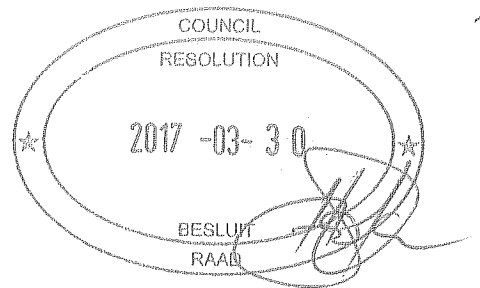


Reference No 26516/1  
Stephens Notoane (3773)  
COUNCIL: 30 March 2017



28. UTILITY SERVICES DEPARTMENT  
PROPOSED EMBEDDED GENERATION POLICY TO SUPPORT AND  
FORMALISE PROCEDURE FOR INSTALLATIONS WITHIN THE CITY  
(From the Executive Committee: 7 March 2017 and the Mayoral Committee:  
20 March 2017)

1. PURPOSE

- (a) To obtain approval to include embedded generation as part of the business of the City of Tshwane and develop a policy to manage such a process;
- (b) To obtain approval to begin a process of reviewing electricity by-laws that are inclusive of embedded generation; and
- (c) To obtain approval to coordinate the introduction of grid-tied and non-grid tied embedded generation technologies onto the city electricity network infrastructure and encourage compliance with the National Electricity Regulator of South Africa guidelines and other applicable legislation for electricity consumers.

2. STRATEGIC OBJECTIVES

- 2.1 Provide sustainable service infrastructure and human settlement management
- 2.2 Promote shared economic growth and job creation
- 2.3 Improved financial sustainability

3. BACKGROUND

Globally, renewable energy targets together with feed-in tariffs have had the biggest impact on the introduction of the renewable energy market. Figures provided by the ~~trustworthy Power Quality and Renewable Services (PQRS)~~ indicate that over the course of 2016 it is estimated that 120MW of actual module sales took place. Roughly 118MW of the total installed capacity has been audited & due to the volume of data is assumed to be representative of the growth of PV installations in SA over time, <http://pqrs.co.za>.

On city level in the Tshwane area strategic decisions had been taken to enhance demand side management through energy-efficiency initiatives, improved metering of electricity and reduced losses from the transmission and distribution of electricity and fuels. To further develop strategies to increase affordability and access to renewable energy supply options.

Solar energy within the city is amongst the best in the country. Heightened environmental awareness, dramatic increases in the price of electricity and rapidly decreasing costs of photovoltaic (PV) panels have all resulted in electricity

distributors around the country being inundated with requests to allow electricity consumers to connect PV and other Embedded Generators (EGs) to the electricity grid.

Against this background a process was launched to implement measures for the development and implementation of guidelines for embedded generation installations. An Embedded Generation (EG) policy was designed in support of the Application procedures, safety measures and documents that will provide guidance to consumers wanting to embark on the embedded generation route. At the later stage, the process will also include tariff determination as the flow of electricity will be by-directional within the city's infrastructure. The city must register and keep record of EG installations within its licensed area. Whilst the city will not be liable for safe operation of such installations, the fact that these systems will be grid-tied open a risk towards the city's personnel and equipment. Hence the development of the policy and technical requirements for the city's consumers. The end result of the registration and coordination of embedded generators will provide information of categories of sources of electricity.

#### 4. DISCUSSION

The Electricity Regulation Act No. 4 of 2006 seeks to achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa. Moreover, it ensures that the interests and needs of present and future electricity customers and end-users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in South Africa.

The City of Tshwane has the constitutional mandate to provide services to its community, including supply of electricity to the residents. Furthermore, the City of Tshwane is committed to reduce demand in the grid and greenhouse gas emissions, enhance energy sustainability, accessibility and affordability to all residents and encourage and promote shift to cleaner, more efficient and diverse energy use and supply.

The Energy and Electricity Department (EED) has been tasked to develop and implement guidelines for embedded generation. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a state-owned German development agency that provides expert services worldwide in the field of international cooperation for sustainable development and has provided a supportive role in the development of the EG process. Within the EG context interconnection rules, technical standards, quality related aspects are being investigated via cross-functional workgroups within the EED.

The EG policy and accompanying documents forms a major part in formalizing the process to create a suitable and safe environment for embedded generation. Prospective EG applicants within the City of Tshwane electricity distribution areas will now be able to apply and register installations when the EG policy is approved. Financial impact study or assessment must be conducted to establish potential revenue losses and gains from the introduction of EG. The approval of the EG policy will assist The Energy & Electricity Department (EED) to report on the sites and sizes of the installations to the National Energy Regulator of South Africa (NERSA).

Many opportunities exist not only for the city to support the Green Economy Framework but this policy can also be contributed to via commercial and residential PV installations. Furthermore the Requirements for Embedded Generation (EG) had been developed to ensure that applications are dealt with in-line with the set standards such as the NRS 097 series and others. Procedures were categorised with reference to NERSA to develop and implement a comprehensive EG programme for systems smaller and larger than 1 Mega-Watt (MW).

The procedures and systems were developed to accommodate solar PV into municipal distribution operations at a later stage when energy trading is possible while in consideration of the following aspects:

1. Awareness of the regulatory environment.
2. Assessment of the list of technical rules, quality related aspects & guidelines for installers.
3. A proper Application process supported by the necessary documentation
4. The need to integrate the EG consumers with the SAP data base and AMFM (GIS) for registration and effective and safe operations.
5. Assessment of the meter methodology – programming options.
6. Assessment of the revenue impact and the envisaged tariffs for EG consumers.
7. Awareness to re-visit EED Standards for doing maintenance work on Low Voltage (LV) and Medium Voltage (MV) feeders.
8. Building Municipal staff capacity to enable them to cope with the new EG environment.

## 5. COMMENTS OF THE STAKEHOLDER DEPARTMENTS

### 5.1 COMMENTS OF THE CHIEF FINANCIAL OFFICER

Cognisance is taken of the contents of the report.

~~It is recommended in the report that the Mayoral committee take cognisance of the contents of the report and the intentions of implementing the Embedded Generation Policy and the process that outlines the application and review procedures for obtaining approval to install systems such as photovoltaic (PV) solar energy systems on new or existing private properties.~~

It is indicated in the report that no funding is needed currently and that following the approval of this policy, a process to review the electricity by-laws will begin.

It is imperative that the department act proactively to review and reprioritise their current budget in order to ensure that the financial costs relating to the implementation of this policy are catered for.

The Group Financial Services Department will render further financial comments on future reports in this regard.

## 5.2 COMMENTS OF THE GROUP HEAD: GROUP LEGAL AND SECRETARIAT SERVICES

The purpose of this report is:

1. To obtain approval to include embedded generation as part of the business of the City of Tshwane and develop a policy to manage such a process.
2. To obtain approval to begin a process of reviewing electricity by-laws that are inclusive of embedded generation.
3. To obtain approval to coordinate the introduction of grid-tied and non-grid tied embedded generation technologies onto the city electricity network infrastructure and encourage compliance with the National Electricity Regulator of South Africa guidelines and other applicable legislation for electricity consumers.

This initiative is aligned with Strategic Objective 1 which aims to provide sustainable services infrastructure and human settlement management.

Section 23 of the Local Government: Municipal provides that a municipality must undertake developmentally-oriented planning so as to ensure that it strives to achieve objects of local government set out in section 152 of the constitution and gives effect to its developmental duties as required by section 153 of the constitution.

The report complies with the provisions of Section 11(3)(a)&(n) of the Local Government: Municipal Systems Act 32 of 2000, whereby a municipality exercises its legislative or executive authority by developing and adopting policies, plans, strategies and programs, including setting of targets for delivery and also by doing anything else within its legislative and executive competence.

Section 16 (1) of the Local Government Municipal Systems Act 32 of 2000, provides that a municipality must develop a culture of municipal governance that complements formal representative government with a system of participatory governance.

Having taken regard to the aforesaid and with specific reference to the contents of the report, Group Legal Services Department supports the approval of the report and the recommendations thereof, and submits that:

- The report and its Annexures be referred to the Mayoral Committee for their attention, cognisance and approval of the recommendations.

## 6. IMPLICATIONS

### 6.1 HUMAN RESOURCES

There will be a need for a team that will support the implementation of the embedded generation program. This team will require relevant technical skills to assess applications. The skills range will be from engineers/technologist and technicians in the electrical sector. An assessment of the capacity needs to be done to empower the city venturing into the renewable energy business.

## 6.2 FINANCES

No funding is needed currently. Following this policy approval, a process to review the electricity by-laws will begin.

## 6.3 CONSTITUTIONAL AND LEGAL FACTORS

- The National Energy Act, 34 of 2008.
- White Paper on the Promotion of Renewable Energy and Clean Energy Development.
- Integrated Resource Plan (IRP) 2016.
- CoT: Framework for Green Economy Transition 2014

## 6.4 COMMUNICATION

Establish an internal and external communication programme to communicate the Embedded Generation (EG) Policy. A specific focus will be required for external customers to encourage them to participate in the application process for EG to make a legal connection. Information regarding the EG policy and a on-line application procedure will have to be developed on the CoT web page.

## 6.5 PREVIOUS COUNCIL OR MAYORAL COMMITTEE RESOLUTIONS

There was a council resolution in 29 January 2009. The title: Various alternative energy technologies within the City of Tshwane area for electricity supply. See annexure G.

## 7. CONCLUSION

That the Mayoral Committee take cognisance of the contents of the report and the intension of implementing the Embedded Generation Policy and the process that outlines the application and review procedures for obtaining approval to install systems such as photovoltaic (PV) solar energy systems on new or existing private and commercial buildings. Furthermore the intention to ensure standardised implementation that can help to maximize compatibility, interoperability, safety, repeatability and quality.

It is also recommended that municipal staff, particularly those from the procurement, finance, other technical and support departments play a role in the process and application of embedded generation implementation and its impact on municipal processes.

**The Mayoral Committee on 20 March 2017 resolved to recommend to Council as set out below:**

**During consideration of this item by Council on 30 March 2017, and after MMC D Moss addressed Council on this matter, it was resolved as set out below:**

## ANNEXURES:

- A: Policy on Embedded Generation
- B: Requirements for Embedded generation
- C: Tshwane Application form – inverter based grid tied solar PV installation
- D: Cooperation Letter CoT and GIZ
- E: Government Gazette – Small-scale embedded generation (SSEG) licensing exemption and registration notice
- F: 2015 National Energy Regulator of South Africa (NERSA) Consultation Paper - SSEG
- G: Item 1 - Various alternative energy technologies within CoT for electricity supply

## RESOLVED:

1. That cognisance be taken of the contents of the report and the intension of implementing the Embedded Generation Policy and the process that outlines the application and review procedures for obtaining approval to install systems such as photovoltaic (PV) solar energy systems on new or existing private properties.
  2. That approval be granted to begin the process to review the current electricity by-law to include embedded generation.
  3. That approval be granted for the City to allow grid-tied and off-grid embedded generation technologies for private and commercial use in line with the relevant legislation.
  4. That cognisance be taken to allow internal processes of the City to accommodate embedded generation activities and that external stakeholder engagement will be required.
  5. That approval be granted for relevant studies to be conducted in order to ensure that the City's revenue is not negatively impacted by the incorporation of the business of embedded generators.
  6. That approval be granted for relevant departments within the City to play their necessary role in the development of a sustainable energy resources, application and enforcement.
- 
7. That approval be granted to launch a communication programme (internal and external) to communicate the Embedded Generation Policy and the application procedure for customers that want to register their installations.





## City of Tshwane Energy and Electricity Department

### Policy on Embedded Generation (EG)

#### 1. PURPOSE

The purpose of this document is to give guidance regarding the City of Tshwane's requirements and application process for connecting all forms of embedded generation technologies such as photovoltaic systems to the City's electricity network, including renewable energy and co-generation.

#### 2. OBJECTIVES

- 1) To encourage the use of renewable energy in the energy resources mix of the City of Tshwane.
- 2) To provide guidelines and regulate embedded generation installations in the City's licensed electricity distribution area.

#### 3. SCOPE

The policy is applicable to all consumers in the City of Tshwane area licensed for electricity distribution by the National Energy Regulator of South Africa (NERSA). Eskom consumers residing in the City of Tshwane's jurisdiction area must register their embedded generators through Eskom and must comply with Eskom's requirements.

#### 4. DEFINITIONS

In this policy, the following meanings apply:

**Anti-islanding:** The ability of a small-scale embedded generation (SSEG) installation to disconnect the generator instantly and automatically from the municipal electricity grid whenever there is a power outage, thus preventing the export of electricity to the municipal electricity grid from the SSEG. This is done primarily to protect municipal workers who may be working on the grid and who may be unaware that the grid is still being energised by the SSEG.

**Bi-directional meter:** A meter that measures electricity flow in both directions (import and export) separately.

**Co-generation:** The sequential or simultaneous generation of multiple forms of useful energy (usually mechanical and thermal) in a single, integrated system.

**Consumer:** The person who owns or operates an embedded generator (EG) and wishes to connect the EG to the network.

**Embedded generator:** Generates electricity that is “embedded” in the local electricity distribution network in that it is connected to the utility network on the customer’s side of the Utility’s electricity meter.

**Generating capacity:** The maximum amount of electricity, measured in kilovolt amperes (kVA), that can flow out of the generation equipment into the customer’s alternating current wiring system. This is therefore the maximum alternating current power flow that can be generated.

**Grid-tied:** An SSEG that is connected to the municipal electricity grid either directly or through a customer’s internal wiring is said to be “grid-tied”. The export of energy to the municipal electricity grid is possible when generation exceeds consumption at any point in time.

**Inverter:** A power device that converts direct current to alternating current at a voltage and frequency that enable the generator to be connected to the municipal electricity grid.

**Isolated:** A section of a municipal electricity grid that is disconnected from all other possible sources with electrical potential.

**Reverse power flow:** The flow of energy from the customer’s electricity installation to the municipal electricity grid (ie export) as a result of instantaneous generation exceeding the instantaneous consumption at the generation site in question.

**Small-scale embedded generator:** A generator with a generation capacity of less than 1 000 kW (1MW).

## 5. BACKGROUND

The City of Tshwane has been inundated with applications from residential, commercial or industrial customers to develop, install and commission embedded generation (EG). It is thus essential that the City of Tshwane regulates this process. The City can also explore EG business opportunities such as wheeling, energy trading and emissions reduction, as well as buying electricity generated by these consumers.

The regulatory framework of the Department of Energy (DoE) and NERSA is under development for small-scale and other embedded generators. It states that installations with a capacity under 1 MW do not require a NERSA electricity generation licence. Furthermore, licensed distributors such as municipalities and Eskom are required to record all installed EG in their licensed electricity distribution areas. The City, as a licensed electricity distributor, has established the guidelines in this document in order to comply with DoE and NERSA requirements and to ensure that its consumers follow a prescribed format when installing generators.

The City further wishes to ensure that the introduction of EG does not affect the performance of its electricity network infrastructure negatively and to remain compliant with the Occupational Health and Safety Act, Act 85 of 1993. This document is based on the NRS 097 series of standards (and their latest revisions). Further stipulations are included to address the specific needs of the City of Tshwane.



Renewable energy technologies are viewed not only as tools for improving energy security and mitigating and adapting to climate change, but are also increasingly recognised as investments that can provide direct and indirect economic advantages. These technologies also reduce dependence on fossil fuels, thereby improving local air quality and safety. The facilitation of EG systems will also stimulate the EG industry through employment creation and increased income for EG applicants, should reverse feeding be compensated.

The draft 2016 Integrated Resource Plan (IRP) envisions strong and unprecedented renewable energy, including solar PV. The IRP recognises that SSEG will be a definite factor in the future generation mix. Although the electricity distribution industry is highly regulated, SSEG's have not yet been adequately covered in national policy or legislation. In this void, the City has developed policies and practices that it believes are consistent with broader national policy. The City will not allow reverse feed and compensation for electricity generated until SSEG tariffs are in place.

## 6. IMPLEMENTATION

The City of Tshwane may register and authorise grid connection of SSEG's up to 1 MVA without a generating license. Installations of 1 MVA or greater must produce a generating licence or exemption letter from NERSA with their application, failing which the application will not be considered. Installations for the sole purpose of selling electricity may also require licensing from NERSA irrespective of their size, measured in kilovolt ampere.

The City of Tshwane document "Requirements for Embedded Generation" will include all relevant conditions and requirements that customers must adhere to when they apply and install EG. This document will be reviewed continuously to comply with relevant legislation.

The document covers the following system-size categories:

- a. Up to 350 kVA
- b. Above 350 kVA to 1 MVA
- c. Above 1 MVA

NRS 097-2 covers simplified utility connection criteria for low-voltage connected generators. The requirements differentiate between customers supplied by shared and dedicated LV networks, but explicitly exclude low-income domestic electrification networks, ie shared LV networks supplying customers with a living standard measure of less than seven.

- All LV consumers with system sizes below and including 350 kVA must comply with the sizing limitations and other provisions specified in NRS 097-2-3.
- Commercial and industrial consumers installing EG with sizes above 350 kVA may have to conduct grid impact studies at their cost. System sizes above 1 MVA will also require NERSA approval.

## 6.1 Stakeholders

STAKEHOLDER	ROLE
EG owner	Installation, commissioning and compliance with regulatory requirements
EG designer	Installation, commissioning and compliance with regulatory requirements
Energy and Electricity Department	Regulation and distribution of electricity within the licensed distribution area
Financial Services Department	Financial management of regulatory requirements and EG processes
Building Department	Ensure compliance with building regulation requirements
Emergency Services (Fire Brigade)	Ensure compliance with regulatory requirements
National Department of Energy	Ensure compliance with legislative requirements
National Department of Environmental Affairs	Ensure compliance with legislative requirements
National Electricity Regulator of South Africa (NERSA)	Regulation and approval of larger installations

## 6.2 Electricity generation licences

A generating licence is required for EG installations larger than 1 MVA. This licence must be applied for directly at NERSA. The City is obliged to report to NERSA regularly regarding all grid-connected generation. Any application that requires a NERSA licence will also require a grid impact study. The application process for these systems must still be developed by the City.

## 6.3 Metering

All consumers installing EG will require bi-directional advanced metering infrastructure (AMI) for billing purposes.

## 6.4 Tariffs

The City will continuously review its tariffs to accommodate EG. The electricity supply agreement for consumers with EG may have to be amended in line with the applicable tariff structure. Tariffs are determined annually by the City and are subject to approval by NERSA.

## 6.5 Grid studies

To date, NERSA has not provided a legal framework for the connection of EG systems above 1 MVA for municipalities. NRS 097-2-3 applies to SSEG systems up to 350 kVA connected to an LV network. The City reserves the right to require grid impact studies at the EG applicant's cost for systems above 350 kVA or which otherwise exceed the parameters for a "simplified connection" as set out in NRS097-2-3.

## 6.6 Embedded generation application process

EG applicants will have to submit applications by hand, although online submission through the City's website is in the pipeline. The application process will require inputs from various stakeholder departments of the City. Applications for systems larger than 350 kVA or those that exceed the parameters for simplified connection as set out in NRS097-2-3 may require external stakeholder assessments (eg Department of Energy, Department of Environmental Affairs and NERSA). The applicant must pay all costs involved.

## 6.7 Embedded generation costs

Applications for EG installations will be dealt with on a first come, first served basis. The applicant must pay all costs for the application and installation of the EG system, as well as for reconfiguration or upgrading of the upstream network infrastructure. Grid access tariffs may also be applicable.

- a. The applicant is responsible for all the costs of the application process.
- b. The applicant is responsible for the cost of any specialist grid studies.
- c. The applicant is responsible for any applicable cost due to changes required to the utility network upstream of the connection point as a result of their EG installation.
- d. A consumer who causes the need for a network infrastructure reconfiguration or upgrade is solely liable for the total cost.
- e. The applicant is responsible for all costs associated with specialist tests that must be carried out, eg inverter testing, as well as for obtaining the required certification of the design and the installation as detailed below.

## 6.8 Regulatory frameworks

The EG process will be governed by the applicable regulatory framework for municipalities and licensed electricity distributors:

- a. NRS 097-2: Grid interconnection of embedded generation: Part 2 Small scale embedded generation
- b. Electricity Regulation Act, Act 4 of 2006, and Electricity Regulation Amendment Act, Act 28 of 2007, as amended
- c. South African Distribution Code (all parts)
- d. South African Renewable Power Plants Grid Code
- e. Occupational Health and Safety Act 1993, as amended
- f. SANS 10142- Parts 1 to 4: The Wiring of Premises

- g. SANS 474/ NRS 057 Code of Practice for Electricity Metering
- h. NRS 047 Electricity Supply – Quality of Service
- i. NRS 048: Electricity Supply– Quality of Supply
- j. NRS 097-1: Code of practice for the interconnection of embedded generation to electricity distribution networks: Part 1 MV and HV (Eskom 240-61268576/DST 34-1765: Standard for the interconnection of embedded generation is applicable until published
- k. City of Tshwane Electricity By-law
- l. Applicable City of Tshwane electricity tariffs

## 6.9 Business case

On the EG owner's side, the aim is to reduce dependence on the electricity supplied by the City. This in turn will cause a drop in the demand for electricity and reduce the revenue collected by the City.

