



Power outage



Infrastructure failure



Financial crisis



Reflective city



Robust city



Flexible city



Building redundancy



# Building resilience to energy insecurity: enabling small-scale embedded generation

## Purpose

This case study demonstrates how distribution utilities, i.e. municipalities, can successfully and sustainably introduce embedded generation into their systems, policies and financial models, while ensuring they can provide electricity to everyone, including the poor.

It uses Cape Town, a city in South Africa (SA), as an example and discusses:

- the impact of increased electricity costs and load shedding on the city;
- how the municipality responded, with a specific focus on renewable energy small-scale embedded generation;

- how the process has been replicated in other municipalities across SA; and
- how this response can build resilience to future energy insecurity.

It specifically highlights **six levers** to drive this transition (see box on the right) and demonstrates the **importance of collaborative approaches to build resilience**.

It also highlights **information that can support other SA municipalities to replicate the process**, which may be critical given that Eskom has initiated load shedding once again in 2018/9 and is seeking a 30% electricity price increase from 1 April 2019 onward.

### LEVERS TO DRIVE SMALL-SCALE EMBEDDED GENERATION

-  Technical support & knowledge for utilities & the government
-  Provision of regulatory & policy certainty to guide market growth
-  Creation of technical standards to ensure quality of implementation
-  Growth of local skills base to service the growing market & create jobs
-  Development of new finance models to streamline investment
-  Stimulation of private sector investment through the removal of information asymmetry

Cape Town aspires to be a resilient city and is working in partnership with 100 Resilient Cities (100RC), pioneered by the Rockefeller Foundation. Cape Town is developing a roadmap to enable the city to become more resilient to growing physical, social and economic challenges. This case study is part of a series highlighting how Cape Town is building resilience.



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## Problem

In 2008, 2014/5 and 2018/9, load shedding across SA demonstrated the economic impact of power outages and failed infrastructure on investor confidence and risk to business operations. Stage 1 to 3 load shedding costs the SA economy anywhere between R20 billion to R80 billion per month (US\$1.5 billion to US\$5.8 billion per month).

To mitigate the economic and social impacts of load shedding, there has been a large increase in demand for viable alternative energy sources, driven by rapidly increasing electricity prices

and significant decreases in the price of renewable energy (RE).

This clean energy revolution presents SA with an exciting opportunity to tackle numerous issues linked to the universal provision of safe and affordable energy to all citizens. However a leapfrog transition from traditional “dirty” energy to a more sustainable technology also represents a significant challenge for municipalities whose current business model depends on electricity sales as a core revenue source.

As a result of losing customers to alternative sources such as rooftop photovoltaic (PV), tariff prices for the remaining customers will need to increase in order to cover the grid and infrastructure maintenance costs. This creates further incentive to use RE sources. This, in part, has driven many SA municipal distribution utilities to the verge of what is known as the “utility death spiral”.

This required an intervention to allow consumers to build resilience to electricity insecurity, whilst ensuring an adequate municipal budget. This process and its impact is discussed below.

## Solution

Abundant sunshine across SA means that solar energy offers a uniquely positioned solution. The relative **affordability (increasingly so) and simplicity of solar PV power means that it can be installed on nearly every rooftop.**

As a result, the Small-Scale Embedded Generation (SSEG) market is dominated by rooftop solar PV. It is estimated that current installed capacity in SA is ~700MW in total. More than 200MW’s worth of solar PV modules were sold or installed in SA in 2018, and, with continued load-shedding cycles and electricity price increases, **SA could possibly exceed 1GWp of rooftop solar PV installations by the end of 2019.**

These developments are set to transform SA’s energy market from a monopoly model to a distributed generation model made up of multiple smaller generators, buyers and sellers. In turn, these developments create significant opportunities for investors and businesses, in particular, equipment suppliers, project developers, technical advisors and financial investors.

However, unlocking this transformation requires extensive collaboration between several local, provincial and national partners. Local municipalities have a chance to play a proactive role in the shifting energy landscape by creating the rules, regulations and tariffs to promote the uptake of SSEG, while creating futureproof, connected, climate adaptive municipalities.

In line with this, the City of Cape Town and the Western Cape Government formulated a process to allow SSEG. This was done with the support and technical guidance of **GreenCape**, a technical not-for-profit organisation which supports the growth of green businesses.

The processes used to support the transition to SSEG, including the development of regulations and tariffs, is summarised, graphically, on page 3.

