



## Introduction

Substantial opportunity exists for efficiencies to be achieved in electricity consumption in South Africa. Implementing efficiency is both faster and cheaper than new generation, and also contributes towards carbon emissions reduction commitments in line with the Long Term Mitigation Scenario adopted by cabinet in 2008. National government, coordinated through the National Electricity Response Team, has set a target of achieving 10% efficiency (equivalent of some 3 000MW) across all sectors within the next 3 years.

The 2009/10 budget delivered recently by Treasury recognizes municipalities as an important site of electricity efficiency delivery. Funding of R700 million over the MTEF will be made available for municipalities to implement DSM/efficiency. Procedures for 'qualification', distribution and fund administration are currently being developed.

## The Municipal Electricity Efficiency Response Tool<sup>1</sup>

The Municipal Electricity Efficiency Response Tool is designed to assist municipalities develop a 3-year electricity efficiency response plan aiming to achieve a minimum of 10% reduction in consumption off a 2008 electricity consumption baseline. The tool will enable municipalities to prioritise, plan and budget electricity interventions in a systematic and strategic programme of action, rather than on an ad hoc projects basis.

The tool examines the potential efficiency impact of 100% penetration of a variety of tested interventions within a municipality – based on current municipal electricity consumption data. Associated electricity savings and costs are detailed. The tool has been developed around electricity efficiency alone and does not look to load management planning.

The following section will guide you through the use of the energy efficiency tool. The figures shown are based on data received from Ekurhuleni Metro. If there are any queries regarding the use of this electricity efficiency tool, please contact the City Energy Support Unit.

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<sup>1</sup> This tool has been based on assumptions derived from substantial modeling of interventions, detailed costing exercises and Eskom data on technology and behaviour impacts of efficiencies. The assumptions have been peer reviewed and are considered robust. The tool has been developed by Sustainable Energy Africa, within its City Energy Support Unit, at the request of the Department of Provincial and Local Government, and in collaboration with DME, NEEA, ISLGS and the ERC.



### Step 1: Establishing the baseline

Municipalities must enter their latest annual electricity consumption across the sectors of residential (disaggregate between mid-hi income and low income – most simply by using FBE connections for this), commercial, agricultural, industrial, streetlights and losses within the **Municipal Electricity Consumption Breakdown (2007/8)** table into the yellow boxes provided (Figure 1). The tool will then show a pie chart of the breakdown of electricity use by sector.

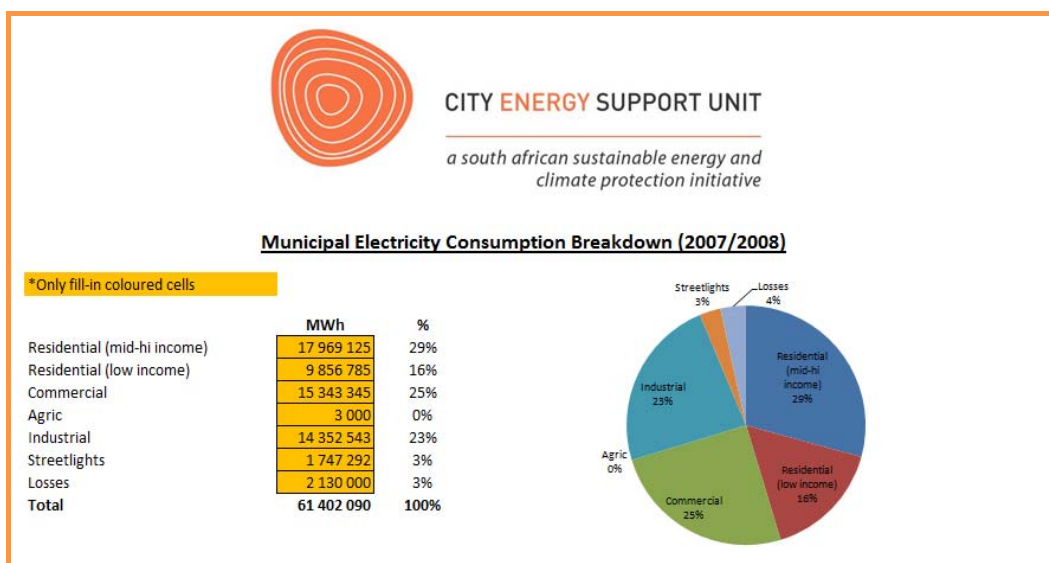


Figure 1: Establishing the baseline, entering current annual electricity data

Although the 10% consumption reduction should ideally be based on anticipated load growth this data is often difficult for municipalities to obtain. The simpler baseline of existing consumption is thus used.

