



# **Small-Scale Embedded Generation**

A Guide for South African Municipal Distributors

# Small-Scale Embedded Generation (SSEG)

## Guide for South African Municipal Distributors

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# Foreword

*"Driving sustainable local energy transition through small scale embedded generation"*

The South African energy transition is well underway, and the acceleration of Small-Scale Embedded Generation (SSEG) is contributing significantly towards it. The increasing installation of embedded generation, particularly solar rooftop PV is a reality that municipal distributors have to adjust to. In this regard, municipal distributors need to be prepared so that they can accommodate SSEG in a safe and financially sustainable manner. Additionally, we need to ensure that the benefits of SSEG are harnessed, and any negative technical or financial impacts are mitigated.

The South African Local Government Association (SALGA) in collaboration with Sustainable Energy Africa (SEA), the Department of Mineral Resources and Energy (DMRE) and the South African-German Energy Programme (GIZ-SAGEN) under the SSEG Support Programme, have developed a practical guideline to help municipalities establish and improve their current SSEG processes. This guideline outlines the high-level institutional, operational and staff changes required to accommodate SSEG safely onto the municipal network. It further highlights the processes and resource documents endorsed by SALGA and the Association of Municipal Electricity Utilities (AMEU) for this purpose; as well as outlining the support facilities and resources that are available to support municipalities to achieve SSEG readiness.

In pursuit of the SALGA Energy Summit Declaration of 2018, we encourage our members to use this valuable implementation guide as a resource towards furthering their energy transitions.

**Mr Xolile George**

Chief Executive Officer,  
South African Local Government Association (SALGA)





# Message of Support

As the Small-Scale Embedded Generation (SSEG) market segment grows, it is vital that municipalities are prepared for the challenges that come with the acceleration of embedded generator installations.

It is important to acknowledge and praise the team who successfully developed this SSEG Guide for South African Municipal Distributors and commend the practical and proactive steps taken to ensure municipalities are ready to capitalise on the burgeoning SSEG market segment.

There are significant benefits to the increased uptake of SSEG, but to realise these fully, municipalities and installers must be trained on the topic and supported with comprehensive guidelines and resources. The Guide for South African Municipal Distributors sets the foundation and will assist distributors to take advantage of the growth in the sector.

This resource is user-friendly and comprehensive and outlines the high-level institutional and operational changes that are necessary. Practicalities of the processes, requirements, documents, and capacity needed to accommodate SSEG onto the network are all outlined as well as detailing the documents endorsed by SALGA and the AMEU to accommodate SSEG onto the network without negative technical or financial impacts.

Capacity building of our members has always been a key goal for the Association, and the SAPVIA **PV GreenCard programme** is built to support and promote safe and quality installations and will further complement the ambitions of this guide. The PV GreenCard programme is based on training, accreditation, standardisation and documentation of embedded solar PV installations. There are currently 320 installation companies registered with some 1200 installers trained across the country through the programme.

I am certain that the SAPVIA PV GreenCard programme combined with the Guide for South African Municipal Distributors will ensure that we build a viable and sustainable SSEG market segment.

**Mr Niveshen Govender**

Chief Operations Officer (COO),  
South African Photovoltaic Industry Association (SAPVIA)



# 1. Introduction

## 1.1. SSEG installations in municipal distributor areas are accelerating

The acceleration of embedded generator installations, particularly solar photovoltaics (PV), is a trend municipal distributors across the country are having to adjust to. Much of this is small-scale embedded generation (SSEG), which is up to 1 MW in capacity. This trend is expected to continue as solar PV prices decrease and Eskom power prices rise steadily, which corresponds with a global acceleration of such installations. Some distributors are reporting as much as a doubling of numbers of SSEG systems each year. While these developments have many benefits, accelerating SSEG connections can bring a range of challenges to municipal distributors, including technical, financial and staff capacity issues.

## 1.2. Installed capacity of SSEG

The South African Local Government Association (SALGA) recently conducted a survey to estimate total installed SSEG capacity in municipal distributor areas, and whether such distributors have processes in place to assess and accept suitable systems onto their networks. The report, *Status of Small-Scale Embedded Generation (SSEG) In South African Municipalities - November 2020 (SALGA)*, estimates total official registered SSEG installation numbers at 3 280 as of November 2020 (Figure 1), with an estimated capacity of 282 MW. However, the actual number of systems installed – registered (legal) and unregistered (illegal) – is likely to be much higher than this. Considering data uncertainties, the SALGA report estimates conservatively the total number of SSEG systems to be about 13 000, amounting to about 330 MW installed capacity in municipal distribution areas. It also acknowledges that these figures could be much higher – for example, one study in the City of Johannesburg suggest over 30 000 systems in this metro alone (PEETS 2020), and some industry experts estimates indicate totals of as much as 700 MW across the country.

## 1.3. Municipal distributor response to SSEG to date

The SALGA report shows that some municipal distributors have responded to the increasing presence of SSEGs as of November 2020, having formal SSEG application processes in place or otherwise accommodating SSEG, but 66% (109 out of 165 licensed distributors) had not (Figure 2). For more information on SSEG in municipalities, refer to: SALGA 2020. Status of Small-Scale Embedded Generation (SSEG) In South African Municipalities – November 2020. South African Local Government Association, Tshwane.

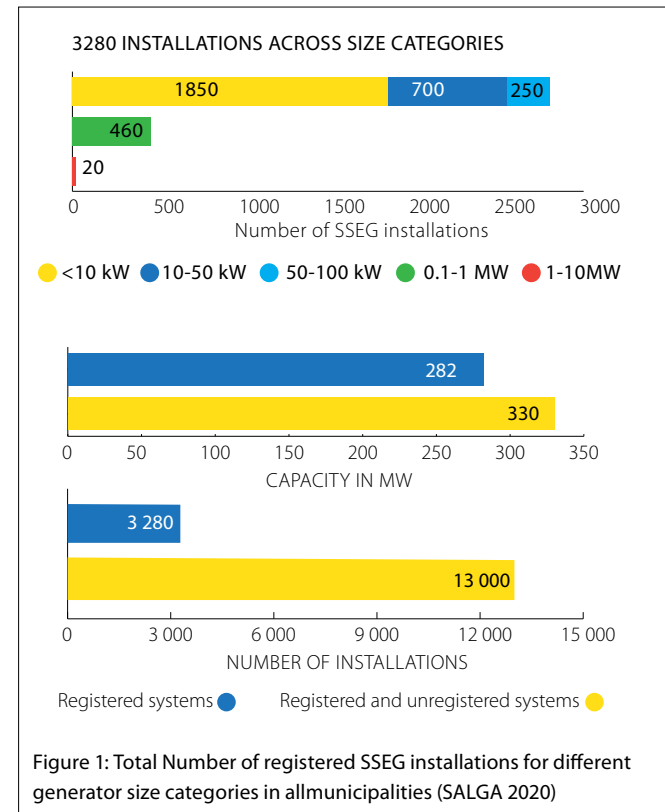


Figure 1: Total Number of registered SSEG installations for different generator size categories in all municipalities (SALGA 2020)

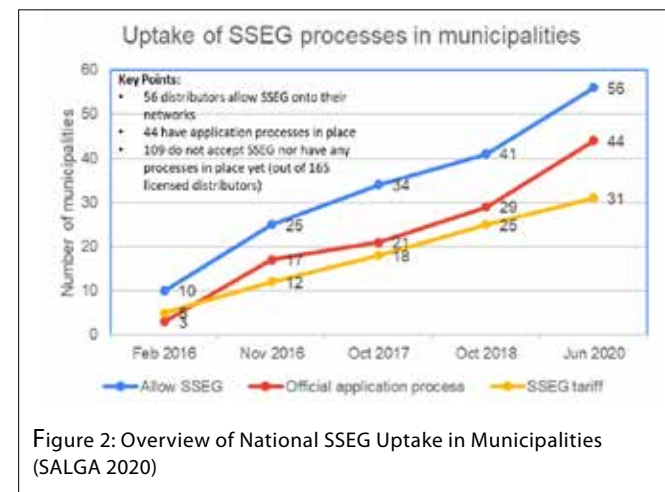


Figure 2: Overview of National SSEG Uptake in Municipalities (SALGA 2020)





## **SMALL SCALE EMBEDDED GENERATION**

**VIDEO for a quick overview of SSEG in  
Municipal Distributor Areas.  
Produced specifically for use by  
South African Municipal Distributors –  
covers all key aspects of SSEG trends,  
technologies, revenue impact and  
customer business case, including  
how distributors can respond.**

[https://youtu.be/\\_HQdd6Qh31o](https://youtu.be/_HQdd6Qh31o)



## **1.4. Technical and revenue impact considerations for distributors**

Municipal distributors clearly need to respond to the growing presence of SSEG on their networks. Indeed, distributors are obliged to provide “open and non-discriminatory access” to the network for such generators (Distribution Network Code para 4(1)). On the one hand, responding positively to these developments has the potential to be of benefit to the municipality, the customer and the local economy if handled properly. On the other hand, having generators at the customer end of the network is new to many municipal distributors, and there may be concerns around safety, power quality and revenue impact from the increased presence of SSEG on their networks, amongst other things.