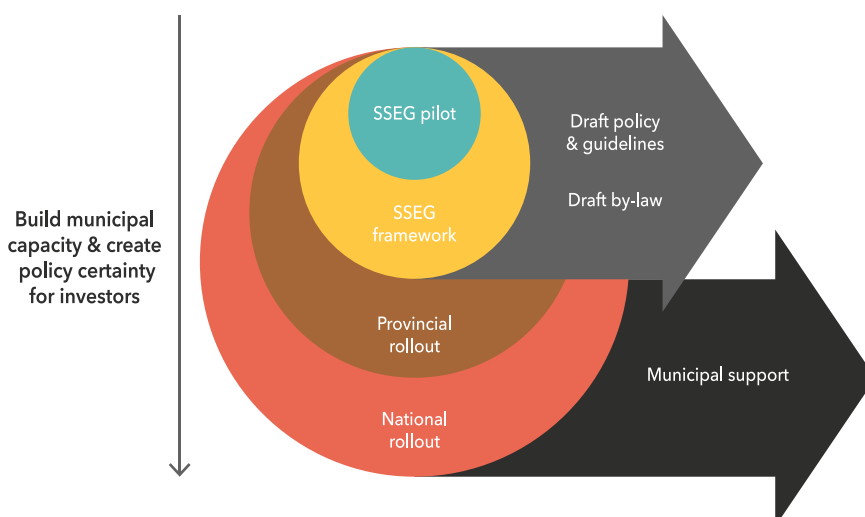
### 1. Piloting the process

The City of Cape Town was one of the first municipalities in SA to develop a SSEG policy, guidelines and by-law and have a SSEG (i.e. feed-in) tariff approved on a pilot basis by the National Energy Regulator of SA (NERSA).

It initiated a pilot in 2012 with three domestic households to prepare the municipal systems and processes to accommodate the SSEG requirements. This pilot was successful and NERSA has subsequently approved the SSEG tariffs of other municipalities from 2015, subject to the condition that these tariffs must conform to any SSEG regulations that may be promulgated in the future (these are currently in draft form).

### 2. Developing the SSEG framework

The Western Cape Government and GreenCape supported local municipalities to build capacity related to SSEG whilst creating policy certainty for investors.



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**STANDARD DOCUMENTS:**

- SSEG contract
- SSEG application form
- SSEG commissioning report
- SSEG decommission report
- SSEG guideline requirements for embedded generation

**ADDITIONAL DOCUMENTS:**

- Municipal SSEG tariff design
- Summary report on solar PV in municipalities (i.e. how this has worked in practice)
- Municipal walkthrough (i.e. answers to frequently asked questions)
- Creating equity in solar PV (i.e. its use for low income electrification)
- SSEG-approved inverter and equipment (NRS 097-2-1-2010)
- SSEG application checklists (i.e. general technical safety/ application)
- SSEG commissioning report with tests
- Municipal by-law amendments for SSEG
- Local distribution utility RE policy
- All documents (standard and additional) are available from GreenCape's website.

Based on the City of Cape Town's experiences and process, GreenCape produced several supporting documents for municipalities (see box above).

This includes standard templates which allow municipalities to add necessary details and rework the document to fit their municipal context - specifically a draft

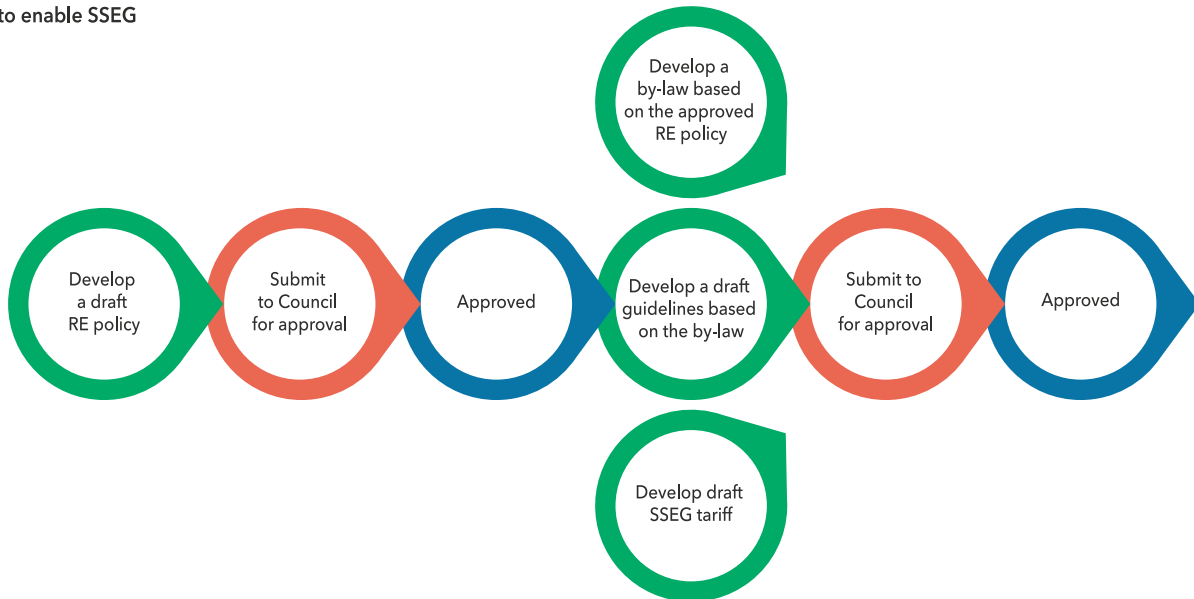
RE policy, SSEG guidelines and by-laws that can be revised (if necessary) and adopted by the relevant municipal council.

