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The Challenges to get RE going in Municipalities



Electricity Services
Perspective

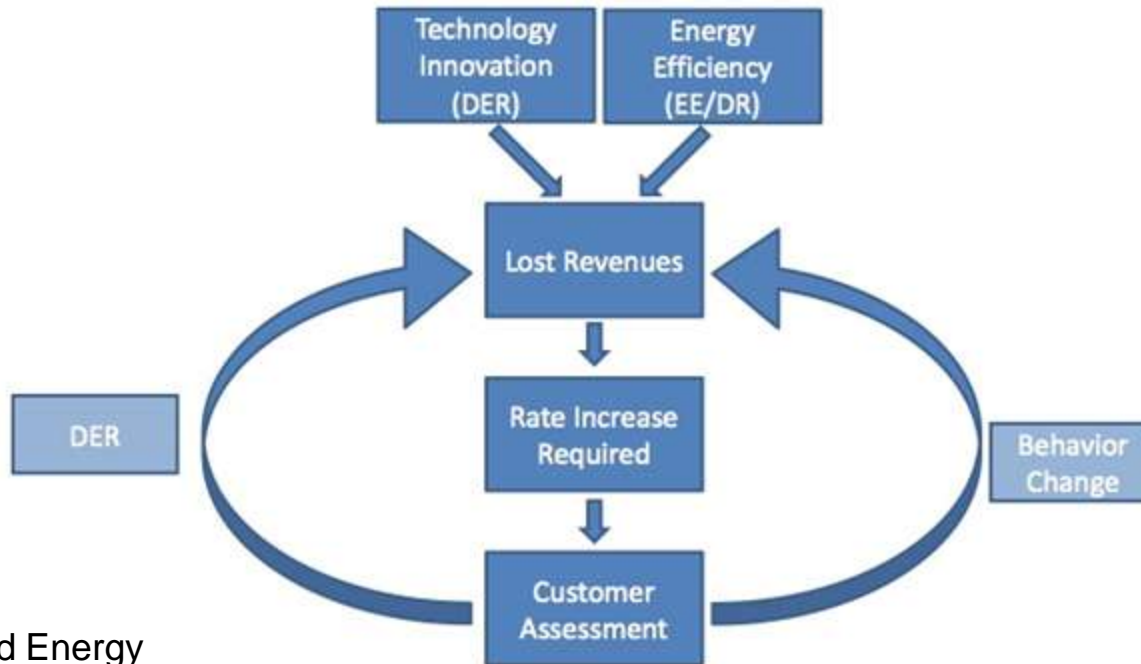
The Reality



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Vicious Cycle from Disruptive Forces



DER: Distributed Energy Resources (eg EE, RE)

Context



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- Cabinet decision- single buyer of electricity from IPP's- Eskom
- Legislation- NERSA generating license required if not generating “for own use”
- IRP2010
- Rapidly decreasing price of RE
- Rapidly increasing price of Eskom Electricity
- Rapidly approaching convergence of prices
- Green economy agenda- job creation, greenie points, moral prerogative

- Municipality with Electricity Distribution license

Who Generates RE?



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Eskom

Large scale IPP's (> 5 MW) This is where the RE action is!!!

The municipality

- The Electricity Services department
- Other departments (Waste (biogas), Facilities (rooftop pv), Water (micro-hydro))

IPP's (selling to Eskom, to the munic's , to other consumers)

Businesses- generating to offset own consumption

Residential consumers- generating to offset own consumption

Who Pays for RE?



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All consumers through the electricity tariff (national)

- This is national policy

All municipal consumers through the electricity tariff (local)

- Will NERSA allow?

Voluntary purchasers

- Own generation (munics, private consumers)
- Through purchase of Green Electricity Certificates
- Through purchase from someone else, wheeling across a Utility network. (e.g. Darling Wind Farm)

Who can claim the benefits?



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- The landlord?
- The generator?
- The purchaser
- The municipality?

What does 10% or energy generated from renewable energy sources really mean?