It has been found that the worst approach for a distributor is to do nothing – to have no application process or SSEG tariff in place. In these situations, illegal systems tend to flourish, there is no control of important technical aspects, and revenue impact is worsened – sometimes through illegally reversing meters.

## **1.5. Ready-to-use standards, specifications and approaches**

Significant work has been undertaken in recent years to ensure that the necessary standards, specifications and approaches are available to enable SSEG connections in a responsible, technically sound and legal manner. In addition, SSEG tariff setting approaches have been developed which recover network costs for the distributor yet are fair to the customer and are in keeping with NERSA tariff setting principles. These approaches and documents are described later in this document.

## **1.6. Purpose of this guide**

This document describes how municipal distributors can adjust to a future where SSEG is a more significant part of their network. It starts by outlining the high-level institutional and operational changes that are necessary, and then moves to the practicalities of the processes, requirements, documents, and capacity needed to accommodate SSEG onto the network without negative technical or financial impacts. It describes the documents endorsed by SALGA and the AMEU for this purpose, as well as noting the capacity building support available.

## 2. Becoming an SSEG-ready municipal distributor: Process of change

### 2.1. Establishing the basics (first steps) and the move to full municipal SSEG readiness

There are a number of steps which can be implemented in the short term for a municipal distributor to respond to the current SSEG installation trends. These are relatively easy to do, and documentation and other support is available for this. Other measures to become fully SSEG-ready such as changes to the organogram, generally take longer. Given that the rollout of SSEG is not waiting for municipal distributor readiness, it is advisable to start with the first steps without delay. Overall, municipal readiness can be described in these categories:



#### A Institutional readiness

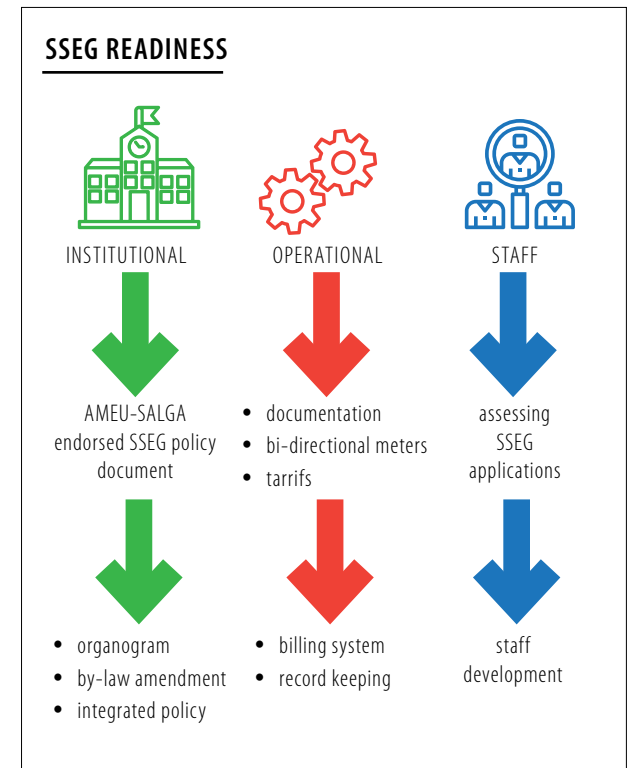
A key **first step** is to develop an SSEG policy which specifies what the distributor allows, does not allow, and the application process for customers to seek permission to install. An existing **AMEU-SALGA endorsed SSEG policy document** can be customised for this purpose. This policy can be communicated to customers and installers as an informal guide even before it has formal approval from Council (remember that SSEG installations are usually not waiting for the distributor to be formally ready).

In the **longer term**, the **municipal organogram** should reflect SSEG (and other sustainable energy) needs, relevant key performance indicators (KPIs) may be introduced for senior staff, and an **SSEG by-law amendment** should be passed to make the policy legally binding on customers. SSEG policy should also be integrated with broader municipal policies, such as around **climate change and the green economy**.



#### B Operational readiness

As a **first step**, the necessary **documentation** can relatively quickly be put in place – such a set has been developed and endorsed by AMEU and SALGA for use, including an *SSEG Application Form*, *Technical Requirements for SSEG* document (which notes all standards and specifications to be complied with), and a *Commissioning Report*, amongst others. In order to accept reverse feed from SSEG customers (which is recommended), **bi-directional meters** should be procured. Suitable **SSEG tariffs** should also be developed for submission to the National Energy Regulator of South Africa (NERSA).



“Establishing a basic, functioning SSEG application process can relatively easily be done by the Electricity (or Energy) Department, and is generally within their mandate.”



## C Staff readiness

**As a first step**, staff need to be trained in **assessing SSEG applications** for permission to connect using the AMEU-SALGA endorsed SSEG Application form, Requirements document, etc.

**In the longer term, staff should be capacitated** on all aspects of SSEG, including knowing how to deal with complex, non-standard applications; specifying and assessing grid impact studies etc.

## 2.2. How to proceed?

In general, most of the first steps noted can relatively easily be mandated and achieved within the Electricity (or Energy) Department. It is beneficial however, to have full municipal buy-in for the process early on so that when policies and by-laws are presented to the Management Committee (Mancom), Portfolio Committees or Mayoral Committees, the members of these bodies are informed and are supportive. A sensible approach may therefore be:

**Start implementing the First Steps noted above, such as:**

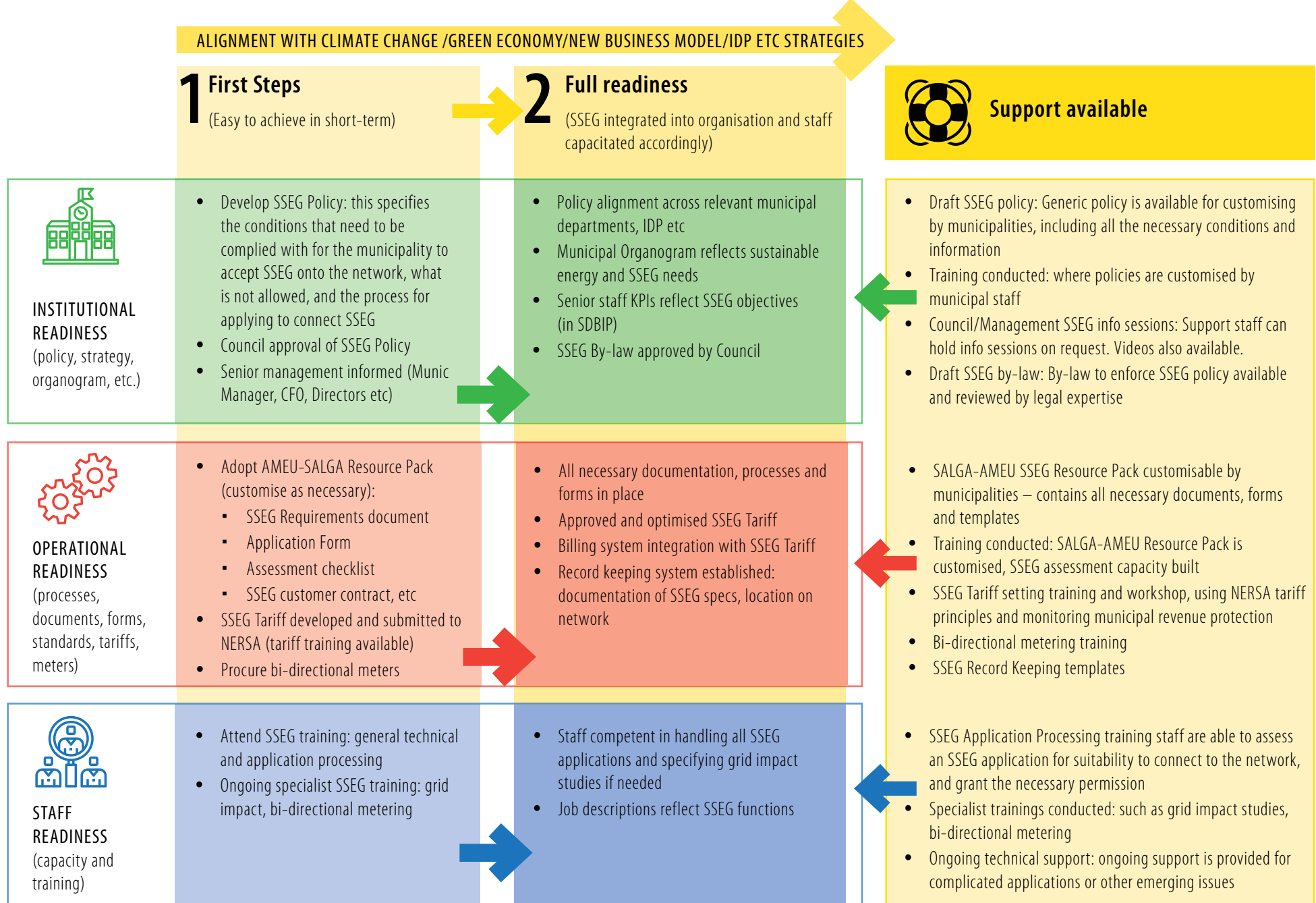
- Identify relevant staff to send on SSEG training which is available:
  - SSEG technical training and SSEG application processing
  - SSEG tariff development training - for tariff submission to NERSA
- Customise and adopt the AMEU-SALGA endorsed SSEG documentation and forms