### Step 2: Summarising municipal electricity efficiency potential

Once consumption figures have been inserted, the model will automatically provide a picture of potential efficiency impacts through the interventions in Table **Summary of potential impact of EE interventions** (figure 2). This table also details associated costs per unit of electricity saving. The costs are mostly based on retail costs per unit unless other information was available. The impact given assumes a 100% implementation of the specific intervention. The impacts of the interventions are based on the assumptions for each sector, which are outlined in separate worksheets in the document. If there is municipality specific data available, which could be fed into the assumptions, this data can be sent to the City Energy Support Unit and the tool can be edited to be city specific based on this data.

It must be noted that some of the interventions cannot be implemented simultaneously and the implementation of some interventions may affect the efficacy of others. The installation of Solar Water Heaters, for example, will negate the effect of geyser blankets (SWH geysers



are already insulated), they will also reduce the impact of efficient showerheads as the amount of electricity needed to heat water is reduced. It must also be noted that Isoboard and Gypsum ceilings should be mutually exclusive and the city should decide to install one or the other. Where possible, these effects have been implemented into the calculations of the tool.

	Technology	Behavioural	Total	Cost of Intervention per unit (retrofit)	kWh Saved over lifespan	c/kWh Saved
<b>Residential (16% of total consumption)</b>						
EE Lighting (mid-high inc)	2.6%	0.4%	3.1%	R 25.20	480	5.25
EE Lighting (low inc)	2.5%	0.7%	3.2%	R 25.20	480	5.25
Geyser thermostat adjusting (10 degrees)	0.0%	0.7%	0.7%	R 0.00	1848	0.00
Aerated Shower Heads**	1.3%	0.0%	1.3%	R 230.00	5070	4.54
Geyser Blankets*	1.4%	0.0%	1.4%	R 110.00	2560	4.30
SWH	7.9%	0.0%	7.9%	R 14 500.00	20000	72.50
Hot Boxes	0.5%	0.0%	0.5%	R 119.00	2044	5.82
Ceillings in RDP houses-gypsum*	0.3%	0.0%	0.3%	R 1 600.00	23600	6.78
Ceillings in RDP houses-isoboard	0.6%	0.0%	0.6%	R 2 587.50	38000	6.81
<b>Sub Total</b>	<b>14.9%</b>	<b>1.8%</b>	<b>16.7%</b>			
*Not included in sub-total as effects are negated by other interventions						
**effect on sub-total is reduced due to simultaneous installation of SWH's						
<b>Commercial (25% of total consumption)</b>						
EE Lighting	1.2%	0.8%	1.9%	R 172.00	360	47.78
HVAC	3.0%	1.5%	4.5%	R 950.00	325	292.10
<b>Sub Total</b>	<b>4.2%</b>	<b>2.3%</b>	<b>6.4%</b>			
<b>Industrial (23% of total consumption)</b>						
Efficient Motors	0.9%		0.9%	R 14 700.00	90560	16.23
Variable Speed Drives	0.7%		0.7%			
EE Lighting	0.5%	0.1%	0.6%	R 890.00	1030	86.41
HVAC	0.1%	0.0%	0.1%	R 950.00	325	292.10
<b>Sub Total</b>	<b>2.2%</b>	<b>0.2%</b>	<b>2.3%</b>			
<b>Streetlights (3% of total consumption)</b>						
HPS Streetlights	1.0%		1.0%	R 1 150.00	300000	0.38
<b>Sub Total</b>	<b>1.0%</b>	<b>0.0%</b>	<b>1.0%</b>			
<b>Total</b>	<b>22.2%</b>	<b>4.3%</b>	<b>26.4%</b>			

Figure 2: Summary of potential impact of EE interventions

### Step 3: Prioritising interventions

Based on the **Potential Impacts** table, municipalities must prioritise interventions and decide on penetration targets for implementation of the various interventions for the 3 year response period. It must be noted that the cumulative total after 3 years must not exceed 100%. It is also important to take into consideration the cumulative effect of certain interventions (outlined above).

It should be noted that efficiency can take time to build up momentum and municipalities might wish to consider a target breakdown over the three years that reflects this, i.e. 2% in Yr1; 3,5% in Yr2 and 6% in Yr 3.

An example action plan is given below. As the costs are based on retail figures for the equipment of the interventions involved, it must be noted that the total costs given in the action plans do not reflect the total costs, which need to be borne by the municipality. It is therefore imperative for the municipality to leverage private sector or national investment and funding wherever possible for certain interventions.



