Renewable Energy Scenarios

for Municipalities in South Africa

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SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION

SALGA

Inspiring service delivery

Contents

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1. Introduction

The electricity industry is undergoing considerable changes around the world. The key global trend in the electricity sector is to move away from centralised generation and distribution monopolies to more localised and integrated electricity systems. Increasingly, new players are becoming involved in generating and distributing electricity at a local level. There is also a growing trend towards digitisation and alternative low-carbon electricity technologies. This is driven by a reduction in the costs of renewable energy technologies, such as solar photovoltaic and wind turbines, combined with increasing integration with telecommunications networks through smart metering.

These trends are also becoming visible in South Africa, which has a traditional monopolistic electricity industry. Eskom has been the primary generator and transmitter of electricity, with bulk electricity being distributed to customers by both Eskom and municipalities through local grids. However, there is now an emerging trend where municipalities and consumers (such as local businesses and residents) are beginning to generate their own electricity. This is due to high electricity tariff increases, supply constraints and load shedding, cost reduction and increasing environmental awareness. This results in both a reduction in demand for electricity and an increase in new players in the market.

Changes in the electricity sector have the potential to create both risks and opportunities for municipalities. Without adequate preparation, municipalities may not be able to adapt quickly enough to the changing market. This could have a significant impact on income streams for municipalities, as well as result in a potential loss of opportunities in the new emerging sector.

The purpose of this booklet, therefore, is to provide background information on the current key topics in relation to renewable energy in municipalities. It is targeted at municipal councillors and officials and outlines several possible scenarios that a municipality may be faced with. The booklet also outlines some ways in which municipalities can respond to changes in the sector.

This booklet is part of a series of booklets about Energy and Electricity for Municipalities. This booklet is about Renewable Energy. Another booklet in the series is about Opportunities for Municipalities in Energy Efficiency. Other booklets are under preparation, including a booklet on the Challenges in the Electricity Distribution Industry. The purpose of the series of booklets is to provide municipalities with information on key topics within the energy and electricity sector that have implications for the role of municipalities in energy and electricity. The booklets also provide guidance on dealing with the various issues as well as access to additional resources.

1.1 Structure of This Booklet

This booklet summarises three primary areas of potential change, linked to the renewable energy trends. These are:

- Procuring electricity
- Generating electricity
- Facilitating electricity

Within each of these sections, possible scenarios facing municipalities are presented, outlining the key challenges and possible ways in which municipalities can respond to these trends and challenges.

It is important to note that this is a snapshot in time representing the status quo in early 2018. The renewable energy sector is very dynamic, and opportunities and risks are evolving constantly. However, by proactively engaging with the changing environment of the electricity sector, municipalities can continue to ensure that communities have access to affordable, sustainable and simplified electricity services into the future.

2. What is Renewable Electricity Generation?

Renewable electricity (RE) is generated by resources that are easily replenished, such as wind, solar, biomass and hydro power. Renewable electricity generation, therefore, refers to electricity from non-traditional forms of base load generation, such as large-scale coal and nuclear. Renewable energy is much more scalable than traditional forms of electricity, with installations ranging in size from small residential ones to large-scale wind farms. However, they are limited by the availability of the renewable resources and often a mix of technologies is required to accommodate fluctuations in resource availability. RE may also involve additional investment in the electricity grid infrastructure to allow for a more flexible flow of electricity.

2.1 Some Key Terms

Balancing Costs

Balancing costs are the costs of having electricity reserves in place to accommodate the difference in forecasted generation and the actual generation from RE facilities. For example, a wind farm may forecast production of 100MWh but only manages to produce 80MWh. The system still needs to have the additional 20MWh in reserve. The cost of maintaining this reserve is called the balancing cost.

Grid Parity

Grid parity refers to a situation where the cost of producing energy from a renewable energy source is similar to, or less than, the cost of purchasing energy from the traditional electricity grid.

Integrated Resource Plan (IRP)

The IRP is the National Electricity Plan and is a subset of the Integrated Energy Plan (IEP). The IRP directs the expansion of the electricity supply over the long term. The IRP lists targets for generation of electricity from different technologies, such as coal, nuclear and various renewable energy technologies.