**Submit an item for noting to Council on the Electricity (or Energy) Departmental SSEG intentions, to prepare them for future submissions.**

**Proceed with council submission of SSEG Policy and by-law when appropriate.**

The flowchart below (Figure 3) provides more detail on the action areas in the three categories of municipal distributor readiness, together with available support resources. Step-by-step implementation information is provided in the following sections.

Figure 3. Municipal Distributor Small-Scale Embedded Generation Readiness (implementation support in following pages)



## 2.3. Step-by-step guide

This section provides more detail on implementing both the first steps and longer-term actions discussed earlier and notes the support available in these areas.

### Develop an SSEG policy, including the technical ‘requirements’ document

This is a good starting point for a municipal distributor. It clarifies what SSEG sizes and parameters the distributor will and will not allow, as well as the process of applying for permission to connect. It is usually in two parts:

1. **Overarching SSEG Policy**, setting the distributor SSEG intentions and policy principles.
2. **Requirements for SSEG document**, which is an appendix to the overarching policy and contains all technical parameters, standards and specifications that are to be complied, including the NRS097 series, SANS10142 and others. This document needs to be comprehensive yet clear for customers and installers. It is one of the most important documents in a municipal distributor’s SSEG process



*Notes:*

- *The ‘Requirements’ document forms an appendix to the overarching policy because it is then easy to update as technology or legislation changes, without going through a council process.*
- *To make the policy legally binding for customers, a by-law amendment is necessary (see later).*



Figure 4: Overarching SSEG Policy

## SSEG policy typically has 2 components:

1

### Overarching SSEG Policy:

Clarifies municipal intentions regarding SSEG, in keeping with national regulatory frameworks, and states municipal SSEG policy principles



<https://www.sseg.org.za/small-scale-embedded-generation-policy/>



### OVERARCHING SSEG POLICY

#### Purpose:

- States the municipality's intentions and policy principles regarding SSEG

#### Content:

- National regulatory environment
- SSEG definition
- Policy principles applicable, including
  - Distributor is accepting SSEG
  - Permission is required to connect
- Compliance with the Requirements Document (which is an Appendix to this policy)
- SSEG tariffs to be applied
- Contractual agreements necessary between the customer and the distributor
- Responsibilities within the municipality

2

### Requirements for SSEG Document

(Appendix to over-arching policy): this is an integral part of the policy and contains all of the technical and other detailed requirements relating to SSEG. It should be an Appendix to the Policy because then it can be updated as national legislation and other technical aspects change without a full council and public participation process.



<https://www.sseg.org.za/ameu-salga-sseg-requirements-for-embedded-generation/>



### SSEG REQUIREMENTS (APPENDIX TO POLICY)

#### Purpose:

- Specify technical and other details of what SSEG the municipality allows, does not allow, and the process for application

#### Content:

- Technical compliance requirements for connection to ensure:
  - Safety of installations
  - Power quality
- Applicable specifications and standards (NRS097, SANS10142 etc)
- Licensing and registration requirements
- Options when technical parameters are exceeded
- Application process details



Customisable templates and support available

SALGA-AMEU Template available can be easily customised and adopted



Endorsed by SALGA-AMEU



<https://www.sseg.org.za/small-scale-embedded-generation-policy/>

SALGA-AMEU Template available can be easily customised and adopted



Endorsed by SALGA-AMEU



<https://www.sseg.org.za/ameu-salga-sseg-requirements-for-embedded-generation/>







Figure 5: Requirements for SSEG document

**The Requirements for SSEG Document draws on a range of technical specifications and standards. The key ones are described here.**



*Note that the NRS 097-2 documents are industry specifications, not national standards, and thus are not automatically mandatory. The distributor makes them mandatory through their inclusion in policy, and enforcement of the policy via a by-law.*

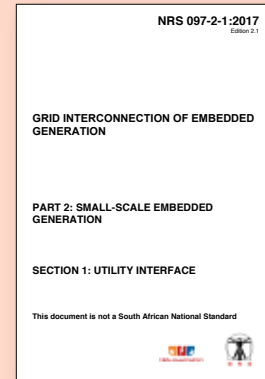


#### NRS 097-2-1: SSEG UTILITY INTERFACE

This specification covers the power quality and safety aspects of the SSEG at the point of utility connection. For PV systems, all inverters are required to be certified for compliance with this specification.

##### Content:

- **Power quality** (parameters in accordance with NRS048), including
  - Voltage ranges, unbalance, harmonics, fault levels, DC injection, flicker etc
- Synchronisation with the utility power
- **Safety** disconnect, in particular **anti-islanding**
- Labelling requirements



<https://www.sseg.org.za/grid-interconnection-of-embedded-generation-nrs-097-2-12017/>

#### SANS 10142-1-2 THE WIRING OF PREMISES:

Specific requirements for embedded generation installations connected to the low voltage distribution network

**(DRAFT – not yet released as of end 2020)**

**This standard ensures safe operation of embedded generators under normal and fault conditions**

It covers the installation and wiring of all aspects of embedded generators, including storage, up to the point of utility connection

#### NRS 097-2-3: SIMPLIFIED UTILITY CONNECTION CRITERIA FOR LOW VOLTAGE GENERATORS

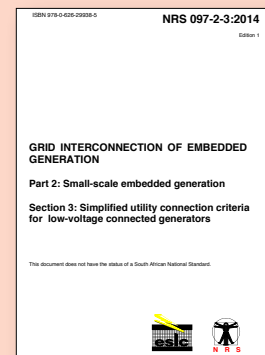
This specification details generation sizes (individual and cumulative) that can be installed without negative grid impacts (and without having to do detailed grid studies)

##### Content:

- Shared feeder SSEG size limitations
- Dedicated feeder SSEG size limitations
- Flowchart to aid decision on ability to connect



*Note: If an SSEG falls outside of these parameters, this does not mean it should be refused, but rather that more detailed studies need to be done.*



<https://www.sseg.org.za/grid-interconnection-of-embedded-generation/>

#### OTHER RELEVANT STANDARDS

**Grid Connection Code Requirements For Renewable Power Plants:** the NRS 097 documents reflect the provisions of the Grid Code (in case of conflict, the Grid Code takes precedence, as it is a mandatory document)

**NRS 048 – Power Quality:** The NRS 097-2-1 reflects the provisions in this document



<https://www.sseg.org.za/ameu-salga-sseg-requirements-for-embedded-generation/>



<https://www.sseg.org.za/ameu-salga-sseg-requirements-for-embedded-generation/>







## What size PV SSEG systems can connect to a distribution network?

Distributors need to check several parameters before they approve the connection of an SSEG. Below is an indication of systems that will typically be accepted for connection:

### CUSTOMERS ON SHARED FEEDERS:

KEY CRITERION: SSEG maximum size is 25% of circuit breaker capacity

**Residential Example 1:** 60 Amp 1-phase supply  
Max SSEG size 3.5kWp



**Residential Example 2:** 80 Amp 3-phase supply  
Max SSEG size: 13.8kWp



### CUSTOMERS ON DEDICATED FEEDERS:

KEY CRITERION: SSEG maximum size is 75% of Notified Maximum Demand (NMD)

**Small Commercial Example:** NMD: 450kVA  
Max SSEG size 337kWp



**Large Commercial Example:** NMD: 3500kVA  
Grid Study needed for SSEG over 350kVA



### Other checks to be done:

(if SSEG systems do not comply with the below, they may be refused permission to connect, even if they are within the acceptable size limits)

1. Inverter certification (NRS097-2-1)
2. Total SSEG capacity of transformer and feeder not exceeded (NRS097-2-3)
3. NERSA registration/license compliance
4. <350kVA (otherwise impact study needed)
5. LV connected (MV systems need impact study)
6. Fault level, earthing, phase balancing
7. Net consumer or net generator



## How to develop a process to assess and approve SSEG applications from customers

The following three documents are important in this regard:

