Energy efficiency and renewable energy initiatives in South African Municipalities

AMEU Technical Convention

Johannesburg - 5 October 2015
OUTLINE

1. Introduction
2. EE / RE in municipal IDPs
3. Existing municipal EE and RE projects
4. Business models
Why sustainable energy?

• Traditionally for municipality, energy = electricity distribution + INEP
• Since 10 years, broader role in strategic management of energy supply and use of all forms of energy
• Benefits of sustainable energy:
  – Energy security – reduce load shedding
  – Control electricity price / tariffs
  – Economic growth opportunity
  – Reduced municipal own energy bill
  – Reduced carbon footprint
  – Better quality of life for their residents (AQM, energy poverty)
Electricity is everywhere

- Electricity Management is transversal and relates to other infrastructure and planning sectors

Pictures source: mainly: SEA State of Energy in SA cities, 2015, EEDSM documents from DoE, SALGA guideline on EE in the water sector
The LG Energy Efficiency and Renewable Energy Strategy

⇒ A strategy which can be adopted / adapted by municipalities
⇒ A strategy for SALGA to support municipalities

1. LG energy governance
2. Municipal own Energy Efficiency
3. Energy access for all
4. EE in the residential, commercial and industrial sectors
5. Renewable Energy Development
6. Electricity Services (including revenue model)
7. Efficient transport and mobility
8. Spatial Planning
1. Introduction

2. EE / RE in municipal IDPs

3. Existing municipal EE and RE projects

4. Business models
Energy topics in municipal IDPs

So far 25% of the municipalities analysed have included climate change or energy in their IDP budget

Baseline 2012: 13%
OUTLINE

1. Introduction
2. EE / RE in municipal IDPs
3. Existing municipal EE and RE projects
4. Business models
Existing municipal energy efficiency projects

High Mast in Nelson Mandela Bay
(Source: Nelson Mandela Bay Municipality)

All of Polokwane Municipality’s traffic lights have been replaced with LEDs.
(Source: Polokwane Municipality)

Awareness Raising on Energy
(Source: City of Cape Town)

There are as well other EE projects

Energy Efficiency and Demand Side Management grant

"YOU CAN'T MANAGE WHAT YOU DON'T MEASURE"
Electricity consumption in municipal infrastructure


City Operations - SoE 2007/2009

City Operations 2014

Electricity consumption City of Cape Town). Source: presentation by the City of Cape Town October 2015

Table 1: Energy consumption range for the South African water supply chain

<table>
<thead>
<tr>
<th>Process</th>
<th>Min. (kWh/M€)</th>
<th>Max. (kWh/M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstraction</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Distribution</td>
<td>0</td>
<td>350</td>
</tr>
<tr>
<td>Water treatment</td>
<td>150</td>
<td>650</td>
</tr>
<tr>
<td>Reticulation</td>
<td>0</td>
<td>350</td>
</tr>
<tr>
<td>Wastewater treatment</td>
<td>200</td>
<td>1800</td>
</tr>
</tbody>
</table>

(Source: Swartz et al, 2013)
Existing municipal renewable energy projects

City of Johannesburg
- Landfill gas to electricity
  - 1.1 MW Municipal Project, electricity used on site

City of Tshwane
- Small Scale Embedded Generation
  - Proposed tariff waiting for Nersa approval

City of Cape Town
- PPA for 5.2 MW wind (Darling Wind farm)

City of Cape Town
- Green buildings: taxi rank and electricity department (with solar PV generation)

City of Tshwane
- Wheeling electricity from biogas to a willing buyer (4 MW)

City of Johannesburg
- Biogas to energy in WWTP
  - 1.1 MW Municipal Project, electricity used on site

Camdeboo LM
- Solar PV in WWTP
  - 11 kW Municipal Project, electricity used on site (off grid)

Ekurhuleni
- Landfill gas to electricity
  - 1 MW Municipal Project, electricity fed into the grid

Dihlabeng LM
- PPA for 3 MW hydroelectricity
  - (megaflex – long term PPA)

Kheis LM
- Using NEP and FBAE to provide solar energy to their communities

Maletwai LM
- Landfill gas to electricity
  - 7.5 MW Municipal Project, electricity fed into the grid

Undoni LM
- Using FBAE to provide solar and green cooking energy to their communities

Drakenstein LM
- Small Scale Embedded Generation
  - Net-billing scheme in place
    - (all RE and cogeneration technology)

City of Tshwane
- Small Scale Embedded Generation
  - Proposed tariff for net-billing waiting for Nersa approval

City of Cape Town
- Small Scale Embedded Generation
  - Net-metering scheme in place
    - (all RE and cogeneration technology)

Nelson Mandela Bay
- Small Scale Embedded Generation
  - Net-metering scheme in place

Nelson Mandela Bay
- 20 year wheeling framework agreement supporting privately financed renewable energy generation and purchase

Access to energy

Legend:
- Renewable Energy
- Small Scale Embedded Generation
- Others (Wheeling, PPA, etc.)
- Green buildings
- Access to energy

Image courtesy: WEC Projects

Nelson Mandela Bay
- 20 year wheeling framework agreement supporting privately financed renewable energy generation and purchase

Others (Wheeling, PPA, etc.)