Independent Power Producer (IPP)

An IPP is defined as an entity in which the government or any organ of state does not hold controlling ownership that undertakes or intends to undertake the development of new generation capacity.

Levelised Cost of Electricity (LCOE)

An LCOE is way of calculating the value of a unit of electricity (at present Rand value) over the lifetime of a generating asset. LCOE considers a range of factors, such as financing, fuel, operational and maintenance costs, to determine a price for electricity generated from a particular installation. LCOE costs are often required for financing large-scale RE projects.

Power Purchase Agreement (PPA)

A PPA is a contract that outlines the conditions of an agreement by a generator of energy and a purchaser of that energy. PPAs are usually long term and specify the rate at which the electricity will be bought for between the period of the agreement.

Renewable Energy Independent Power Producer Procurement (REIPPP)

The REIPPP Programme was set up by the state to add new sources to the energy mix in South Africa, as defined in the IRP. Through the REIPPP, renewable energy is purchased from IPPs and connected to the national electricity grid. For more info see: https://www.ipp-projects.co.za/

Small-Scale Embedded Generator (SSEG)

Small-scale embedded generation refers to power generation facilities located at residential, commercial or industrial sites where the electricity is generally also consumed. These are mainly

solar photovoltaic (PV) systems, but also include other technologies such as wind and biogas. A SSEG customer generates electricity on the customer's side of the municipal electricity meter, to which the generation equipment is connected, and which is synchronised with the municipal electricity grid (i.e. 'embedded').

Wheeling

Wheeling refers to the transportation of electricity from a generator to a customer using the electricity grid. Since the wheeling of electric energy requires the use of transmission and/or distribution infrastructure, there is often an associated fee paid by the users to the infrastructure owners. This fee is called 'use of system charge'.

2.2 Overview of the Legislation

Electricity Distribution Mandate

The Constitution of the Republic South Africa (No. 108 of 1996) assigns to municipalities the responsibility for administering services to communities in a sustainable way, including electricity reticulation and street lights.

The Municipal Systems Act (No. 32 of 1998) defines the roles of municipalities as service authorities and assigns to municipalities the right to determine the service provider that will distribute electricity within their boundaries.

The Municipal Finance Management Act (No. 56 of 2003) outlines the requirements for municipalities to set tariffs for service provision, including electricity tariffs. Section 33 of the MFMA stipulates that a municipality can only enter into a contract imposing financial obligations on the municipality beyond a three-year period if:

- A draft of the contract is publicly advertised for comment 60 days prior to the municipal council meeting at which the contract will be considered for approval.
- The municipal council has considered the financial implications of the contract and any comments received on the proposed contract.
- The municipal council has adopted a resolution on the financial benefits of the contract and authorised the municipal manager to sign the contract on behalf of the municipality.

The Electricity Regulation Act (No. 4 of 2006) and the Electricity Regulation Amendment Act (No. 28 of 2007) defines 'municipality' that has executive authority and rights to reticulate electricity within its boundary. These regulations provide municipalities with the 'authority function' of energy reticulation. This function includes the development of policies, drafting by-laws, setting tariffs, deciding how energy reticulation services are provided and regulating the provision of these services in terms of the by-laws and other mechanisms.

New Generation Regulations

Over and above the energy reticulation mandate, there are also a number of regulations and rules that provide guidance on how municipalities can deal with new generation in their areas of control. Some of these are summarised below:

Electricity Regulation Act, 2006. New Generation Regulations of 2011 (published as GNR. 399 in Government Gazette No. 34262 dated 4 May 2011) provides regulations targeted specifically at government structures and outlines the rules for the procurement and new generation capacity of electricity by organs of state. The regulations state that the Minister of Energy may make a determination as to whether any new generation capacity shall be established by Eskom, another organ of state or an Independent Power Producer (IPP). If the new generation capacity is established by an IPP then the Minister may also determine the identity of the buyer or, where applicable, the procurer and the buyer. The REIPPP is a programme managed through such determination.