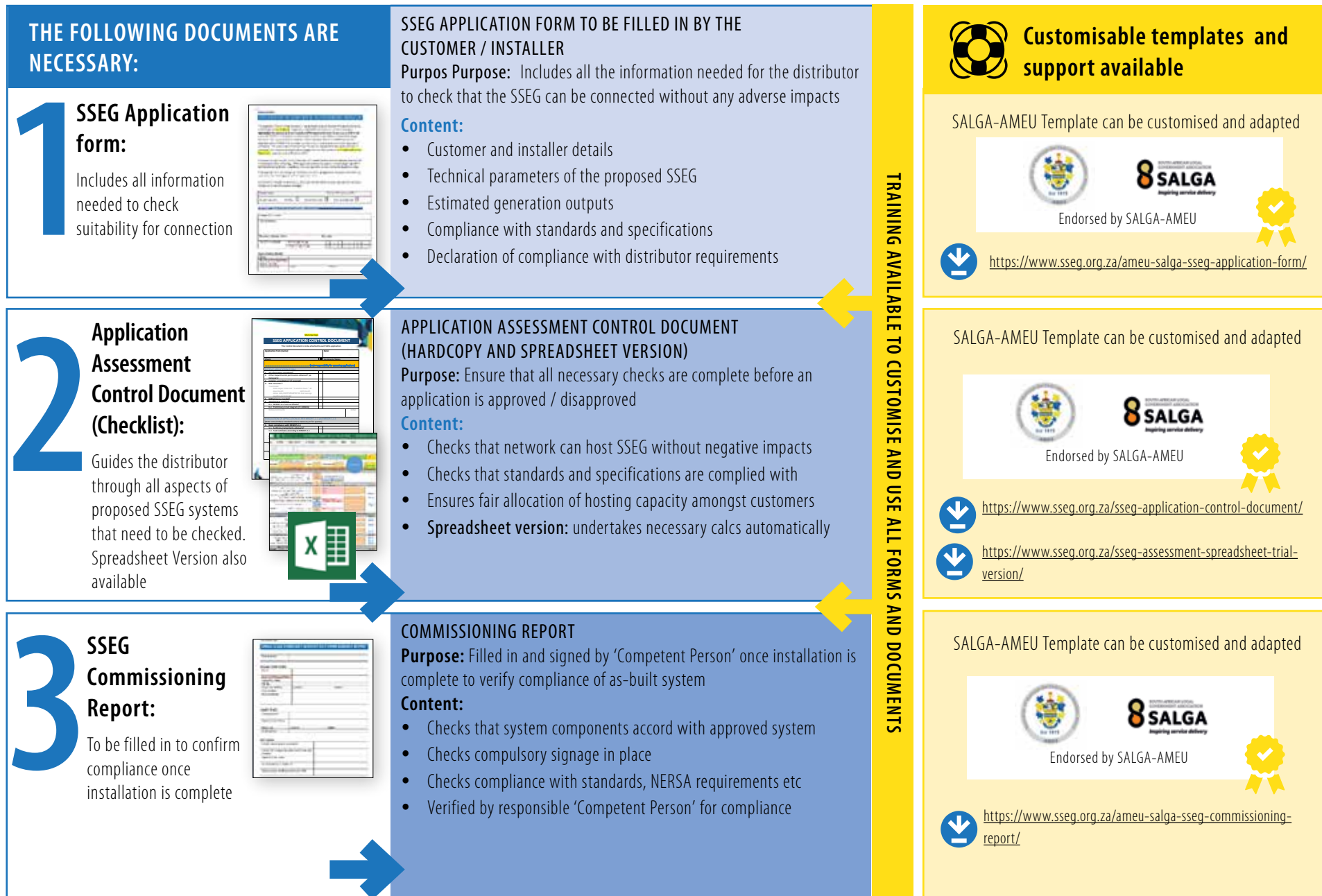


1. **SSEG Application Form** – the customer and/or installer fills this in. It contains enough information for the distributor to determine if the SSEG can be connected without any negative impact.
2. **Application Assessment Control Document (Checklist)** – used by the municipal distributor to check all important parameters of the proposed SSEG for compliance and undertake the necessary calculations regarding potential impact on the local network. **A spreadsheet version** is also available, which performs these calculations automatically.
3. **SSEG Commissioning Report** – filled in by the customer or installer after installation is complete and signed off by a ‘Competent Person’ to verify that the as-built system complies with the applicable requirements, standards and specifications. Municipalities define a ‘Competent Person’ differently, with some requiring a Pr.Eng or Pr.Tech.Eng to sign off, for example, and others allowing a suitably certified installer to do this. From a legal standpoint, both of these approaches are acceptable (see *Municipal Legal Framework Applicable to Small-Scale Embedded Generation*, Cliffe Dekker Hofmeyr, SALGA, 2018).





Figure 6: Develop a process to assess and approve SSEG applications





## Establishing the necessary legal framework



1. It is required by law that SSEG customers sign a contract with the municipal distributor. An AMEU-SALGA endorsed contract has been developed for this purpose. It combines all the items that were previously covered in separate Connection Agreements and Supplemental Contracts.
2. An SSEG Electricity By-Law amendment is necessary to make the municipal distributors SSEG Policy legally binding for customers. This amendment does not need to be in place before SSEG applications are accepted, and many municipalities run a well-functioning SSEG process while the by-law amendment is undergoing the (often slow) formal approval and adoption process.

Refer to Figure 7 for schematic and more information.





Figure 7: How to ensure the necessary Legal Framework is in place

## THE FOLLOWING DOCUMENTS ARE NECESSARY:

### 1 Contract for Connection of SSEG

Between the customer and the distributor:

Covers the requirements of both a Connection Agreement and a Supplemental Contract



### CONTRACT FOR CONNECTION OF SSEG TO BE SIGNED BY THE CUSTOMER AND DISTRIBUTOR

**Purpose:** Specifies and makes binding the rights and obligations of both the customer and the distributor.

#### Content:

- Includes both the requirements of a **Connection Agreement and Supplemental Contract** in one document.

Developed for distributors by *Cliffe Dekker Hofmeyr*.



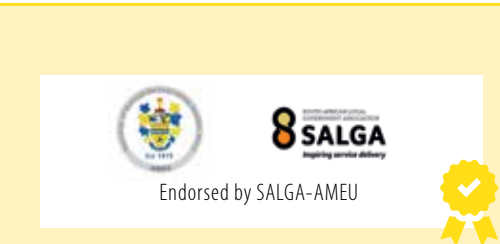
**Customisable templates and support available**



<https://www.sseg.org.za/contract-for-connection-of-an-embedded-generator/>



<https://www.sseg.org.za/sseg-electricity-supply-bylaw-amendment-guide/>



<https://www.sseg.org.za/municipal-legal-framework-applicable-to-small-scale-embedded-generation/>

### 2 SSEG By-Law:

Provides Electricity By-law amendment text that makes compliance with distributor SSEG policy legally binding on the customer



### SSEG BY-LAW (AMENDMENT)

**Purpose:** Makes the provisions in the distributors SSEG Policy legally binding upon customers

#### Content:

- Asserts that customers are not allowed to connect SSEG without express permission of the distributor
- Requires that the distributors policy regarding SSEG be complied with

Developed for distributors by *Cliffe Dekker Hofmeyr*.

## INFORMATION DOCUMENT:

### Legal Framework Applicable to SSEG:

Covers all relevant national and local legislative frameworks that apply to SSEG



### MUNICIPAL LEGAL FRAMEWORK APPLICABLE TO SMALL-SCALE EMBEDDED GENERATION

**Purpose:** Contextualises all SSEG by-law and policy guidelines within relevant national and local legislative frameworks.

#### Content:

- Clarifies the purpose of policies and by-laws around SSEG
- Reviews key aspects of national and local legislation (Constitution, OHS Act, ERA, MSA etc), and notes their relevance to SSEG

Developed for distributors by *Cliffe Dekker Hofmeyr (SALGA 2018b)*.



## Develop tariffs for SSEG

A sensible SSEG tariff will ensure that customers with SSEG continue to contribute their share of network fixed and variable costs. A balanced tariff also considers the interests of the customer and their SSEG business case. An SSEG tariff typically includes a fixed charge, variable charge, and export credit. It is recommended that export is accepted and credited by municipal distributors, as this has advantages for both the distributor (who on-sells this power at a profit) and the customer, whose business case is improved by such credit. Training on SSEG tariff setting is available, supported by a spreadsheet tool developed for this purpose. SSEG tariffs need to comply with NERSA tariff principles and rules.

Refer to Figure 8 for schematic and more information.