However, the introduction of EG can assist the City by providing a local electricity supply. The current business model requires the City to develop infrastructure to transport electricity to the consumer. When reverse feeding is allowed, another opportunity arises for the City to sell services such as wheeling and energy trading.

## 6.10 Risks

### 6.10.1 Economic

Increases in the price of electricity and the rapidly decreasing costs of EG solutions will impact negatively on municipal revenue. In future this may lead to grid defection, with serious revenue consequences. It is therefore important that the City creates an EG connection environment that is customer-friendly.

### 6.10.2 Environmental

Current coal-generated electricity produces greenhouse gas emissions.

### 6.10.3 Safety

The connection of any embedded generator to the electrical grid must comply with the NRS097-2-1 standard, and be certified as such, to avoid safety concerns of unintentional islanding, for example. New work practices and training will have to be adapted to the EG environment.

### 6.10.4 Infrastructure design

If a proposed connection is in an already constrained area of the network, network reconfiguration may be required to connect the consumer. This may require detailed technical assessments and re-designs.

## 6.11 Monitoring

### 6.11.1 Revenue

There could be a revenue dip due to the introduction of EG, in particular in the residential sector, and this should be rectified by appropriate tariffs. Tariffs need to be adapted due to EG being part of the energy mix.

### 6.11.2 Quality

Ensure constant monitoring of quality of service and supply. Employ technology and systems to ensure quality of supply is maintained.

The protection systems associated with EG plants must be coordinated with other protection systems associated with the electricity network. Adherence to NRS097-2-1 is essential to ensure that power supply quality of EG is maintained. EG equipment must be certified for compliance with this standard.

### 6.11.3 Smart grid

The introduction of a smart grid is important for network monitoring and network control. The adoption of EG for the City's network will support the use of suitable smart meters.

### 6.11.4 Metering

Bi-directional metering must be introduced to EGs with suitable smart capabilities in keeping with the City's smart grid intentions.

## 7. COMMUNICATION

A circular will inform all regions and the Energy and Electricity Department about the policy. The document will be made available on the City of Tshwane intranet. More information about the process will be communicated via the City of Tshwane website and communication bulletins.

## 8. REVISION

REVISION NUMBER	CHANGE EFFECTED	DATE OF CHANGE
00	New policy	November 2016

Grid access tariffs may also be applicable.

## APPENDICES

- i. Process flow chart
- ii. Requirements for Embedded Generation
- iii. SSEG application form




---

## REQUIREMENTS FOR EMBEDDED GENERATION

---

### Final Draft

Version 8 October 2016

---

### Purpose of this document

- Specify the requirements for prospective small scale embedded generators (SSEGs) in the City of Tshwane electricity distribution areas.
- Specify the procedure for prospective SSEGs to apply for permission for installation.
- Specify SSEG system sizes and types permissible, and provide other relevant guidelines.
- Ensure that SSEG systems are registered as per NERSA's requirements.

### Coverage of the document

**Only solar photovoltaic SSEGs** are covered by this document currently. **SSEG system sizes:** The document covers systems with a generation capacity smaller than 350 kVA connected to a low voltage network (in keeping with the parameters of NRS097-2-3). PV Embedded generators with a capacity higher than 350kVA may be given permission subject to a more detailed analyses being conducted, including systems connected to an MV network up to 11kV.

**Reverse feed into the distribution network:** Currently reverse feed may **NOT** take place and will **NOT** be compensated for by the City of Tshwane. The city of Tshwane reserves the right to require a bi-directional meter to be installed to monitor energy flow.

**Net consumers:** Only SSEG customers who remain net consumers are permissible (i.e. who consume on average more electricity than they generate from the SSEG system over a 12-month average)

**Eskom distribution areas:** The document does not apply to customers in Eskom licensed distribution areas. It is assumed that this consumers will be monitored and registered through Eskom.

**Stand-alone generators:** Generators that are not connected to the electricity grid in any way, and are thus 'stand-alone' generators, do not need permission from the City of Tshwane Electricity Department. However, approvals from other City departments may still be necessary, such as from the Planning and Development Department. It is the responsibility of the prospective stand-alone generator installer and/or owner to directly obtain these necessary approvals.

**Wheeling / Transfer of power to a different location:** The power produced by the SSEG must be utilised on the property on which the generator is located. SSEGs are not permitted to wheel power.

DRAFT

## Contents

Final Draft .....	1
Purpose of this document .....	1
Coverage of the document .....	1
Glossary .....	4
Abbreviations.....	5
1 Introduction.....	5
2 General Requirements.....	5
2.1 Generation license requirements .....	6
2.2 Generation size limitations .....	6
2.3 Metering and tariffs .....	7
2.4 Load profile management .....	7
2.5 Grid studies .....	7
2.6 Payment for SSEG application, peripheral equipment and studies .....	7
2.7 Applicable technical standards .....	8
The status of key applicable national standards .....	8
2.8 Professional sign-off.....	8
2.9 Testing of Inverters .....	9
2.10 Inspections by Electricity Department .....	9
2.11 Approvals from other CoT departments .....	9
3 How to apply for permission to install SSEG.....	10
4 Queries .....	12
5 System Expansion .....	12
6 Decommissioning.....	13
7 Change of property ownership.....	13
Appendix 1: Relevant Standards and Regulations .....	13
List of Standards and Regulations.....	13
Standards of Importance .....	14
NRS 097-2-1 (Part 2: Small Scale Embedded Generation, Section 1) .....	14
NRS 097-2-3 (Part 2: Small Scale Embedded Generation, Section 3) .....	14
South African Renewable Power Plants Grid Code (SARPPGC) .....	14
Other Standards and Legislation .....	14
Appendix 2: Other Departmental approval information .....	16
Appendix 3: Relevant forms and documents available on the City of Tshwane website .....	16



## Glossary

- Alternating current:** The flow of electrical energy that follows a sine wave and changes direction at a fixed frequency (i.e. it 'alternates'). Most residential and commercial uses of electricity require alternating current.
- Direct Current:** The flow of electrical energy in one constant direction. Direct current is typically converted to alternating current for practical purposes as most modern uses of electricity require alternating current.
- Anti-Islanding:** The ability of an SSEG installation to instantly and automatically disconnect the generator from the municipal electrical grid whenever there is a power outage in the utility municipal electrical grid, thus preventing the export of electricity to the municipal electrical grid from the SSEG. This is done primarily to protect municipal electrical grid workers who may be working on the grid and who may be unaware that the grid is still being energized by the SSEG.
- Bi-directional meter:** A meter that separately measures electricity flow in both directions (import and export)
- Cogeneration:** The sequential or simultaneous generation of multiple forms of useful energy (usually mechanical and thermal) in a single, integrated system.
- Customer:** In the context of this document, customers who also generate shall be referred to as "customers", although in effect they are "customer/generators".
- Embedded generator:** generates electricity that is "embedded" in the local electricity distribution network in that it is connected to the utility network on the customer's side of the utility's electricity meter.
- Generating capacity:** The maximum amount of electricity, measured in kilovolt Amperes (kVA), which can flow out of the generation equipment into the customer's alternating current wiring system. This is therefore the maximum alternating current power flow which can be generated.
- Grid-tied:** An SSEG that is connected to the municipal electrical grid either directly or through a customer's internal wiring is said to be "grid-tied". The export of energy onto the municipal electrical grid is possible when generation exceeds consumption at any point in time.
- Inverter:** A power device that converts direct current to alternating current at a voltage and frequency which enables the generator to be connected to the municipal electrical grid.
- Isolated:** A section of an municipal electrical grid which is disconnected from all other possible sources of electrical potential is said to be isolated
- Load profile:** The profile or curve showing the variation of the customers rate of electricity consumption (or demand) over time.
- Low-voltage:** Voltage levels up to and including 1 kV. (1kV= 1000 Volts)
- Maximum demand:** the highest electrical consumption measured in kilo-volt-ampere over a specific period, normally billing period
- Medium-voltage:** Voltage levels greater than 1 kV up to and including 35 kV.
- Net customer:** A net customer is someone who purchases (imports) more kWh of electricity than they export (sell) it over any 12 month period.
- Net consumer:** See net customer.
- Net generator:** A situation where the site generates more electricity than is consumed on site over a 12 month period, and therefore exports more power onto the municipal network than it draws from the network.
- Pr Eng or Pr Tech Eng or Pr Techni Eng:** This refers to a professional engineer, professional technologist or professional engineering technician who is registered with the Engineering Council of South Africa (ECSA).
- Reverse power flow:** The flow of energy from the customer electricity installation onto the municipal electrical grid (i.e. export) as a result of the instantaneous generation exceeding the instantaneous consumption at the generation site in question.
- Reverse power flow blocking:** A device which prevents power flowing from an embedded generator back onto the municipal electrical grid.
- Small Scale embedded generator:** A small-scale embedded generator for the purposes of these guidelines is an embedded generator with a generation capacity of less than 1000 kW (1MW).
- Stand-alone generator/ off-grid generator:** A generator that is not in any way connected to the municipal electrical grid. Export of energy onto the municipal electrical grid by the generator is therefore not possible.

## Abbreviations

AC	Alternating current
AMI	Advanced Metering Infrastructure
CoT	City of Tshwane
DC	Direct current
ECSA	Engineering Council of South Africa
EED	Energy and Electricity Department of the City of Tshwane
kVA	kilo-Volt Ampere (unit of apparent electrical power, often similar in magnitude to kW)
kW	kilo-Watt (unit of electrical power)
kWp	kilo-Watt peak (the rated peak output of solar PV panels)
LV	Low Voltage
MD	Maximum demand
MV	Medium Voltage
MVA	Mega-Volt Amperes (1000 kVA)
NERSA	National Energy Regulator of South Africa
NMD	Notified Maximum Demand
PV	Photovoltaic
SSEG	Small Scale Embedded Generation/Generator
VAT	Value Added Tax

## 1 Introduction

The City of Tshwane (CoT) has been inundated with applications from residential, commercial or industrial customers to develop, install and commission Small-Scale Embedded Generation (SSEG). It is thus essential that CoT regulates this process.

The regulatory framework from NERSA is under development to clarify certain areas of ambiguity, but does indicate that a SSEG does not require NERSA licensing if it is for “own use”. It further states that installations with capacity under 1MW do not require a NERSA electricity generation license. Furthermore, licensed distributors such as municipalities and Eskom are required to record all installed SSEG in their electricity distribution areas.

The CoT, as a licensed electricity distributor, has established this guidelines in order to comply with the NERSA requirement and to ensure that its customers follow a prescribed format when developing the SSEG. The city further wishes to ensure that the introduction of the SSEG does not impact its electricity network infrastructure performance negatively and that the city remains compliant to the Occupational Health and Safety Act, Act 85 of 1993. This guideline document is centred on the NRS 097-2 series of standards (and their latest revisions). Further stipulations are included to address specific needs of the CoT.

## 2 General Requirements

## 2.1 Generation license requirements

Existing legislation requires that anyone generating electricity not for “own use” and interconnected to the grid must obtain a generating license from the National Energy Regulator of South Africa (NERSA)<sup>1</sup>. Clarity is still required whether feeding surplus generation back onto the utility grid and then drawing the same amount of electricity off the grid at a later stage for consumption is regarded as being generation for “own use”. In the absence of this clarity, the CoT will not require SSEG’s smaller than 1 MVA to obtain such a license. When the necessary regulatory clarity is in place, CoT will change the requirements in this document accordingly, and will require all existing and new SSEGs to comply with the new requirements<sup>2</sup>.

Applicants wanting to connect 1 MVA or greater must produce a generating license or exemption letter from NERSA with their application, failing which the application will not be considered

## 2.2 Generation size limitations

All LV customers planning to install SSEG systems shall aim to comply with the size limitations of NRS097-2-3, including a maximum generator size of 350kVA. Should systems not comply with the NRS097-2-3 (or having different functionalities/capacity as compared with the ones highlighted in the NRS097-2-3), specific grid impact studies are likely to be required by CoT to determine if such installations may proceed, which will be for the customer’s account. This includes SSEG systems intended for connection to an MV network up to 11kV.

Note that ‘generator size’ refers to the maximum output at the point of utility connection – i.e. the output of the inverter for solar PV systems, not the maximum power output of the solar PV panels.

### Shared LV feeders

The maximum individual generation limit in a shared LV feeder shall not exceed 25% of the customer’s NMD up to a maximum of 20kVA. Guidelines on the generation size limits for customers on a shared LV feeder wishing to install an SSEG are shown below (consult NRS097-2-3 section 4.2 for detail):

*Table 1: Maximum individual generation limit in a shared LV feeder (based on NRS097-2-3 section 4.2.2)*

Number of phases	Service circuit-breaker size (in house distribution board)	NMD kVA	Maximum individual generation limit kVA
1	20 A	4.6	1.2
1	60 A	13.8	3.45
1	80 A	18.4	4.6
3	60 A and 80 A	41.4	13.8 (4.6 per phase)

Notes:

- To determine if you have a single-phase or three-phase connection, check the main circuit-breaker on the distribution board. A single-phase supply will generally have a single main circuit-breaker, and a three-phase a triple main circuit-breaker. If in doubt consult an electrician.

If SSEG generation capacity is 4.6 kVA or less, a single-phase inverter can be installed even if the customer has a three-phase connection. Systems above 4.6 kVA are required to be balanced across the phases (consult NRS097-2-3 section 4.2 for details). CoT reserves the right to consider billing information as an input towards maximum demand where the NMD is under-utilized.

<sup>1</sup> As per Schedule II of the Electricity Regulation Act of 2006.

<sup>2</sup> A change in the legal framework governing the electricity distribution and/or municipalities, will automatically be enforceable even if there is a delay in the revision of this document.

### **Dedicated LV feeders**

In dedicated LV feeders the maximum generator size is limited to 75% of the NMD (consult NRS097-2-3 section 4.3 for detail). CoT reserves the right to consider billing information as an input towards maximum demand where the NMD is under-utilized.

### **Cumulative SSEG capacity impact on the network**

Should the cumulative installed capacity of several SSEG systems be such that it may impact negatively on local LV or MV network functioning, as per the stipulations of NRS097-2-3, CoT will not allow further SSEG connections until they can be clearly demonstrated to be undertaken without such negative impact. CoT may request a grid impact study to demonstrate this. For systems that are within the parameters of the NRS097-2-3 however, such negative impact is unlikely.

## **2.3 Metering and tariffs**

CoT is currently reviewing its electricity tariffs to include applicable capacity, network, other charges and accommodate Embedded Generation. The aim is to unbundle such tariffs so that energy charge is not the only revenue driver for the city. Residential SSEG customers will be required to move onto the applicable Embedded Generation tariff, and a bi-directional meter will be installed by CoT. This meter cost will be for the customer's account.

Commercial and Industrial customers will remain on their current tariffs or move to a more Embedded Generation compliant tariff, and a bi-directional meter will be installed by CoT. This meter cost will be for the customer's account.

CoT will not compensate customers for reverse power flow nor does it encourage it at this stage.

## **2.4 Load profile management**

Customers with SSEG systems will find it most financially beneficial to ensure that they utilise as much of the generated electricity as they can and avoid or minimise reverse power flow. For example, where a PV system is installed, loads such as geysers and pool pumps should be shifted to the middle of the day when generation is typically at its highest –from mid-morning to mid-afternoon (roughly from 09:30 until 14:30) when PV generation is at a maximum. Consumers wanting to invest in SSEG must first consider energy efficiency approach in order to maximise the potential of the SSEG.

## **2.5 Grid studies**

Should the generation site not meet the criteria for a simplified utility connection for an LV connected SSEG in terms of NRS 097-2-3, grid studies will have to be carried out at the SSEG applicant's cost.

Under normal circumstances grid studies are not required for the connection of a residential SSEG that is within the limits of the NRS097-2-3.

## **2.6 Payment for SSEG application, peripheral equipment and studies**

- The customer is responsible for all the costs involved in the supply and installation of meters.
- The customer will be responsible for the cost of any specialist grid studies (although such studies are unlikely in the case of residential SSEG installations).
- The customer will be responsible for any changes required to the utility network upstream of the connection point as a result of the SSEG installation (under normal circumstances this is unlikely to be required).
- The customer will be responsible for all the costs associated with specialist tests that need to be carried out, as well as for obtaining the required certification of the design and installation as detailed below.

## 2.7 Applicable technical standards

The latest revisions of all standards referred to in this document shall apply. The following two standards are central to SSEG systems (see *Appendix 1: Relevant Standards and Regulations* for the complete list of standards that SSEGs need to comply with):

1. NRS 097-2: Grid interconnection of embedded generation: Part 2 Small scale embedded generation
2. South African Renewable Power Plant Grid Code

The above standards cover aspects such as voltage range; flicker; DC injection; frequency operating range; harmonics and waveform distortion; power factor; synchronization; safe disconnection from the network; overvoltage and under-voltage; sudden voltage dips and peaks; voltage change; over frequency and under frequency; anti-islanding; DC current injection; network faults; response to utility recovery; isolation; earthing; short-circuit protection; labelling.

The design and installation of all SSEG equipment, shall comply with these requirements. Consult with your supplier and/or installer to ensure that these conditions are met.

### The status of key applicable national standards

The latest revisions of all standards referred to in this document shall apply. NRS 097 consists of the following parts and sections, under the general title *Grid interconnection of embedded generation*:

NRS 097 Part 1: Distribution standard for the interconnection of embedded generation.

The specification sets out the minimum technical and statutory requirements for the connection of embedded generators to medium-voltage and high-voltage utility distribution networks. The specification applies to embedded generators larger than 100 kVA. (under development)

NRS 097 Part 2: Small-scale embedded generation.

The specification sets out the technical requirements for the utility interface, the embedded generator and/or system and the utility distribution network with respect to embedded generation. The specification applies to embedded generators and or embedded generator systems smaller than or equal to 1000 kVA connected to low-voltage networks.

Section 1: Utility interface (published 2010, 2016 revision to be published soon)

Section 2: Embedded generator requirements. (under development)

Section 3: Utility framework. (published)

Section 4: Procedures for implementation and application. (To be developed in the future.)

Wiring standards:

SANS 10142-Part 3: The Wiring of Premises – DC wiring (under development)

*Note: Information on other applicable standards are in Appendix 1: Relevant Standards and Regulations.*

## 2.8 Professional sign-off

Until all relevant standards are finalised, CoT requires SSEG systems be signed off on Commissioning only by an ECSA registered professional engineer or technologist confirming that the system complies with the requirements in this document.

Professional sign-off requirements may be reversed in future when CoT deems the necessary national standards and installer accreditation to be in place to render this unnecessary.

## 2.9 Testing of Inverters

CoT requires inverter test certificates of type tests successfully carried out by a reputable third party test house certifying compliance of the inverters with NRS097-2-1 (and NRS097-2-2 when developed).

The certification body must be SANAS accredited or be recognised by the International Laboratory Accreditation Co-operation (ILAC) or the International Accreditation Forum (IAF) in terms of ISO/IEC 17025:2005 for photovoltaic systems.

The SSEG applicant should require the inverter suppliers to provide the necessary certification before the equipment is purchased.

## 2.10 Inspections by Electricity Department

It is the prerogative of CoT to inspect systems below 4.6kVA capacity, and will do so when deemed necessary. CoT will perform inspections on larger systems, however, potentially including an initial inspection prior to installation to confirm grid infrastructure status, and one on system commissioning.

## 2.11 Approvals from other CoT departments

Approvals from other CoT departments are necessary in some circumstances, such as where a rooftop solar SSEG protrudes beyond a certain amount from the building, either vertically or horizontally. Environmental approval may also be necessary in some cases. See Appendix 2: Other Departmental approval information.

