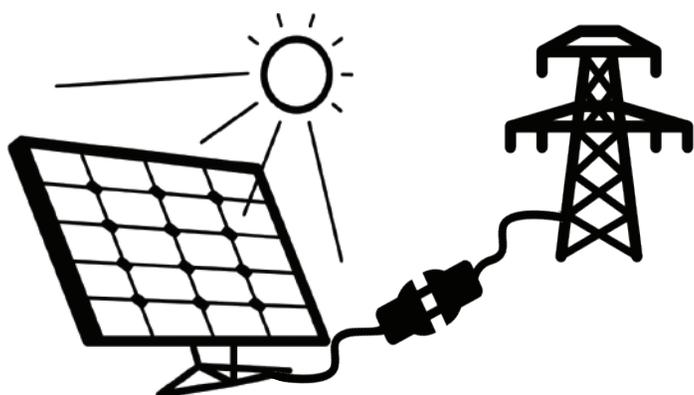


### Connection and Synchronization of Embedded Generation – The Current Status September 2016



Having received many enquiries from clients wishing to connect their embedded generation systems to utilities, we identified the need to prepare a summary whereby persons could understand the principles in a nutshell.

It should be noted that this document refers to both grid-tied and grid-integrated systems (whenever there is some form of connecting to the utility). Off-grid systems are not pertinently part of this discussion.

#### Current Regulatory Position:

*At present legislation and regulations regarding embedded generation is open for interpretation. This results in uncertainty pertaining to compliance.*

One example is the interpretation of the “Own Use” principle as contained in Item 2 of Schedule II of the Electricity Regulation Act 4 of 2006 (“ERA”). Some utilities interpret this as meaning that a specific user is a net consumer of electricity over a certain period, say one year. Other stakeholders interpret it as meaning that no reverse flow of electricity through a meter occurs – the latter is also referred to as “Self Consumption”.

*There are also perceptions in the market about what systems require licensing.*

In order to clarify the position, NERSA commenced a process whereby the Small Scale Embedded Generation (“SSEG”) Rules would have been issued. This process was commenced early in 2015 and would have been issued by Q3 2015. By November 2015 the DOE however took charge of this process and also considered whether change to the ERA is required.

Both these processes are intended to get finality regarding to interpretation and processes to follow.

At present these amendments / clarifications are expected to be issued by Q4 2016.

- SANS10142-3 is currently being developed and would soon regulate the DC (Direct Current) aspects of wiring.

The two regulations currently in place are:

- The NRS097 regulations are applied regarding the connection of embedded generators. This currently prescribes the principles of connection and procedures for shut down of systems.
- SANS10142-1 regulates the electrical wiring of premises. This applies to the AC (Alternating Current) aspects of wiring.

All of these principles have safety as a primary and quality as a secondary aspect in mind, and are not intended to create unnecessary burdensome procedures.

#### Whether a system can be connected to a utility:

When an embedded generation system (Solar PV, Diesel, Biogas, Wind etc.) is considered, the first question asked should be: *Which utility provides the connection?*

Utilities in South Africa are generally Eskom and Municipal Networks, both of whom have their own rules, principles, by-laws and/or guidelines (or lack thereof) on how these system need to connect.

- Eskom does not allow any synchronization of embedded generation to its network unless an application process is followed and Eskom approved the connection.
- Eskom allows connection both to its MV and LV networks subject to certain conditions applicable to each.
- **On the MV network:**

Eskom has an intricate process with a duration of approximately 9 months for approval. Reverse flow of power and “banking” of power is allowed subject to certain conditions.
- **On the LV network:**

Eskom has recently released a less onerous process which allow connection to the LV network but in this instance no reverse flow or “banking” of power is allowed. In this instance the client has to consume all the active power from the solar (embedded) system as it is generated. In-depth knowledge of the consumption profile on the site is required for this system to be optimally designed.
- Both these processes are administered by the Eskom Grid-Access Unit which has representatives in each province.
- Eskom does have a process whereby clients may convert from an LV to an MV connection in order to access the “banking” benefit. This conversion is however so costly that it often adds too much to the costs of the system to remain financially viable and has to be considered for each site.
- An easy way to determine whether a certain site is on LV or MV is where the meter resides. If the meter is a 380 – 400V meter, the connection is an LV one (generally smaller connections between 15KVA – 1MVA). If the meter is a 11KV or 22KV meter, it will be an MV connection (generally larger connections >350KVA). As is evident, an overlap exists in the size of the LV and MV connections, therefore each site has to be considered on its own merits.

- Various municipalities allow the connection of embedded generation on an LV level. Many other municipalities do not as yet allow any connections of this nature and should a client connect such a system in disregard to the municipality’s principles, that client risks being completely disconnected from their electrical supply.
- In instances where municipalities allow connections:
  - Each municipality has its own rules, by-laws and processes to follow.
  - Generally the large Metropolitan municipalities have processes in place whereby embedded generation can be connected.
  - In most instances municipalities consider, witness and inspect these installations before allowing it to be “hot commissioned”.
  - Most municipalities do not accept excess generation back onto their networks.
  - Some municipalities do accept excess generation, with or without compensation to the client.

## Principles of Design:

Prospective clients should start by asking their service provider about the legality of connecting to the utility. If the service provider appears allusive in any respect, caution should be exercised. Many clients have paid excessive school fees for systems that were not compliant which resulted in the client being completely disconnected from their electrical supply.

When a service provider blindly refers to “turning the meter backwards” without explaining that a *specialised four-quadrant meter* would be installed, additional caution should be exercised. Municipalities only accept reverse flow when done through a properly approved bi-directional meter. The older mechanical-type meters could be spun in reverse, however they are not calibrated for reverse flow which results in inaccurate readings and are in any event not an approved method.

In each instance the service provider should provide a detail design whereby the risk of excess generation and the possible curtailment thereof during off-peak periods are mitigated.



*Clients should ask prospective service providers as many questions as possible. When answers to questions of a regulatory nature are avoided or when regulatory aspects are made out as non-issues, caution should be exercised. You are most welcome to address any questions of this nature to us.*