LOCAL GOVERNMENT ENERGY EFFICIENCY AND RENEWABLE ENERGY STRATEGY

STATUS QUO REPORT

Prepared by Sustainable Energy Africa (SEA) - Section 21 (not for profit) company on behalf of the South African Local Government Association (SALGA)

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LIST OF ACRONYMS AND ABBREVIATIONS

ADAM	Approach to Distribution Asset Management
AMEU	Association of Municipal Electricity Utilities
ANC	African National Congress
BRT	Bus Rapid Transit
CFL	Compact Fluorescent Lamp/Light
COGTA	National Department of Cooperative Governance and Traditional Affairs
DEA	National Department of Environmental Affairs
DHS	National Department of Human Settlements
DoE	National Department of Energy (formerly known as Department of Minerals and Energy – DME)
DoT	National Department of Transport
DORA	Division of Revenue Act
DSM	Demand Side Management
DTI	Department of Trade and Industry
DWA	National Department of Water Affairs
EE	Energy Efficiency
EEDSM	Energy Efficiency and Demand Side Management Programme
EPWP	Expanded Public Works Programme
ERA	Electricity Regulation Act (2006)
ESCO	Energy Savings Company
FBAE	Free Basic Alternative Energy
FBE	Free Basic Electricity
FET	Further Education and Training
GBCSA	Green Building Council of South Africa
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German International Corporation)
GJ	Gigajoule
GVA	Gross Value Added
HPS	High Pressure Sodium
HVAC	Heating, Ventilation and Cooling
IBT	Inclining Block Tariff
ICLEI	Local Government for Sustainability
IDM	Integrated Demand Management
IDP	Integrated Development Plan
IMESA	Institute of Municipal Engineering of Southern Africa
INEP	Integrated National Electrification Programme
IRP	Integrated Resource Plan
IRPTN	Integrated Rapid Public Transport Network
KPI	Key Performance Indicator
KPA	Key Performance Area
KSD	King Sabata Dalindyebo Municipality
LED	Light Emitting Diode
LED	Local Economic Development
LG	Local Government
LPG	Liquefied Petroleum Gas
M&V	Measurement and Verification
MCEP	Manufacturing Competitiveness Enhancement Programme
MFMA	Municipal Finance Management Act
MIG	Municipal Infrastructure Grant

MISA	Municipal Infrastructure Support Agency
NEEAP	National Energy Efficiency Action Plan
NBI	National Business Initiative
NCPP	National Cleaner Production Programme
NGO	Non-governmental Organisation
NERSA	National Energy Regulator of South Africa
NLTA	National Land Transport Act
NMBMM	Nelson Mandela Bay Metropolitan Municipality
NMT	Non-Motorised Transit
NRS	National Regulatory Standard
NT	National Treasury
NT TAU	National Treasury Technical Assistance Unit
PFMA	Public Finance Management Act
PPP	Public Private Partnership
PSEE	Private Sector Energy Efficiency
PTIG	Public Transport Infrastructure Grant
PTNOG	Public Transport Network Operations Grant
PTOG	Public Transport Operations Grant
PTSAP	Public Transport Strategy and Action Plan
PV	Photovoltaic
RE	Renewable Energy
REBID	Renewable Energy Bids
REIPPP	Renewable Energy Independent Power Procurement Programme
RSA	Republic of South Africa
RTSSA	Rural Transport Strategy for South Africa
SABS	South African Bureau of Standards
SACN	South African Cities Network
SAGEN	South African – German Energy Programme
SALGA	South African Local Government Association
SANEDI	South African National Energy Development Institute
SANS	South African National Standards
SAPIA	South African Petroleum Industry Association
SARPPGC	South African Renewable Power Plants Grid Code
SDC	Swiss Agency for Development and Cooperation
SDF	Spatial Development Framework
SEA	Sustainable Energy Africa
SEED	Sustainable Energy for Environment and Development
SETA	Services Sector Education and Training Authority
SIPS	Strategic Integrated Projects
SSEG	Small Scale Embedded Generation
StatsSA	Statistics South Africa
SWH	Solar Water Heater
TSA	Taxi Scrapping Allowance
V-NAMA	Vertically Integrated Nationally Appropriate Mitigation Action

Introduction and background

The Swiss Agency for Development and Cooperation (SDC) has been supporting the implementation of energy efficiency interventions in South Africa through the 'Energy Efficient Building Programme2010 – 2013'. The programme is committed to supporting South Africa to contribute to the reduction of greenhouse gas (GHG) emissions in South Africa through energy efficiency interventions at policy, monitoring, research, training and implementation. The South African Local Government Association (SALGA) has, through agreement, partnered with the SDC to facilitate implementation of the local government part of the Programme.

The local government component of this programme has involved the development of energy efficiency strategies and implementation plans in 5 pilot municipalities; institutional capacity assessments in relation to the pilot municipalities' role with respect to energy efficiency; knowledge sharing and the development of communication structures related to energy efficiency between the national and local level. This work has specifically related to five pilot municipalities, but the intention of this final output, a SALGA Municipal Energy Efficiency and Renewable Energy Strategy, is to draw together national learnings and experience towards supporting all municipalities across the country in taking this work forward.

Substantial local level energy work is underway across the country, however this has been predominantly focussed within the larger cities and towns, and is also currently addressed on a voluntary and ad hoc basis. There is an expressed need from municipalities for clarification and guidance as to what is required in the area of energy efficiency and renewable energy development from the local level. This strategy aims to address this need.

The Draft National Energy Efficiency Action Plan of the Department of Energy (DoE, 2013), notes that efficiency must be undertaken primarily by end users (residents, businesses) and encourages sectors and other spheres of governance to develop their own plans towards national efficiency targets[1]. The National Climate Change Response Policy (DEA, 2011), Section 10.2.6 recognises the important role of municipal government in meeting the challenges of climate change, including areas relating to energy service delivery. This strategy development aims to support these national goals.

Given the call from national government for local government to contribute to climate mitigation and efficiency targets, it also seems useful and necessary to begin to draw up a clear picture of the potential contribution that can be made at the local level and assess the support required to realise this potential. Importantly, this strategy will also ensure that the specific experience of local government, their particular challenges and opportunities, are brought to the fore, so that support programme can be strategically directed.