The New Generation Regulations are important for municipalities to take into account, particularly if they are intending to procure electricity from an IPP. The potential impact of the New

Generation Regulations for municipalities is discussed under sections 3 and 4.

Electricity Regulation Act, 2006. Schedule 2 Licensing Exemption And Registration Notice (2018) defines which energy generation activities are exempt from the requirement to apply for and hold a licence. However, these activities must be registered with the National Energy Regulator of South Africa (NERSA).

There are many different types of exemptions that are potentially relevant for municipalities. For example, one of the new exemptions is that a system with installed capacity of no more than one megawatt (1MW), and where the electricity is supplied either directly, through wheeling or to a facility on the same property, does not need a generation licence but is required to be registered with NERSA. These types of systems also have to enter into a connection and use-of-the-system agreement with the local electricity distributor. These examples are covered in more detail in the scenarios overleaf.

3. Procuring Renewable Electricity

The first broad area of transition linked to renewable electricity is where the municipality is presented with the option of procuring electricity from generators other than Eskom. This could be from embedded small-scale generators (SSEGs) which have excess electricity that they wish to sell to the municipality or projects run by Independent Power Producers (IPPs) set up specifically to sell electricity.

3.1 Scenario One: Procuring Electricity from a SSEG

What is the Scenario?

One of the most common scenarios a municipality is presented with is when a small-scale embedded generator (SSEG) has excess electricity that can be fed back into a municipal grid. In this scenario, an existing customer who is connected to the municipal grid installs an electricity generation system, such as solar photovoltaic panels or mini wind turbines. The customer is not able to use all the electricity generated by the SSEG system and would therefore like to sell the excess electricity to the municipality.

Credit: GIZ/Glenn McCreath

What are the Key Challenges?

If there is no system in place to accommodate SSEGs (such as an application form), it is likely they will proceed to connect to the distribution grid in an uncontrolled manner. This could cause safety risks when there is a need for grid maintenance and it is not clear whether or not there are SSEGs feeding into the grid.

There is also a risk of loss of income to municipalities that distribute electricity, as a result of increasing numbers of SSEGs purchasing less electricity from municipalities once they have invested in their own RE systems. This migration of customers could be motivated by security of supply, cheaper electricity or environmental concerns.

The loss of customers could be further intensified if tariffs are increased to try and compensate for a decrease in revenue, pushing up prices further. This creates an additional incentive for customers to migrate to renewable energy. It is, therefore, important to ensure that the municipality establishes the correct pricing structure to ensure that all customers, including customers with SSEG, contribute to the cost of maintaining the grid.

SSEGs intending to sell electricity to municipalities could fall into one of the categories for exemption from licensing in terms of the new "Schedule 2 Licensing Exemption And Registration Notice (2018)". For example, a solar PV rooftop installation that is 1MW or smaller installed on a property that is connected directly to the municipal grid will not need a generation licence. However, they will still be required to be registered with NERSA and sign a connection and use-of-the-system agreement with the municipality.

Resource Tip

See the Small-Scale Embedded Generation Impact Model to assess the potential impacts of SSEGs on municipal revenue:
http://www.cityenergy.org.za/uploads/resource_437.xlsx
http://www.cityenergy.org.za/uploads/resource_436.pdf

What Should You Do?

Municipalities need to ensure there is a holistic system in place to accommodate SSEGs connecting to the local grid. The components of this system should include:

- Revision of the metering and billing system (to allow for bi-directional flows of electricity).
- Definition of the requirements for a generator to connect to the municipal grid and the adoption of a clear application process for SSEGs.
- Design of embedded generation tariffs and an assessment of their implications for the municipality and for customers.
- Establishment of an embedded generation tariff that is approved by NERSA.
- Setting up a system for monitoring and reporting on SSEG installations, as required by NERSA.
- A communications campaign highlighting the new SSEG system and how the tariff was designed.