These guidelines were adopted by the SA Local Government Association (SALGA) and the Association of Municipal Electricity Utilities (AMEU), and can now be used by

any municipality in SA. The process for municipalities to follow is summarised on page 4.

GreenCape can provide further advice and support on the process belows on request.

**Process to enable SSEG**



**3. Rolling out the SSEG framework in the Western Cape**

Technical support was provided to individual municipalities across the Western Cape through the Western Cape Government Energy Security Game Changer.

Significant resources were invested in engaging with all the Western Cape municipalities to ensure that the senior staff, specifically the Municipal Manager

and Chief Financial Officer (CFO), as well as the electricity staff, were aligned in terms of enabling SSEG. In addition, GreenCape, with Provincial Treasury, assisted local municipalities in designing a tariff that minimises revenue losses.

During the early period of engagement, many municipalities were cautious owing to the possible impact of SSEG installations on their revenue. The key message communicated was this:

**“With rising electricity costs and declining solar PV costs, it is better for the municipality to be proactive in allowing SSEG and offering a feed-in tariff than for the customers to go off the grid.”**

- Jack Radmore, GreenCape Energy Programme Manager

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This was a particularly relevant message for CFOs. An additional message was that SSEG could benefit the local economy through job creation and improving energy security.

### 4. Rolling out the SSEG framework across SA

GreenCape worked (and continues to work) closely with SA Local Government Association (SALGA), the Association of Municipal Electricity Utilities (AMEU), as well as the German development agency "Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH" (GIZ) and Sustainable Energy Africa (SEA) to develop a national rollout strategy.

#### Impact

##### Growing investment and resilience within Cape Town

Changes in municipal regulations governing SSEG system installations have

improved market conditions for investors, equipment suppliers, project developers and technical advisors. This has:

- Accelerated private investment in small-scale RE; and
- Increased the capacity of installed RE.

This has unlocked investment in solar PV in Cape Town, with a minimum of ~18MW of solar PV registered by October 2018.

These investments have greater implications in terms of resilience:

- Improved security of electricity supply (for individual consumers in Cape Town and the city as a whole); and
- Economic resilience: business continuity despite load shedding and increased electricity costs.

### Expansion to other municipalities in the Western Cape and SA

This approach has been successfully replicated within the Western Cape, with a total of 22 of 25 municipalities that distribute electricity allowing SSEG by October 2018. Of these, 18 municipalities also have a NERSA-approved feed-in tariff in place.

It has also been replicated across SA, with 18% of local electricity distribution utilities having the regulations and tariffs in place to allow SSEG. This development complements other regulatory changes that, together, contribute to a freer, more 'liberalised' electricity sector, in which municipalities and end users are more empowered in their energy options.

## Lessons learned

This approach has successfully demonstrated the feasibility of supporting municipalities to enable SSEG, both in Cape Town and in several other SA municipalities.

**"Since 2015, about 70MW of solar PV has been installed in the [Western Cape] Province. It is now legal in 22 municipalities to connect rooftop solar PV to the electricity grid, with 18 of the 22 municipalities having nationally approved tariffs in place, meaning users can be compensated for feeding their surplus power back into the municipal electricity grid."**

Helen Zille, Western Cape Premier

The approach has also been successfully replicated, but, based on Cape Town's experience, it requires partnerships and

targeted municipal support from several relevant bodies.

This is required to:

- acquire high-level buy-in from municipal decision makers, primarily through statutory forums (e.g. Mayco, MM Forums and CFO Forums in SA);
- meet with municipalities on an individual basis to assess their context (first the technical staff i.e. electricity department, followed by the CFO);
- encourage the adoption of the SSEG guideline documents (see process below); and
- provide direct follow up support, especially on tariff issues.



For more information and support contact GreenCape's energy sector desk: [energy@greencape.co.za](mailto:energy@greencape.co.za) or call (021) 811 0250. Additional resources on improving water resilience are available from: [www.greencape.co.za/content/sector/energy-services](http://www.greencape.co.za/content/sector/energy-services)