A diagnostic report by the National Treasury Technical Assistance Unit (NT TAU, 2013) on barriers and challenges to implementing climate change projects at the regional and local level concludes:

[1] Development of a first Draft of a National Energy Efficiency Action Plan (NEEAP) for the RSA, Draft 5, DoE, 2013, p 9 and 56: this recognises the role of sub-national government and includes for action the development of an action plan to support municipal action.

"The need for change has been acknowledged. Interviewees overwhelmingly agreed that the emergence of a new geopolitical order and production-consumption system, at the global level has started to expose the structural rigidities of resource intensive economies. The old resource intensive economic system is breaking down and a different economic system is emerging; one that values resource efficiency and low carbon alternatives of production-consumption. It is likely that, in the interim, the socio-economic system will become increasingly volatile and therefore, *it is imperative that local government is empowered to deliver its service delivery objectives under the changing conditions*."

Section 154(1) of the Constitution of South Africa (1996) tasks both national and provincial government with supporting and strengthening the capacity of municipalities to manage their own affairs, exercise their powers and perform their functions. This strategy aims to provide a clear programme of action for local government, to promote energy efficiency and renewable energy development in line with national policy direction and within local governance mandates. It is also designed to provide a clear programme of action, to be led by SALGA, to those tasked with strengthening the capacity of municipalities to undertake this work.

A cornerstone of the strategy development process has been engagement and consultation with the country's municipalities via the SALGA Provincial offices. Despite challenges facing local government, the commitment, passion and calibre amongst local government officials and leaders working in this newly unfolding arena must be acknowledged. Valuable, pioneering energy efficiency and renewable energy work is already underway within South African municipalities. The Strategy development process has drawn extensively on this work and experience.

Local level consultation also made it clear that energy efficiency and renewable energy, at the local governance level, cannot simply be seen as a technical issue, but must be addressed in the context of service provision, in which ensuring sustainability of municipal revenue and electricity service delivery, addressing poverty and access to energy services, and stimulating local economic development is paramount. The strategy developed here aims to reflect these municipal priorities.

This Strategic framework document includes:

Part I) a Status Quo Report and

Part II) a Municipal Energy Efficiency and Renewable Energy Strategic Framework/Programme of action document.

This latter document provides an indication/ outline of key energy efficiency and renewable energy areas for local government to address as well as an outline of key areas of support work to be taken forward by SALGA (in partnership with relevant national departments and key stakeholders) in order to enable, and facilitate, local government ability to address energy efficiency and renewable energy.

Part I: Municipal Energy Status Quo Report

1. An overview of local level energy work in South African cities and towns

Since democracy, there has been a substantial shift in energy policy in South Africa, influenced also by new global forces, that has brought local government into the energy domain. It is useful to trace these shifts in order to understand the need arising for greater strategic direction and support for local government to continue to meet its service delivery objectives within these new parameters. It is also important to recognise and build on pioneering municipal energy work underway, where much has been learnt through a 'learning by doing and sharing' approach.

A period of transition

Historically the energy sector in South Africa focussed almost entirely on the supply side of energy and on issues of energy security, with little attention being given to demand side and sustainability issues – where was energy being used, by whom, for what and how could these needs be met in a manner that would promote social, economic and environmental sustainability.

New thinking across the globe – coming together at the Rio World Summit on Sustainable Development – began to highlight the enormity of the environmental resource challenges facing the world, along with the persistence of poverty and inequality in resource allocation. It also noted the primary role of local (and in particular urban) government, given that world population growth is massively concentrated in the urban areas of developing countries.

This period coincided with the democratic transition in South Africa and the developmental mandate given to the new, unified, system of local government (as articulated in the Municipal Systems Act of 2000). This identified local government as a key platform for redistribution, predominantly through equitable service delivery.

Sustainability issues began to be brought onto the energy agenda by university research teams, NGOs and community representatives[2]. This saw its way into the energy policy of the ANC, and then the new government, post 1994, in the Energy White Paper (1998) and Energy Act (2008). These policies required that energy direction in the country address energy poverty, energy security, development and environmental issues. The major drive of national government in addressing the environment and poverty-related energy issues has been the globally award-winning Integrated National Electrification Programme (INEP), the Free Basic Electricity/Alternative energy policies and the development of Energy Efficiency and Renewable Energy Strategies and related Programme.

Many of these programmes relate to energy demand (on-ground consumption). These new approaches have brought the issue of energy planning strongly into the domain of local government. This is well illustrated by unpacking the role of local government within the 8 Key Objectives of the draft National Integrated Energy Plan, 2013, as illustrated below.

Table 1: Local Government powers and functions relevant to achieving national energy objectives

8 Key National Integrated Energy Objectives	Related municipal mandates, or functions (schedules 4

[2] Ward, S, The New Energy Book, 2008.

(Draft National Integrated Energy Plan, 2012)	and 5, Constitution of RSA 1996; Municipal Systems Act, Municipal Services Act)
1. Ensure the security of supply	Electricity reticulation; Free Basic Alternative Energy
2. Minimise the cost of energy	Electricity reticulation (tariff setting, cross subsidisation); Human settlements (housing delivery); Public transport (limited); Non-motorised transport;
3. Increase access to energy	Electrification; Free Basic Alternative Energy; Human Settlements (thermal efficiency); Public transport; Spatial planning
4. Diversify supply sources and primary sources of energy	Electricity reticulation; Waste management
5. Minimise emissions from the energy sector	Electricity reticulation; Building codes and planning approval
6. Promote energy efficiency in the economy	Manage public facilities; Building codes and development approval; Air quality management; Electricity distribution
7. Promote localisation and technology transfer and the creation of jobs	Local economic development
8. Promote the conservation of water	Water service delivery

It is increasingly apparent that national government requires strong support from local government to meet national objectives in energy and related environment and economic development targets and this has been recognised in recent policy and plans, such as the Department of Environment's National Climate Response White Paper (2011), and the Department of Energy's National Energy Efficiency Action Plan (2013) and IRP 2010 Update Report (2013).