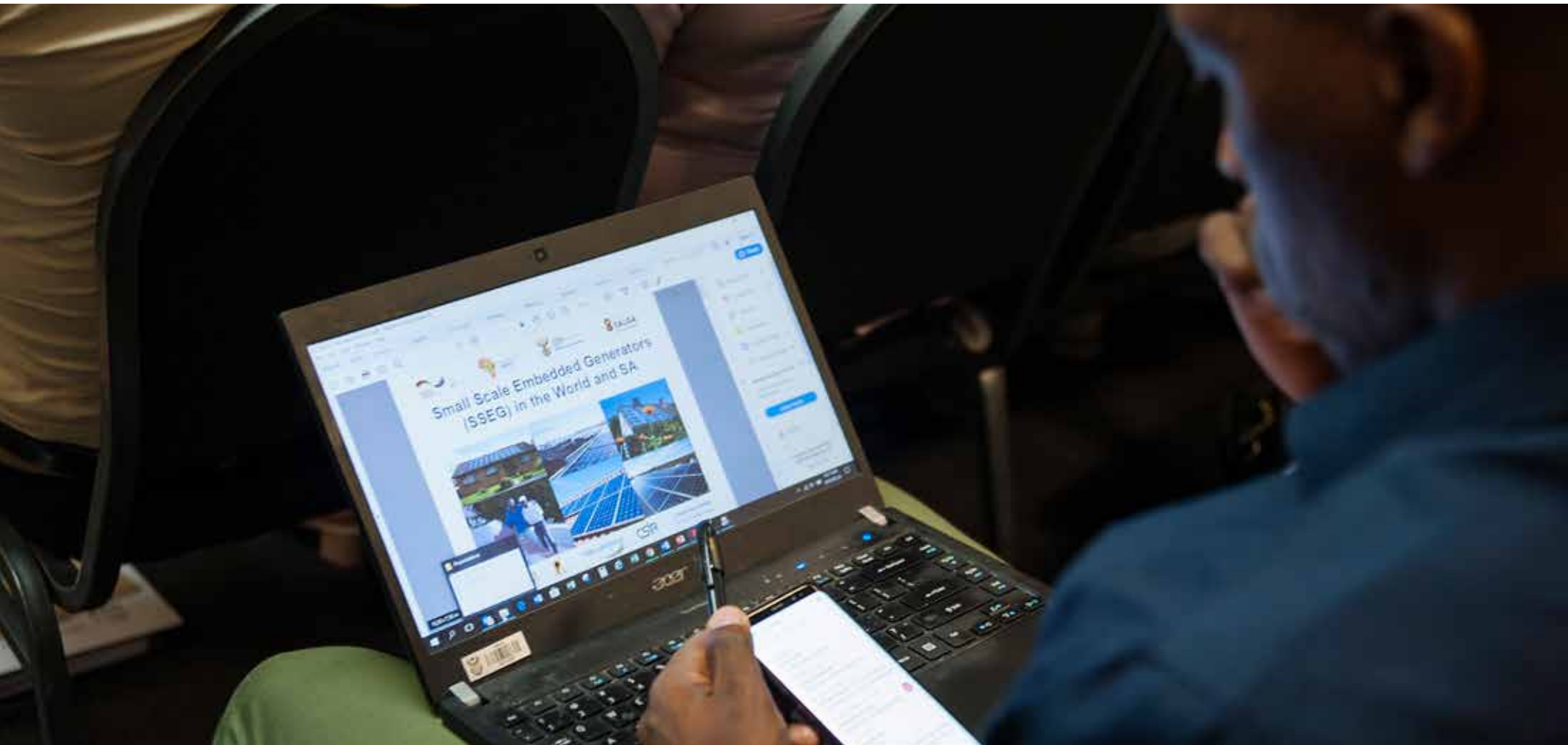




Figure 8. Setting tariffs for SSEG

**Information document:****SSEG Tariff Setting Guidelines:**

An overview of setting appropriate tariffs for SSEG

**SSEG Tariff Setting Guidelines**

**Purpose:** Explain how suitable SSEG tariffs can be set:

- To be cost reflective
- To protect municipal revenue
- To be fair to the customer

**Content:**

- Tariff structures suitable for SSEG
- The use of fixed and variable charges
- Revenue impact case studies



**Customisable templates and support available**



<https://www.sseg.org.za/tariffs/>

**Tariff setting model:****SSEG tariff modelling spreadsheet:**

Enables distributors to assess the suitability of different tariffs for their customer base

**SSEG tariff modelling spreadsheet**

**Purpose:** Support tariff setting by modelling impact of different tariffs on distributor and customer

**Method:**

- Uses actual customer data from distributor
- Checks revenue impact for different tariffs
- Allows different tariff structures
- Cost-of-supply data included if available
- Allows advanced load and financial inputs



**Training available to develop suitable tariffs using the spreadsheet model**

<https://www.sseg.org.za/municipal-revenue-impacts/revenue-impact-tool/>



**Tariff setting accords with NERSA tariff principles**

<https://www.sseg.org.za/municipal-revenue-impacts/revenue-impact-tool/>

**Video:****How to Set Solar PV SSEG Tariffs (10min)****VIDEO: How to set Solar PV SSEG Tariffs**

Produced specifically for South African Municipal Distributors to cover the basic principles of SSEG tariff setting



<https://youtube/v0ra-NFqByY>



## Specifying and evaluating grid impact studies

Grid impact studies need to be conducted (usually by the customer) if the SSEG application assessment reveals that the parameters of the NRS097-2-3 Simplified Connection Criteria specification (which is referred to in the Requirements for SSEG policy document) have been exceeded, and therefore the potential for negative grid impact exists. Useful tools available for this are:



1. Grid Impact Study Specification Guide – allows a municipal distributor to specify the parameters and acceptable ranges to be used in such a study (such as voltages, thermal ratings, fault levels, generator rejection etc.).
2. Grid Study Check sheet – provides distributors a systematic way of assessing a grid impact study presented to them.
3. Recommended practice for assessing connection of SSEG – describes a simple hand calculation and lookup table grid study methodology for SSEG up to 600kVA (beyond this a full study using simulation software will be necessary). Developed by MPE (2018).

Refer to Figure 9 for schematic and more information.



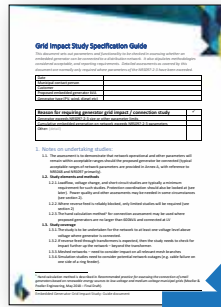


Figure 9. Undertaking Grid Impact Studies for SSEG where more detailed assessments are required

The following documents are useful:

## 1 Grid Impact Study Specification Guide:

To instruct customers on parameters to be checked in the study



### SSEG GRID IMPACT STUDY SPECIFICATION GUIDE

**Purpose:** Clarifies what parameters are to be checked in a grid impact study – a distributor provides this document (and necessary network data) to the customer where grid impact needs to be assessed before an SSEG can be approved

#### Content:

- Parameters to be checked in a grid impact study
- Acceptable ranges for these parameters (based on NRS048, NRS097 etc)
- Data that the distributor will need to provide to the customer



Customisable templates and support available

Training available on Grid Impact Studies



<https://www.sseg.org.za/grid-impact-study-specification-guide/>

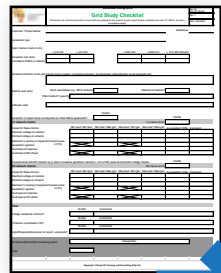
Specification available (can be customised)



<https://www.sseg.org.za/grid-impact-study-specification-guide/>

## 2 Grid Study Checksheet:

For use in assessing studies submitted by customers



### GRID STUDY CHECKSHEET

**Purpose:** To check that relevant parameters in the specification have been assessed and are in range

#### Content:

- List of all key parameters and other important checks relevant to an acceptable study

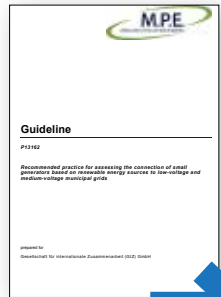
Checksheet available for use



<https://www.sseg.org.za/grid-impact-study-specification-guide/>

## 3 Recommended practice for assessing connection of SSEG:

A hand-calculation method of assessing impact of SSEG connection



### RECOMMENDED PRACTICE FOR ASSESSING THE CONNECTION OF SMALL GENERATORS BASED ON RENEWABLE ENERGY SOURCES TO LOW-VOLTAGE AND MEDIUM-VOLTAGE MUNICIPAL GRIDS (MPE, 2018)

**Purpose:** Enables an impact study via simple hand calculations and lookup tables (as opposed to a full grid simulation study)

#### Content:

- Explains the parameters to be checked
- Steps through a simple impact study methodology, with illustrations

Downloadable



<https://www.sseg.org.za/recommended-practice-for-assessing-the-connection-of-small-generators-based-on-renewable-energy-sources-to-low-voltage-and-medium-voltage-municipal-grids/>

## Video: Introduction to the Grid Impact Studies

(10 min)



### VIDEO: GRID IMPACT STUDIES FOR SSEG

Produced specifically for South African Municipal Distributors, introducing what a grid impact study is, when it is needed, and what should be assessed



<https://www.youtube.com/watch?v=jtsCQtbTQgU&t=3s>





## Procure suitable bi-directional meters

It is generally advisable for municipal distributors to accept SSEG export onto their networks, as this has financial benefits for both the municipality and customer. Bi-directional meters are necessary for this to take place. These meters may be relatively simple and cheap or have significant 'smart' capabilities which can integrate with existing or planned municipal distributor smart metering (or Advanced Metering Infrastructure) functionality. Choice of meter will in part depend on the municipality's intentions in this regard.