Resource Tip

The AMEU SALGA SSEG Resource Pack provides templates for municipalities to establish sound SSEG permitting procedures. More documents are under development and will be added to the pack, which currently contains the following five documents:

- Technical Requirements for Embedded Generation: http://www.cityenergy.org.za/uploads/resource_410.pdf
- Application Form: http://www.cityenergy.org.za/uploads/resource_412.pdf
- Commissioning Report: http://www.cityenergy.org.za/uploads/resource_415.pdf
- Customer Service Contract: http://www.cityenergy.org.za/uploads/resource_413.pdf
- Decommissioning Report: http://www.cityenergy.org.za/getfile.php?id=411&category=5

What Should You Not Do?

Municipalities should not ignore SSEGs. There is a risk that uncontrolled grid connection will cause safety risks on the grid. Not responding to requests from SSEGs will also cause customer frustration and may force them to relocate or withdraw from the grid entirely.

What is the Way Forward?

These are some of the requirements:

- Finalisation of the NERSA regulatory rules for SSEG to clarify the regulatory framework.
- Finalisation of technical standards or guidelines, for example, for wiring code or metering requirements.
- National registry and reporting systems for SSEGs.
- Support for municipalities in electricity tariff design.
- Additional capacity (human resources) to be allocated by electricity departments to this new area of work.
- Electricity distribution departments to include new approaches into their work to retain customers and develop new revenue streams.

3.2 Scenario Two: Procuring Electricity from an IPP

What is the Scenario?

There are Independent Power Producers (IPP) that would like to set up an electricity generation facility for the primary purpose of generating electricity and selling it to a municipality at a rate that is competitive when compared to the Eskom bulk tariff. In this scenario, a municipality is considering purchasing electricity from these IPPs.

What are the Key Challenges?

For IPPs to have a viable business model they will often require a long-term power purchase agreement (PPA) with a municipality at a particular tariff. It is widespread practice for PPAs to include tariff escalation over time. A key risk is that the tariff escalation may result in the municipality

paying in the long term for renewable electricity at a higher rate than the bulk electricity price.

There are also challenges related to capacity within municipalities to adequately manage the technical and financial complexity introduced by projects of this nature. For example, the intermittent supply of renewable energy projects (only when the wind blows or the sun shines) requires high levels of electricity demand-and-supply planning and tariff modelling.

There are also risks related to the current regulations in South Africa regarding the procurement of electricity by municipalities. The key regulations that impact licensing of IPPs are the Electricity Regulation Act 4 of 2006 (ERA), and the New Generation Regulations of 2011 (NGR). The ERA states that 'no person may operate a generation facility without a licence issued by NERSA, unless exempt by the ERA as per Schedule 2'. The NGR states that the Minister of Energy may make a 'Section 34 Ministerial Determination', which allows for new generation to take place and determines to whom this electricity can be sold. In effect, a Section 34 determination from the Minister of Energy may be needed for a municipality to purchase electricity from an IPP. This could be a very lengthy process with no guarantee of a positive outcome. This reading of the regulations is, however, currently being challenged in the courts (see case study below).

Case Study: City of Cape Town

The City of Cape Town (CoCT) initiated a process to purchase electricity from IPPs to meet its renewable energy and climate change commitments. From the outset the CoCT acknowledged that the IPP would need to obtain a generation licence from NERSA. However, NERSA indicated that there was a requirement for a ministerial determination for it to grant generation licences, as per Section 34 of the Electricity Regulation Act (No 4 of 2006). Following two years of unsuccessful discussions between the CoCT, NERSA and the Department of Energy, the Minister of Energy refused to gazette the determination.

In 2017 the CoCT initiated legal proceedings against NERSA and the Minister requesting the court to allow the municipality to buy electricity directly from the IPP. The basis of the court application is to test whether a ministerial determination is in fact needed (or is just a possibility) and, if the determination is needed, to test the constitutionality of Section 34 of the Electricity Regulation Act and the ministerial determination process.

What Should You Do?

The following steps outline a possible starting point for a municipality intending to explore the possibility of procuring electricity from IPPs. These steps have been developed based on lessons from municipalities that have started to experiment with RE procurement.