**Action Plan 2009/10**

	Target 2009/10 (Percentage of Total)	Cumulative Target (percentage of Total)	City electrical efficiency gained	MWh saved/annum	Number of Units Required	Cost of Units	Funding source
<b>Residential (16% of total consumption)</b>							
SWH	10%	10%	0.79%	486 245	243 122	R 3 525 272 788	
Aerated Shower Heads	10%	10%	0.12%	75 692	14 929	R 3 433 762	
Geyser Blankets	5%	5%	0.07%	44 204	120 870	R 13 295 749	
EE Lighting (mid-high inc)	20%	20%	0.61%	374 980	2 343 623	R 59 059 303	
EE Lighting (low inc)	20%	20%	0.63%	389 052	2 431 576	R 61 275 727	
Geyser thermostat adjusting (10 degrees)	20%	20%	0.14%	88 408	334 879	R 0	
Hot Boxes	5%	5%	0.03%	15 416	75 421	R 8 975 075	
Ceillings in RDP houses-gypsum	0%	0%	0.00%	0	0	R 0	
Ceillings in RDP houses-isoboard	20%	20%	0.11%	67 618	35 588	R 92 084 420	
<b>Sub Total</b>			<b>2.51%</b>	<b>1 541 614</b>		<b>R 3 763 396 824</b>	
<b>Commercial (25% of total consumption)</b>							
EE Lighting	20%	20%	0.23%	142 693	1 189 109	R 204 526 789	
HVAC	10%	10%	0.30%	184 120	2 830 608	R 2 689 077 258	
<b>Sub Total</b>			<b>0.53%</b>	<b>326 813</b>		<b>R 2 893 604 046</b>	
<b>Industrial (23% of total consumption)</b>							
Efficient Motors	10%	10%	0.09%	55 975	6 181	R 90 860 346	
Variable Speed Drives	15%	15%	0.11%				
EE Lighting	20%	20%	0.09%	57 353	83 523	R 74 335 861	
HVAC	15%	15%	0.01%	7 105	109 223	R 103 761 452	
<b>Sub Total</b>			<b>0.30%</b>	<b>185 019</b>		<b>R 268 957 658</b>	
<b>Streetlights (3% of total consumption)</b>							
HPS Streetlights	30%	30%	0.29%	180 845	3 014	R 3 466 191	
<b>Sub Total</b>			<b>0.29%</b>	<b>180 845</b>		<b>R 3 466 191</b>	
<b>Total (2009/2010)</b>			<b>3.6%</b>	<b>2 234 291</b>		<b>R 6 929 424 720</b>	

**Action Plan 2010/11**

	Target 2010/11 (Percentage of Total)	Cumulative Target (percentage of Total)	City electrical efficiency gained	MWh saved/annum	Number of Units Required	Cost of Units	Funding source
<b>Residential (16% of total consumption)</b>							
SWH	10%	20%	0.79%	486 245	243 122	R 3 525 272 788	
Aerated Shower Heads	10%	20%	0.12%	75 692	14 929	R 3 433 762	
Geyser Blankets	10%	15%	0.14%	88 408	241 741	R 26 591 497	
EE Lighting (mid-high inc)	20%	40%	0.61%	374 980	2 343 623	R 59 059 303	
EE Lighting (low inc)	20%	40%	0.63%	389 052	2 431 576	R 61 275 727	
Geyser thermostat adjusting (10 degrees)	30%	50%	0.22%	132 612	502 319	R 0	
Hot Boxes	5%	10%	0.03%	15 416	75 421	R 8 975 075	
Ceillings in RDP houses-gypsum	0%	0%	0.00%	0	0	R 0	
Ceillings in RDP houses-isoboard	20%	40%	0.11%	67 618	35 588	R 92 084 420	
<b>Sub Total</b>			<b>2.65%</b>	<b>1 630 022</b>		<b>R 3 776 692 573</b>	
<b>Commercial (25% of total consumption)</b>							
EE Lighting	25%	45%	0.29%	178 366	1 486 387	R 255 658 486	
HVAC	10%	20%	0.30%	184 120	2 830 608	R 2 689 077 258	
<b>Sub Total</b>			<b>0.59%</b>	<b>362 487</b>		<b>R 2 944 735 744</b>	
<b>Industrial (23% of total consumption)</b>							
Efficient Motors	10%	20%	0.09%	55 975	6 181	R 90 860 346	
Variable Speed Drives	15%	30%	0.11%				
EE Lighting	20%	40%	0.09%	57 353	83 523	R 74 335 861	
HVAC	10%	25%	0.01%	4 736	72 815	R 69 174 301	
<b>Sub Total</b>			<b>0.30%</b>	<b>182 650</b>		<b>R 234 370 508</b>	
<b>Streetlights (3% of total consumption)</b>							
HPS Streetlights	30%	60%	0.29%	180 845	1 808	R 2 079 714	
<b>Sub Total</b>			<b>0.29%</b>	<b>180 845</b>		<b>R 2 079 714</b>	
<b>Total (2010/11)</b>			<b>3.8%</b>	<b>2 356 004</b>		<b>R 6 957 878 539</b>	
<b>Cumulative Total (2009/11)</b>			<b>7.5%</b>	<b>4 590 295</b>		<b>R 13 887 303 258</b>	