E.g. RE generated within municipal boundaries but paid for by the whole country-
can the munic add that into the 10%

Legislation



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- Electricity Regulation Act and regulations (“Municipal void”)
 - New Generation Regulations
 - Distribution Grid Codes
 - IRP 2010
 - Distribution Licenses
- MFMA
- Municipal Supply By laws. (In Cape Town’s case, no one may connect in parallel with the grid without prior written consent of the Director of Electricity)

There is no clear mandate allowing Municipalities or Eskom to purchase excess generated electricity from small scale embedded generators.

Hence divergence of approaches between munics.

Renewable Generation- Network Arrangements



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Eskom's
Networks



DWF Green
Electricity



Eskom Coal Based
Electricity

40+ City Intake Substations

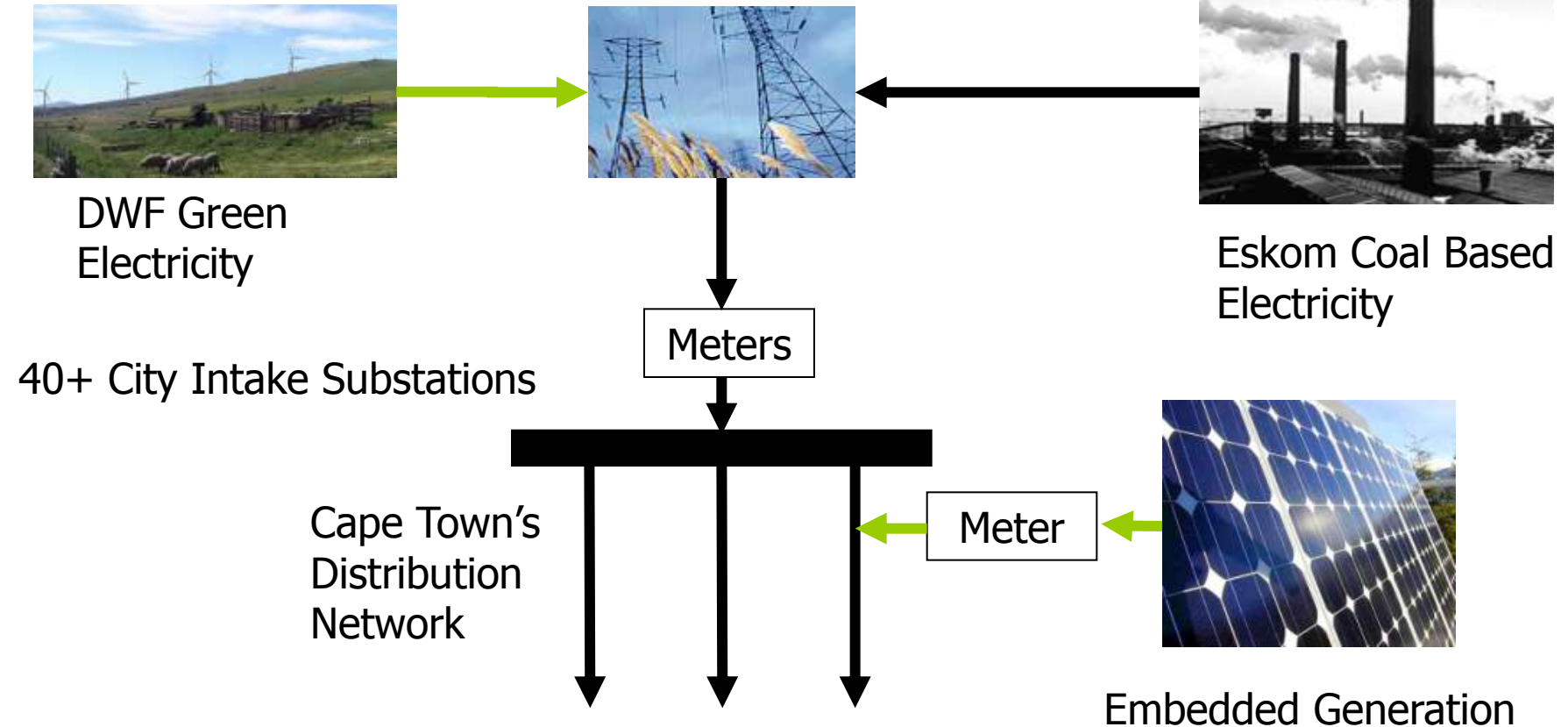
Meters

Cape Town's
Distribution
Network

Meter



Embedded Generation



Current National RE Policy and Programmes



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- Cabinet decision 5 September 2007 – Eskom designated as the “central buyer of power from IPP’s”
- Role of Municipalities regarding RE is undefined- excluded from IPP definition and IRP2010
- DOE New Generation Capacity IPP Procurement Programme (Large Scale > 5 MW)
- DOE New Generation Capacity IPP Procurement Programme (Small Scale 1- 5 MW) (tender expected by August 2013) Max 100 MW
- Eskom Integrated Demand Management (IDM) 100 kW- 1 MW “Standard Offer” pilot (R1.20/kWh) Max 10 MW
- NERSA’s “Standard Conditions for small scale (< 100kW) embedded generation within municipal boundaries)

Wheeling



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- Administratively burdensome
- Monthly adjustment of two meter readings- consumer's and at intake sub
- Multiple agreements to be negotiated (6 or more)
- Far easier for munics to purchase directly and either recover the cost from the Central Buyer's Office or from Eskom, or through their own tariff.

Examples of Embedded Generation (is that PV or SWH?)



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PV



SWH



Examples of Embedded Generation Small Wind Turbines



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Horizontal axis

Wind speed minimum 2.5 m/s



Vertical axis

Wind speed minimum 1 m/s



Small Scale Renewable Generation (SSEG)



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To be able to implement (approve) SSEG, municipalities require:

- To have technical specifications including upstream grid requirements
- An installation approval process
- Other (non-electricity) municipal departmental approvals
- A metering solution
- SSEG tariffs (need appreciation of revenue impacts)
- Business processes in place (e.g. billing)
- A connection agreement for generators
- Clarification on the requirement for generator licenses for small scale embedded generation

Technical Specifications



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NRS 097	Grid interconnection for embedded generation: Installations <100kW	Standards for connecting to the grid that includes aspects such as safety and protection, metering and utility compatibility.	Published
DST 34-1665	Distribution Standard for the Interconnection of Embedded Generation (DSiEG): Installations 100kW – 1 MW*	Interconnection standard covers legal requirements, operational safety, and network interface. This standard serves to fulfil Eskom Distribution's obligation under Section 8.2(4) of the South African Distribution Code: Network Code.	Published

- Specialist grid impact studies
- Inverter type testing requirements
- Electricity design certified by a professional engineer.
- On-site testing and handover
- Certificate of Compliance

- Status- in progress – Multi-part workgroup- Eskom, Munics, Industry
- Cape Town- interim standards and requirements- at developer's risk.

Metering Solutions



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Need separate measurements of imported and exported energy-excludes “in meter off-setting” e.g. Electro-mechanical meters running backward (also not accurate).

Commercial and Industrial

- Bi-directional credit meters (off the shelf)
- In Cape Town’s case will use AMR (automated meter reading)

Residential

- Smart meters required nationally to be provided to all residential consumers using more than 1000kWh per month.
- City of Cape Town- prepayment meter policy- bi directional smart prepayment meter under development

(Current meters decrement units on reverse power flow)

Bi directional meters allow the possibility of dual tariff rates

Other Municipal Requirements



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Approval of generators required from other Municipal Departments:

- Noise (wind turbines, generator exhausts)
- Other interference (flickering shadows from wind turbines)
- Air pollution (bio mass generation/incineration, exhaust gases)
- Waste management
- Building regulations (e.g. small wind turbines, PV panels)
(including sign off of structural design)
- Servitudes for power lines and cables