Another development that brings energy into the local government domain is market forces that are rendering rooftop PV to be a financial proposition. This means that households or businesses can produce electricity to meet a substantial amount of their consumption needs. Although this development is likely to be slow in reaching sizeable proportions, it requires a radical re-think as to how electricity distribution businesses, and municipal revenue models, are configured. And while mass take up is likely to be slow, installations are *already underway*, with municipalities receiving applications for grid-feed in on a regular basis. Thus, municipalities have to establish procedures and systems *now*, or run the risk of dangerous and illegal connections becoming widespread; and these procedures need to ensure service delivery sustainability into the future.

Capacity development for local sustainable energy development

A number of organisations and programmes have contributed to the development of local level engagement with energy efficiency and renewable energy. In 1998 Sustainable Energy Africa (SEA) set up the SEED (Sustainable Energy for Environment and Development) Programme, which ultimately became the City Energy Support Unit Programme of SEA. This work pioneered the development of energy data reports for cities (State of Energy reporting) and Energy and Climate Change Strategy development. It has supported a learning network amongst municipalities working in this area, for over fifteen years, building capacity through 'learning by doing' and sharing of experience amongst officials, regional and national departments and stakeholders.

In the early years of 2000, ICLEI ran a three year Cities for Climate Protection Programme, which looked at internal municipal energy consumption and supported pilot projects with efficient or renewable energy alternatives. ICLEI Africa is now running the Urban-LEDS Programme, supporting the development of low carbon strategies amongst 'secondary' city partners.

The SA Cities Network has always included a sustainability component within its member cities. Energy indicators form part of the SACN State of Cities reporting and the organisation is also involved in on-ground studies relating to renewable energy development and energy efficiency and led the 2009 City Renewable Energy Summit. Recently the SACN have published a Consolidation of Lessons Learnt for EE and RE Initiatives within Cities: Development of a Roadmap for Future Uptake[3].

The South African Local Government (SALGA) has long been a key partner within the INEP Programme, and has recently included an Energy Efficiency component to its infrastructure/services work. Provincial SALGA capacity is also developing around this aspect of energy development. With SDC support SALGA has been actively supporting the development of EE/RE strategies amongst five pilot 'secondary' cities.

The Association for Municipal Electricity Utilities (AMEU, established 1915), is an association of municipal electricity distributors as well as other organisations (academic, state-owned enterprises, commercial) that have a direct interest in developing quality electricity supply services in Southern Africa.

The Department of Energy (DoE) has worked on the global award-winning Integrated National Electrification Programme (INEP) with municipal distributors, since the INEP Programme inception, and has also run local rollout of the 'Basa Njenga Magogo' smokeless stove Programme. In 2009 the DoE began its first efficiency programme with local government with the inception of the DORA-funded Municipal Energy Efficiency and Demand Side Programme. This provides funding to municipalities to engage with public lighting, water pumps and water heating efficiency. It has also funded the rollout of local solar water heating projects.

The Department of Cooperative Governance and Traditional Affairs established the Municipal Infrastructure Support Programme via the Municipal Infrastructure Support Agency (MISA), in 2011, to provide technical capacity support to facilitate infrastructure development via the Municipal Infrastructure Grant, towards improved service delivery in municipalities.

[3] SA Cities Network, Consolidation of Lessons Learnt for EE and RE Initiatives within Cities, prepared by Aurecon, 2013.

2. Legal framework and alignment with national policy

City governments have a central role to play in managing energy consumption and GHG emissions. They can incentivize energy efficiency; promote renewable energy use and public transport. Indirectly they can influence city energy use through urban planning and economic development. Cities are substantial energy users across civic amenities and services and can provide leadership through reducing their own GHG emissions. However, the powers and functions of local government set out in the Constitution are not explicit about the energy dimension of these roles and responsibilities and mandates to act in this regard have often been reliant on interpretation and political endorsement by a proactive leadership.

Pioneering cities in South Africa believe the mandate to act with regard to energy and climate is implicit in the objectives of local government and the powers and functions accorded to local government in the Constitution (1996), the White Paper on Local Government (1998) and Municipal Systems Act (2000). The most recent legal opinion developed on this is that of Cliffe Dekker Hofmeyr, for the South African Cities Network[4]. De Visser, Associate Professor of Community Law, University of Western Cape, has also developed valuable opinions that draw on the developmental role allocated to local government in the Constitution[5].

South Africa's supreme law, the Constitution of the Republic of South Africa, 1996, under Section 24, states that all South Africans have the right to a healthy environment and the right to have the environment protected. Cliffe Dekker Hofmeyr contend that this can be inferred to include the implementation of clean renewable energy and energy efficiency projects. This is reinforced in the Constitutional objectives accorded to local government, namely: the provision of services to communities in a sustainable manner, promotion of social and economic development and a safe and healthy environment (section 152 (1)).

The Constitution sets out the powers and functions of municipalities (Section 56 (1) and Schedules 4B and 5B), which include aspects relating to air pollution, building regulation, electricity and gas reticulation, municipal planning and street lighting. Therefore, given that municipalities derive authority to intervene in these matters, from the Constitution, they are empowered to legislate on energy efficiency and renewable energy dimensions relating to these powers and functions within their jurisdiction.

The National Energy Act, 1998 specifically mandates renewable energy development and energy efficiency in that it addresses environmental management considerations and increased generation and consumption of renewable energy. It also has as objectives the need to diversify our energy supply, effective management of energy demand and energy conservation.

The Integrated Resource Plan (IRP) of 2010 informs the renewable and energy efficiency interventions on a national level, which are seen to have a bearing on municipalities. However, although the IRP 2010 Update Report begins to introduce elements directly within local government jurisdiction, the IRP 2010 still lacks specific local government energy efficiency or renewable targets. Should the IRP 2010 Report Update become policy, this would signal a step-change in that it lays the foundation for the development of a local

[4] SA Cities Network: Consolidation of Lessons Learnt for EE and RE Initiatives within Cities, 2013. Prepared by Aurecon.
[5] Jaap de Visser, UWC Local Government Project, Community Law Centre: LEGAL OPINION: in RE CITY OF CAPE TOWN'S PROPOSED Solar water heating by-law, 2007; available from Sustainable Energy Africa.

government component within national electricity planning. This would substantially address current difficulties in planning and committing resources for renewable energy and energy efficiency initiatives within municipalities.