### 3 How to apply for permission to install SSEG

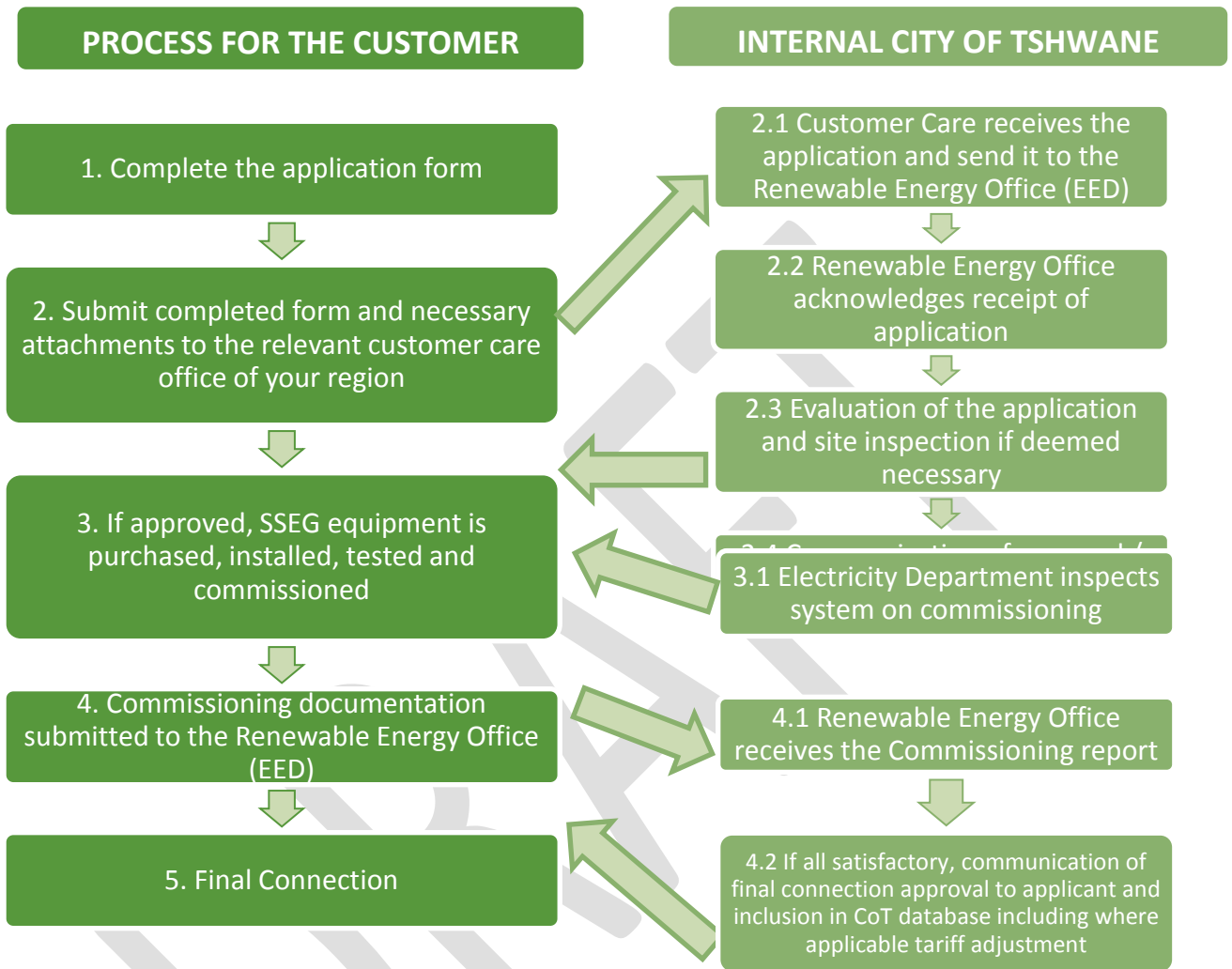


Figure 1: Summary of City of Tshwane's Small Scale Embedded Generation application and approval process

## STEP 1: COMPLETE THE APPLICATION FORM

Visit the City of Tshwane's website and download the application form (insert link when available),

The form requires both basic and technical information of the proposed SSEG project to ensure that all SSEG connections are made safely and legally and in compliance with all NRS097-2 and other CoT and national requirements. The application form needs to be signed by the property owner. Details of the proposed installer must also be provided, and the installer must also sign the form. The customer is required to engage with the proposed installer or a professional in completing the application form.

In the case of a **Body Corporate** which on-sells electricity to units within a complex, the Body Corporate is considered by CoT to be the customer and therefore must submit the application as if they were the 'property owner'.

The application requires the following, amongst others:

- Information on equipment specifications
- Inverter certification from recognised certification body for compliance with NRS097-2-1
- Preliminary circuit diagram showing major system components and the point of common coupling (PCC) must be provided.
- Earthing arrangements in accordance with SANS 10142 sections and as described in NRS 097-2-1.
- System protection detail: this includes information about anti-islanding, power quality etc.
- Proposed peak power generation output.

**New electricity connections:** The SSEG application form does not cover applications for new electricity connections. The application form for new connections must be filled in separately and must accompany the SSEG application form. It may be required that the SSEG capacity be indicated on new electricity connection applications, so that if there is an impact on the performance of the infrastructure and upstream network infrastructure configuration, it can be addressed.

**Approval from other departments:** In some cases approval from other CoT departments may be necessary, and must be obtained before submitting the application form. See Appendix 2: Other Departmental approval information.

## STEP 2: SUBMIT COMPLETED APPLICATION FORM AND ATTACHMENTS

Once the application form has been completed, the form must be emailed to [sseg@tshwane.gov.za](mailto:sseg@tshwane.gov.za). Receipt of the application form will be acknowledged by the EED.

## STEP 3: INSTALLATION COMMENCEMENT UPON APPROVAL

After the Energy and Electricity Department (primarily Connections Section) has evaluated the application and carried out any inspections deemed necessary, the customer will be informed in writing whether the SSEG application has been successful. Once notified of a successful application, installation may start. It is recommended that the customer does not pay for any equipment prior to such notification of success, as it is not guaranteed that applications will be approved.



#### STEP 4: COMMISSIONING AND DOCUMENTATION TO BE SUBMITTED

Once fully installed, the system is ready for testing and commissioning by the SSEG installer. The Commissioning Report template is available on CoT's website ([www.tshwane.gov.za](http://www.tshwane.gov.za)). Note that permanent connection of the SSEG system to the electricity grid is only permitted on receipt of written permission from the CoT. However the SSEG may connect to the utility grid for the commissioning process only, thereafter it must be disconnected until written approval is granted by the City.

Commissioning of the system must be undertaken by a Pr Eng or Pr Tech Eng, who must complete and sign off the SSEG Commissioning Report (this requirement may be reversed in future when CoT deems the necessary national standards and installer accreditation to be in place to render this unnecessary).

CoT must be notified of the commissioning time and date, and will inspect the system on such commissioning (although for systems of 4.6kVA and less, such inspections may not be deemed necessary by CoT).

In addition to the Commissioning Report, the following documentation must also be completed:

- A signed Contract for Embedded Generation This agreement is a legally required contract that governs the relationship between CoT and the customer. The agreement is valid for as long as the project is in existence (available on CoT's website, i.e. [www.tshwane.gov.za](http://www.tshwane.gov.za))
- As-built electrical drawings
- NRS 097-2-1 inverter type test Certificate and test report from a SANAS accredited institution (and NRS 097-2-2 once published)
- Electrical installation Certificate of Compliance according to SANS 10142-1 (and SANS 10142-3 once published)
- Operation and maintenance procedures (also to be kept on site)

All completed documentation must be submitted to the renewable energy office:

Renewable Energy Office - [sseg@tshwane.gov.za](mailto:sseg@tshwane.gov.za)

285 Francis Baard Street, Bothongo Plaza East first floor (room 105), Pretoria

Tel: 012 358 6762 / 4168

#### STEP 5: APPROVAL GRANTED TO CONNECT TO THE GRID AND GENERATION COMMENCES

If all of the above is satisfactory, approval to connect SSEG to the grid is provided by the CoT to the customer, in writing, together with any operation and other requirements deemed necessary<sup>1</sup>. The CoT may perform an inspection of the installation prior to granting such approval.

<sup>1</sup> This approval is subject to the fact that CoT will not allow reverse feeding and that no compensation will be made to the consumer of excess power generated on site.

## 4 Queries

All queries can be directed to:

Renewable Energy Office - [sseg@tshwane.gov.za](mailto:sseg@tshwane.gov.za)

285 Francis Baard Street, Bothongo Plaza East first floor (room 105), Pretoria

Tel: 012 358 6762 / 4168

## 5 System Expansion

Should an expansion or a change to the system be required, a new application must be completed stating the existing system size and configuration.

## 6 Decommissioning

The EED must be informed when SSEG systems are decommissioned. A system which has been decommissioned must be physically disconnected from the grid at the customer's cost by the removal of appropriate wiring.

The Decommissioning Report is available on CoT's website ([www.tshwane.gov.za](http://www.tshwane.gov.za)) of this document must be completed and submitted to the EED, together with a certificate of compliance to this effect.

## 7 Change of property ownership

In the event of transfer of ownership of a property which has SSEG installed, the new owner will be required to sign a new Supplemental Contract or alternatively the SSEG system must be decommissioned as detailed above.

---

# APPENDICES

## Appendix 1: Relevant Standards and Regulations

All relevant standards and regulations are listed below:

The City of Tshwane requires that SSEG installations comply with a range of standards and regulations. This section provides an overview of these legislative requirements. The Professional Engineer / Technologist will highlight aspects most applicable to the SSEG system in question.

### List of Standards and Regulations

There are a number of standards and regulations that the project developer has to be aware of. The most relevant standards and regulations that must be complied with are:

- Electricity Regulation Act, Act 4 of 2006 and Electricity Regulation Amendment Act, 28 of 2007 as amended
- South African Distribution Code (all parts)
- South African Grid Code (all parts)
- South African Renewable Power Plants Grid Code
- Occupational Health and Safety Act 1993 as amended
- SANS 10142- Parts 1 to 4: The Wiring of Premises
- SANS 474/ NRS 057 Code of Practice for Electricity Metering
- NRS 048: Electricity Supply– Quality of Supply
- NRS 097-1: Code of Practice for the interconnection of embedded generation to electricity distribution networks: Part 1 MV and HV (Eskom 240-61268576 / DST 34-1765: Standard for the interconnection of embedded generation, is applicable until published)
- NRS 097-2: Grid interconnection of embedded generation: Part 2 Small scale embedded generation (all sections)
- City of Tshwane Electricity By-Laws
- City of Tshwane applicable electricity tariffs

Guidance on their applicability and coverage is given below:

## Standards of Importance

Of the compliance standards and regulations stated above, two of these standards are the most important for embedded generation, namely:

1. NRS 097-2: Grid interconnection of embedded generation: Part 2 Small scale embedded generation (all sections)
2. South African Renewable Power Plants Grid Code

These two set the majority of regulatory requirements in order for compliance to be granted by the City of Tshwane for the installation and operation of an SSEG and therefore should be consulted with care. This section will provide an overview of key aspects of both documents. These overviews should be seen only as summaries, and the standards themselves will need to be referred to for a complete picture. Applicants will require assistance from their installer or professional engineer/technologist to ensure full compliance.

### NRS 097-2-1 (Part 2: Small Scale Embedded Generation, Section 1)

This document serves as the standard for the interconnection of SSEG's to the utility network and applies to embedded generators smaller than 1000kVA connected to LV networks of type single, dual or three-phase.

### NRS 097-2-3 (Part 2: Small Scale Embedded Generation, Section 3)

This document provides simplified utility connection criteria for low-voltage connected generators.

### South African Renewable Power Plants Grid Code (SARPPGC)

This document sets out the technical and design grid connection requirements for renewable power plants (RPP) to connect to the transmission or distribution network in South Africa. Embedded generators of Category A that are connected to a low-voltage (LV) network or mainly of relevance:

#### i) **Category A: 0 – 1 MVA (Only LV connected RPPs)**

This category includes *RPPs* with *rated power* of less than 1 MVA and connected to the *LV* voltage (typically called 'small or micro turbines'). This category shall further be divided into 3 sub-categories:

#### ii) **Category A1: 0 - 13.8 kVA**

This sub-category includes *RPPs* of *Category A* with *rated power* in the range of 0 to 13.8 kVA.

#### iii) **Category A2: 13.8 kVA – 100 kVA**

This sub-category includes *RPPs* of *Category A* with *rated power* in the range greater than 13.8 kVA but less than 100 kVA.

#### iv) **Category A3: 100 kVA – 1 MVA**

This sub-category includes *RPPs* of *Category A* with *rated power* in the range 100 kVA but less than 1 MVA. Note: *RPPs* with a *rated power* greater than 4.6 kVA must be balanced three-phase.

## Other Standards and Legislation

### *Electricity Regulation Act, Act 4 of 2006 (ERA)*

All applicants should familiarize themselves with the ERA. The act states that no person may, without a license issued by the regulator (NERSA), operate any generation facility. The ERA holds that exemption is held for systems for 'own use', and non-grid-tied installations.

### *South African Distribution Code*

The South African Distribution Code applies to all entities connected to the distribution network, including EGs. It sets the basic rules for connecting to the distribution network, ensures non-

discrimination to all users connected to the distribution network and specifies the technical requirements to ensure the safety and reliability of the distribution network. A more detailed guideline pertaining to the connection of SSEG's to the utility network and the specific requirements involved is found in the NRS 097-2-1.

#### *South African Grid Code*

The South African Grid Code contains the connection conditions that are required by all generators, distributors and end-users (customers) connected to the utility grid, as well as the standards used to plan and develop the transmission system. Page 5 of the Network Code provides a summary of the grid code requirements applicable to specific ratings of non-hydro units, while page 6 provides those for hydro units. For SSEG's the requirements for ratings below 20 MVA should be adhered to accordingly as per the South African Grid Code.

#### *Occupational Health and Safety Act, 1993*

The Occupational Health and Safety Act provides for the health and safety of the people by ensuring that all undertakings are conducted in such a manner so that those who are, or who may be, directly affected by such an activity are not negatively harmed as far as possible and are not exposed to dangers to their health and safety.

#### *SANS 10142-1 The Wiring of Premises - Low-voltage installations*

This document serves as the South African national standard for the wiring of premises in low-voltage networks. The aim of the document is to ensure that people, animals and property are protected from dangers that arise during normal as well as fault conditions, due to the operation of an electrical installation. Compliance to the standards and regulations as laid out SANS 10142-1 is required and proof should be provided via an electrical installation certificate of compliance.

#### *SANS 10142-2 The Wiring of Premises - Medium-Voltage installations above 1 kV a.c. not exceeding 22 kV a.c. and up to and including 3 000 kW installed capacity*

This document serves as the South African national standard for the wiring of premises in medium-voltage networks. The aim of the document is to ensure that people, animals and property are protected from dangers that arise during normal as well as fault conditions, due to the operation of an electrical installation. Compliance to the standards and regulations as laid out SANS 10142-2 is required and proof should be provided via an electrical installation certificate of compliance.

#### *SANS 10142-3 The Wiring of Premises – DC installations and wiring (once published)*

#### *SANS 474 / NRS 057 Code of Practice for Electricity Metering*

SANS 474 specifies the metering procedures, standards and other such requirements that must be adhered to by electricity licensees and their agents. It refers specifically to new and existing metering installations for the purpose of billing. It further specifies the initial calibration and certification requirements as well as compliance testing of metering installations and the subsequent procedures to ensure continued compliance. It specifies the procedures for the manipulation and storage of metering data and sets a standard format for the numbering of electricity meters.

For more specific details with regard to the metering for SSEG purposes, NRS 097-2-1 should be consulted and any requirements as defined by the City of Tshwane must be adhered to.

#### *NRS 048*

The NRS 048 series covers the quality of supply parameters, specifications and practices that must be undertaken to ensure correct and safe operation. The NRS 048-2 and NRS 048-4 have the most relevance to the operation and connection of SSEG's to the utility network:

NRS 048-2: 'Voltage characteristics, compatibility levels, limits and assessment methods' sets the standards and compatibility levels for the quality of supply for utility connections as well as for stand-

alone systems. It is intended that generation licensees ensure compliance with the compatibility levels set in this document under normal operating conditions.

NRS 048-4: 'Application guidelines for utilities' sets the technical standards and guidelines for the connection of new customers. It also sets the technical procedures for the evaluation of existing customers with regards to harmonics, voltage unbalance and voltage flicker.

*City of Tshwane Electricity Supply By-Laws?*

## Appendix 2: Other Departmental approval information

### Planning and Building Development Management

No building plans are required to be submitted provided the SSEG installation does not project more than 1.5 m, measured perpendicularly, above the roof and/or not more than 600mm above the highest point of the roof. If the above parameters are exceeded then full building plans, including an engineer's endorsement, are required. A relaxation in terms of the Zoning Scheme Regulations is also required under either one or both of the above circumstances.

**Ground-mounted PV systems:** no building plans are required to be submitted provided the panel(s) in its installed position does not project more than 2.1 metres above the natural/finished ground level. Full building plans are required where any part of the installation projects more than 2.1 metres above the ground level.

### Environmental Approvals

A residential SSEG installation does not require Environmental Approval unless it exceeds the electricity generation threshold mentioned in the section pertaining to City Planning and Development Division.

### Emergency Services Approvals

Applications for SSEG (including systems with battery backup) exceeding 4.6kVA per phase may require inspection and/or approval from the city's Fire Department.

## Appendix 3: Relevant forms and documents available on the City of Tshwane website

Website address: [www.tshwane.gov.za](http://www.tshwane.gov.za)

Links:

*Supply Contract for SSEG (draft developed)*

*Application form (draft developed)*

*Commissioning report (draft developed)*

*Decommissioning report (draft developed)*



### APPLICATION FOR INVERTER BASED GRID TIED SOLAR PV INSTALLATION

This application form is for the connection inverter-based solar PV type small-scale embedded generation to the electrical installation of existing residential, commercial or industrial customers. Systems up to 350kVA are covered in this process, above which they are beyond the scope of the NRS 097-2-3 and therefore require more detailed studies in their assessment. Please engage with the City of Tshwane Electricity Department separately in such cases.

PLEASE NOTE: FAILURE TO PROVIDE ALL RELEVANT INFORMATION AS REQUIRED BELOW, WILL LEAD TO DELAYS IN THE APPLICATION PROCESS!

Return Completed Forms to [sseg@tshwane.gov.za](mailto:sseg@tshwane.gov.za) (create such new email address) or to the Customer Care office or the regional office in your area.

<b>Project Name:</b>	
----------------------	--

#### Property Owner details

Name:	
ID number (if an individual):	
Telephone Number:	
Email Address:	

#### Applicant details (if different from Property Owner)

Name:	
ID number (if an individual):	
Telephone Number:	
Email Address:	

#### Installer Details\*

Installer (Company name):		
Address:	Physical:	Postal:
Website:		
Contact Person Name:		

Telephone:	
Cell:	
Email address:	

\* - When installer accreditation is implemented by the PV industry, confirmation of such accreditation will be required of installers

### Property Details

Erf number:			
Portion number (if applicable):			
Electricity/Municipal Account Number: (indicate if new connection still being applied for and no account yet)			
Meter Number:			
Current Tariff:			
Physical address: <i>Street Address / Pole Number, Township / Suburb / Farm, Postal Code</i>			
Premise number:			
Property type (tick appropriate):	Residential		
	Business		
	Commercial/Industrial		
	Agricultural		
Current connection capacity (circuit breaker size for a residence, of NMD for other customers) (kVA)			

### Site and initial design details

Site GPS coordinates:	Latitude (dd mm ss)	S			°			'			"
	Longitude (dd mm ss)	E			°			'			"
Site Plan:	Attach for commercial/industrial only (show location and dimensions of intended installation infrastructure in relation to the existing buildings and property point of connection.)										
Site land use zoning:											
Preliminary design:	Attach circuit diagram and design showing major components, proposed point of common coupling, isolating and interfacing devices with City of Tshwane electrical network, protection schemes, customer electrical installation, operating characteristics, earthing arrangements, etc.										



**Embedded Generator (EG) details**

Total nameplate DC Capacity of PV system (kW):		
Total inverter AC capacity (kVA):		
Grid connection mode (tick appropriate)	Energy from PV system to be used within consumers electricity network and excess power to be exported to Tshwane Electricity Distribution network	
	Energy from PV system to be used solely for exporting to Tshwane Electricity Distribution Network (not permitted currently)	
Does the EG include storage capabilities (tick appropriate):	Yes	
	No	
	Details	
	Capacity (kWh):	
Earthing arrangement (tick appropriate)	TN-C-S	
	TN-S	
	TT	
	IT	
	TN-C	

**Construction Schedule**

Anticipated Construction Start Date:	
Anticipated Commissioning Date:	

**Inverter Details**

Manufacturer:		
Model:		
Inverter AC rating:		
Number of Phases (tick appropriate):	Single Phase	
	Three Phase	
Number of Inverters:		
Inverter manufacturer guarantee period:		
NRS 097-2-1 Certification:	Inverters are required to be certified according to NRS 097-2-1. Approved third party inverter type test certification must be attached to this application form (tick).	