- **Step1 –** Assess the need and set targets for alternative electricity procurement and generation. This assessment should take into account costs not necessarily reflected in the tariff, such as additional grid management costs. This assessment could lead to a general energy procurement strategy for the municipality which would analyse all scenarios and options and their respective costs.
- **Step 2 –** Develop a local energy supply plan to define the best mix for a diversified energy supply portfolio.
- **Step 3 –** Ensure that NERSA and Treasury (national and provincial) are aware of the municipality's intention to investigate procurement from IPPs.
- **Step 4 –** Develop a standard PPA that can be used for IPPs.
- **Step 5 –** Draft terms of reference for the procurement of electricity from IPPs, outlining the size and technology limitations.
- **Step 6 –** Conduct a procurement process and assess the offers made by different IPPs.
- **Step 7 –** Award preferred IPPs, subject to the Section 33 process of the Municipal Finance Management Act (MFMA) of 2003 being concluded (i.e. approval to commit the city budget for a period exceeding three years) and the necessary electricity generation licences being obtained by the IPP from NERSA.
- **Step 8 –** Conclude a final agreement on a PPA between the municipality and the IPP, based on conclusion of the licensing and section 33 processes.
- **Step 9 –** Conduct a grid connection assessment.

Resource Tip

Ekurhuleni Metropolitan Municipality is currently following the process as described above. The eThekwini Municipality has a draft PPA that can be used as a template for other PPAs. See: www.cityenergy.org.za/uploads/resource_384.docx

What Should You Not Do?

Many municipalities are approached by prospective IPPs with unsolicited bids requesting municipalities to sign memoranda of understanding (MoU) or PPAs that will allow them to generate electricity for the municipality. A PPA without a formal procurement process should NOT be entered into with an IPP.

What Is the Way Forward?

These are some of the requirements:

- Secure policy clarity from the Department of Energy and other national departments around the scope for municipalities to procure their own electricity. This could include the following, or a combination of the following:
  - Specific allocation for municipal RE projects within the IRP with determinations from the Minister.
  - An implementation programme under the IRP, which could be managed in partnership with with IPP Office, for example, where a municipal IPP procurement programme could be developed and managed.
  - Dedicated support from NERSA for assisting the IPPs through the licensing process.
  - Municipalities developing their own individual programmes.
- Conduct evidence-based research to quantify the costs and benefits of such programmes to strengthen the municipal and SALGA lobbying position.
- Undertake pilot projects (once policy clarity and evidence-based research is in place) through the most capacitated municipalities.
- Share lessons learnt and tools, such as standardised PPAs, terms of reference and technical specifications, from these pilot projects with other municipalities.

4. Generating Renewable Electricity

The second broad area of transition linked to renewable electricity is where a municipality generates its own electricity from renewable sources. This could be through the installation of a solar photovoltaic system, biogas digester or a range of other renewable energy technologies.

4.1 Scenario Three: Generating RE for Own Use

What is the Scenario?

The municipality may decide to install a renewable energy system on existing infrastructure or buildings. This size of installation is designed to supplement the electricity use of the infrastructure, but may also have excess energy to feed into the grid during less-busy periods.

What are the Key Challenges?

The primary risk with these types of smaller installations is the upfront capital cost associated with the technology. For example, a one megawatt (1MW) solar photovoltaic roof-top system may cost R15 million. As a result, there needs to be careful assessment of the financial impact of the installation over a long-term period.

Resource Tip
See the CSIR's "A Guideline for Public Entities on Cost-efficient Procurement of PV assets": https://researchspace.csir.co.za/dspace/handle/10204/9738

What Should You Do?

The installation of renewable energy systems will typically follow a standard supply chain management process. It is also common practice to finance an installation of this size from the municipal budget rather than sourcing finance from an external agency. It is good practice to include at least a three-year maintenance component in the installation contract, or even longer for more complex installations. Lessons learnt from pilot projects have shown that having a maintenance contract greatly improves the handover and long-term functionality of the system.