City of Cape Town
- Signing PPA with RE generators
  - (megaflex – 3 years)
How did it happen?
1. Introduction

2. EE / RE in municipal IDPs

3. Existing municipal EE and RE projects

4. Business models
Business models for EE RE

Municipal Own Energy Efficiency

Municipal Own Renewable Electricity Generation

Buying RE from a private developer (through a PPA)

Small Scale Embedded Generation (net-billing / net-metering)

EE / RE in the residential, commercial and industrial sectors (incl. HP SWH or own RE)

Wheeling of electricity

Technical intervention (ripple control, Demand Side Management)

Municipal own projects

Facilitating, promoting, enabling, encouraging other projects

Alternative Energy Access (off-grid / alternative access to energy – incl. LP SWH)

ENERGY EFFICIENCY

RENEWABLE ENERGY
Business models for RE

<table>
<thead>
<tr>
<th>Project Owner</th>
<th>“Buyer” of electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality</td>
<td>Own use</td>
</tr>
<tr>
<td>Private party</td>
<td>Own use (with excess fed back into local grid)</td>
</tr>
<tr>
<td>Private party Or BOT / PPP</td>
<td>Municipality</td>
</tr>
<tr>
<td>Private party</td>
<td>Another private party</td>
</tr>
</tbody>
</table>

Contractual arrangement / business model

- Net billing
- PPA
- Wheeling
# Business model: municipal own generation

## Description
Municipalities invest in own RE projects (Landfill gas to electricity + biogas or PV in WWTP + hydro in water reticulation systems + PV systems on municipal buildings)

## The latest
More and more municipalities investigate the concepts. A series of case study will unpack existing projects, success factors and lessons learnt.

## Next steps
Share information about existing projects and assist in replications. Facilitate (financial schemes?)

## Success factors
Political leadership (a clear strategy); Dedicated project manager; Own investment by the municipality, O&M contract; Followed applicable regulations / legislation (MFMA, SCM); Electricity for “own use”

## Challenges
Financing; lack of capacity and resources

[Case studies available (by GIZ / SALGA / SEA)]
**Small Scale Embedded Generation / net-billing**

<table>
<thead>
<tr>
<th>What is it?</th>
<th>Consumers install generation unit (mainly solar panels) to generate their own electricity (own use) and possibly feed excess electricity into the grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>The latest</td>
<td>Municipalities pushed for feeding to be allowed. Illegal installations endanger safety of staff and security on the grid</td>
</tr>
<tr>
<td>Next steps</td>
<td>NERSA regulatory rules should be published in June. NERSA to approve tariffs (1 July 2015?) – at least as further pilots. <strong>Design win-win tariffs</strong>. Assist municipalities in implementing regulation (application, billing, standards, etc.). A national compensation scheme? (NetFIT)</td>
</tr>
<tr>
<td>Existing examples</td>
<td>3 municipalities allowing net-metering (NMB, CCT, Drakenstein LM) + several others waiting for their tariffs to be approved by NERSA</td>
</tr>
</tbody>
</table>
Process to date 2008 / 2015

2008 / 2010:
Several municipalities (CCT, NMBM) enquire about embedded generation

September 2011:
NERSA present a Decision Paper relating to Small Scale Embedded Generation within Municipal Boundaries (less than 100kW)

2012 / 2014: several AMEU / SALGA / ESKOM / GIZ workshops to discuss comments (support of expert financed by GIZ)
- Information sent to all AMEU members at different stages of the process
- 13 municipalities (7 metros) actively participated

May 2014: consensus reached on net-metering concept. Proposal sent to all municipalities for comments via circular Nb 14/2014

July 2014:
Concept approved by SALGA NEC and submitted to NERSA

2014/15:
NERSA consultation on regulatory rules

Nov 2015 ????:
Approval of the regulatory rules and of municipal net-billing tariffs ????

NMBM small scale embedded generation pilot project installed in 2008 – copyright / photographer: D Liebenberg
Guiding principles of municipal position on SSEG

- **Avoid informal connections**
  - => Sufficient incentive (export tariff)

- **Encourage uptake**
  - => Low administrative overhead
  - => Security of investments (guaranteed tariff or concept)
  - => Low overhead costs for additional equipment, such as meters etc.

- **Limit impact on municipal revenue**
  - => Export tariff that is sufficiently low
  - => Fair coverage of costs of grid usage

- **Decrease peak consumption**
  - => Tariff that provides an incentive for timely use of electricity (no Time of Use needed if export tariff < import tariff)
| Description | A municipality wants to buy renewable electricity from a private generator through a Power Purchase Agreement (PPA) |
| Challenges | Barriers: MFMA says: “best value for money” and there must be financial and economical benefits to contract longer than 3 years AND, price RE > megaflex (in most cases though probably only for a limited period of time) |
| Next steps | How to finance this gap? |
| Existing examples | eThekwini – PPA at megaflex for no longer than 3 years – 6 contracts signed. This model is however not necessarily viable for new project development |

- This also has huge potential to limit load shedding (what if municipalities could buy RE from private sources during load shedding, even at above megaflex?)
# Third party transportation of electricity / wheeling

**Willing buyer / willing seller**

<table>
<thead>
<tr>
<th>What is it?</th>
<th>A private generator of electricity sells electricity to a private buyer and use the municipal grid to transport electricity</th>
</tr>
</thead>
</table>
| The latest                                      | 2012: Nersa published regulatory rules  
A working group (AMEU, Eskom, EIUG, SAIPPA, SAREC) is reviewing the rules under the leadership of Nersa |
| Next steps                                      | When review is completed, there will be public consultations                                                              |
| Existing examples                               | Bronkhorstpruit Biogas Project (with City of Tshwane and Eskom wheeling)  
Nelson Mandela Bay and Amatola Green Power |

*Case studies available (by GIZ / SALGA / SEA)*
City Energy Website

www.cityenergy.org.za
Thank you

Contact:
Aurelie Ferry
aferry@salga.org.za
+27 (0)79 140 6698
www.cityenergy.org.za

Pictures credits: Picture1 – Ekurhuleni Waste Management Services
Picture 2 – WEC Projects (generators at Johannesburg Northern Works)