**PV Panel Details**

Manufacturer:	
Model:	



Total number of panels:	
Power output per panel (kWp):	
Manufacturer guarantee period:	

**Estimated Proposed Consumption and Generation Levels**

Month	Estimated Energy Production (kWh)	Estimated Energy Consumption (kWh)	Estimated monthly kWh Export to Grid (Production less Consumption)	Estimated daily maximum exported power (kVA)
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
Total:				-

**List of regulatory approvals, requirements and references that the installation will comply with (tick (✓) appropriate or mark N/A) (note that the latest version of all of the below standards are applicable)**

Electricity Regulation Act, Act 4 of 2006 and Electricity Regulation Amendment Act, Act 28 of 2007	
Occupational Health & Safety Act, No. 85 of 1993 as amended	
South African Distribution Code (all parts)	
South African Grid Code (all parts)	
South African Renewable Power Plants Grid Code	
SANS 474 / NRS 057 : Code of Practice for Electricity Metering	
SANS 10142- Parts 1 to 4: The wiring of premises (as amended and published)	
NRS 048: Electricity Supply – Quality of Supply	
NRS 097-1 : Code of Practice for the interconnection of embedded generation to electricity distribution networks : Part 1 MV and HV	
NRS 097-2 : Grid interconnection of embedded generation: Part 2: Small scale embedded generation	

**NERSA license**

Does the system require a license from NERSA? (tick)	No	
	Yes	

**Clearance by other City of Tshwane Departments**

FUNCTION	SECTION	COMMENTS	NAME	SIGNATURE	DATE
Zoning/Subdivision/ Building Structure Plans*	Building Planning				
Emergency Services		Needs to be checked			

\* - No building plans are required to be submitted provided the SSEG installation does not project more than 1.5 m, measured perpendicularly, above the roof and/or not more than 600mm above the highest point of the roof.

#### Attachments checklist (tick)

Site Plan (commercial and industrial only)	
Preliminary circuit diagram	
Inverter type test Certificate of Compliance and Test Report according to NRS 097-2-1, issued by accredited 3 <sup>rd</sup> party test house	

#### Declaration

I request the City of Tshwane to proceed with a preliminary review of this embedded generation interconnection application and I agree to pay the cost associated with completing this review and obtaining written consent of the City of Tshwane (though such costs are unlikely except if grid studies are required).

I further consent to the City of Tshwane providing this information to the National Electricity Regulator of SA (NERSA) and other Distributors as required.

I declare that this installation has been designed such that it complies with the requirements laid out in the latest version of City of Tshwane's *Requirements for Embedded Generation* document.

#### Property Owner Signoff

_____	_____	_____
Name	Date	Signature

#### Applicant Signoff (if different from property owner)

_____	_____	_____
Name	Date	Signature

#### Installer sign-off

**Organisation name:****Person:**

Name

Date

Signature

Note: It is recommended that this form is filled in by a PV installer familiar with the technical details of the intended generation technology. ECSA-registered professional sign-off of the Commissioning Report is however mandatory.

**FOR OFFICE USE**

Date Application Received:

Application  
Reference No.

Further Information Required

YES / NO

Date  
Received:

More detailed studies Required

YES / NO

Date  
Complete:

Initial Inspection Required

YES / NO

Date  
Undertaken:

Approved in Principle:

YES / NO

Date Applicant  
Advised:
**COMMISSIONING:**

Commissioning Report received:

YES / NO

Date received:

Further information required:

YES / NO

Date Received:

Installation inspection:

YES / NO

Date inspected:

Bi-directional meter installed:

YES / NO

Date installed:

Approved for connection:

YES / NO

Date Applicant  
Advised:



### SMALL-SCALE EMBEDDED GENERATION COMMISSIONING REPORT

PLEASE NOTE: FAILURE TO PROVIDE ALL RELEVANT INFORMATION AS REQUIRED BELOW, WILL LEAD TO DELAYS IN THE APPLICATION PROCESS.

<b>Project name:</b>	
----------------------	--

#### Property Details

Electricity Account Number:	
Physical address:	

#### Contact Details

Property Owner Name:	
Property Owner Contact details:	
SSEG Owner Name:	
SSEG Owner Contact Details:	

#### Installer Details

Name:	
Address:	
Contact Person Name:	
Telephone:	
Email address:	

**SSEG Details**

PV panel manufacturer and model:	
PV panel total kWp:	
Inverter manufacturer and model:	
Serial number(s) of inverter(s) and independent disconnection switching unit(s) (if not integrated into one of the components of the EG):	
SSEG rating (kVA):	
Single of three phase:	

**Attachments Checklist:**

Final version of circuit diagram:	✓
Inverter type test Certificate of Compliance AND Test Report according to NRS 097-2-1, issued by accredited 3 <sup>rd</sup> party test house:	
Electrical installation Certificate of Compliance (SANS 10142-1, and SANS 10142-3 when published):	
Signed contract for SSEG:	
Operation and maintenance procedures (also to be kept on site):	

**Compulsory Declaration (to be completed by ECSA registered Pr Eng or Pr Tech Eng)**

The SSEG installation complies with the relevant sections of NRS 097-2-1:	
The loss of mains protection has been proved by a functional test carried out as part of the on-site commissioning, e.g. a momentary disconnection of the supply to the SSEG in order to prove that the loss of mains protection operates as expected:	
Safety labels have been fitted in accordance with NRS 097-2-1:	
The SSEG installation complies with the relevant sections of SANS 10142-1 and other relevant SANS 10142 standards for solar PV, and an installation certificate of compliance is attached:	
The SSEG installation complies with licensing requirements of NERSA	
Comments:	

**Professional Signoff (mandatory)**

_____	_____	_____	_____
ECSA Registered professional Name	Reg. no.	Date	Signature

GIZ Office Pretoria, P.O. Box 13732, Hatfield 0028, Pretoria, South Africa

Maswanganyi M.R.  
Act. Strategic Executive Director: Energy and Electricity (EED)  
Energy & Electricity Department  
Bothongo Plaza East  
285 Francis Baard Street, Pretoria  
PO Box 423

**Office Pretoria,**

Hatfield Gardens  
Block C, 2<sup>nd</sup> Floor  
333 Grosvenor Street  
Hatfield 0028, Pretoria  
South Africa

T +27 (12) 423 5900  
F +27 (12) 342 0185

29/02/20166

**Subject: City of Tshwane SSEG programme**

Dear Mr. Maswanganyi,

South Africa has made the expansion of renewable energy (RE) a high political priority in response to an acute shortage of electricity. This is reflected in dedicated strategies and support programmes to develop RE all over the country. Many municipalities operate electricity distribution systems and play an active and important role in enabling the use of renewable Small Scale Embedded Generation (SSEG). Facing a growing number of enquiries for the interconnection of grid-tied SSEG, several municipalities have recently implemented dedicated SSEG programmes (e.g. City of Cape Town and Nelson Mandela Bay).

The South African-German Energy Programme (SAGEN), funded by the German government and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with the Department of Energy (DoE) collaborates with the South African Local Government Association (SALGA) and frontrunner municipalities to establish adequate framework conditions for SSEG.

GIZ is a state-owned German development agency that provides expert services worldwide in the field of international cooperation for sustainable development. GIZ has over 50 years of experience in a wide variety of areas, including economic development and employment, energy and the environment, and peace and security.

Within this context SAGEN has supported various AMEU workshops on the topic of embedded generation and has also organised two technical workshops with relevant staff of City of Tshwane (CoT) to inform about interconnection rules, technical standards, quality related aspects as well as financial implications of SSEG. In addition, potential steps to promote SSEG in Tshwane have been discussed.

As a result of the workshops, CoT has indicated their interest to further collaborate with GIZ. The aim is to put the necessary technical requirements

Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices  
Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 36 + 40  
53113 Bonn, Germany  
T +49 228 44 60-0  
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1 - 5  
65760 Eschborn, Germany  
T +49 61 96 79-0  
F +49 61 96 79-11 15

E [info@giz.de](mailto:info@giz.de)  
I [www.giz.de](http://www.giz.de)

Registered at  
Local court (Amtsgericht)  
Bonn, Germany  
Registration no. HRB 18384  
Local court (Amtsgericht)  
Frankfurt am Main, Germany  
Registration no. HRB 12394

Chairman of the Supervisory Board  
Dr Friedrich Kitschelt, State Secretary

Management Board  
Tanja Gönner (Chair)  
Dr Christoph Beier (Vice-Chair)  
Dr Hans-Joachim Preuß  
Cornelia Richter



and processes in place that will allow City of Tshwane to offer a formalised procedure to connect embedded generation to the grid.

Potential areas of support from GIZ could include:

- Support regarding the City of Tshwane's requirements and application process for connecting all forms of small-scale sustainable embedded generation such as photovoltaic systems to the City's electricity network
- Support on the definition of the technical requirements and rules for installers (such as interconnection rules), acceptance procedure for PV inverters, standards for commissioning, maintenance and training procedures, types of metering
- Support in analysing and addressing costs and benefits in order to promote sustainable and socially acceptable development of small-scale embedded generation (e.g. through adequate tariff design)
- Support in addressing legal implications of generating electricity "(not) for own use".
- Support to the establishment of a communication process with customers (existing, but not registered) and new applications
- Assistance and hands-on support for the interconnection of pilot installations to the grid

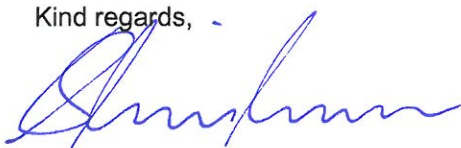
GIZ could provide support to relevant staff members of City of Tshwane on all of these issues. GIZ technical advisory services do not imply any costs for City of Tshwane as expenditures will be covered by GIZ under the SAGEN programme.

In order to make the initiative a success, it is recommended that CoT establishes a project team to drive and coordinate the process. GIZ would directly support this project team. Ideally the project team would incorporate representatives of all relevant departments (e.g. Electricity, Sustainability Unit, Planning and Building ...).

Knowledge gained through the cooperation between GIZ and CoT would ideally be made available to other municipalities, with the aim to support peer-to-peer learning among South African Municipalities.

We are looking forward to collaborate with City of Tshwane.

Kind regards, -



Dr. Sascha Thielmann

Head of South African - German Energy Programme (SAGEN)

## DEPARTMENT OF ENERGY

NO. 1482

02 DECEMBER 2016

## ELECTRICITY REGULATION ACT, 2006

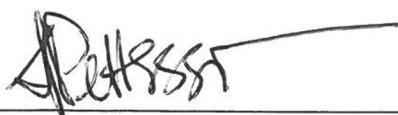
PUBLISHED FOR PUBLIC COMMENTS: DRAFT LICENSING EXEMPTION AND  
REGISTRATION NOTICE

I, Tina Joemat-Pettersson, the Minister of Energy, intend, –

- (a) under section 36(4) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) (“the Act”), and after consultation with the National Energy Regulator (“Regulator”) and any person who may be affected, to amend Schedule 2 to the Act by substituting it with the Schedule (“the Schedule”) set out in the Annexure hereto; and
- (b) under section 9(1) of the Act, and in consultation with the Regulator, to determine that a person who operates a generation facility contemplated in items 1.1, 1.2, 1.3, 1.4, 1.5 or 1.6 of the Schedule, or a person who performs the activities of a reseller as contemplated in item 1.8 of the Schedule, must register with the Regulator.

Interested persons and organisations are invited to submit, within 30 days, written comments on the proposed Draft Licensing Exemption and Registration Notice to the Director-General, Department of Energy, Private Bag X96, Pretoria 0001; Matimba House 192 Visagie Street, Pretoria; or email to [joseph.maraba@energy.gov.za](mailto:joseph.maraba@energy.gov.za) (for attention Chief Director: Electricity Policy).

Kindly provide the name, address, telephone number, fax number and email address of the person or organisation submitting the comments. Comments received after the closing date may not be considered.



TINA JOEMAT- PETTERSSON, MP

Minister of Energy



**ANNEXURE****SCHEDULE 2****EXEMPTION FROM OBLIGATION TO APPLY FOR AND HOLD A LICENCE**

1. The following activities are exempt from the requirement to apply for and hold a licence under the Act:
  - 1.1 The operation of a generation facility with an installed capacity of no more than 1MW which is connected to the national grid, in circumstances in which—
    - 1.1.1 the facility is installed and connected on the consumer side of the electricity meter and serves a single consumer located on that side of the electricity meter;
    - 1.1.2 the generator has entered into a connection agreement with, or obtained approval from, the holder of the relevant distribution licence, which agreement or approval authorises the supply of electricity into the national grid if the facility engages in such supply; and
    - 1.1.3 as at the date on which the connection agreement is entered into or the approval is obtained, the Minister has not published a notice in the *Gazette* stating that the amount of megawatts (MW) allocated in the integrated resource plan for embedded generation of this nature has been reached.
  - 1.2 The operation of a generation facility with an installed capacity of no more than 1MW which is connected to the national grid, in circumstances in which—
    - 1.2.1 the generation facility is operated solely to supply a single consumer or related consumers by transporting electricity through the national grid;
    - 1.2.2 the generator has entered into a use-of-system agreement with the holder of the distribution or transmission licence in respect of the power system over which the electricity is to be transported; and
    - 1.2.3 as at the date on which the use-of-system agreement is entered into, the Minister has not published a notice in the *Gazette* stating that the amount of MW allocated in the integrated resource plan for embedded generation of this nature has been reached.

- 1.3 The operation of a generation facility with an installed capacity of no more than 1MW which is not connected to the national grid, for the sole purpose of producing electricity—
  - 1.3.1 for consumption by the generator or owner of the generation facility in question;
  - 1.3.2 for consumption by a consumer who is related to the generator or owner of the generation facility within the meaning contemplated in section 2 of the Companies Act, 2008 (Act No. 71 of 2008); or
  - 1.3.3 which is supplied to a consumer for consumption on the same property on which the generation facility is located.
- 1.4 The operation of a generation facility for demonstration purposes only, whether or not the facility is connected to a transmission or distribution power system, in circumstances in which—
  - 1.4.1 the electricity produced by the generation facility is not sold; and
  - 1.4.2 if the facility is connected to the national grid, the generator has entered into a connection agreement with, or obtained approval from, the holder of the relevant transmission or distribution licence.
- 1.5 The operation of a generation facility for the sole purpose of providing standby or back-up electricity in the event of, and for a duration no longer than, an electricity supply interruption.
- 1.6 The continued operation of an existing generation facility which, immediately prior to the date of commencement of this Schedule, was exempt from the requirement to apply for and hold a licence under the Act.
- 1.7 The operation of a distribution facility that is connected to a generation facility contemplated in items 1.1 to 1.6 and is used exclusively for the transportation of electricity from that facility to—
  - 1.7.1 the consumer, if the electricity is not to be transported through the national grid; or
  - 1.7.2 the nearest point of connection, if the electricity is to be transported through the national grid.
- 1.8 The sale of electricity by a reseller in circumstances in which—

- 1.8.1 the tariff or price charged by the reseller to consumers does not exceed the tariff or price that would have been charged to such consumers for the electricity if it had been purchased from the holder of a distribution licence over the area in which the electricity is supplied to the consumer; and
- 1.8.2 the reseller has entered into an agreement with the holder of a distribution licence over such area which regulates the relationship between the reseller and the holder of the distribution licence and the obligations of the reseller in respect of the quality of supply to consumers.
2. For purposes of item 1:
- 2.1 "electricity meter" means a meter that is used to measure the flow of electricity that flows out of or into the national grid and has been installed by or on behalf of a licensed distributor;
- 2.2 "existing generation facility" means a generation facility which was in operation on or immediately prior to the date of commencement of this Schedule;
- 2.3 "national grid" means the publicly-owned interconnected network of transmission and distribution power systems used for the supply of electricity to customers across the territory of the Republic, and includes any portion thereof;
- 2.4 "point of connection" means the point at which a generator or consumer connects to the national grid;
- 2.5 "property" means:
- 2.5.1 a farm, agricultural holding, erf or sectional title unit; and
- 2.5.2 a building located on that farm, agricultural holding, erf or sectional title unit notwithstanding that the building extends beyond the boundary of that farm, agricultural holding, erf or sectional title unit;
- 2.6 "related consumers" means consumers which are related to each other within the meaning contemplated in section 2 of the Companies Act, 2008 (Act No. 71 of 2008);
- 2.7 "reseller" means a person which purchases electricity from a distribution licensee in order to on-sell such electricity to consumers.

**SUMMARY NOTE****DRAFT LICENSING AND REGISTRATION NOTICE ("the Notice")**

The purpose of the Notice is to exempt various categories of generation facilities and electricity resellers from the requirement to hold a licence under the Electricity Regulation Act, 2006 ("**ERA**"), and to require these activities to rather be registered with the National Energy Regulator ("**NERSA**"). It does so by amending the existing Schedule 2 to ERA so as to exempt these activities and, in the second paragraph of its introduction, requiring these activities to be registered.

Generally speaking, the Notice exempts five categories of generation facilities from the licensing requirement, in certain circumstances: embedded generation where no wheeling takes place (clause 1.1), facilities that wheel through the grid (clause 1.2 of the Annex), off-grid generation (clause 1.3 of the Annex), facilities used for demonstration purposes (clause 1.4 of the Annex), and back-up generation (clause 1.5 of the Annex).

Importantly, the first three categories of generation facilities are only exempt from the licensing requirement if their installed capacity is no more than 1MW. In the case of the first two categories, a facility will also only be eligible for exemption if the Minister of Energy ("**the Minister**") has not published a notice in the *Gazette* stating that the amount of megawatts (MW) allocated in the integrated resource plan ("**IRP**") for embedded generation of this nature has been reached.

The intention is that the IRP will specify an allocation for embedded generation facilities of up to 10MW in installed capacity. This provision in the IRP is intended to facilitate the licensing or registration of these facilities and do away with the need for the Minister on a case by case basis to grant approval for deviations from the IRP in terms of section 10(2)(g) of ERA for the relevant facilities. The result is, generally, as follows:

- qualifying generation facilities with a capacity of no more than 1MW will not require a licence but will rather be subject to registration with NERSA as per the Notice;
- qualifying generation facilities with a capacity of between 1MW and 10 MW will require a licence but no ministerial approval for deviation from the IRP will be required, provided that the IRP allocation for this category of facilities has not been used up; and
- generation facilities with a capacity of more than 10MW will require a ministerial approval for the deviation from the IRP for a licence to be issued by NERSA.

The sale of electricity by resellers (who purchase electricity from distribution licensees and on-

sell to consumers) is also exempt in specified circumstances. The requirements for this exemption are: the tariff charged by the reseller does not exceed the tariff that would have applied if the consumers had purchased the electricity from the relevant distributor; and an appropriate agreement is in place with the licensed distributor.



## **Consultation Paper**

# **Small-Scale Embedded Generation: Regulatory Rules**

**PUBLISHED ON 25 FEBRUARY 2015**

### ***Issued by***

The National Energy Regulator  
526 Madiba Street  
Arcadia, Pretoria  
0007

### ***Contact Details:***

Tel: +27 (0)12 401 4600

Fax: +27 (0)12 401 4700

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

## Table of Contents

<b>1</b>	<b>THE CONSULTATION PROCESS .....</b>	<b>11</b>
<b>2</b>	<b>INTRODUCTION .....</b>	<b>13</b>
<b>3</b>	<b>BACKGROUND .....</b>	<b>14</b>
<b>4</b>	<b>PURPOSE .....</b>	<b>16</b>
<b>5</b>	<b>APPLICABLE LAW.....</b>	<b>17</b>
<b>6</b>	<b>PROPOSED REGISTRATION PROCESS OF SMALL-SCALE EMBEDDED GENERATION .....</b>	<b>19</b>
<b>7</b>	<b>REPORTING REQUIREMENTS OF THE DISTRIBUTING UTILITIES TO NERSA .....</b>	<b>20</b>
<b>8</b>	<b>GRID INTERCONNECTION STANDARDS FOR SMALL-SCALE EMBEDDED GENERATION .....</b>	<b>20</b>
<b>9</b>	<b>INVERTERS FOR THE SMALL-SCALE EMBEDDED GENERATION .....</b>	<b>21</b>
<b>10</b>	<b>CODES OF PRACTICE ON SMALL-SCALE EMBEDDED GENERATORS .....</b>	<b>22</b>
	10.1 GRID CONNECTION REQUIREMENTS .....	22
	10.2 POWER QUALITY AND LIMITATION OF LIABILITY .....	22
	10.3 TECHNICAL PERFORMANCE.....	23
	10.4 INFORMATION EXCHANGE PROTOCOLS .....	23
	10.5 SIGNALS, COMMUNICATION AND CONTROL FUNCTIONS.....	24
<b>11</b>	<b>TARIFF DESIGN .....</b>	<b>24</b>
	11.1 REVENUE IMPACT ON DISTRIBUTORS.....	25
	11.1.1 <i>Fixed network costs</i> .....	26
	11.1.2 <i>Fixed retail (service and administration) costs</i> .....	27
	11.1.3 <i>Ancillary services costs</i> .....	27
	11.1.4 <i>Variable costs</i> .....	27
	11.1.5 <i>Connection and metering cost</i> .....	27
	11.2 AVOIDED COSTS .....	28
	11.3 TARIFF CHARGE COMPONENTS FOR CONSUMPTION.....	28
	11.4 SSEG NET-BILLING TARIFFS .....	29
	11.4.1 <i>Consumption tariff for SSEG</i> .....	29
	11.4.2 <i>Export credit tariff for generated exported energy</i> .....	30
	11.5 CONNECTION CHARGES .....	31

## Definitions

### **Administration charge**

The administration charge covers the costs of the administration of the account. It is a contribution towards fixed costs such as meter reading, billing and meter capital. It is a fixed charge payable every month whether electricity is consumed or not.

