Enquiries@capetown.gov.za

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

GreenCape