Refer to Figure 10 for schematic and more information.





Figure 10. Procuring bi-directional meters for SSEG

### Information document:

#### Metering for Small-Scale Embedded Generation

Information to help municipalities understand and procure suitable SSEG metering systems.



#### METERING FOR SSEG - GUIDELINE

**Purpose:** Provide an overview of bi-directional metering characteristics and options

**Content:**

- Types of bi-directional meters
- Integration with Smart Metering/Advanced Metering Infrastructure (AMI)
- Configuring registers in meters
- Specifications and procurement of bi-directional meters



**Customisable templates and support available**

**Guide available for use**

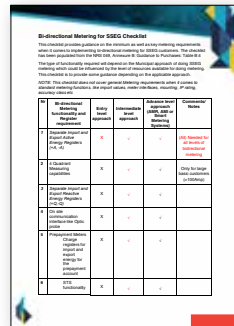
**Training available on bi-directional metering**



<https://www.sseg.org.za/metering-for-small-scale-embedded-generation/>

### Checklist and Specification:

Bi-Directional Metering for SSEG Checklist  
Technical functionality checklist and specification information to help with procurement.



**METERING CHECKLIST AND SPECIFICATION FOR SSEG**  
**Purpose:** Provide a checklist of meter functionality requirements and information to be included in a meter specification

**Content:**

- Checklist of meter functionality requirements
- Technical information on bi-directional metering
- Specification information for procurement

**Spec available for use**

**Training available on bi-directional metering**



<https://www.sseg.org.za/metering-for-small-scale-embedded-generation/>

### Video:

Bi-directional metering  
(10min)



#### VIDEO: BI-DIRECTIONAL METERING FOR SSEG

Produced specifically for South African Municipal Distributors - introducing the purpose of bi-directional metering, types of meters, and the interface with Advanced Metering Infrastructure (Smart metering)



<https://www.youtube.com/watch?v=eU5Z-3ZooSs>



## Communicate with your customers

Keeping customers informed about the municipal distributor's mandatory application process, and what key requirements for SSEG are, helps with compliance. Communication should not feel 'top down' for the customer, but it is important to consider their perspective. Information dissemination can be through flyers with the rates bill, newspaper notices or even radio interviews, for example.

Refer to Figure 11: for schematic and more information.



## Establish an SSEG record keeping system

Municipal distributors need to establish a record keeping system for SSEG. Key SSEG parameters should be recorded such as size, type, voltage, expected energy output etc. (this information will also periodically be requested by NERSA), as well as their location on the network so that the local hosting capacity of the network can be monitored (there are limits to the amount of SSEG that can be accommodated in any one part of the network without potential negative impacts). Larger cities may use their Enterprise Management System for such record keeping (e.g. SAP). Others may adapt and use a simple spreadsheet which is available for this purpose.

Refer to Figure 12: for schematic and more information.



Figure 11: Communicating with your customers, and installers

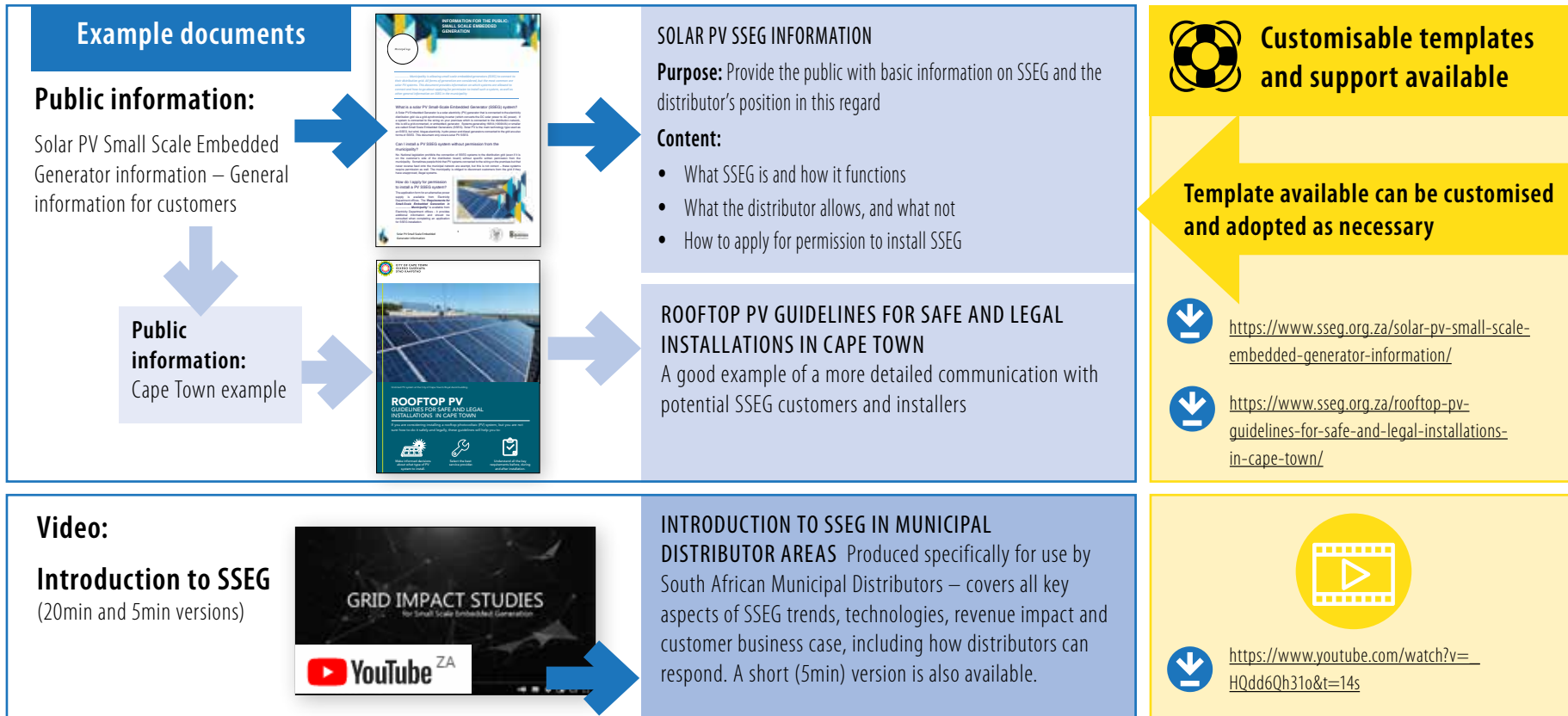
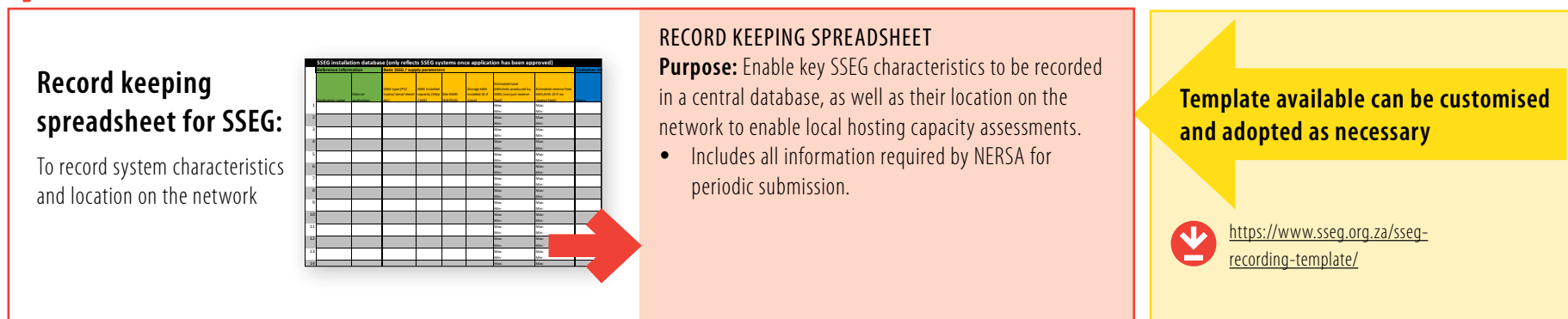


Figure 12: Record keeping of SSEG system details and locations





## Questions municipal distributors typically ask regarding SSEG

### Typical questions by municipal distributors



Should I allow SSEG to connect to my network?