The steps that can be followed include:

- **Step 1 –** Assessment of the renewable energy resources available in the municipality to help determine which technologies to focus on. This assessment could lead to a general energy procurement strategy for the municipality which would analyse all scenarios and options and their respective costs.
- **Step 2 -** Assess the need and set targets for alternative electricity generation and procurement.
- **Step 3 –** Assessment of infrastructure (e.g. wastewater treatment works, building roofs, parking lots, etc.) for possible integration of alternative electricity technologies.
- **Step 4 –** Conduct a feasibility study of potential installations.
- **Step 5 –** Ensure a budget allocation for the installation in the Medium-Term Expenditure Framework (MTEF).
- **Step 6** – Issue a terms of reference for installations and conduct a procurement process.

What Should You Not Do?

Municipalities should not install small-scale systems that have very long payback periods (e.g. longer than 15 years) as this could be considered wasteful expenditure. Municipalities should also not install systems that are inappropriate to the available resources. The design and size of the installations should match the available resources (wind, sunshine) and the potential use for the electricity.

What is the Way Forward?

These are some of the requirements:

- Easily accessible renewable energy re-

source information at a municipal level (e.g. fine-scale wind and solar maps).
- Support in identifying funding for pilot projects.
- Standardised procurement documents and technical specifications for installations.

Resource Tip
There are a number of case studies on municipal RE projects available on http://www.cityenergy.org.za/category.php?id=3#13

4.2 Scenario Four: Generating RE for Sale

What is the Scenario?

A municipality may decide to install a renewable energy plant for the specific purpose of generating electricity and feeding into the electricity grid. This could be in the form of a waste-to-energy project, solar farm, wind farm or other type of renewable energy installation.

What are the Key Challenges?

Medium and large-scale electricity generation facilities can be very expensive. They require advanced technical, financial, contractual and project skills. Careful financial planning will be needed during the planning process.

There are also various legislative and licensing requirements. The municipality will need to apply for an electricity generation licence and register the plant with NERSA (if it is above 1MW). The municipality may also need a determination from the Minister of Energy to go ahead with the installation (refer to Scenario Two for more information on this).

What Should You Do?

Installations of this nature should be treated partly as infrastructure investment projects and partly as potential income-generation projects (resulting from the generation and sale of electricity).

The following steps should be considered when embarking on a project of this nature:

- **Step 1 –** Assess the renewable energy resources available in the municipality to determine which technologies to focus on.
- **Step 2 –** Assess the need and set targets for alternative electricity generation and procurement. This assessment could lead to a general energy procurement strategy for the municipality which would analyse all scenarios and options and their respective costs.

Credit: GIZ/Glenn McCreath

- **Step 3 –** Assess infrastructure (e.g. wastewater treatment works, building roofs, parking lots, etc.) for the possible integration of alternative electricity technologies.
- **Step 4 –** Calculate a levelised cost of electricity (LCOE) for the potential installation.
- **Step 5 –** Conduct a feasibility study of potential installations.
- **Step 6 –** Investigate financing options, which could include different types of ownership and investment options.
- **Step 7 –** Issue a terms of reference for installations and conduct the procurement process.

A LCOE is recommended as it takes into account the financing, operational and maintenance costs, as well as other costs, over the entire lifespan of the project. This will provide an accurate 'best value' assessment with comparison to other sources of electricity, such as Eskom. It will also assist in securing financing for the project if required. There is currently a debate about how to include the co-benefits of renewable energy installations in LCOE assessments.

It is current best practice to include an operational and maintenance component in the scope of work or the terms of reference, where the external service provider will initially ensure the operation and maintenance of the facility, as well as the transfer of knowledge to the municipality.

What Is the Way Forward?

These are some of the requirements:

- Ensure there is a clear framework for municipal energy generation projects, for example, through an implementation programme under the IRP, in partnership with the IPP office, where municipal RE projects could be supported (refer to Scenario Two).
- Dedicated support from NERSA to assist municipal RE projects through the licensing process.
- Work with National Treasury and other financial institutions to unlock funding support and/or surety for the investment in RE projects.