The White Paper on Renewable Energy Policy (2003) seeks to ensure that renewable energy is a significant part of the country's energy mix. Energy efficiency is also identified as an important facet of integrated energy planning and the policy states that the greatest potential for efficiency measures is in the industrial and household sectors. It further points out that local government can play a large role in improving energy efficiency by ensuring the existence of applicable laws, education Programme and policies.

The White Paper on National Climate Change Response (2011) presents the country's vision for an effective climate change response and the long-term transition to a climate-resilient low carbon economy and society. Cliffe Dekker Hofmeyr feel that this policy document does not clearly argue for the benefits of renewable energy and energy efficiency. However, among the identified interventions to mitigate emissions, the main opportunities consist of energy efficiency measures, demand-side management and moving to a less emissions-intensive generation mix. It is however unclear how municipalities are empowered to go about implementing and achieving these goals, although they are identified as key partners, with SALGA as a key support (Section 10.2.6).

While regulations and policies exist at a national level to promote renewable and energy efficiency, very little evidence is found of municipalities that utilize their legislative powers to pass bylaws to encourage or enforce the promotion of these approaches within the municipality. The Municipal Systems Act does empower municipalities to pass bylaws for energy efficiency and renewable energy, however, the preferred approach by municipalities has been to develop policies, plans and strategies. It should be noted that policies, plans and strategies do not impose the same legal obligation as created by bylaws. Municipalities with detailed energy efficiency and renewable energy strategies, and a clear motivation for initiating energy efficiency and renewable energy initiatives, have been more successful in implementing these than municipalities approaching this area of work on an ad hoc basis. It is imperative for detailed action plans to be developed alongside these strategies.

The national legislative environment also imposes numerous challenges for municipalities to implement these initiatives. This includes not clearly specifying the role/mandates of municipalities in implementing energy efficiency and renewable energy measures. For example, some policies might set targets for the implementation of energy efficiency and renewable energy at a national level, without clearly identifying the municipal mandate in this regard. If municipalities are expected to contribute, as broadly identified in policy, these need to be translated into specific Key Performance Areas (KPA's) within municipal management systems. The Municipal Financial Management Act (MFMA) is also complex in relation to municipal procurement abilities for both energy efficiency and renewable energy technologies.

The National Energy Regulator of South Africa's (NERSA) lack of enforcement of the *Dx license conditions,* which empower the regulator to enforce stricter energy efficiency and renewable energy conditions on municipalities that have specified minimum requirements, is seen as being a barrier, or opportunity missed, in the implementation of energy efficiency and renewable energy initiatives.

As noted in Section 1 above, the market development that is beginning to see rooftop PV becoming affordable at a household and business level, and on-ground installation of systems and grid feed-in applications, also means that local government have to engage with this sector.

3. The municipal energy picture

3.1 State of the data and data protocols

Energy data is not collated along the lines of municipal geo-political boundaries, making the exercise of putting together a local energy picture, for individual municipalities, complex. Most metros have done detailed State of Energy studies and a number of the 'secondary cities' are beginning to follow suite. However, there is limited information for some of the smaller towns. Data collated here comes predominantly from Sustainable Energy Africa's State of Energy in SA Cities reports (2006 and 2011), which in turn have drawn on local state of energy reports and some original data collation, and data recently compiled through the SALGA SDC and ICLEI Urban-LEDs Programme for secondary cities. *Figures therefore come from different years and are indicative, but cannot be examined comparatively.*

The following particular difficulties exist in relation to developing a local level energy picture:

a. Liquid fuel data is made available, as per latest ruling of the Competitions Commission, after a 'reasonable time period', which, for annual consumption data, is six months after the period in question. This is a reasonable time frame and this outcome of the Commission is welcome. However, data is still measured along magisterial district lines, making local estimations somewhat clumsy. SEA have provided a national 'tool' that makes a broad sweep estimation that can be used by municipalities, but detailed local level studies should refine this.
b. Municipal electricity departments are happy to make electricity data available. At a high level this is easily accessible, but sector breakdown becomes difficult due to different billing structures. Eskom data is not measured according to municipal boundaries. However, they are sometimes able and prepared to provide high quality data approximating these boundary lines, in other instances they do not permit this to be made available, or at least published, due to customer confidentiality (for e.g. where they may supply only one or two large customers in an area the concern is that the publication of this data would be considered a breach of confidentiality) as well as Municipal-Eskom competition issues.
c. Coal and LPG is not regulated and data very hard to quantify, or apportion.
d. Harvested fire wood and other biofuel use is hard to quantify.

State of energy reporting for South African cities and towns follows global norms and protocols for local level energy and GHG emissions reporting. This means that all energy consumed within an area, is counted within that area. A full set of municipal energy data, should therefore, by definition, add up to national energy consumption totals. Available local level data[6] is presented in Table 2.

[6] NOTE: this data is compiled from existing data and is not from a single source year, making any comparisons between cities and towns difficult. However, the data is able to provide broad strategic indications. A data update exercise, through SEA's City Energy Support Unit, is scheduled to take place in 2014. A full set of data, with data sources noted, is to be found in Appendix 3.

Table 2: Municipal energy overview 2014

NB Figures come from different years and are indicative, but not comparative.