- Yes. Distributors are **obliged to provide open and non-discriminatory access** for embedded generators to connect to the network (Distribution Network Code 4(1)).
- Accommodating SSEG onto the network, if done properly, can be **beneficial for the distributor, the customer, and the local economy**.
- SSEG is part of a growing trend to install renewable, affordable energy, which is likely to continue. Distributors aren't in control of it and should work with this trend.
- Not formally accepting SSEG onto the network has been found to result in more illegal installations. Trying to stop it increases the risk of grid defection.



Introductory SSEG video provides information on the trends and potential advantages of SSEG



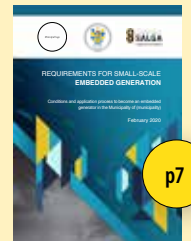
<https://www.youtube.com/watch?v=HQdd6Qh31o&t=14s>

What conditions should I put in place for SSEG wanting to connect to my network, so safety and power quality is assured?



- There are a range of technical conditions that SSEG systems should comply with, including anti-islanding, maximum size limits, phase balancing etc. These are all clarified in the **NRS097-2-3 and NRS097-2-1 specifications** (based on the Grid Code, NRS048 etc). Requiring compliance with these specifications will ensure safety and power quality adherence.

The AMEU-SALGA **Requirements for SSEG** document includes reference to the NRS097 specifications and other necessary compliances



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**Training available**



<https://www.sseg.org.za/ameu-salga-sseg-requirements-for-embedded-generation/>

How do I make the conditions I put in place legally binding on SSEG customers?



- First, the municipality should formally adopt an SSEG Policy (e.g. the AMEU-SALGA **Requirements for SSEG** document)
- Second, to make the Policy legally binding on customers, an **SSEG Electricity By-law amendment** is necessary.

By-law amendment guidance and text is provided in a legally reviewed SSEG by-law document



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<https://www.sseg.org.za/sseg-electricity-supply-by-law-amendment-guide/>



**Resources for more  
information or support**

## Typical questions by municipal distributors

**How do I make sure SSEG will not have a negative impact on my network, especially when there are many of them?**



- As long as conditions in the NRS097-2-3 specification (Simplified Connection Criteria) are followed, SSEG can generally be connected without fear of negative network impact. This also considers the cumulative impact of many SSEGs in one area.
- For systems beyond limits of the NRS097-2-3, **grid impact studies** will be required before permission to connect can be given.

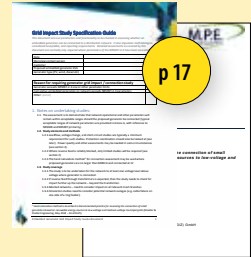
A specification for grid impact studies has been developed, and a simplified study methodology is available, as well as a video

**Training available**



<https://www.sseg.org.za/grid-impact-study-specification-guide/>

<https://www.sseg.org.za/recommended-practice-for-assessing-the-connection-of-small-generators-based-on-renewable-energy-sources-to-low-voltage-and-medium-voltage-municipal-grids/>



**Should I accept reverse feed from SSEG systems onto my network?**



- It is best to accept reverse feed (export), and credit it on the customer's bill, as it is usually beneficial for both the distributor (they on-sell this energy at a profit) and helps the customer business case (they are credited for energy exported).
- The necessary bi-directional meters need to be in place to accept reverse feed.



Introductory SSEG video provides information on the trends and potential advantages of SSEG



<https://www.youtube.com/watch?v=HQdd6Qh31o&t=560s>

**What sort of metering changes are necessary for SSEG?**



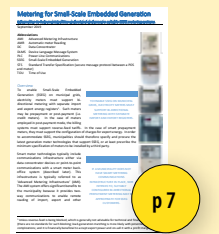
- To accept reverse feed, it is necessary to procure and install bi-directional meters.
- These may be simple, or more complex and have 'Smart' capabilities.

Information document on bi-directional meters is available, and a video. NRS049 provides procurement guidance

**Training available**



<https://www.sseg.org.za/metering-for-small-scale-embedded-generation/>



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## Typical questions by municipal distributors



What can I do about SSEG impact on municipal revenue?

- **Revenue loss is only a problem if inappropriate tariffs are applied** to SSEG customers.
- Appropriate SSEG tariffs, informed by a Cost of Supply study, will avoid revenue loss, and at the same time be fair on the customer.

### Training available

Tariff setting information and tariff modelling tool supports SSEG tariff setting. Tariff video also available.

<https://www.sseg.org.za/wp-content/uploads/2019/07/SSEG-Tariff-Guidelines.pdf>

<https://www.sseg.org.za/municipal-revenue-impacts/revenue-impact-tool/>



How do I set up a process to accept SSEG applications?

- The quickest way to set up an SSEG application process is to adopt the **AMEU-SALGA Resource Pack**, which contains all the necessary documentation for such a process. It can be customised as necessary.
- **Staff training** is also important to be able to assess SSEG applications.

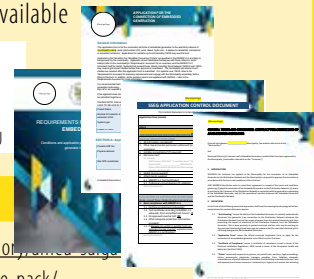
AMEU-SALGA Resource Pack is available



### Training available

<https://www.sseg.org.za/category/ameu-salga-resource-pack/ameu-salga-sseg-resource-pack/>

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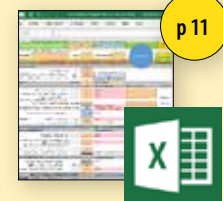
How do I evaluate SSEG applications in accordance with the necessary standards and requirements?

- All the relevant standards and requirements to be checked are specified in the AMEU-SALGA endorsed **Requirements for SSEG document**.
- The AMEU-SALGA **Control Document** (Checklist) steps through all the necessary checks to be performed on SSEG applications before approval.

Control Document to assess SSEG applications is available

<https://www.sseg.org.za/sseg-application-control-document/>

<https://www.sseg.org.za/sseg-assessment-spreadsheet-trial-version/>



## Typical questions by municipal distributors

## Resources for more information or support

How do I get my council and/or senior management on board?



- Remind them of the **SALGA Energy Summit Declaration** (SALGA 2018a) which includes clear local government commitments to enable SSEG.
- The SSEG introductory video can help them understand the importance of SSEG and how distributors should respond to the growing numbers of installations.



SALGA Energy Summit Declaration, and SSEG video available



<https://www.youtube.com/watch?v=HQdd6Qh31o&t=14s>



<https://www.salga.org.za/Documents/Documents%20and%20Publications/Documents/Final-Energy-Summit-Declaration-2018.pdf>



How do I communicate to the public around SSEG?



- Generic SSEG information for the public can be customised for distribution
- Leaflets can be distributed with rates bills, and notices in newspapers and radio interviews can be explored for effective communication

Generic Public information on SSEG available



<https://www.sseg.org.za/solar-pv-small-scale-embedded-generator-information/>



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Where can I get training and other technical support regarding SSEG?



- The SALGA-DMRE-GIZ **Municipal Distributor SSEG Support Program** provides training and technical support around SSEG.
- Email [support@sseg.org.za](mailto:support@sseg.org.za) to apply to participate or for more information.
- GreenCape also supports Western Cape municipalities with SSEG.

SSEG Support Programme



Training available



<https://www.sseg.org.za/>





## 3. Where to find resources and support

### 3.1. National Municipal Distributor SSEG Support Programme

The Municipal SSEG Support Programme has been in existence since 2017, and is a partnership between SALGA, the Department of Mineral Resources and Energy (DMRE), and GIZ. It is implemented by Sustainable Energy Africa (SEA) NPC, with the Solar Training Centre and CSIR.

**Objective:** To capacitate municipalities to allow SSEG onto their networks in a technically sound and safe manner, and to support SSEG tariff setting to protect both the interests of the municipality and SSEG investors.

**Training provided:** Training for municipal distributors, as well as a comprehensive set of documentation which can be used in municipal SSEG processes. The following support is offered to municipal distributors:

- Annual 5-day training courses on SSEG, enabling municipalities to develop the necessary documentation and start accepting and processing SSEG applications from customers
- Specialist trainings, including:
  - grid impact studies,
  - tariff setting, and
  - bi-directional metering.

**Technical support provided:** An ongoing technical support help desk is available when problems or queries arise here: [www.sseg.org.za](http://www.sseg.org.za).

### How to join the Municipal SSEG Support Programme?

Annual invitations to join the programme are circulated to all municipalities. To apply to join and receive SSEG capacity building support, send an email to [support@sseg.org.za](mailto:support@sseg.org.za). **Support is subject to the availability of resources.** In addition, GreenCape supports Western Cape municipalities with SSEG.