### **Bi-directional meter**

The bidirectional meter is a meter that is installed for Net Metering customers and records the power flowing in two directions. It measures how much electricity customers use from the embedded generation and how much electricity the utility system supplies to the customer with an embedded generator.

### **Bi-directional distribution rate**

The concept of bi-directional distribution rate is that the customer taking power from the grid needs the grid in order to have reliable service, and should pay the same rate as other customers. This same customer, however, also 'needs' the grid when he or she is in an exporting condition, and pays the same distribution charge when feeding power to the grid.



<b>Customer</b>	Means electricity customer.
<b>Distributed Generation</b>	Distributed generation is defined as the installation and operation of electric power generation units connected directly to the distribution network or connected to the network on the customer site of the meter
<b>Distribution Grid code</b>	A code of practice that sets minimum technical requirements applicable to all participants operating or connected to the Distribution System as approved by NERSA.
<b>Embedded Customer</b>	A customer whose supply is taken from the distribution system.
<b>Embedded Generator</b>	An entity that operates one or more units that is connected to the Distribution System. Alternatively, a legal entity that desires to connect one or more units to the Distribution System.
<b>Export tariff</b>	A payment for every kilowatt-hour (kWh) of surplus electricity a customer system exports to the electricity grid.

<b>Feed-in tariff</b>	An administrative tariff or standard offer approved by the Energy Regulator for a renewable energy generator or energy efficiency interventions.
<b>Integrated Resource Plan 2010</b>	In terms of the Electricity Regulation Act of 2006, it means a resource plan established by the national sphere of government to give effect to national policy. It refers to the coordinated schedule of generation expansion and demand-side intervention programmes, taking into account multiple criteria to meet the electricity demand.
<b>Generator</b>	A legal entity licensed to engage in the production of electricity through a unit or power station.
<b>Genflex</b>	A new tariff category proposed by Eskom for customers that are consuming and generating energy at the same point of supply.
<b>Import tariff</b>	A payment for every kilowatt-hour (kWh) of electricity imported to a customer system from the electricity grid.

**Licensed Distributor**

Reference is made to the 'licensed electricity distribution authority'. In South Africa, this may be Eskom, or the municipal electricity service provider.

**Megawatt**

A unit of power equal to one million watts.

**Net-metering**

Net-metering is a service to an electric consumer under which electric energy generated by that electric consumer from an eligible on-site generating facility and delivered to the local distribution facilities may be used to offset electric energy provided by the electric utility to the electric consumer during the applicable billing period.

**Network charges**

The network charge is a tariff charge payable per premise every month. The network charge recovers network costs (including capital, operations, maintenance and refurbishment) associated with the provision of the network capacity required and reserved by the customer. The network charge in the retail tariff or in the Distribution use of system charges may or may not be the same in structure and value.

<b>Network Service Provider</b>	A legal entity that is licensed to provide network services through the ownership and maintenance of an electricity network.
<b>Reactive Power</b>	Reactive power is produced when the current waveform is out of phase with the voltage waveform due to inductive or capacitive loads.
<b>Participant</b>	In this document, it means the Embedded Generator.
<b>Reliability service charges</b>	The charge for services provided by the network service provider to ensure short-term reliability to customers.
<b>Renewable Energy Grid code</b>	Grid Connection Code for Renewable Energy Power plants connected to the Transmission System or Distribution System in South Africa.
<b>System Operator</b>	The legal entity licensed to be responsible for short-term reliability of the Integrated Power System (IPS), which is in charge of controlling and operating the Transmission system and dispatching generation (or

balancing the supply and demand) in real time.

**SSEG**

Small-Scale Embedded Generation in this document is referred to as Solar PV generation

**Tariff**

A tariff is a combination of charging parameters applied to recover measured quantities such as consumption and capacity costs, as well as unmeasured quantities such as service costs

**Time of Use**

The time of day, or season during which electricity is used.

**Time-of-Use tariff**

A tariff with energy charges that change during time-of-use periods and seasons.

**Wholesale Electricity Pricing System**

A totally unbundled, cost-reflective tariff structure.

## ACRONYMS AND ABBREVIATIONS

CSP	Concentrated Solar Power
CPPA	Central Power Purchasing Agency
DC	Direct Current
DG	Distributed Generation
DoE	Department of Energy
DUOS	Distribution Use of Systems
EIA	Environmental Impact Assessment
EG	Embedded Generation
FIT	Feed in Tariff
GWh	Gigawatt hours
IPP	Independent Power Producer
IRP	Integrated Resource Plan
LCOE	Levelised Cost of Energy
LV	Low Voltage
MV	Medium Voltage
MW	Megawatt
NEM	Net Energy Metering
NERSA	National Energy Regulator
NIPS	National Integrated Power Systems
NMD	Notified Maximum Demand
NRS	National Rationalised Specifications
OCGT	Open Cycle Gas Turbines
PPA	Power Purchase Agreement
PUC	Point of Utility Connection
PV	Photovoltaic
RE	Renewable Energy
REEEP	Renewable Energy Efficiency Programme
REFIT	Renewable Energy Feed-In Tariff

REGC	Renewable Energy Grid Code
REIPP	Renewable Energy Independent Power Producer
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REFSO	Renewable Energy Finance and Subsidy Office
RPP	Renewable Power Plant
SMME	Small Medium and Micro Enterprises
SSREG	Small-Scale Renewable Embedded Generation/Generator
SSPVEG	Small-Scale Photovoltaic Embedded Generation
SWH	Solar Water Heater
TOU	Time-of-Use
WEPS	Wholesale Electricity Pricing System

## 1 THE CONSULTATION PROCESS

The National Energy Regulator (NERSA) is in the process of drafting the Small-Scale Embedded Generation: Regulatory Rules. However, prior to the decision, the Energy Regulator will embark on a due process involving stakeholder consultations. As part of this process, NERSA is requesting that stakeholders comment on the issues raised in this consultation paper. The consultation paper is broken down into sections relating to the key elements/components that make up the Small-Scale Embedded Generation. Each section provides the draft rules followed by questions to stakeholders for comments.

NERSA will collate all comments received, which will be taken into consideration when the decision is made. NERSA will also hold a public hearing in April 2015 wherein presentations may be made by interested and affected parties. The process for the consultation and decision-making is outlined in the table below:

<b>DRAFT HIGH-LEVEL TIMELINES FOR APPROVAL OF THE SMALL-SCALE EMBEDDED GENERATION REGULATORY RULES</b>	
<b>ACTIVITY/TASK</b>	<b>DATE</b>
Publication of notice of consultation paper for stakeholder comments on Small-Scale Embedded Generation: Regulatory Rules	25 FEBRUARY 2015
Closing date for stakeholder comments on Small-Scale Embedded Generation: Regulatory Rules	25 MARCH 2015
Public Hearing	10 APRIL 2015 <sup>1</sup>
Energy Regulator decision on the Small-Scale Embedded Generation: Regulatory Rules	22 MAY 2015
Publication of the Small-Scale Embedded Generation: Regulatory Rules on the NERSA website	30 MAY 2015

Stakeholders are requested to comment in writing on the Small-Scale Embedded Generation: Regulatory Rules Consultation Paper. Written comments can be

<sup>1</sup> Details regarding logistics (venue, time, etc.) will be communicated in due course.



forwarded to [embeddedgeneration@nersa.org.za](mailto:embeddedgeneration@nersa.org.za); hand-delivered to Kulawula House, 526 Madiba Street, Arcadia, Pretoria, or posted to PO Box 40343, Arcadia, 0083, Pretoria, South Africa. The closing date for the submission of comments is **25 March 2015 at 16:00.**

For more information and queries on the above, please contact Mr Moefi Moroeng or Mr Lucky Ngidi at the National Energy Regulator of South Africa, Kulawula House, 526 Madiba (formerly Vermeulen) Street, Arcadia, Pretoria.

Tel: 012 401 4600

Fax: 012 401 4700

## 2 INTRODUCTION

The Electricity Regulation Act, 2006 (Act No. 4 of 2006) ('the Act') mandates the National Energy Regulator (NERSA) to, among other things, regulate prices and tariffs, and issue licences for electricity Generation, Transmission, Distribution, exports and imports, and trading activities. Electricity generation and reselling falls under trading activities (buying and selling of electricity), however, unlike all other activities that are licensed, these supplies which are below 1MVA remains unregulated (non-licensed and/or unregistered).

The National Energy Regulator Act, 2004 (Act No. 40 of 2004) serves as the establishing legislation of the Energy Regulator and promotes the protection of the interests of vulnerable groups within the Electricity Supply Industry (ESI).

Based on NERSA research and analysis, Solar Photovoltaic (PV) has a bigger demand in South Africa at the moment than other technologies. This has necessitated NERSA to focus on all small-scale embedded PV generation. An urgent and proper Regulatory rules for small-scale embedded PV generation is recommended and a two-phase approach for the introduction of standardised tariff schemes for them be considered in South Africa.

In the short term, this consultation will be focusing on the regulatory rules for a modified net-metering scheme (or net-billing scheme) with different tariffs for exporting and importing energy for small-scale embedded generation up to 1MVA of installed capacity. The regulatory rules will define the basic principles and mechanisms for such a scheme. Such a net-metering (or net-billing) scheme could be implemented in the short term, within the responsibilities of the individual distributors.

During a second phase, more complex structures for handling fees, subsidies, levies and taxes, e.g. involving a Central Power Purchasing Agency and/or

introducing compensation schemes for municipalities, could be put in place. Such a scheme would need policy commitment and a specification of IRP targets of South Africa with respect to the use of Small-Scale Energy Generation (SSEG) (which are not defined at present). This process should be accompanied by studies about the cost impact of SSEG. In particular, avoided cost of municipalities, avoided cost of generation from a national perspective etc. should be considered as there are significant potential benefits of SSEG from an overall economic perspective. By doing so, the focus would shift away from just looking at the impact on revenues of municipalities but towards a broader national point of view. This would also allow to define a fair compensation schemes that may be needed once penetration rates of SSEG reach significant levels.

### **3 BACKGROUND**

To date, South Africa's renewable energy policy of 2003 has largely been driven by a 10,000GWh target by 2013 and renewable energy project subsidies offered through the Renewable Energy Finance and Subsidy Office (REFSO). From 2009 to 2011, a Renewable Energy Feed-In Tariff (REFIT) was considered and published, which resulted in great interest by Independent Power Producers (IPPs) to develop renewable energy projects in South Africa. However, due to legislative constraints in 2011, a competitive procurement process entitled the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) was launched by the Department of Energy (DoE) in its place.

In terms of section 34 of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) ('the Act'), the Minister has determined that 3,725 megawatts (MW) to be generated from Renewable Energy sources is required to ensure the continued uninterrupted supply of electricity. This 3,725MW is broadly in accordance with the capacity allocated to Renewable Energy generation in the Integrated Resource Plan 2010–2030 (IRP 2010). This IPP Procurement Programme has been

designed to contribute towards the target of 3,725MW and towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in South Africa.

REIPPPP only made provision for large and small-scale solar photovoltaic greater than 5MW and 1MW respectively, which effectively excludes most rooftop systems. In spite of this, the past year has seen a great increase in the number of private rooftop PV systems installed on residential and commercial/industrial premises at the cost of the owners. Ostensibly for generating electricity for own use, these systems are nonetheless grid tied, and could be capable of feeding surplus power back into the grid. A number of residential rooftop grid tied PV systems have also come to light, using net-metering by agreement with the relevant municipalities. Several municipalities have drawn up procedures for connecting such systems, and NERSA has also produced documents covering such situations. So it would seem that in spite of exclusion from the large-scale REIPPPP, privately installed small-scale grid tied rooftop solar is alive and well and growing in South Africa.

The IRP 2010–30 Update [2] states that 9,770MW of solar PV capacity is planned to be installed in South Africa by 2030. The IRP 2010–30 Update also estimates that Embedded Generation (EG) residential and commercial PV could reach 22.5GW by 2030 based on *Living Standards Measure 7* (LSM 7) households and 5kWp PV household installations [2]. Even if this estimate is partially correct, this points to a significant level of installed Small-Scale Solar PV Embedded Generation (SSPVEG) capacity in South Africa by 2030.

1. The South African IRP 2010, approved and published in May 2011 by the DoE, outlines the proposed power generation mix for South Africa. The IRP 2010 seeks to increase the overall contribution of new renewable energy generation to 17,800MW by 2030 (42% of all new-build generation).

2. Based on the approved IRP 2010, on 02 July 2011, the Minister of Energy issued a Determination for the IPP procurement programme in accordance with section 34(1) of the Electricity Regulation Act, 2006.
3. The Energy Regulator concurred with the Ministerial Determination on 07 July 2011.
4. On 19 December 2012, the Minister of Energy made a new determination for the procurement of an additional 3,200MW capacity to the previous determination of 3,725MW. The total capacity to be procured is currently 6,925MW.

The new capacity allocation is as follows:

**Table 1: New capacity allocation**

<b>Technology</b>	<b>Capacity (MW)</b>
Onshore wind	3 320
Solar photovoltaic (PV)	2 525
Concentrated Solar Power (CSP)	600
Small hydro ( $\leq 40$ MW)	135
Landfill gas	25
Biomass	60
Small projects	200

## **4 PURPOSE**

The principal aim of this Consultation Paper on the regulatory rules for small-scale embedded generation is to:

- (a) solicit comments from stakeholders on the proposed regulatory rules for small-scale embedded generation; and

- (b) explore various tariff options available in promoting and incentivising installations that are grid-tied.

## 5 APPLICABLE LAW

### ***Electricity Regulation Act of 2006***

The Electricity Regulation Act, 2006 (Act No. 4 of 2006) ('the Act') stipulates that no person may operate a generation facility without a licence from the Energy Regulator, except for activities listed on Schedule 2 of the Act, namely:

- 1 *Any generation plant constructed and operated for demonstration purposes only and not connected to an inter connected power supply*
- 2 *Any generation plant constructed and operated for own use*
- 3 *Non-grid connected supply of electricity except for commercial use*

The small-scale embedded generators that are connected to the grid and operated for commercial purposes must therefore be licensed or registered by the Energy Regulator. Even zero or net consumption customers must be licensed or registered, due to connection to the grid.

Section 10 of the Act details the information that should be included in an application for licensing of a generation plant. Section 11 of the same Act requires that once an application for a licence is made, the applicant must publish a notice of the application in appropriate newspapers or other appropriate media circulating in the area of the proposed activity in at least two official languages. The advertisement must state:

- a) *the name of the applicant;*
- b) *the objectives of the applicant;*
- c) *the place where the application will be available for inspection by any member of the public;*

- d) *the period within which any objections to the issue of the licence may be lodged with the Regulator;*
- e) *the address of the Regulator where any objections may be lodged;*
- f) *that objections must be substantiated by way of an affidavit or solemn declaration; and*
- g) *such other particulars as may be prescribed.*

Due to the envisaged high volumes of solar rooftop installations, the licensing of small-scale embedded PV generators using the above process may be a burden to the applicants who have little resources and may put constraints on NERSA. In view of the above it may be prudent to register small-scale embedded PV generators instead of being licensed.

Registration of small-scale renewable energy projects is not new to South Africa. In 2011, NERSA approved the *Standard Conditions for Embedded Generation within Municipal Boundaries* where embedded generators up to 100kW are registered by the municipalities and allowed to sell power to municipalities. However, the document was approved without due public consultations and is not clear to most stakeholders. Stakeholders are of the view that the cut-off point of 100kW is too small for most proposed small-scale embedded generators. Furthermore, the current renewable energy procurement programmes do not cover projects less than 1MW. Small-scale renewable energy projects from 1MW to 5MW will be procured by DoE under Small-Scale Renewable Energy Programme while large-scale projects (more than 5MW) are procured by DoE under the Renewable Energy Bidding Programme (REBID). This leaves projects between 100kW and 1MW with no legal framework for implementation. It is therefore proposed that the *Standard Conditions for Embedded Generation within Municipal Boundaries* that was approved in 2011 be replaced by this document once approved.

## 6 PROPOSED REGISTRATION PROCESS OF SMALL-SCALE EMBEDDED GENERATION

Under this document, it is proposed that projects less than 1MW be registered by the Energy Regulator. To ensure a seamless interconnection with the network service provider, it is proposed that the embedded generator will submit an application to the licensed distributor, who will assess the status of its network to determine its technical capacity to accommodate the new generator. The licensed distributors will then be responsible for designing and maintaining the application forms to be used by prospective embedded generators.

Once the application is accepted, the licensed distributor will maintain the database of the generators and on a monthly basis, submit that database to NERSA for registration. NERSA would require the following minimum information for registration:

- i. customer name and account number
- ii. the technology of the generator;
- iii. the installed capacity;
- iv. its location (both of the network and GPS);
- v. whether there is energy storage associated with it;
- vi. customer's average annual energy consumption (without embedded generation);
- vii. average annual import from the grid after installation of the generator;
- viii. expected annual energy export to the grid after installation of the generator;
- ix. technical studies and report on how much the network can take on these installations.

*Stakeholder comment # 1:*

- I. *Stakeholders are requested to comment on the proposed registration as opposed to licensing.*



*II. Stakeholders are further requested to comment on the adequacy of the required minimum information. If not, kindly list additional information that you would like on the NERSA registration database given that such aggregated information would be published for research purposes.*

## **7 REPORTING REQUIREMENTS OF THE DISTRIBUTING UTILITIES TO NERSA**

It is proposed that the licensed distributors report to the Energy Regulator on an annual basis on the following Information:

- i. the number of installations;
- ii. the total capacity installed;
- iii. the total energy generated to the system in each 'Time-of-Use tariff' metered time period;
- iv. complaints received from customers on the same circuit as the generation about quality of supply;
- v. all safety related incidents involving generation;
- vi. the tariffs applicable to these installations; and
- vii. the Standard Supply Agreement.

*Stakeholder Comment # 2:*

*The stakeholders are requested to comment on the adequacy and confidentiality of information required from licensed Distributors.*

## **8 GRID INTERCONNECTION STANDARDS FOR SMALL-SCALE EMBEDDED GENERATION**

There are currently no approved mandatory standards to govern the SSEG in South Africa, however there is a series of specifications (NRS 097 series) that shall

be used to facilitate the interconnection of the SSEG to the distribution network. It must be noted that this NRS 097 series is currently not complete and does not adequately cover all the technical aspects of grid interconnection of the SSEG. Once the series is complete, some parts of it will be converted to into a Renewable Energy Grid Code (REGC) and adopted as part of a licence condition to the distributors.

In the absence of the approved standards for SSEG interconnection with the network, the conditions for grid connection of embedded PV generators shall follow the requirements prescribed by NRS 097-2-1:2010 and NRS 097-2-3:2014 which at present among others pertains to the following aspects:

- a) Direct current injection
- b) Point of isolation of the embedded generation
- c) Quality of Supply threshold for the embedded generation
- d) Size of the small-scale embedded generation and other operation principle also covered by the REGC under the codes.

*Stakeholder Comment # 3:*

*Stakeholders are requested to comment on appropriateness of connection of SSEG to the grid in the absence of relevant approved standards.*

## **9 INVERTERS FOR THE SMALL-SCALE EMBEDDED GENERATION**

The compliance with the REGC and the NRS 097 series requirements dictates that the SSEG inverters need to be type tested to certify that their operations complies with these stipulations. There are no type testing or SANAS approved testing houses for inverters in South Africa at the moment. An alternative way needs to be developed to ensure that technically performing inverters are employed in the

absence of inverter standards and testing houses. Inverters are an important component of SSEG and their optimum performance is equally important.

*Stakeholder Comment # 4:*

*In the absence of a SANAS approved test house, is self-certification of products by local manufactures acceptable?*

## **10 CODES OF PRACTICE ON SMALL-SCALE EMBEDDED GENERATORS**

### **10.1 Grid Connection Requirements**

The Renewable Energy Grid Code requires that if the generators are going to be grid tied, they must be willing to undergo technical compliance tests of the applicable, to ensure good quality of supply as well as safe and sustainable operation of the network.

*Stakeholder Comment # 5:*

*Stakeholders are requested to comment on current grid code relevancy for SSEG regarding testing of compliance to the technical requirements e.g. reactive power support, low or high voltage ride through etc. To what level can these generators be tested for technical compliance?*

### **10.2 Power Quality and Limitation of Liability**

Intermittent generators produce some transients (reactive power and current, voltage dips and swells, power factor etc.) and these can be injected into the network and they may prove to be harmful at some point. The Grid Code currently has some requirements in place for renewable energy generators under reactive power, power quality, frequency response etc.