Municipality	Code	Energy (GJ)	Electricity (GJ)	Liquid Fuel (GJ)	tCO_2	Population	GVA (millions)	GJ/GVA (millions)	GJ/ capita	tCO_2/ capita	Data year
METROS											
Buffalo City	A	21,434,507	4,655,834	14,914,690	2,513,420	724,308	34,357	624	30	3.5	2007
Cape Town	A	195,994,461	48,303,379	144,635,091	24,081,610	3,497,097	182,518	1,074	56	6.9	2009
Ekurhuleni	A	181,112,506	39,547,868	141,564,637	20,314,662	3,178,470	159,724	1,134	57	6.4	2011
EThekwini	A	191,122,738	42,427,468	140,977,007	22,815,537	3,584,680	176,100	1,085	53	6.4	2010
Johannesburg	A	142,612,254	52,493,812	85,977,722	21,302,088	3,888,182	285,926	499	37	5.5	2007
Mangaung	A	18,163,624	5,042,761	12,870,963	2,360,628	662,063	17,955	1,012	27	3.6	2004
Nelson Mandela Bay	A	32,191,176	11,133,645	20,430,591	4,669,993	1,050,934	54,398	592	31	4.4	2007
Tshwane	A	104,513,830	42,497,981	52,583,464	16,573,293	2,345,909	169,205	618	45	7.1	2007
SECONDARY CITY											
KwaDukuza	B2	5,315,012	2,299,023	3,015,990	866,873	231,189	24,358	218	23	3.7	2012
Mbombela	B1	11,684,300	1,204,936	10,479,364	1,081,531	527,203	11,544	1,012	22	2.1	2007
Msunduzi	B1	25,034,993	6,447,101	10,069,502	3,229,878	616,733	17,057	1,468	41	5.2	2007
Polokwane	B1	11,461,953	1,842,075	9,619,878	1,197,410	561,770	18,949	605	20	2.1	2007
Sol Plaatje	B1	5,642,450	1,338,037	4,236,374	684,566	243,015	10,772	524	23	2.8	2007
Tlokwe	B1	4,332,903	1,393,402	2,919,927	712,768	129,075	3,823	1,133	34	5.5	2004
RURAL											
King Sabata Dalindyebo	B2	5,055,483	974,635	4,065,745	560,514	451,711	12,301	411	11	1.2	2011
Thulamela	B4	2,445,150	911,129	1,534,021	366,073	618,462	No data	No data	4	0.6	2011
INDUSTRIAL											
Rustenburg	B1	57,183,679	39,630,023	11,439,133	12,640,515	549,575	26,620	2,148	104	23.0	2011
Saldanha	B2	23,477,790	4,021,563	3,004,343	2,690,743	78,985	4,359	5,386	297	34.1	2007
Sedibeng	C1	88,944,560	40,532,772	16,015,511	15,325,469	800,833	22,845	3,893	111	19.1	2007
Steve Tshwete	B1	19,782,826	10,988,089	8,794,737	3,771,142	229,831	No data	No data	86	16.4	2011
uMhlathuze	B1	60,263,447	51,780,470	7,116,064	15,315,773	360,002	13,664	4,410	167	42.5	2004

3.2 Local energy demand, supply and related carbon emissions

Whilst noting that the data sets are far from comprehensive, the data provides important indications for the strategy development process. The most concentrated consumption of energy takes place within the metros: **31% of national electricity consumption and 66% of liquid fuel (petrol, diesel, LPG, HFO, etc.) consumption takes place within these 8 municipalities**. This offers important opportunities for economies of scale and reduced transaction costs.

Table 3: Municipal vs. national energy consumption

Municipality type	Liquid fuel (GJ)	% of national	Electricity (GJ)	% of national	Ave % contribution municipality type
Metro (data for 8 cities)	613,954,165	65.6%	246,102,749	31.3%	4%
Secondary city (data for 6 city/towns)	40,341,035	4.3%	14,524,574	1.8%	0.3%
Rural (2 municipalities)	5,599,766	0.6%	1,885,764	0.2%	0.1%
Industrial (5 towns)	46,369,788	5.0%	146,952,918	18.7%	3.7%
Remainder	228,988,562	24.5%	375,765,996	47.9%	Approx. 0.2%
National*	935,253,316	100.0%	785,232,000	100.0%	

1. National electricity figure: Eskom 2007 Annual Report
2. National liquid fuel figure: 2007 SAPIA fuel sales data

A closer analysis of the proportion of transport fuels (petrol and diesel) shows that over half of the consumption of these fuels takes place within the metros and secondary cities, and close on 60% of national petrol consumption takes place in dense urban areas, indicating that urban spatial form, urban management and local transport options may have a major role to play in levels of consumption.

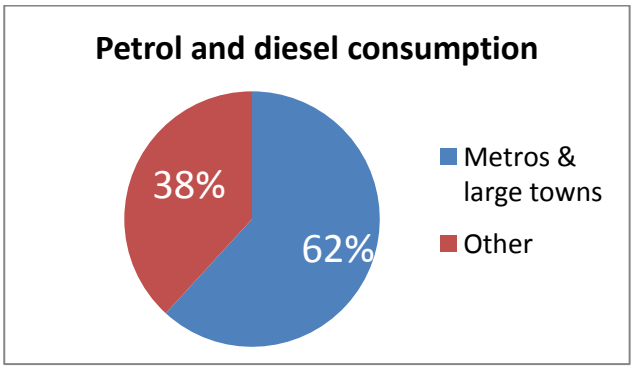

Figure 1: Urban transport fuel consumption as a portion of national (SAPIA, 2007)

Despite the inclusion of some of the important 'secondary cities,' such as Mbombela, Polokwane and Msunduzi, the 13 other municipalities for which data is available account for only 10% of national liquid fuel consumption and 21% of electricity use. The industrial nature of municipalities such as Rustenburg (platinum mining), Steve Tshwete (steel production), uMhlathuze (aluminium smelting) and Saldanha (steel production) account for the relatively high proportion of electricity use in these 13 municipalities.

While per capita energy consumption is reasonably similar within the metros and 'secondary cities,' energy consumption per capita in the smaller, more rural and/or less developed towns, such as King Sabata Dalindyebo and Thulamela, is very low. Both of these municipalities fall into former 'Bantustans' areas created by the Apartheid government and, as a result, lags other municipalities in infrastructure development. As a comparison, whilst Polokwane and Thulamela municipal areas both have a similar-sized population (roughly 600,000), Thulamela's energy consumption per capita is drastically lower; almost by a factor of ten (4 GJ/capita versus Plokwane's 35 GJ/capita).

The energy picture is fossil fuel dominated: Liquid fuel is derived from imported oil and produced from coal and natural gas (over 30% of total liquid fuel consumption)[7]. Electricity is from Eskom generation, of which final consumption is 90% coal-derived, 5% nuclear and 5% hydro derived (IRP 2010). Renewable energy via the REIPP comes on line this year (2014) and by 2030 should represent 9% of final consumption. Heavy coal dependence has implications for GHG emissions and potential carbon taxes.