Nema (EIA), Water,

Tariffs for SSEG



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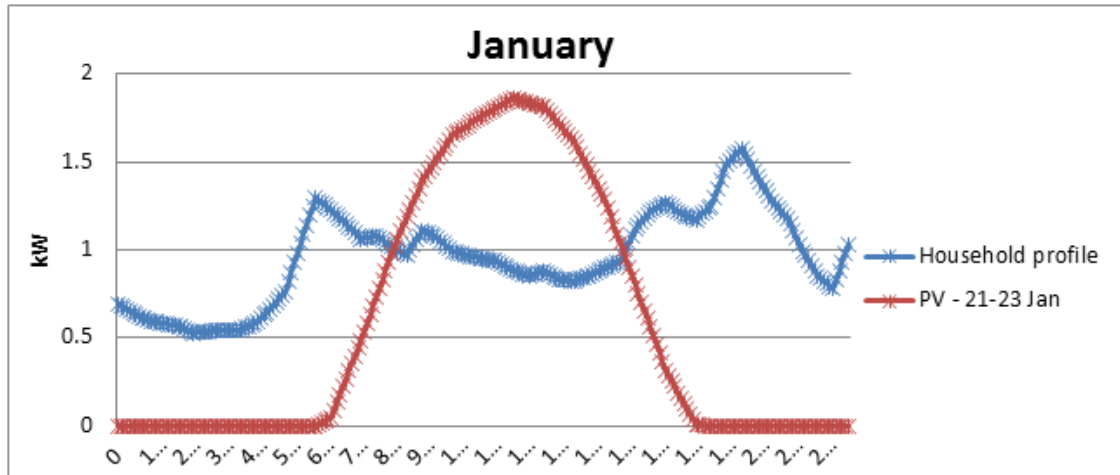
- Tariffs to be approved annually by Municipal councils and NERSA
- In theory consumers can end up with no net consumption at the end of each month
- There is a cost to provide, maintain and administer the electrical network
- NERSA < 100kW guidelines require monthly fixed service charge to cover network and admin charges, and an energy charge)
- There is an energy cost associated particularly with embedded generation- e.g. PV takes place at times when it is relatively cheaper to purchase energy from Eskom/and consumption takes place when it is relatively more expensive to purchase electricity from Eskom- vast difference between peak winter (208.53c per kWh) and off peak summer (24.95c per kWh) purchase cost. “One unit generated on a balmy summer’s day is NOT of equal worth to one unit consumed during a peak period winter storm.”
- Can address energy cost by requiring load shifting to coincide with PV generation period , and/or take energy cost into account in the tariff.

Typical Generation and Consumption Profiles



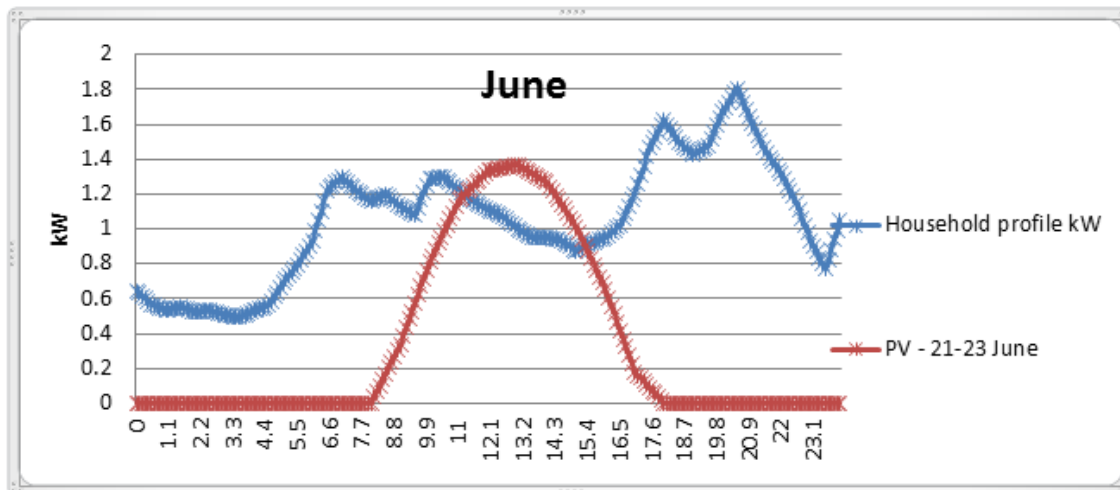
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Generation: from 2 kW (peak) DC array

Consumption: average of 25 households which use 748kW per month



[Source: from data generated by PVWatts2 and provided by Davis]