**Stakeholder Comment # 6:**

*Stakeholders are requested to comment on whether the monitoring of these transients are to be done by the generator as well as the network owner. How is limitation of liability going to apply?*

**10.3 Technical Performance**

The utilities/network owners will have a certain level of expectations with regard to the technical performance requirements of the small-scale embedded generation technology to be installed. The Grid Code also has requirements in place for expected technical performance of the plants

**Stakeholder Comment # 7:**

*Stakeholders are requested to comment on the relevant expectations of the network owners with regard to the performance requirements of the SSEG technology to be installed as per the grid code requirements.*

**10.4 Information Exchange Protocols**

According to the Information Exchange Code, there needs to be communication protocols with the participants who are involved or connected to the network. The code outlines some rules on communication protocols between the distributor and generator etc.

**Stakeholder Comment # 9:**

*Stakeholders are requested to comment on the rules on communication protocols between the SSEG and the network owners/Utilities or the relationship based on what the grid code currently requires own metering points and billing.*

## 10.5 Signals, Communication and Control Functions

More advanced functions, some of which may require communication capability (between inverter and utility) must be considered. Examples of such functions are: limiting maximum active power upon instruction from the utility, supporting instructions to connect/disconnect, ability to update default settings in response to changing grid conditions, etc.

*Stakeholder Comment #10:*

*Stakeholders are requested to comment on the compliance of these types of generators in terms of such requirements, where they will need to have a remote control capability to do this if the network owner does not have access to this capability.*

## 11 TARIFF DESIGN

As the penetration of SSEG grows, pricing and tariffs together with the regulatory policies need to be in place. These pricing/tariffs and regulatory policies need to ensure that the utility can collect enough revenue to cover its cost of supply and continue to safely and reliably provide electricity services to all its customers.

Most tariffs for residential and small customers are not cost-reflective as they do not reflect the fixed costs associated with the management, operations and maintenance of the grid and the retail-related costs to serve these customers. If the electricity tariff supplying a customer is not cost reflective and own generation is installed, it means that there will be a loss of revenue to the network service provider that needs to be recovered from other customers as there is no commensurate reduction in costs. Many tariffs comprise variable c/kWh only charges and no or limited fixed charges removing fixed costs. This means that if consumption decreases due to own generation, the distributor loses revenue that is not commensurate with a reduction of costs.

### 11.1 Revenue impact on distributors

From the utility's perspective, revenue loss is a concern. SSEG reduces the utility's sales and the revenue, but also avoids some costs such as energy purchase costs.

The Energy Regulator needs to consider mechanisms for facilitating the development of the SSEG in South Africa while mitigating a potential negative impact on the utility's revenue.

The main issues for a utility related to the connection of SSEG installations are:

- i. SSEG causes a reduction in sales and where tariffs are not structured to recover all fixed costs through fixed charges, there will be a negative revenue impact due to the loss in sales.
- ii. Customers may be net zero consumption customers, but still need the grid as a backup of variable energy resource.
- iii. Even though consumption might be lower or even zero, customers may still require the infrastructure to draw the same demand affecting the grid and generation capacity as customers that do not have own generation – typically those installing PV.
- iv. There remains a cost to connect and use the grid as a backup and to consume when needed.
- v. This cost is not recovered if fixed charges are not cost-reflective and there is a net-metering/billing or net-FIT tariff scheme.
- vi. It constitutes variable avoided cost of supply (fuel and variable operating costs).
- vii. Most tariffs for residential and small customers do not have cost-reflective network charges.
- viii. Customers that do not have SSEG could subsidise the tariffs of customers with SSEG – unless the consumption tariffs and the export credit tariff are made cost-reflective.

- ix. The customer should be aware that they will not be getting a credit based on current tariffs – the credit should be related to the total utility’s avoided costs.
- x. The customer’s avoided cost could therefore only be related to costs that are avoided by embedded generation and this needs to be factored in by the customer when investing in such equipment.

As SSEG reduces the utility’s energy purchase costs, energy sales and revenues, the Energy Regulator needs to consider mechanisms of dealing with the impact of SSEG. The impact on revenue to the utility should be mitigated through an SSEG net-billing tariff for both export (generation) and import (consumption) design. This can be managed through the appropriate tariff structures for both export and import of energy that will ensure a fair recovery of revenue for all parties, the distributor, customers with SSEG and those without SSEG.

The various components of the tariff structure that must be considered for both the import and export credit tariff (under a net-metering scheme) are as follows:

#### *11.1.1 Fixed network costs*

It must be ensured that the fixed costs associated with maintaining and operating the network are recovered through appropriate fixed charges. These costs may even increase due to SSEG and the network needs to manage bi-directional flow and the peak demand is not necessarily reduced.

#### *Stakeholder comment #11*

*Stakeholders are requested to comment on the fixed network costs to protect the distributors against revenue losses.*

### 11.1.2 *Fixed retail (service and administration) costs*

It must be ensured that the fixed costs associated with providing a retail service (metering, billing, customer call centre) network are recovered through appropriate fixed charges. These costs may even increase due to SSEG.

*Stakeholder comment #12:*

*I. Stakeholders are requested to comment on the service and administration charges for SSEG.*

### 11.1.3 *Ancillary services costs*

Ancillary service costs cover the cost of the system operator to keep the system whole and balanced including all customer's consumption and generation.

*Stakeholder comment #13:*

*Stakeholders are requested to comment on the proposed approach to recovering the cost of ancillary services from traders and retailers.*

### 11.1.4 *Variable costs*

Variable costs are costs associated the amount of consumption of energy such as the generation of electricity and line losses and these costs are not treated as fixed (even though there might be fixed cost components).

### 11.1.5 *Connection and metering cost*

There may be incremental costs associated with the grid connection, as well as if metering has to be changed. Such incremental costs are payable by the customer through a connection charge



*Stakeholder comment #14:*

*Stakeholders are requested to comment on the appropriateness of connection and metering charges for SSEG.*

## **11.2 Avoided costs**

The SSEG might avoid certain costs for a distributor and should be fully compensated through an export credit rate for any measurable reduction of cost to the utility. This would be the avoided energy cost/purchases, and, if any, the network and line losses costs.

As more and more SSEG is connected its possible, however, that SSEG could increase the costs of the network and line losses.

*Stakeholder comment #15:*

*Stakeholders are requested to comment on the proposed approach used for dealing with avoided costs. Please provide other alternatives, if any.*

## **11.3 Tariff charge components for consumption**

Distributors recover their costs through typically the following tariff charges:

- a. Variable (c/kWh)
  - Energy charges to recover energy cost (cost of energy purchases)
  - Losses
  - Reliability service charges to recover ancillary service costs
- b. Fixed (R/day or R/kVA – based on capacity)
  - Network charges to recover network capital, maintenance, returns and operating costs

- Service and administration charges to recover the retail costs associated with billing, meter reading and customer service
- c. Other
  - Connection charges to recover incremental metering and network related costs (once off)
  - Charges related to the contribution to subsidies (could be fixed or variable)

*Stakeholder comment #16:*

*Stakeholders are requested to comment on the appropriateness of the aforementioned method of tariff design. Please provide alternative methodologies, if any.*

#### **11.4 SSEG net-billing tariffs**

The customer would receive a multipart bill with NERSA-approved:

- charges for consumption, use of the grid and retail services:
  - fixed charge based on the installed capacity (use of system charges, admin costs),
  - a set tariff for net-import of electricity or optionally a TOU tariff; and
- an export credit rates tariff for any net-export of electricity.

*Stakeholder comment #17:*

Stakeholders are requested to comment on the appropriateness and the relevance of the aforementioned tariff method.

##### **11.4.1 Consumption tariff for SSEG**

Customer consumption tariff = Fixed charges + Variable charges.

Fixed Charges (R/day charge based on NMD) = Network charge + service and administration charge)

Variable charge (R/kWh) = Variable energy consumption charge + ancillary/reliability service charge based on all energy consumed.

- The distributor may motivate to recover some network costs through a variable charge to minimise the impact on the customer with SSEG and to facilitate a legal connection to the grid.
- The variable energy charges may be a single energy charge or Time-of-Use (TOU) if TOU metering is available and the distributor has NERSA approved TOU charges

*Stakeholder comment #18:*

*Stakeholders are requested to comment on the appropriateness and the relevance of the aforementioned tariff method.*

#### *11.4.2 Export credit tariff for generated exported energy*

The SSEG shall be compensated for own energy exported onto the grid at a rate equivalent to the avoided energy costs of the distributor. Such a credit rate will not impact the price of all other customers. For municipalities this will be based on the energy only charges charged by Eskom to the municipality. For Eskom, this will be Eskom's average energy.

Export credit tariff = Avoided variable purchase cost of the distributor (either on a TOU basis or the weighted annual average if a single energy rate is used)

*Stakeholder comment #19:*

*Stakeholders are requested to comment on the appropriateness and the relevance of the aforementioned tariff method and the challenges.*

### 11.5 Connection charges

Connection charges will apply to all customers who want to connect to the grid. The distributor will determine the connection charges in accordance with the principles contained in the Distribution Code.

Costs relating to grid connections, such as network studies, capital and metering is payable through the connection charge.

*Stakeholder comment #20:*

*Stakeholders are requested to comment on the proposed approach to recovering the transmission connection cost and the raising of an early termination guarantee.*

**COUNCIL MINUTES: CITY OF TSHWANE METROPOLITAN MUNICIPALITY:  
29 JANUARY 2009**

**REPORT OF THE SPEAKER: MATTERS FOR CONSIDERATION**



ESSR 12/05/2008  
VINCENT KOBUWE ((012) 358 4171)  
COUNCIL: 29 January 2009

1. **PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT  
(ENERGY AND ELECTRICITY DIVISION)  
VARIOUS ALTERNATIVE ENERGY TECHNOLOGIES WITHIN CITY OF  
TSHWANE AREA FOR ELECTRICITY SUPPLY  
(From the Mayoral Committee Cluster: Infrastructure Development:  
10 October 2008 and the Portfolio Committee: Public Works and  
Infrastructure: 11 November 2008)**

1. **PURPOSE**

The purpose of this report is to highlight various alternative Energy sources and Energy saving methods that can be implemented in line with National imperatives and to seek approval to investigate and implement acceptable solutions.

2. **STRATEGIC OBJECTIVE(S)**

Strategic Objective 1: Provide quality basic services and infrastructure.

Strategic Objective 2: Accelerate higher and shared economic growth and development

Strategic Objective 3: To fight poverty, build clean, healthy safe and sustainable communities

3. **BACKGROUND**

As a result of the country's economic growth, the overall electricity demand in South Africa has increased, by 15% per annum, which means that peak-period demand exceeds the utility's ability to supply electricity during peak periods. Also the required reserve is gradually being depleted due to continuous growth of demand on the network.

It is envisaged that the City of Tshwane's will diversify the energy supply and increase renewable and cleaner energy sources by 10% in 2020. This can be fulfilled by utilizing alternative energy resources/technologies such as solar, natural gas, bio-fuels and other Renewable Energy sources.

#### 4. DISCUSSION

##### 4.1 SOLAR WATER HEATER: SOLAR ENERGY TECHNOLOGY FOR DOMESTIC, COMMERCIAL AND INDUSTRIAL USE.

- OBJECTIVES

To introduce solar energy to be used as a sustainable and non exhaustible free energy source, for domestic, commercial and industrial use.

- BENEFITS

The global use of Solar Water Heaters (SWH) is driven by the socio-economic need for job creation, environmental concerns, energy security, national economy and peak energy demand reduction.

Hot water accounts for at least 25% of an average household's energy use. A solar water heater can reduce this consumption by around three quarters. Installing a solar water heater also reduces greenhouse pollution.

The process of manufacturing and installation of the Solar Water heating Systems will boost the local economy and benefit social development and services delivery.

- DELIVERABLES

Most solar water heaters consist of solar collectors mounted on the roof of a house; a pump for circulating the heat transfer fluid (depending on the type of system); a heat exchanger for transferring the heat to storage; and one or two storage tanks for storing solar-heated water for periods when there is no sun.

A conventional water heater consumes at least 25% of the electricity in an average house, and these figures are higher for many households. Considering an alternative way to heat water - Solar Water Heating is a promising alternative that could save up to 40% of the domestic electricity consumption with all the environmental benefits

- BUDGET

Internal Budget

Budget is not available for the implementation of the project.

External Budget

CoT can form partnership with various Government Stakeholders to source funds for implementation of this project.

##### 4.2 COMPRESSED NATURAL GAS (CNG).

- OBJECTIVES

To accept natural gas as an alternative fuel that can play an important role as cleaner option to customers within our city.

To develop a Natural Gas Supply System within the CoT for industrial and residential customers.

- **BENEFITS OF NATURAL GAS**

It is an attractive fuel with accurate process control, constant heating values and pressures and on tap availability, reduction in harmful emissions and improved safety.

Increased natural gas use of cleaner natural gas vehicles, or increased industrial natural gas use, could all serve to combat smog production, especially in urban centres where it is needed the most. Emissions of particulates from natural gas combustion are 90 percent lower than from the combustion of oil, and 99 percent lower than burning coal.

Standby gas powered generator units can assure less interruptions of electricity and can assist to bring down electricity peaks.

Natural gas is an extremely important source of energy for reducing pollution and maintaining a clean and healthy environment. The use of natural gas does not contribute significantly to smog formation, as it emits low levels of nitrogen oxides, and virtually no particulate matter.

- **DELIVERABLES**

CoT indicated that they will diversify energy supply and increase renewable and cleaner energy sources by 10% in 2020. This can be fulfilled by natural gas,

Areas that are constrained by the availability of electricity can be supplied by containerized gas until the market size makes it economical to supply such area by pipe.

Natural gas in an isolated, buried pipeline poses a considerable lower risk liquid fuels that are transported by road / rail.

- **BUDGET**

Internal Budget

Budget is not available for the implementation of the project.

External Budget

CoT can form partnership with various stakeholders to source funds for implementation of this project.

### 4.3 GEYSER CONTROL/UNDER FLOOR HEATING.

- OBJECTIVES

The objectives of the technology (Ripple control) is to optimize the energy by utilizing load control device to shift the hot water heater load to non – peak periods, and to control the demand of electricity by switching on/off non essential loads during peak periods.

The technology will assist in the National crisis of load shedding and power outages due capacity problems if implemented in the households.

- BENEFITS OF THE TECHNOLOGY

Reduction of energy usage during peak periods by remotely switching on/off geyser loads, and all other loads that are used for heating.

Reduction of green gas emission through the reduced power generation at power stations

Saving of at least 40% of household energy bill

- DELIVERABLES

The technology to be implemented will have the capability of remotely switching on/off specific loads during peak periods. The following appliance can be controlled using the technology:

- Domestic water heaters (Geyser)
- Air Conditioners
- Under floor heating.

The remote switching will ensure control and determine the effectiveness of the whole programme in terms of energy savings and peak load reduction. The implementation of ripple control technologies will assist in the overall peak demand reduction.

- BUDGET

Internal Budget

Budget is not available for the implementation of the project.

External Budget

CoT can form partnership with various stakeholders to source funds for implementation of this project.



#### 4.4 REPORT ON THE USE OF SOLAR POWERED TRAFFIC LIGHTS

##### • OBJECTIVES AND BACKGROUND

Most major traffic intersections in the Tshwane area of supply has been experiencing intermittent power failures due to unplanned power failures and load shedding on the entire electricity network. As a result there are numerous cases where the intersections were disrupted for an unacceptable period of time. The traffic utilizing these intersections came to a stand still. This causes major delays on the main traffic corridors linking to the city.

These power failures have had a negative impact on the image of CoT Traffic Signal System, the Department involved and the Municipality.

Referring to the current infrastructure development and the demand for the electricity supply, Eskom will not be able to sustain continuous supply of electricity to the whole of the Republic of South Africa. This is evident through the recent load shedding activities scheduled until 2014 when the generation plants would be complete and operational.

The country has recently been experiencing power constraints proved by the number of outages and load shedding experienced in the country. A considerable percentage of the load is consumed by public lighting networks and traffic control systems.

One of the solutions is to implement the use of solar powered traffic control system, which is independent of the grid supply network. While the environmentally-friendly lights will help reduce the city's electricity bill, their main purpose is to keep traffic flowing during power cuts.

NERSA established the programme addressing the Demand Side Management (DSM) which is currently managed by Eskom to address the load problems nationally. Eskom uses the Energy Service Companies (herein referred to as the ESCos') as their agents to implement the programme effectively throughout the country. Changes to the NERSA/Eskom DSM policy in the year 2006 has made it possible to apply for a full (100 %) funding for projects classified/ characterized as DSM projects.

*The use of the solar powered traffic light technology is piloted in order to attain the following objectives:*

- To play a significant role in addressing the looming power shortages due to economic growth that has created more demand for electricity.
- Minimization of accidents due to no traffic lights
- Reduce electricity bill for the City of Tshwane and use the savings for other community projects
- Reduce stress levels within drivers that might lead to unnecessary accidents and road rage due to congestion.

- **BENEFITS OF THE TECHNOLOGY**

A solar-powered traffic light is an alternative renewable energy technology that collects heat from the sun and uses it to provide electrical energy to the traffic control system and the LED's in the traffic light bulb heads.

The use of this technology contributes to the goal of energy independence and also reduces the gap between the energy demand and the supply.

The streetlights to be installed use the Light Emitting Diode (LED) technology. LED's consume lesser energy than the conventional bulbs heads, whilst producing the same amount of luminance. The usage of this technology will assist to reduce the overall electricity demand ultimately focused to benefit the City of Tshwane and the country.

- **DELIVERABLES**

Tshwane Energy and Electricity Division (TEED) is currently compiling a full technical specification document and the scope of works for the system and the technology that will be used.

To realise the immediate impact in the reduction of traffic congestions during power outages and load shedding and the minimisation of customer complaints, it becomes absolutely important that the solar powered traffic light roll-out strategy be addressed as a matter of priority.

TEED has major intersections within and linking the Central Business District for the implementation of the solar-powered traffic light project.

The project is envisaged to take six months to complete commencing this year and immediately after Council's approval. This period represent only the roll-out on the identified thirty intersections:

- **BUDGET**

Internal Budget

Budget is not available for the implementation of the project.

External Budget

CoT can form partnership with various stakeholders to source funds for implementation of this project.

#### 4.5 LP GAS (Liquid Petroleum Gas)

- **OBJECTIVES OF THE TECHNOLOGY**

To promote LPG as an appropriate household energy for thermal purposes with a long-term view of converting consumers to natural gas. Depending on availability install piped gas as part of package when developing.

To contribute towards the DSM interventions of energy usage reduction new residential especially with regards to electricity use during peak periods.

- **BENEFITS OF THE TECHNOLOGY**

Better strategy on planning and management of electricity demand side programme.

Provide an indication on the need to increase generation capacity.

LPG as a viable strategy to manage electricity demand during peak periods.

Formulations of LPG supply policy.

Proven load shift from electricity usage as a result of LPG usage.

- **DELIVERABLES**

Each household get the following:

-Two free 9kg cylinders.

-One Gas stove.

#### 4.6 Ethanol Gel Not included

- **OBJECTIVES**

CoT to meet their energy demand by ensuring access to alternative energy.

Given its environmental and economic benefits, together with the vast availability of feedstock, ethanol has taken on prominence as one of the most favoured alternatives to fossil fuel.

The following is a brief synopsis of why cook safe is the ~~best~~ solution to the paraffin problem:

The cook safe stove runs off clean burning ethanol fuel.

Once ethanol is introduced to the stove, it cannot spill even when the unit is tilted, moved or turned upside down.

The low centre of gravity makes the stove stable when in use.

Both burners are fitted with their own regulator to adjust heat.

Ethanol produces a hotter flame for faster cooking

- **BENEFIT OF THE TECHNOLOGY**

The success of this project will be measured in terms of its impact in minimising the constraint of insufficient electricity energy supply.

As a significant part of the program, the intention is to encourage all electricity consumers, including those that are connected to the national electricity grid, to use energy optimally and more efficiently, hence the efforts to promote Ethanol as a thermal energy of choice for various household energy applications (e.g. cooking and space heating)

Better strategy on planning and management of electricity demand side programme;

Given its environmental and economic benefits, together with the vast availability of feedstock, ethanol has taken on prominence as one of the most favoured alternatives to fossil fuel.

Ethanol is safe as compared to paraffin.

- **DELIVERABLES**

Each household to receive the following  
Each household get a free bottle of Ethanol gel  
Cook safe stove.

- **BUDGET**

Internal Budget

Budget is not available for the implementation of the project.

External Budget

CoT can form partnership with various stakeholders to source funds for implementation of this project.

#### 4.7 ENERGY FROM LANDFILL WASTE

- **OBJECTIVES OF THE TECHNOLOGY**

The main objective of this technology is to supplement coal fuel at Pretoria West Power Station using the usable waste material to fire the boilers.

- **BENEFIT OF THE TECHNOLOGY**

The consumption of a coal by Pretoria West Power station can be reduced which will results in savings for coal purchases in the long run

The emission of methane and other green gas at the landfill sites will be minimized as most the waste will be used to fire the boilers.

The cost of recycling or landfill sites maintenance will be reduced as less waste will be recycled there

- **DELIVERABLES**

The deliverable of this technology will be in the form of electricity generated in MW at Pretoria West Power Station as results of burning waste

The reduction in tonnage of waste that was supposed to be recycled at the landfill sites.