Within Mpumalanga, where most of South Africa's coal-fired electricity-generating power plants are situated, this is also a very local problem: air pollution due to the power stations results in respiratory illness, and land and water degradation. Coal trucks ferrying coal to the power stations damage roads. Municipalities within Mpumalanga noted that coal mining has a huge and damaging 'footprint.'

Considering energy-related carbon emissions per capita, the average amongst the metros is 6 tonnes of CO_2 per person. This is equivalent to large cities globally (Paris, London, Berlin). However, these international cities have far higher levels of development. Amongst secondary and smaller South African municipalities for which data is available, it is clear that heavy industry pushes per capita carbon emissions to extremely high levels. Notable is that in a number of secondary cities the per capita emissions falls between 1-3 tonnes CO_2. This is low by global standards and close to the global 'fair share' of carbon per capita (approx. 2 tonnes/person). While this often represents underdevelopment and poverty, it also offers an opportunity/challenge to ensure that the required future development enhances and supports these low emissions averages.

[7] US Energy Information Administration: South Africa, January 2013 update

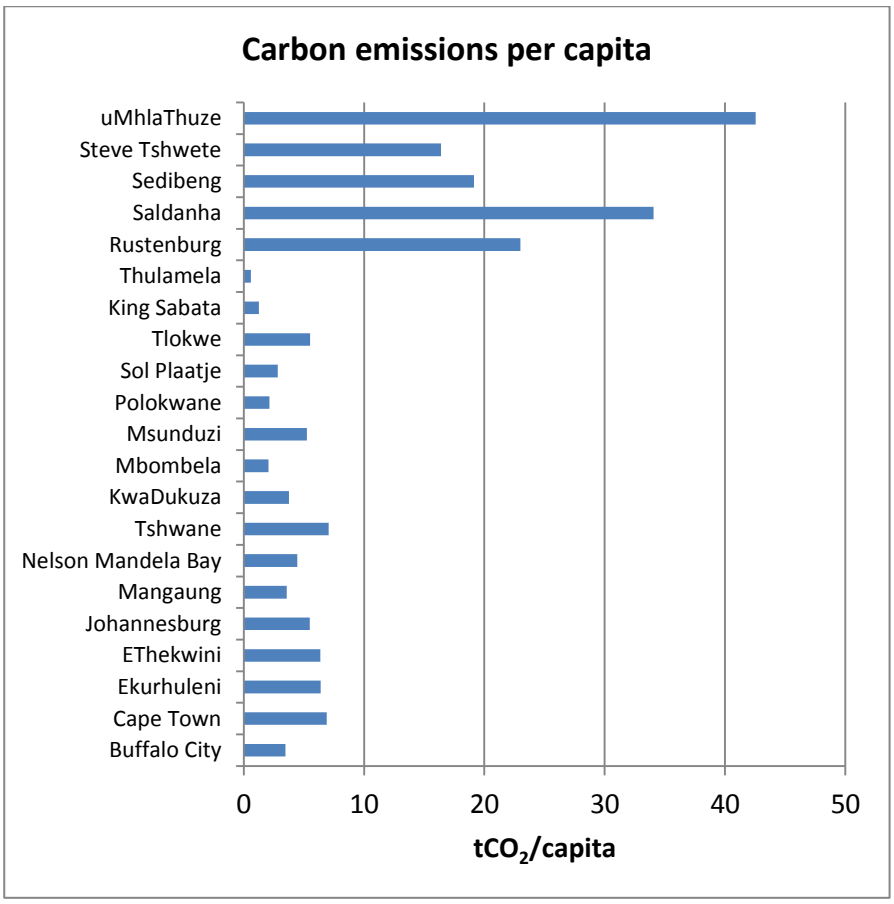

Figure 2: Carbon emissions per capita in South African municipalities (SEA, 2013)

The overarching data picture indicates that metros and secondary cities will be crucial partners in meeting energy-related emission-reduction goals (where intervention transaction costs may be lower). The majority of the poor, given urbanisation, also live in larger cities and towns, making these important centres for addressing energy poverty. In municipalities with smaller populations and lower levels of urban infrastructure, the most vital energy issues may relate to energy access for residential and productive development and ensuring that the infrastructure development path facilitates a low-carbon trajectory. Where transaction costs are higher, it makes sense to consider centralising as many interventions as possible. This must be done through engagement with local government, rather than top-down and not taking into account local imperatives and systems (e.g. reporting time frames differ from national to local government).

3.3 Sector breakdowns

Within municipal energy consumption, the **transport sector** (generally includes, petrol, non-industrial diesel, aviation gas, international marine fuel and jet fuel consumption) accounts on average for half of total consumption. Within the metros that house airports and harbours, and towns with limited industry, this figure is even higher (60-77%). In municipalities with substantial industry, this proportion can be lower (example: 13% in Rustenburg).

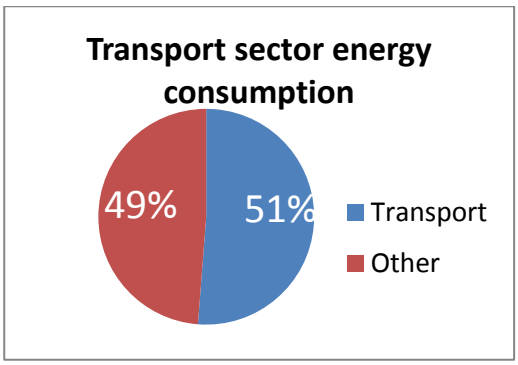

Figure 3: Average transport sector related energy across all municipalities with available data (SEA, 2013)

Municipal energy efficiency must, critically address the transport sector. This needs to consider efficient vehicles, cleaner fuel, public transport, smart/unified transport systems. However, urban form and 'healthy' densification, as well as lifestyle changes must form part of this.