5. Facilitating Additional Electricity Services

The third broad area of transition linked to renewable electricity is where the municipality plays a facilitator role in the sector. The municipality could grant non-discriminatory third-party access to the grid to create an enabling environment for new generation capacity, promote alternative uses of energy as a service delivery option or even develop electricity storage capacity as an economic driver.

5.1 Scenario Five: Wheeling of Private Sector Electricity

Wheeling refers to the transport of electricity on a grid. To better understand wheeling electricity, it is useful to think of a road network analogy. If a road network is well run and allows for several types of vehicles, there is increased potential for economic development and social upliftment opportunities. However, it is also important that there is budget for the maintenance of the road network.

If this analogy is applied to the electricity grid it would make sense to allow other entities to make use of the grid. This would stimulate economic opportunities and social development by allowing for new users of the network. However, users help to pay for the ongoing maintenance of the grid.

What is the Scenario?

An opportunity may arise where an IPP wants to sell electricity to a customer who is connected to the municipal grid. In this scenario, the IPP requests access from the municipality to 'wheel', or transport, electricity through the grid to another entity or customer.

What are the Key Challenges?

The main risk with wheeling is that it is difficult to determine how much to charge users of the grid. The ERA makes provision for wheeling

Credit: GIZ/Glenn McCreath

by stating there should be 'non-discriminatory network access to all users of the transmission or distribution system'. NERSA has developed guidelines and 'Rules on network charges for third-party transportation of energy', which outline the process for calculating 'use-of-system charges'. Significant issues have been raised by municipalities and the sector regarding these rules and, as a result, NERSA is currently undergoing a consultation process to review the rules and regulations.

Another risk with wheeling is that the municipality may lose the customer who is buying electricity through a wheeling process. This can be partly managed if the tariff for grid usage is properly set, which should enable the municipality to recover a large portion of the costs of managing the grid. However, the loss of cross-subsidisation from this customer would require a revision of the municipal revenue model to identify other areas of income for cross-subsidisation.

A final challenge with wheeling is the increased administration burden associated with new types of customers. For example, the billing system would need to be revised to accommodate wheeling charges and to differentiate between electricity provided as municipal electricity and electricity provided by a third party.

Resource Tip

Nelson Mandela Bay Metropolitan Municipality (NMBM) has initiated a wheeling agreement process for green power trading. The Metro initially set a grid usage charge of 7% of the value of the electricity sold. This was later revised to 20% following a detailed cost-of-supply study. See: http://www.cityenergy.org.za/uploads/resource_341.pdf

What Should You Do?

Currently, there is uncertainty over estimating costs for the grid 'system charges'. It is critical for municipalities to ensure that a cost-reflective tariff for wheeling is charged so that the municipality can recover all the costs associated with the grid.

The steps that a municipality could follow to facilitate wheeling include the following:

- Conduct a detailed cost-of-supply study to determine the cost of the grid usage, following the methodology from NERSA.
- Establish an overall strategy for wheeling, including the aims and long-term implications of wheeling.
- Draft a generic connection and use-of-system agreement.
- Revise the billing system to accommodate wheeling charges and third-party sales.

What Should You Not Do?

Municipalities should not allow service providers to use the grid for wheeling without paying for this usage.

What Is the Way Forward?

These are some of the requirements:

- A clear methodology and process for determining cost of supply for the electricity grid, and support and capacity building to develop and analyse the cost-of-supply studies in municipalities.
- Finalisation of NERSA rules and guidelines and 'Rules on network charges for third-party transportation of energy'.
- Greater understanding of the impact on municipal revenue (through the cost-of-supply study) and on the municipality's capacity to cross-subsidise electricity from other revenue streams.

5.2 Scenario Six: Increasing Energy Access and Reducing Energy Poverty

The final scenario relates to additional electricity services where municipalities provide alternative energy services to households to increase energy access and fight energy poverty.

What is the Scenario?

Opportunities exist for municipalities to provide a basket of renewable and alternative energy services to households that do not have access to grid-connected electricity. This could be mainly in areas, such as informal settlements, where this is no grid infrastructure. It could also be relevant in grid-connected areas where supply is constrained, or where households are energy-poor.