## Municipal SSEG Resource Portal

This website hosts all of the resources described in this document, in particular the AMEU-SALGA endorsed set of documentation that can be used to rapidly establish a sound SSEG application assessment and approval process.

[www.sseg.org.za](http://www.sseg.org.za)



## Online SSEG Training Courses

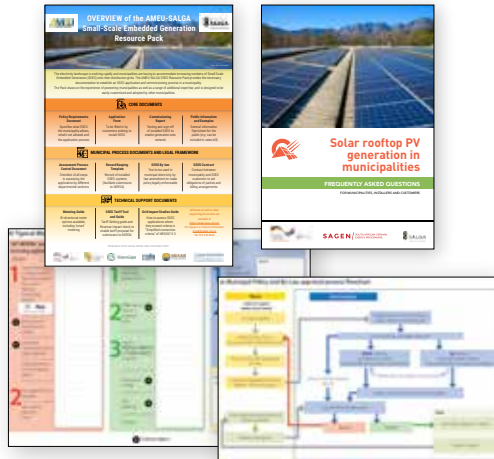
This website hosts a growing set of courses relevant to SSEG in municipal distributor areas. Facilitated courses are run periodically, but they are also freely accessible to individuals at any time, although you will need to register and login.

[www.training.sseg.org.za](http://www.training.sseg.org.za)



## Summary of the SSEG Support Resources

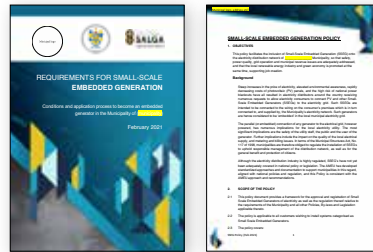
### Overview & process



### Training (in person and online)



### Policy & Requirements



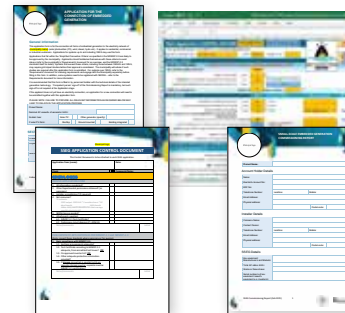
### Legal – contracts, bylaws etc.



### Tariff support



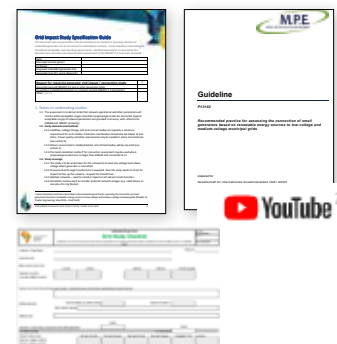
### Application assess & Commissioning



### Procurement



### Grid impact studies



### Record keeping



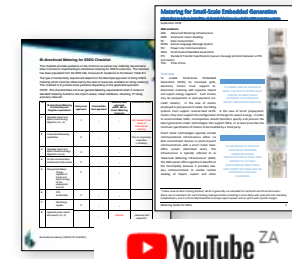
### Support website



### Public information



### SSEG metering



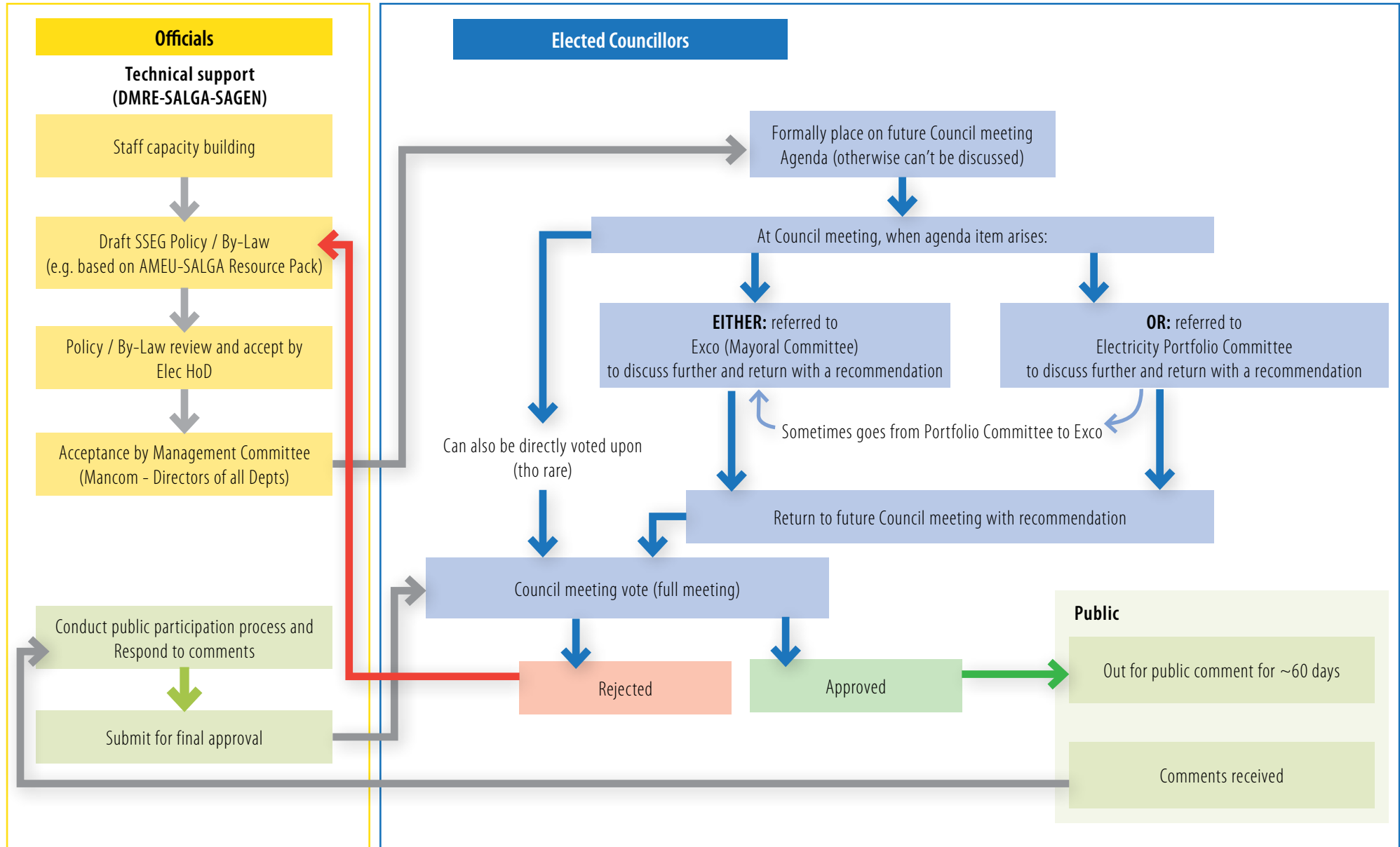


## 4. References

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- SALGA 2020. Status of Small-Scale Embedded Generation (SSEG) In South African Municipalities - July 2020. South African Local Government Association, Tshwane, 2020.

## 5. Appendices

### a) Municipal Policy and By-Law approval process flowchart





## b) Typical Municipal distributor SSEG action plan template (used in training)

### 'GET MOVING' (essential steps to start receiving applications)

#### ACTIVITY

- 1** Communicate to Industry / Customers that DRAFT Requirements document exists, and SSEG Application forms should be submitted



- Accept and process Application forms submitted

- Approve upon Commissioning, subject to "Right to adapt rules..."

Bi-directional meters or Reverse feed blocking required

- 2** Record approved SSEG on spreadsheet
- Source / specify bidirectional meters

#### NOTES

### POLICY and REGULATORY

#### ACTIVITY

- 1** Departmental workshop etc. approval for Policy

- 2** LEGAL: Approval for by-law amendment process

- 3** Submit to **PORTFOLIO COMMITTEE** and **COUNCIL PROCESS** for approval

- Technical inputs as needed

- Public participation

**APPROVAL**

#### NOTES

### SSEG TARIFFS

#### ACTIVITY

- 1** Draft tariffs approved by CFO (workshop, present etc)

- 2** NERSA tariff submission

**NERSA APPROVAL**

Tariffs on municipal financial software

#### NOTES

**FURTHER TRAINING NEEDS** (e.g.grid impact, metering, application assessment etc.)



This document describes how municipal distributors can adjust to a future where SSEG is a more significant part of their network. It starts by outlining the high-level institutional and operational changes that are necessary, and then moves to the practicalities of the processes, requirements, documents, and capacity needed to accommodate SSEG onto the network. It refers to documents endorsed by SALGA and the AMEU for this purpose, as well as noting the capacity building support available.