Data also indicates that non-motorised transport (walking and cycling) forms a huge proportion of all mobility in our municipal areas. Within the metros, in 2001, this was on average **43% of all mobility** (Ekurhuleni is the outlier with a much smaller proportion of 'foot' transport); and in the 'secondary' and smaller towns this was, on average **53%**[8]. It must be noted that the data is old, as the 2011 StatsSA Census did not include transport mode-related queries for comparison. Nevertheless, even if substantial improvement has occurred, these figures are sizeable and, from the perspective of addressing poverty, inequality and access it is important this this be noted. Non-motorised transport support should be a cornerstone of any transport/mobility-related municipal strategies.

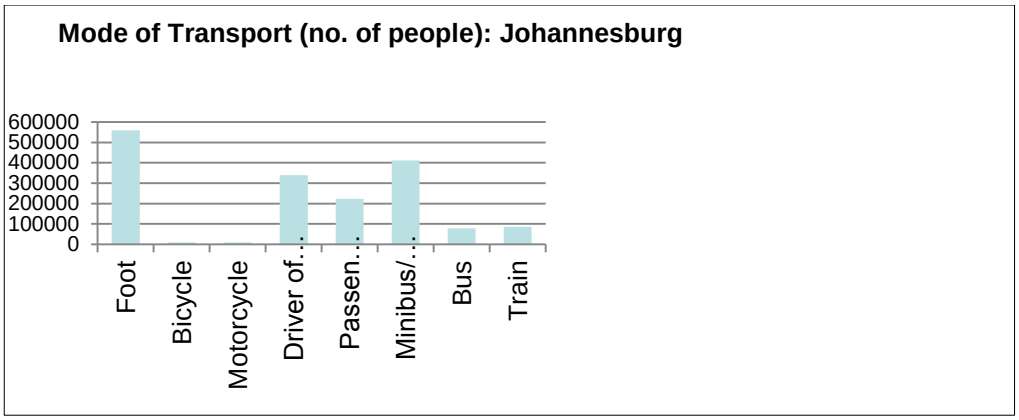

Figure 4: Mode of transport to work and school, 2001, StatsSA

Of the non-transport related sectors (industry, commerce and residential), the industrial and residential sectors make up the next-largest chunk of energy consumption, followed by the commercial sector.

Non-metro municipalities follow, broadly, the same pattern, save for slight variations: more rural municipalities have low levels of industry; and very high industrial energy consumption in industrial towns throws all other energy consumption proportions out (when industry data is removed, the remaining consumption exhibits similar characteristics to other towns). See Figure 5 below for illustrative purposes.

[8] StatsSA Census 2011

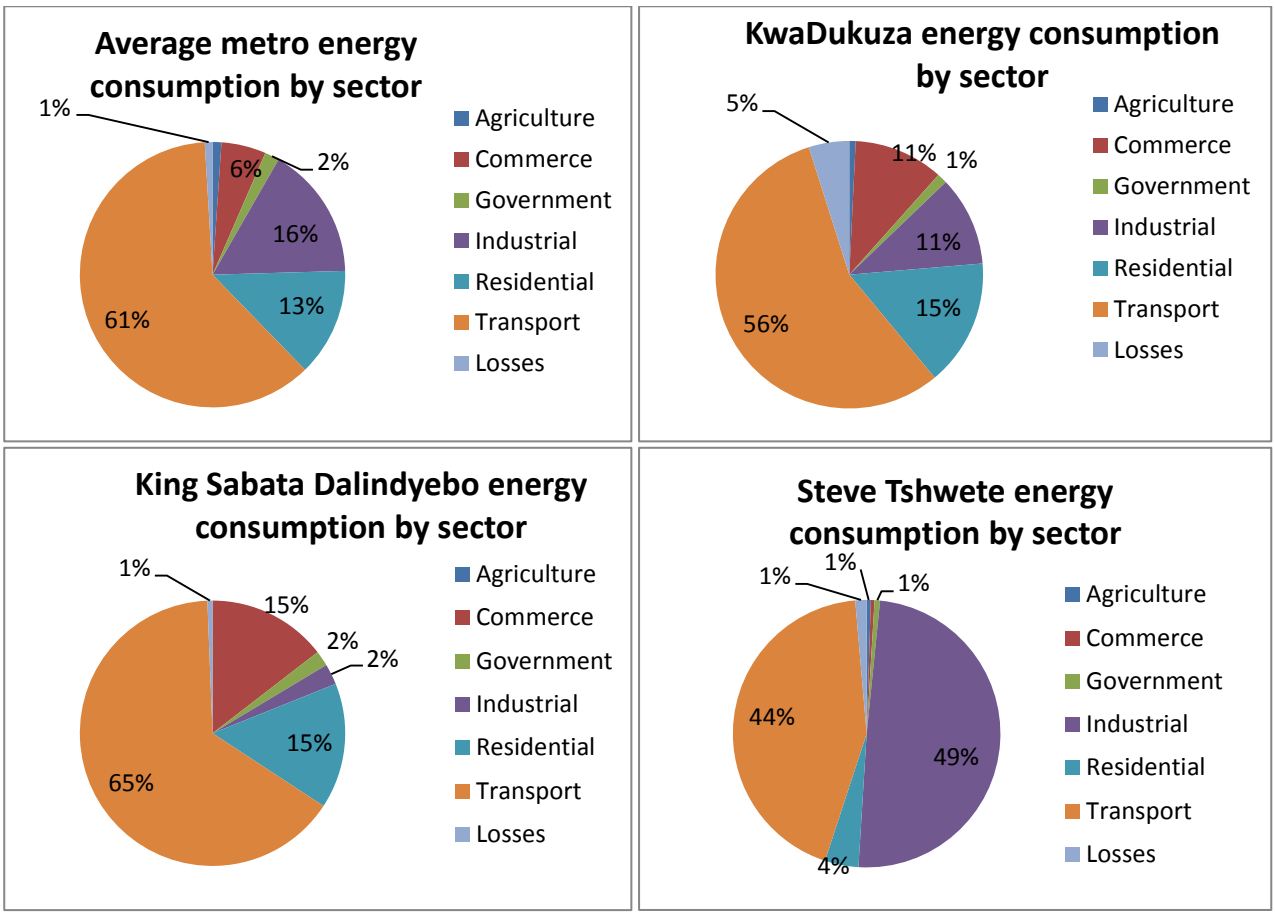

Figure 5: Average energy consumption by sector across metro cities and typical secondary and more rural municipalities. Note: excludes international marine fuels

The **commercial and residential sectors** both largely relate to the built environment. While households usually comprise some 15-20% of total energy consumption, within *electricity* consumption they consume **30-40% of the municipal total**, and this often during peak load times, thus representing an important energy efficiency and renewable energy opportunity (with lower load levels, the country can lower its installed capacity requirements, facilitating renewable energy development). Greater efficiency in the built environment of a town can also support business in the area. Security of supply is also important for business development.