The basket of energy services may include a combination of gas stoves, solar water heaters, solar chargers and energy efficient lighting. These can be used instead of fuel sources, such as paraffin, that contribute to the risk of fires and air pollution.

Other benefits include reduced peak electricity consumption, reduced theft of electricity, and opportunities for small business development.

Resource Tip

For information on effective solar water heating programs see 'Review of best practise solar water heating implementation by local government'. http://www.cityenergy.org.za/uploads/resource_351.pdf

Municipalities could also consider setting up micro- or mini-grids. Mini-grids are smaller, decentralised grids that often have renewable energy components and provide basic electricity needs to communities. A mini-grid pilot project is under development in Raymond Mhlaba Local Municipality in the Eastern Cape.

Resource Tip

For more information on mini-grids, see 'Energy Access in South Africa a toolkit for developing successful green mini-grids': http://www.cityenergy.org.za/uploads/resource_426.pdf
For more information on alternative household energy access, see the chapter on household energy access in the 'Sustainable energy solutions for South African local government – A practical guide': http://www.sustainable.org.za/userfiles/household%20energy.pdf

What are the Key Challenges?

The key risk with offering alternative energy services is push-back from community members who see it as a sub-standard service. It is important to manage the stakeholder consultation process when initiating programmes of this nature.

There also needs to be careful consideration of the long-term implications, for both the municipality and the user. These include operational and maintenance costs, as well as other factors such as safety, levels of services and practicability for the users.

What should you do?

An appropriate basket of alternative energy technologies depends on the existing energy requirements of beneficiaries and communities. Typically, this varies from community to community. Planning and research are, therefore, important parts of the process. The steps to follow could include:

- **Step 1 –** Conduct community surveys to gain an understanding of existing energy behaviour and financial affordability within a particular community.
- **Step 2 –** Select a sub-set of alternative technologies that are appropriate for the community.
- **Step 3 –** Conduct stakeholder consultation processes that clearly communicate the intention of the programme and explain the technology.
- **Step 4 -** Pilot different combinations of the alternative technology in different areas.

What is the way forward?

These are some of the requirements:

- Assistance with assessing and developing baskets of alternative energy options.
- Assistance with communicating the viability of alternative energy technologies, particularly in communities that cannot be electrified.
- Share learnings from the mini-grid pilot project in Raymond Mhlaba Local Municipality to enable further development if and where found feasible.

5.3 Scenario Seven: Operating a Storage Facility

Energy storage facilities store excess electricity generated in times of lower demand for use at a later stage when demand is high. In South Africa the most common storage facilities are hydro-electric pumped-storage schemes that make use of potential energy, and solar water heaters and concentrated solar power plants that store heat energy. Batteries are another way to store electricity for later use, and could be used to provide storage where renewable energy installations produce electricity intermittently.

What is the Scenario?

A municipality may consider investing in electricity storage facilities, such as large-scale batteries and pump-storage schemes, to store excess electricity for use at times of peak demand or in the event of load shedding. In some instances, storage technologies can also be used in place of grid upgrades.

At this stage, storage technology is a very expensive option for municipalities. However, electricity storage is seen as a key component of long-term renewable energy base load options. The field is evolving rapidly, with continuous technological innovation and investment.

What are the Key Challenges?

As with electricity generation systems, the key risk is the capital cost associated with installations of this nature. Careful planning is therefore required to ensure investment is made in appropriate technology.

What should you do?

The steps to follow with storage facilities are the same as those for generation facilities (see Section 4.2). It should be re-emphasised that storage options are currently very expensive for municipalities, despite this being a rapidly developing field. Implementing time-of-use tariffs could assist in making these storage options slightly more feasible.

What should you not do?

Municipalities should be cautious about investing in storage facilities as some technologies can be prohibitively expensive. However, it is also worth noting that there is currently significant international investment and local studies in electricity storage technologies. In future these technologies may be a much more viable option for consideration.

Notes

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