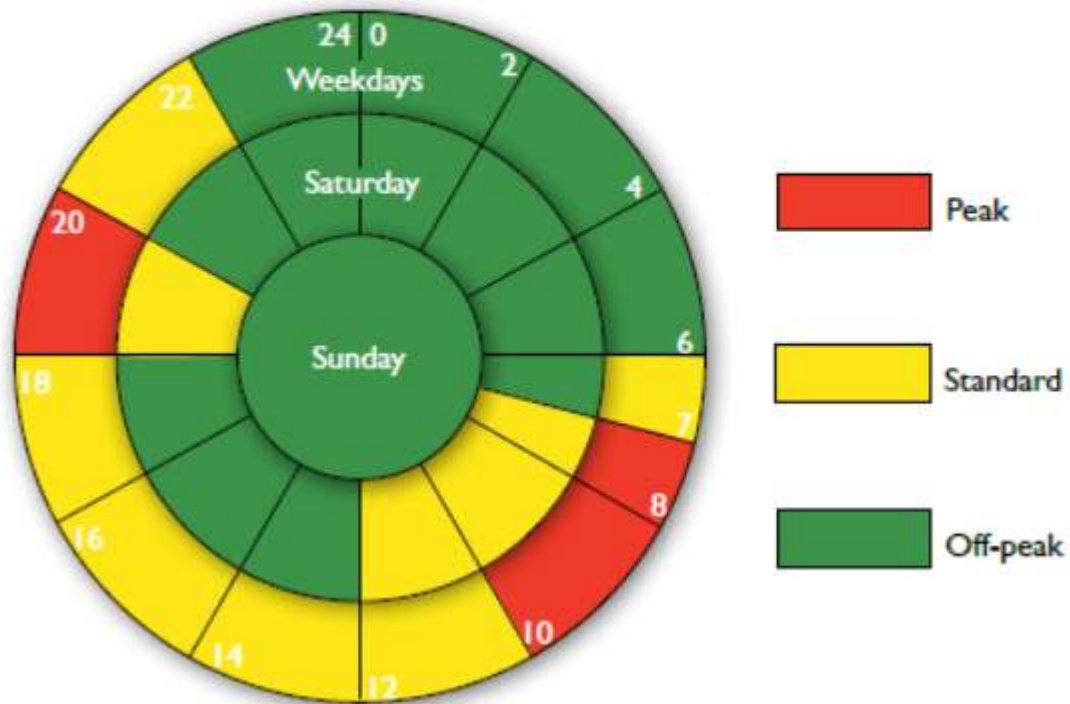
Time of Use tariff Periods- Megaflex tariff



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MEGAFLEX MINIFLEX and RURAFLEX



City SSEG Tariffs (inc VAT)



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Residential:

- Daily service charge (R12.08 per day)
- Energy consumption charge (101.25c per kWh)
- Energy generation purchase tariff (52.49c per kWh)

- Encourages load shifting to maximise use of own generation
- Not looking for “averaged” net generators.

Contribution Towards System Load and Electricity Sales Income



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- Cape Town has about 550 000 residential consumers (250 000 middle/upper income (non-lifeline)) and a yearly overall consumption of 11 Terawatt hours (11 000 000 kWh)
- Assume 100 000 3kWp units installed
- 100 000 units will generate 0.48 TWh or about 4.4% of Cape Town's consumption (assuming no reverse power flow)
- Impact on electricity sales income will be higher.
- A net metered 3kWpk PV panel together a 200l SWH will provide all the electricity needs of a middle income household (600kWh/month)!
- PV generation makes little or no contribution towards reducing the evening peak unless accompanied with load shifting to outside peak periods

Summary- Opportunities for RE in Munics



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- Large scale- purchase , or wheeling- unlikely (outside of boundaries, not allowed to purchase)
- Small scale- wheeling- to Eskom- maybe!(?)
- Embedded- to offset own consumption
 - At present no reverse power flow allowed
 - Reverse power flow for Commercial and Industrial- this year?
 - Reverse power flow residential- with Prepayment meter- now
 - With bi-directional prepayment meter- ??? In the future.
- Bio gas from waste (landfill, Anaerobic Digestion) PPP's
- Solar water heaters
- Pv on City facility rooftops.



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