**Action Plan 2011/12**

	Target 2009/10 (Percentage of total)	Cumulative Target (percentage of Total)	City electrical efficiency gained	MWh saved/annum	Number of Units Required	Cost of Units	Funding source
<b>Residential (16% of total consumption)</b>							
SWH	10%	30%	0.79%	486 245	243 122	R 3 525 272 788	
Aerated Shower Heads	15%	35%	0.18%	113 538	22 394	R 5 150 643	
Geyser Blankets	45%	60%	0.65%	397 836	1 087 834	R 119 661 738	
EE Lighting (mid-high inc)	20%	60%	0.61%	374 980	2 343 623	R 59 059 303	
EE Lighting (low inc)	20%	60%	0.63%	389 052	2 431 576	R 61 275 727	
Geyser thermostat adjusting (10 degrees)	30%	80%	0.22%	132 612	502 319	R 0	
Hot Boxes	5%	15%	0.03%	15 416	75 421	R 8 975 075	
Ceilings in RDP houses-gypsum	0%	0%	0.00%	0	0	R 0	
Ceilings in RDP houses-isoboard	20%	60%	0.11%	67 618	35 588	R 92 084 420	
<b>Sub Total</b>			<b>3.22%</b>	<b>1 977 297</b>		<b>R 3 871 479 695</b>	
<b>Commercial (25% of total consumption)</b>							
EE Lighting	25%	70%	0.29%	178 366	1 486 387	R 255 658 486	
HVAC	5%	25%	0.15%	92 060	1 415 304	R 1 344 538 629	
<b>Sub Total</b>			<b>0.44%</b>	<b>270 426</b>		<b>R 1 600 197 115</b>	
<b>Industrial (23% of total consumption)</b>							
Efficient Motors	10%	30%	0.09%	55 975	6 181	R 90 860 346	
Variable Speed Drives	10%	40%	0.07%				
EE Lighting	20%	60%	0.09%	57 353	83 523	R 74 335 861	
HVAC	10%	35%	0.01%	4 736	72 815	R 69 174 301	
<b>Sub Total</b>			<b>0.26%</b>	<b>161 122</b>		<b>R 234 370 508</b>	
<b>Streetlights (3% of total consumption)</b>							
HPS Streetlights	30%	90%	0.29%	180 845	1 808	R 2 079 714	
<b>Sub Total</b>			<b>0.29%</b>	<b>180 845</b>		<b>R 2 079 714</b>	
<b>Total (2011/12)</b>			<b>4.2%</b>	<b>2 589 690</b>		<b>R 5 708 127 032</b>	
<b>Cumulative Total (2009/12)</b>			<b>11.7%</b>	<b>7 179 984</b>		<b>R 19 595 430 290</b>	

**Figure 3: Example three year action plan**

Municipalities with existing energy implementation targets also need to ensure that these line up with the targets identified in the Response Plan.

**NOTE: costing of interventions is for technologies only. This does not include cost of implementation (labour). Behavioral interventions are also not costed within this model.**

**Step 4: The Response Plan**

Municipalities insert agreed-upon penetration targets into the **Action Plan** Table. This will provide municipalities with a breakdown of the number of units and related cost estimate for the target to be achieved as well as a cumulative total efficiency gain, which could be expected.

**Step 5: Business Planning and Implementation**

Each intervention action requires a detailed business plan to be developed by the appropriate line department. For the purposes of the overarching Response Plan the following information should be provided:

Intervention	Target	No. of units	Estimated cost	Potential source(s) of financing	Actions	Responsible line department	M&E
e.g. efficient lighting (residential)	20% of all residential lighting	X million cfls	Rx mill	Treasury funding Home owners	Technology replacement drive – utilize an esco Awareness	Electricity	Esco reports on cfls delivered.



The '**How to Implement Renewable Energy and Energy Efficiency Options**' manual is available for download at [www.cityenergy.org.za/implementation](http://www.cityenergy.org.za/implementation). This details ways to go about implementation of the interventions and will support the development of each intervention's detailed business plan.

Detailed business plans will need to highlight:

- how customer co-investment is being encouraged
- how activities will encourage cooperation and liaison with ESCOs to get technical and financial know-how to customers
- detailed financing arrangements, including implementation costs
- how behavioral interventions are being targeted alongside technology interventions.

### **Step 6: Institutional arrangements**

Municipalities need to detail how the Response Plan will be implemented. This needs to address:

1. Which municipal department will coordinate and hold overall responsibility for the Implementation Plan.
2. How will implementation be monitored – will there be regular inter-departmental meetings, etc. If implementation is cross-departmental overarching responsibility needs to be held in a fairly high, or central, place in order to ensure cooperation of all.
3. How will actions be reported on to council and political support for the plan realized?
4. How and where will budget be allocated?