- **BUDGET**

The funding for this project will be required for the purpose of changing the waste receiving sites at Pretoria West Power Station to enable the transportation of waste from the dumping site to the boilers, and also for removing the ashes to the dumping site, this can be carried out in phases using internal funds together with external funds.

#### 4.7.1 LANDFILL GAS

- **OBJECTIVES OF THE TECHNOLOGY**

To extract the methane gas at the landfill sites to be used firing the generators to generate electricity as part reducing landfill gas emission to the atmosphere

- **BENEFIT OF THE TECHNOLOGY**

Electricity generated in KWH that can be used in small scale or even connected to the grid.

Reduction of the greenhouse gas in compliance to the international commitment in reducing the greenhouse gas

- **DELIVERABLES**

The amount of electricity generated from the landfill sites, it is expected that 2-5 MW of electricity can be produced at each site depending on the size of site and the composition of the waste material to enable high volume of methane gas

- **BUDGET**

There are external funds like the ones from Central energy fund, world bank that can be used to fund this kind of the project. It is estimated that for a pilot project it cost close to R5million

## 5. SUMMARY OF ALTERNATIVE ENERGY TECHNOLOGIES

TECHNOLOGY	BENEFITS	DELIVERABLES	TARGET	BUDGET
1.1 Burn Of Waste At The Stations	<ul style="list-style-type: none"> <li>• Reduced waste</li> <li>• Less cost of coal</li> </ul>	PTA West MW	2012	Internal and External
New Waste to Energy Plant	<ul style="list-style-type: none"> <li>• Reduced waste</li> </ul>	190,000 MWh	2014	PPP
1.1.1 Sewage Sludge	<ul style="list-style-type: none"> <li>• Reduced cost of coal</li> </ul>	Rooiwaal MW	2010	Internal Funding
1.1.2 Anaerobic Digestion	<ul style="list-style-type: none"> <li>• Self generation sewage plants</li> </ul>	2 MW at each sewage plants	2009	External/internal funding
1.1.3 Landfill Gas	<ul style="list-style-type: none"> <li>• Reduced emission</li> <li>• Electricity generation to reduce demand</li> </ul>	2- 5 MW at each landfill site	2011	External funding
1.1.4 Solar energy		10% Saving	2020	Internal and External

TECHNOLOGY	BENEFITS	DELIVERABLES	TARGET	BUDGET
	-Save up to 40% of the domestic electricity consumption - Environmental benefits			
1.1.5 Compressed natural gas	Reduce harmful emissions Cleaner alternative fuels	10% Saving	2020	Internal and External
1.2 LP Gas	<ul style="list-style-type: none"> <li>• Reduce electricity demand on the national Grid.</li> <li>• Provide an indication if there is a need of increase in Eskom capacity.</li> <li>• Less cost of electricity</li> <li>• Structuring of the future LPG national rollout strategy.</li> <li>• Indicate if LPG could be a viable strategy to manage electricity demand during peak periods.</li> </ul>	<p>Each household get two free 9kg cylinders.</p> <p>One Gas stove.</p> <p>Connection equipment per household.</p> <p>Gas stove (only if the project is launched on winter).</p>	2010	Internal and External
1.3 Ethanol	<p>1.4 Minimise the constraint of insufficient electricity energy supply through DSM.</p> <p>1.5 More safe.</p> <p>1.6 Less electricity bill.</p>	1.7 Each Household get a free bottle of Ethanol gel & a cook safe stove.	1.8 2010	1.9 Internal & External
	<p>1.23 Reduction of Peak loads</p> <p>1.24 Reduced emission of green gas.</p> <p>1.25 Reduced energy bill for households</p>	1.26 40 % Energy Saving for each household	1.27 Continuous	1.28 External
1.29 Solar traffic lights	<ul style="list-style-type: none"> <li>• Reduction of Peak loads</li> <li>• Reduced emission of green gas</li> <li>• Reduce dependence on fossil power</li> <li>• minimization of accidents due to no traffic lights</li> <li>• reduce stress levels within drivers that might lead to unnecessary accidents and road rage due to congestion and inconsiderate drivers</li> </ul>	Independence from grid network	Continuous	External + Internal
1.30 Solar Street lights	<ul style="list-style-type: none"> <li>• Reduction of Peak loads</li> <li>• Reduced emission of green gas</li> <li>• Reduce dependence on fossil power</li> <li>• Provides street lighting as a security attribute during power cuts</li> </ul>	• Independence from grid network	Continuous	External + Internal

TECHNOLOGY	BENEFITS	DELIVERABLES	TARGET	BUDGET
	1.31 Energy Efficient Street lights (LED Technology)	<ul style="list-style-type: none"> <li>70 % Energy Saving on energy consumed by public lighting network</li> </ul>	Continuous	External + Internal

## 6. COMMENTS FROM THE CHIEF FINANCIAL OFFICER

(Unaltered)

It is mentioned in the report that no budget is available for this project within the CoT.

It should be noted that the budget of the CoT is a balanced budget which means that no surplus or deficit exists.

Therefore, all additional financial implications for the CoT will have to be managed within the approved Medium Term Revenue and Expenditure Framework. Any additional budgetary needs will have to be managed by means of identifying savings, reprioritising of functions and efficiency gains.

No budget requests can be considered on an ad-hoc basis by means of reports. Budget allocations takes place during the annual budget and annual adjustments budget processes only if additional revenue is available or when planned expenditure have not taken place and savings are available for re-prioritisation.

Therefore recommendation 3 of the report cannot be supported. All expenditure incurred with regards to this project must be managed within the departments Medium-Term Revenue and Expenditure Framework.

Should funds be received from external sources Section 15 (a)(b) of the Local Government: Municipal Finance Management Act, 2003 (Act 56 of 2003) must be adhered to.

Section 15 (a)(b) of the Municipal Finance Management Act 2003, (Act 56 of 2003) reads, *inter alia*, as follows:

"A municipality may, except where otherwise provided in this Act, incur expenditure only-

- (a) in terms of an approved budget; and
- (b) within the limits of the amounts appropriated for the different votes in an approved budget."

The Strategic Executive Director of the Department receiving the external funding must ensure that the funds are included in the Annual Budget or during the Adjustments Budget process.

This department will gladly render further financial comments on any further reports elucidating all financial implications for the CoT.

7. COMMENTS FROM THE STRATEGIC EXECUTIVE DIRECTOR: CORPORATE AND SHARED SERVICES (LEGAL SERVICES)

(Unaltered)

The report is a reflection of a number of options available to Council in order to either decrease the load on the existing and traditional use of energy resources such as electricity as well as to introduce new usage of renewable energy resources. The project on the Solar Water Heating system is already in an advanced stage and includes almost every major role-player in the RSA i.e. National Government, Municipalities, ESCOM, private companies and others. The use of natural gas is in the early stages of being investigated.

Both the above may require the promulgation of by-laws and corporate agreements to be entered into. It is advised that TEED work close together with this Legal Division to ensure legal compliance of all initiatives that are undertaken.

Other than the above I wish to confirm my support of the recommendations.

8. COMMENTS FROM THE STRATEGIC EXECUTIVE DIRECTOR: CORPORATE AND SHARED (HUMAN RESOURCE MANAGEMENT)

(Unaltered)

Cognisance is taken of the report and recommendations.

9. COMMENTS OF THE STRATEGIC EXECUTIVE DIRECTOR: HOUSING AND SUSTAINABLE DEVELOPMENT (HOUSING SERVICES)

(Unaltered)

The contents of the report are understood and supported within the contexts of an alternative source of energy. The recommendations are supported. It is further requested that should roll out be done to low cost housing the two departments should jointly execute the project.

10. COMMENTS OF THE STRATEGIC EXECUTIVE DIRECTOR: CITY PLANNING DEVELOPMENT AND REGIONAL SERVICES

(Unaltered)

It is imperative for the city in today's climate of inefficient and insufficient supply of electricity and the move towards "greener" energy to explore alternative sources to electricity. This report is therefore welcomed.

It is stated that cleaner energy sources will be increased by 10% in 2020. It is however not clear from which base this increase will be. Or is it the aim, as I guess, to provide 10% of the total energy consumption in the form of alternative energy by 2020 ? The aim / vision must be stated clearly. If this is the case then those 10% must be broken up between the various alternative energy sources, i.e. solar power, natural gas, ripple control technology, solar powered traffic lights, LP Gas etc. Therefore, a well defined aim must be formulated before the project can be implemented.



To 4.1: It is stated that hot water accounts for approximately 25% of an average household energy use. Later a figure of 30% - 40% is mentioned. What is correct? The deliverables are unclear. No timeframes are given. Is it the aim that each and every household, commercial building, factory etc must install solar heating?

To 4.2: The deliverables are once again not clear. Will the whole municipal area be serviced by gas pipelines? Timeframes.

To 4.4: An additional objective of the use of solar powered traffic lights is, of course, the saving of fuel.

One of the objectives mentioned is the reduction of the electricity bill for the city, which saving could be used for other community projects. It would be more logical to use those savings rather for other electricity - saving projects, for which there are no funds available.

To 4.5: What is LP Gas? The deliverables are not clear. Where do the funds come from? Is it really the intention that each household gets a gas stove and 2 cylinders? Would it not be better to give those 'hand-outs' to the households in financial need?

To 4.6: Again it is questionable whether each household should get a cook save stove and bottle of gel, or only those households that are in need and will use these stoves effectively.

To "Recommended": The amount of the funds that are needed for these projects must be stated before Council can approve them.

#### 11. COMMENTS OF STRATEGIC EXECUTIVE DIRECTOR: ECONOMIC DEVELOPMENT

(Unaltered)

The principle of pro-actively investigating alternative sources of energy is supported. A cost benefit analysis of each option will indicate which options will be economically viable and will also assist in determining priorities for implementation.

#### TOURISM

The Tourism Division has read the report on Alternative Energy and is in support of the proposed projects.

#### LOCAL ECONOMIC DEVELOPMENT (LED)

The recommendations in this report are fully supported especially that Council make budgetary provision for alternative energy projects. A firm commitment from Council will unlock other sources of funding and these projects are ideal opportunities to form Public, Private sector Partnerships. It is also suggested that Acting Executive Director: Energy and Electricity actively participate in the upcoming Tshwane International Trade and Infrastructure Investment Fair to take place 28 to 30 May 2008 where there will be opportunity to present these projects plans to potential investors and or innovative funding sources.

## 12. IMPLICATIONS

### 12.1 HUMAN RESOURCES

We would require a program management team comprising of Engineer (specialist), Project manager and the administrator.

### 12.2 FINANCES

None (Feasibility Funds be made available annually to pilot the projects )

### 12.3 CONSTITUTION AND LEGAL FACTORS

None

### 12.4 COMMUNICATION

Information must be conveyed to consumers via channels of communication use by the City.

Education material on technologies being implemented for the community.

Internal engagement with stakeholders during the implementation of the program.

### 12.5 PREVIOUS COUNCIL/MAYORAL COMMITTEE RESOLUTIONS

None

## 13. CONCLUSION

- The thorough investigation of alternative energy technologies will provide a platform for the City of Tshwane to make decisions based on reliable information.
- The implementation of investigated technologies will provide better results and will enable the City to play its role as the leading Capital City in Africa while demonstrating energy saving initiatives.
- The implementation of alternative energy technologies will enable the City to have more capacity available for more connections which can also link to more revenue being collected.
- The City will play an important role in the reduction of green gases.
- The use of cleaner energy resources will assist in improving the environment which City of Tshwane's community share.

## ANNEXURE:

A: Renewable Energy Business Plan

**IT WAS RECOMMENDED (TO THE PORTFOLIO COMMITTEE: PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT: 11 NOVEMBER 2008):**

That it be recommended to the Mayoral Committee:

1. That the Mayoral Committee approve the alternative energy initiatives as outlines in paragraph 5 of the report to assist the reduction of energy consumption as per National program, be approved.
2. That the City Manager be authorised to investigate the alternative energy technologies outlined in paragraph 5 of the report and other new technologies introduced in the market.
3. That alternative funding options be investigated and be included in the Business Plans of the alternative technologies to source grants from relevant organs of the state.
4. That the City Manager be authorised to sign the agreements/contracts/ memorandum of understanding with external organs of state which are offering the grants to fund the projects
5. That permission be granted for Public Works and Infrastructure Development Department (Energy and Electricity) to utilise the Eskom DSM approved ESCO (Energy Services Company)

**During the discussion of this item by the members of the Portfolio Committee: Public Works and Infrastructure Development at its meeting held on 11 November 2008, it was agreed that a sixth recommendation be added to make provision for the submittance of quarterly reports in this regard.**

**It was therefore resolved to recommend as set out below:**

**IT WAS RECOMMENDED (TO THE MAYORAL COMMITTEE: 19 NOVEMBER 2008):**

That it be recommended to the Council:

1. That the alternative energy initiatives as outlines in paragraph 5 of the report to assist the reduction of energy consumption as per National program, be approved.
2. That the City Manager be authorised to investigate the alternative energy technologies outlined in paragraph 5 of the report and other new technologies introduced in the market.
3. That alternative funding options be investigated and be included in the Business Plans of the alternative technologies to source grants from relevant organs of the state.

4. That the City Manager be authorised to sign the agreements/contracts/memorandum of understanding with external organs of state which are offering the grants to fund the projects
5. That permission be granted for Public Works and Infrastructure Development Department (Energy and Electricity) to utilise the Eskom DSM approved ESCO (Energy Services Company)
6. That quarterly reports regarding alternative energy initiatives to assist the reduction of energy consumption be submitted to the Portfolio Committee: Public Works and Infrastructure Development.

**During discussion of this item by the Mayoral Committee on 19 November 2008, it was also agreed that the City Manager be mandated to identify resources available and present the report to the Mayoral Committee, so that when authorisation to sign is given to the City Manager, it is known what was signed. That this should not be limited to external organs of state only because there are opportunities internationally.**

**IT WAS RECOMMENDED (TO THE COUNCIL: 29 JANUARY 2009):**

1. That the alternative energy initiatives as outlined in paragraph 5 of the report to assist the reduction of energy consumption as per National program, be approved.
2. That the City Manager be authorised to investigate the alternative energy technologies outlined in paragraph 5 of the report and other new technologies introduced in the market.
3. That alternative funding options be investigated and be included in the Business Plans of the alternative technologies to source grants from relevant organs of the state.
4. That the City Manager be authorised to sign the agreements/contracts/memorandum of understanding with external organs of state which are offering the grants to fund the projects
5. That permission be granted for Public Works and Infrastructure Development Department (Energy and Electricity) to utilise the Eskom DSM approved ESCO (Energy Services Company)
6. That quarterly reports regarding alternative energy initiatives to assist the reduction of energy consumption be submitted to the Portfolio Committee: Public Works and Infrastructure Development.
7. That a coordinated interdepartmental approach be adopted which includes the Department of Agriculture and Environment.

During consideration of this item by Council on 29 January 2009, Cllr EN Ndoko seconded by Cllr M Baloyi proposed the following amendment:

(Unaltered)

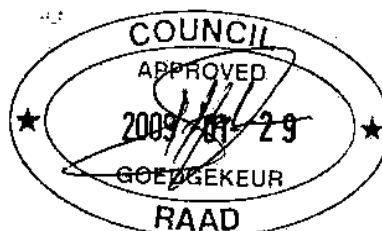
Amend recommendation 7 as follows:

7. That a coordinated interdepartmental approach be adopted, which includes the department of Agriculture and Environmental and a comprehensive communication strategy be incorporated as part of the approach.

The Council acceded to Cllr Ndoko's proposal and thereafter resolved as set out below:

RESOLVED:

1. That the alternative energy initiatives as outlines in paragraph 5 of the report to assist the reduction of energy consumption as per National program, be approved.
2. That the City Manager be authorised to investigate the alternative energy technologies outlined in paragraph 5 of the report and other new technologies introduced in the market.
3. That alternative funding options be investigated and be included in the Business Plans of the alternative technologies to source grants from relevant organs of the state.
4. That the City Manager be authorised to sign the agreements/contracts/memorandum of understanding with external organs of state which are offering the grants to fund the projects
5. That permission be granted for Public Works and Infrastructure Development Department (Energy and Electricity) to utilise the Eskom DSM approved ESCO (Energy Services Company)
6. That quarterly reports regarding alternative energy initiatives to assist the reduction of energy consumption be submitted to the Portfolio Committee: Public Works and Infrastructure Development.
7. That a coordinated interdepartmental approach be adopted, which includes the department of Agriculture and Environmental and a comprehensive communication strategy be incorporated as part of the approach.



## **RENEWABLE ENERGY BUSINESS PLAN**

**PROJECT AREA:** City of Tshwane  
**PROJECT INITIATOR:** David Mahlangu, Benevolent Tumagole and Mokale Rasetlola  
**PROJECT TITLE:** Renewable Energies  
**REFERENCE:** PUBLIC WORKS AND INFRASTRUCTURE  
DEVELOPMENT DEPARTMENT  
(ENERGY AND ELECTRICITY)  
REPORT ON ALTERNATIVE ENERGY

## Executive Summary

South Africa and its neighbouring Countries are faced with a challenge of both development and the energy resources to nurture this development. During the previous months Eskom has been under generating as compared to the electricity national demand. The Government of South Africa has since begun the process of legitimization of electricity demand reduction initiatives such as use of renewable energy resources and efficient energy use. The municipalities and Eskom were expected to reduce their consumer demand by at least 10%. This unfortunately could not be achieved through the public voluntary load reduction period. During this period consumers were expected to reduce their total monthly energy consumption by 10% but this figure was not reached.

Therefore, this task is allocated to the municipalities and Eskom to champion the process. Furthermore consumers who do not comply may be faced with a fine for exceeding their average monthly energy usage. This project is aimed at reducing the maximum demand and energy consumption by a minimum of 10% over a 12 month period. The projects also go beyond these targets and aim to educate and make the consumers more aware and energy efficient in all their activities that requires the use of any energy resource. The expected recovery period for the implementation of this project is calculated to be discussed in Financial Statement and Projections below.

## TABLE OF CONTENTS

RENEWABLE ENERGY BUSINESS PLAN	1
EXECUTIVE SUMMARY	2
I BUSINESS OVERVIEW	5
1.1 MISSION	5
1.2 STRATEGIC OBJECTIVES	5
1.3 THE PRODUCT	6
1.3.1 Solar Water Heater (SWH)	6
1.3.1.1 Background	6
1.3.1.2 Direct water heating system	6
1.3.1.3 Indirect water heating system	6
1.3.1.4 Benefits SWH	7
1.3.1.5 Challenges	7
1.3.2 Compressed Natural Gas	7
1.3.2.1 Background	7
1.3.2.2 Benefits of Natural Gas	8
1.3.2.3 Challenges	8
1.3.3 Geyser, air-conditioner and floor heating load control (Ripple Control)	8
1.3.3.1 Background	8
1.3.3.2 Benefits of ripple control	9
1.3.3.3 Challenges	9
1.3.4 LP Gas	9
1.3.4.1 Background	9
1.3.4.2 Benefits of LP Gas	9
1.3.4.3 Challenges	10
1.3.5 Traffic Lights	10
1.3.5.1 Background	10
1.3.5.2 Benefits	10
1.3.6 Compact Florescent Lights	11
1.3.6.1 Background	11
1.3.6.2 Benefits	11
1.3.6.3 Challenges	12
1.4 SITE	12
1.5 PRODUCTION	12



2	MANAGEMENT	13
2.1	ENTREPRENEURS	13
2.2	MANAGEMENT STRUCTURE FOR THE PROJECT	14
2.2.1	<i>Implementation program</i>	15
2.2.2	<i>Work Allocation</i>	15
3	THE MARKET	15
3.1	COT CUSTOMERS	15
3.2	OTHER MARKET RELATED FACTORS	16
4	PROJECT ROLL-OUT PLAN	16
5	FINANCIAL STATEMENT AND PROJECTIONS	18
5.1	PROJECT COST	18
6	LEGAL AND REGULATORY ENVIRONMENT	18
7	SWOT ANALYSES AND RISK/REWARD ASSESSMENT	19
7.1	STRENGTHS	19
7.2	WEAKNESSES	19
7.3	OPPORTUNITIES	19
7.4	THREATS	20
8	APPENDICES AND SUPPORTING DOCUMENTATION	20

## **1 Business Overview**

Energy and Electricity is a Division of the Department of Public Works and Infrastructure Development (PW & ID) of the City of Tshwane. The Division is responsible for the provision of electricity services to the community of the City of Tshwane (CoT) within its licensed distribution area, specifically to install new infrastructure, to maintain it, to collect revenue from its customer and to ensure quality of service throughout the CoT.

### **1.1 Mission**

The Energy and Electricity Division (TEED) satisfies the energy needs of clients by the provision of affordable, reliable and safe energy within its licensed area of supply while recognizing the importance of the environment, the region, transformation, equity, capacity, energy conservation, growth and development.

### **1.2 Strategic Objectives**

- To provide access to alternative energy to all consumer within the CoT boundaries
- To cut electricity consumption by at least 10% to manage the load shedding
- To provide alternative energy sources (renewable energy ) and implement energy efficient technologies to all essential operations of the City ( i.e traffic lights, public lighting)
- To provide integrated maintenance to all energy supply infrastructure
- Target procurement programs that supports BBBEE and local economic empowerment
- Provide free basic energy and social support package for the indigent
- Installation and maintenance of network including high masts and streetlights (renewable energy source/energy efficiency technologies)

- Consolidation of consumer base and support maximum revenue collection
- Development of division's human capital through training, consultation with employee/representatives, participation and implementation programs that promote equity and gender representation.

### **1.3. The product**

#### **1.3.1 Solar Water Heater (SWH)**

##### **1.3.1.1 Background**

Solar energy is simply natural energy extracted from the sun's rays during day time. This energy is then converted into electricity which in this case it is converted into heat that is used to heat water. The water is heated indirectly or directly depending on the type of technology chosen. Some systems have a backup element (electrically energized) to heat the water from the pre-heated temperature to the temperature required. In this type of system the solar part of the system would pre heat the water and if the required temperature is not reached then the electricity is only then used.

Installation of a water circulation pump usually powered through solar energy is employed for systems bigger than 300 litres and where frequent use of hot water is important, like in hospitals. The SWH life expectancy is 10 -20 years.

##### **1.3.1.2 Direct water heating system**

The water in the collector is heated directly through direct sunlight energy. The water is then circulated through the collector and into the storage tank and again through the collector to ensure uniform water temperature throughout the system.

##### **1.3.1.3 Indirect water heating system**

The water in the collector is heated by using heat exchange fluid which runs through the pipes in the collector. The heat transfer fluid is then circulated throughout the system as in direct system above and heats the water in the

storage tanks by transferring the heat generated to the water directly through direct sunlight energy. The water is then circulated through the collector and into the storage tank and again through the collector to ensure uniform water temperature throughout the system.

#### **1.3.1.4 Benefits SWH**

- The global use of Solar Water Heaters (SWH) is driven by the socio-economic need for job creation, environmental concerns, energy security, national economy and peak electricity demand reduction.
- Hot water accounts for approximately 40% of an average household are energy use. A solar water heater can reduce this consumption by around three quarters. Installing a solar hot water heater also reduces greenhouse pollution.
- The process of manufacturing and installation of the Solar Water heating Systems will boost the local economy and benefit social development and services delivery.
- The reduction in the demand on the Eskom's electricity will be reduced significantly.

#### **1.3.1.5 Challenges**

- The solar water heating technology is expensive currently and it is not readily available in South Africa.
- Although it has already being successfully piloted in parts of the City, its technology is not understood by majority due to its uniqueness.

### **1.3.2 Compressed Natural Gas**

#### **1.3.2.1 Background**

Natural gas is extracted from parts of the world as another energy source that can be primarily used for heating purpose. Its smoke level when burning is significantly less as compared to the paraffin. It is an attractive fuel with accurate

process control, constant heating values and pressures and on tap availability, reduction in harmful emissions and improved safety.

Increased natural gas use of cleaner natural gas vehicles, or increased industrial natural gas use, could all serve to combat smog production, especially in urban centres where it is needed the most. Emissions of particulates from natural gas combustion are 90 percent lower than the combustion of oil, and 99 percent lower than burning coal.

#### **1.3.2.2 Benefits of Natural Gas**

- Due to less pollution by the gas, it is environmentally friendlier and its use will contribute positively to the reduction of green gas emissions.
- The gas can be used as a source of heating energy required for cooking in the households.

#### **1.3.2.3 Challenges**

- The establishment of the supply system to the consumers.
- The growing number of consumers who wish to use the technology will force the TEED to begin the reticulation network for this resource.

### **1.3.3 Geyser, air-conditioner and floor heating load control (Ripple Control)**

#### **1.3.3.1 Background**

The geyser, heating and cooling technologies are currently not as efficient enough compared to the benefits they bring to the households. They require to be switched on for a period of time before their function can bring the required benefit to the user. The use of ripple control system will help reduce the consumption during peak periods through switching on and off specific load groups during specific times through out the day to bring the peak load to the minimum.

### **1.3.3.2 Benefits of ripple control**

- The implementation of ripple control will help reduce the maximum demand of the City (It is crucial in shifting and managing peak loads)
- Due to the fact that Eskom charge CoT for maximum demand, if this maximum demand is managed properly it can also bring the tariff at which CoT is charged down.
- The savings obtained from implementation of this technology can also assist in rolling out the system to other areas of the City.
- There will also be very small savings in the total energy used by households.

### **1.3.3.3 Challenges**

- Each consumer will have to learn to plan and use their energy to the benefit of all users connected to the supply.
- There will also be very small savings in the total energy used by households.
- It might not be aligned to the specific consumer behavioral patterns at all times

## **1.3.4 LP Gas**

### **1.3.4.1 Background**

LPG is an appropriate household energy for thermal purposes with a long-term view of converting consumers to natural gas.

### **1.3.4.2 Benefits of LP Gas**

- Better strategy on planning and management of electricity demand site programme as most of the demand is built by cooking and heating appliances.
- LPGas as a viable strategy to manage electricity and to reduce consumption

- Formulations of LPGas supply policy and the sustainability of suppliers through the National LP Gas price control legislations.

#### **1.3.4.3 Challenges**

- Majority of the people has wrong perception about the LP Gas. Most believe that this is a dangerous source of energy.
- The LPGas price is not yet regulated
- Availability and limited number of filling stations

#### **1.3.5 Traffic Lights**

##### **1.3.5.1 Background**

Most major traffic intersections in the Tshwane area of supply has been experiencing intermittent power failures due to unplanned power failures and load shedding on the entire electricity network. As a result there are numerous cases where the intersections were disrupted for an unacceptable period of time. The introduction of the efficient traffic lights system will provide a more reliable service and the usage of the alternative energy sources will reduce dependability from electricity. To mention a few, we have in the market, the Light Emitting Diode (LED) which consumes less energy with similar benefits as the conventional lighting bulbs and using solar energy through PhotoVoltaic (PV) module to provide power to the traffic lights.

##### **1.3.5.2 Benefits**

- The use of solar energy in the traffic lighting system will reduce the risk of accidents.
- Reduce electricity bill for the City of Tshwane
- Reduce stress levels within drivers that might lead to unnecessary accidents and road rage due to congestion.
- Reduce fume emission and fuel consumption for the vehicle

### **1.3.6 Compact Florescent Lights**

#### **1.3.6.1 Background**

The strategic objective is to optimise energy usage through energy efficient lights. The installation of these lights will contribute in the reduction of energy consumption on the electricity networks and thus reduce the energy demand of the City of Tshwane

Load shedding that has been experienced in recent weeks has been brought about by a shortage of generation supply capacity and is a last resort measure to prevent a collapse of the national electricity supply system.

The power failures experienced have a negative impact on the image of Tshwane Municipality. In line with international best practice Eskom is implementing Demand Side Management (DSM) in South Africa through collaboration with the Department of Minerals and Energy (DME) and the National Electricity Regulator (NERSA).

The Energy White Paper identifies energy efficiency as one of the areas that needs to be developed and promoted at the same time that Eskom builds sufficient generation capacity to meet the needs of future electricity demand. Although Eskom has plans to build new power plants, there has been rapid economic growth which resulted in an increased demand for electricity.

#### **1.3.6.2 Benefits**

- The use of the CFL will reduce the total energy consumption of the consumer by approximately 75% as compared to the incandescent light bulb (ILB).
- The life span of the CFL is 6 times longer than the ILB.
- The CFL consumes less energy but has the same lighting output and the consumer does not need to change the bulb holder, it uses the same bulb holder.



- The calculated approximate saving is 136MW.

#### **1.3.6.3 Challenges**

- The disposal of the CFL in an environmentally friendlier manner due to the mercury content which is less than 5% of the total chemical contents.
- Availability of the CFL in large quantities in the market to assist the consumers in buying the same technology should the CFL loose its life.
- The cost price of the ILB as compared to the CFL.

#### **1.4 Site**

The site is the City of Tshwane's Electricity licensed area. The targeted beneficiaries are primarily the domestic and commercial consumers. TEED will through marketing phase introduce the project to its consumers. The technologies will be installed at full or subsidized cost to the consumers. The consumers will sign the installation off on completion and take full responsibility from then onwards.

#### **1.5 Production**

The technologies mentioned earlier are currently not popular due to their seldom use throughout the country. Many people see the only source of energy as electricity and they seldom wish to explore or learn about other sources particularly the renewable energy sources. Households usually appreciated buying energy efficient appliances because they are marketed as being that not because their energy bill would be low.

As a result, the production of these renewable technologies as well energy management devices were only explored by large energy consumer and also not as a way of contributing to the reduction of the demand to the national supplier but mostly as a way to reduce spending toward electricity. Therefore there is no or less availability of these technologies to the open market. There can be a long lead times to the deliveries.

Most of these equipments/technologies are manufactured outside the country. Although there are South African National Standards (SANS) used to regulate these devices, they are all based or referred to the European Standards.

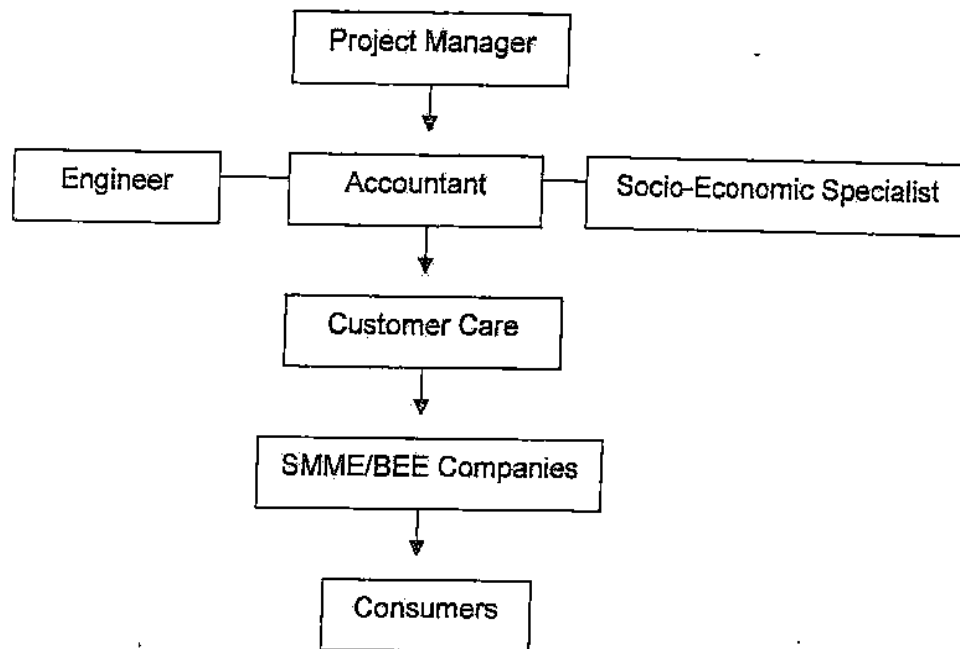
## **2 Management**

### **2.1 Entrepreneurs**

The roll out of the projects will require enough training programs to be put in place. Through the introduction of these technologies great opportunities will arise that will support economic growth to small local businesses as well as permanent and temporary employment for the community. The implementation of the project includes training of the local businesses and labour.

Currently there is an Expanded Public Works Program (EPWP) aimed at producing qualified artisans that can work on the network. Tshwane Energy and Electricity Division aims to produce more artisans although not all of them would be absorbed. The successful artisan can be provided with additional training to enable them to become self-employed and assist in the roll-out of these projects.

## 2.2 Management Structure for the Project



- Level 1:

- The Project Manager will manage the overall project. He/she shall carry the responsibility and accountability of the entire project.

- Level 2:

- The engineer will ensure technical compliance of the technologies and as well as the quality workmanship to the consumers.
  - The accountant will look at the financial management and implication throughout the project stages.
  - The socio-economic specialist will ensure the welfare of the SMME/BEE as well as of the communities. They will also look at the report on the social impact of the technologies to the lives of the people.

- Level 3:

- Customer care will play an important role in coordinating and gathering information about the project. They will also report on consumer satisfaction issues.

- BEE/SMME will carry-out the actual implementation under the management of the engineer.
- Consumers will be allowed to interact with the City regarding the project through the Customer Care structure.

### **2.2.1 Implementation program**

- All projects are divided into four stages of implementation
- The four stages are also linked with the training of the local businesses. The project is envisaged to produce approximately 80 to 100 small businesses that would be sustainable through the implementation and maintenance of the technologies.
- Every stage of the project will have at least five businesses getting trained. This will provide capacity will there would be visible progress on site.

### **2.2.2 Work Allocation**

- The work will be allocated equally in terms of the total quantities of services required. However, this will not be achieved accurately as the companies would have the familiarize them selves with the environment and are expected to pick up speed while implementing the projects.
- Furthermore, the allocation of work must be done in line with CoT's procurement policies and the targets of development of local businesses.

## **3 The Market**

### **3.1 CoT Customers**

By CoT consumers it means all domestic, commercial and industrial within CoT's area of electricity supply.

- CoT must educate its consumers about the use of alternative energy resources and energy management.
- Assisting the consumers to understand the technologies and their intentions will build a proper foundation and support to the beneficiaries.

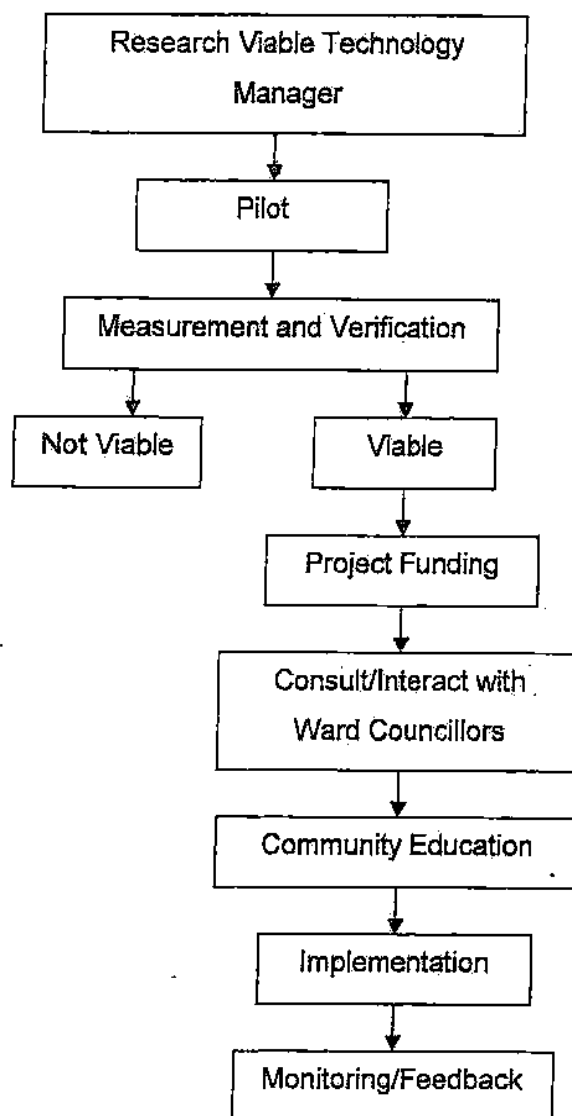
- o It must be clearly indicated to the consumers that the aim of these projects is not to limit them from the right to access conventional energy source(s) as well as not to infringing on their right to a better life.

### **3.2 Other market related factors**

- The roll out of the projects will require to be aligned with the relevant training of the local SMME to be able to immediately provide after sale service to the customers.
- CoT will also have to engage the suppliers to provide the minimum replacement stock at a proportion of the quantities installed.
- The CoT must ensure that enough capacity through training programs is achieved to enhance the viability of the project.

## **4 Project Roll-Out Plan**

The TEED will use the model below to implement this project.



## 5 Financial Statement and Projections

### 5.1 Project cost - Implementation

TOTAL DSM PROJECT COSTING						
Item Description	Quantity	Total Unit Cost	Total Required Capital	Total Energy Saving in kWh	Total Energy Saving in Rands (R)	Cost Recovery per Annum
SOLAR WATER HEATER	150000	R 13,225.89	R 1,983,853,500.00	194,400,000.00	R 87,480,000.00	R 419,904,000.00
COMPRESSED NATURAL GAS	150000	R 20,286.08	R 3,042,912,420.00	10,125,000.00	R 4,556,250.00	R 21,870,000.00
RIPPLE CONTROL	15000	R 896.71	R 13,450,587.50	875,000.00	R 303,750.00	R 3,645,000.00
LP GAS	8000	R 1,148.88	R 6,893,250.00	360,000.00	R 162,000.00	R 777,600.00
TRAFFIC LIGHTS	800	R 278,135.00	R 220,908,000.00	10,813,440.00	R 4,886,048.00	R 23,357,030.40
Compact Florescent Light	3600000	R 29.93	R 107,747,640.00	163,296,000.00	R 73,483,200.00	R 352,719,360.00
TOTALS			R 5,268,017,857.50	216,373,440	R 97,363,048.00	R 469,653,630.40

### 5.2 Cost recovery calculations

COST RECOVERY PLAN					
Item Description	Quantity	Period of Implementation	Total Required Capital	Total Energy Saving in Rands (R)	Period in years to recover initial cost
SOLAR WATER HEATER	150000	1	R 1,983,853,500.00	87,480,000.00	4.7
COMPRESSED NATURAL GAS	150000	5	R 3,042,912,420.00	4,556,250.00	139.1
RIPPLE CONTROL	15000	1	R 13,450,587.50	303,750.00	3.7
LP GAS	8000	1	R 6,893,250.00	162,000.00	8.9
TRAFFIC LIGHTS	800	1	R 220,908,000.00	4,886,048.00	9.5
Compact Florescent Light	3600000	1	R 107,747,640.00	73,483,200.00	0.3

## 6 Legal and Regulatory Environment

The following will be observed and will provide reference throughout the implementation period:

- Relevant SANS documentation
- City of Tshwane By-Laws for energy usage (Currently under development and approval process)
- Supply Chain Management policies

## 7 SWOT Analyses and Risk/Reward Assessment

### 7.1 Strengths

- The project will bring stability to the supply industry in terms of demand to the consumers.
- Consumers will be educated on better usage of the energy resources.
- The successful implementation of the project will assist the City to achieve the 10% load reduction by 2020. Its contribution will be approximately █%.
- The reduction in the current demand will assist in the further electrification of the City as more capacity will be made available. In simple terms, the city would use its current capacity to electrify the future demand.
- The major component, Solar Water Heating System, has a life span of 10 to 20 years with most suppliers recommending 20 years.

█  
 █  
 █  
 █

### 7.2 Weaknesses

- The project returns on investment period in long.
- The technologies identified herein require less maintenance but a very small percentage of servicing cost.
- Although the project has potential in terms of savings on demand, it shares the savings with an intellectual gain to the communities, that is, understanding of the better usage of energy.

### 7.3 Opportunities

- The project will bring about 80 small businesses into operation.



- The training and usage of the small and local business will add to the training of artisans through the EPWP program. The successful candidates can be assisted to form their own small business growing through this project and to other opportunities available in the country.
- These companies will employ the local people to assist in the economic growth of the areas.
- The CoT will have a platform to investigate the use of alternative energy resources to complement the current electricity supply to the City.

#### **7.4 Threats**

- The implementation of the renewable energy resource project has a high initial cost with recovery period very long, about 17 years.
- Resistance of the community due to lack of understanding and rearranging their daily activities to become more energy conscious.
- Availability of the equipment in large quantities in the market particularly the SWH.

## **8 Appendices and Supporting Documentation**

Item Description	Delivery Period	Quantity	Training Cost per person (R per item)	Project Cost	Unit Alignment	Total Cost
Solar Water Heater (SWH)		10000	10000			
TOTAL'S						
Maintenance Cost	R	348,783,809.00				
Implementation cost per unit	R	13,228.84				
Consumer energy in kWh per Household per month		1088				

Quantity installed per week  
per MWDC (Local  
Contractor)

Period per Project Phase

Item Description	Delivery Period	Quantity	Training Output (Local)	Expected Savings in kWh when stage complete	Cost per kWh saving per stage
Stage 1 (First Quarter)	Jul - Sep 08	15000	15000	15000	0.15
Stage 2 (Second Quarter)	Oct - Dec 08	30000	30000	30000	0.15
Stage 3 (Third Quarter)	Jan - Mar 09	45000	45000	45000	0.15
Stage 4 (Fourth Quarter)	Apr - Jun 09	60000	60000	60000	0.15
TOTAL'S		150000	150000	150000	0.15

Cost Saving over 12 months after completion

Recovery Period in years