Within the residential sector the Integrated National Electrification Programme (INEP) of government has had a substantial impact on electrification levels across the country: amongst the metros, the average electrification level amongst households in 89%; and amongst other municipalities within the data study, 87%. Rural electrification levels are lower, with only around 55% of rural population having access to grid-electricity[9]. The outstanding households are usually in more rural settings, where it is extremely costly to extend the grid connection, or amongst informal settlements in the urban context where issues of land rights, electrification standards, or accessibility inhibit electrification. However, it should also be noted that the figures for electrification include not only formal electricity connection, but informal, or 'illegal' connections. Formal electrification is often far lower and this means that many poor households, while they have access to electricity for lighting, do not benefit from the national energy poverty subsidy via the Free

[9] US Energy Information Administration: South Africa, 2013.

Basic Electricity Grant, and suffer intermittent access, dangerous connections and often costly electricity that is paid for through a third party.

Whether formal or not, a positive trend with increasing access to electricity, is the reduction in paraffin consumption amongst households in South African municipalities[10]. Figure 6 below provides a visual overview of change in fuel source for cooking and lighting in South African households from 1996 – 2011. The increase in electricity is sizeable, particularly from 2001 – 2011. This seems to have directly replaced paraffin consumption.

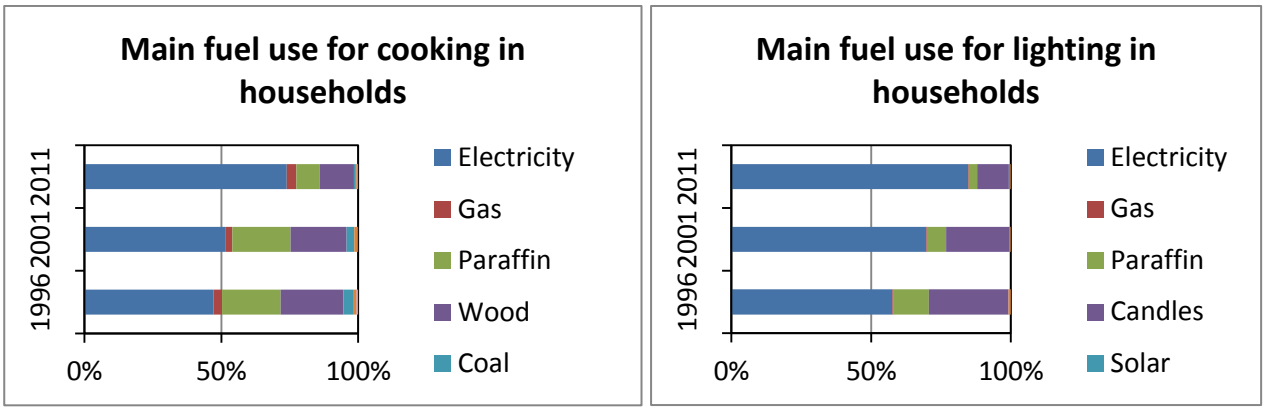

Figure 6: Main fuel use for cooking and lighting in households in South Africa 1996-2011 (Source: StatsSA Census 1996, 2001, 2011)

Despite impressive improvements, substantial households still suffer the burden of energy poverty, either through lack of access to modern, safe forms of energy (and consequent health/safety impacts), through badly designed housing that has very low thermal performance, or through the increasing proportion of household income that is spent on meeting energy needs. Addressing the hundreds of thousands of households suffering in these conditions is a primary task of South African municipalities wishing to address sustainable energy (EE/RE) issues.

Within mid-high income households in South Africa, the major fuel used for lighting, cooking and heating is electricity. This offers some scope for the possible expansion of cleaner fuels for cooking, such as LPG or natural gas. Within electricity consumption, the most sizeable end use is in heating of water. Geyser ripple control relays have been implemented successfully in a number of municipalities and the potential for the expansion of solar water heating/heat pumps has long been understood. A national subsidy has been available to help overcome the major upfront capital cost barrier to uptake of solar water geysers or heat pumps. Mass rollout of the technology remains elusive and many municipalities have been exploring viable ways to support this. A challenge is that legal review indicates the difficulty of municipalities installing SWHs as municipal owned infrastructure within private properties, thus leaving the uptake entirely in private hands. The City of Cape Town has recently launched a programme of endorsing service providers who offer sound products with good associated financing options.

Amongst the built environment (commercial, residential and industrial) all new building, including low income housing, is now subject to the new, energy efficient building regulations captured in SANS 10400-XA. This requires that a specified efficiency per square meter is met in the building design, and a minimum of 50% of heating requirements must be met through solar water heating/heat pump. Challenges in

[10] StatsSA Census 1996, 2001, 2011

enforcing the new regulations need to be addressed for the full effectiveness of these regulations to be realised.

Municipalities have some control over industry in their jurisdictions, through building regulation, electricity supply metering, Air Quality control and business licensing. However, real influence in industrial processing is usually vertical, through industrial bodies or business associations.

Sustainable energy development and GHG emissions: rapid municipal analysis tool[11]

The table below is based on a growing understanding of key energy issues across the country. It is designed to support rapid analysis of energy development and GHG emissions issues and can form the basis of local energy policy and strategy or action plan development.

A and B2: metros and large towns	
Profile	Key issues
• significant contribution to national energy consumption: some 40% of national electricity generated is consumed within the largest cities and towns; and over 50% of petrol and diesel; • relatively high per capita carbon footprint (around 6-7 tons/capita for largest 5 metros; 4 tons/capita for large towns, smaller metros); • transport responsible for over half of energy consumption and around 30% of emissions • households responsible for around 30% of emissions – most of this occurring amongst mid-high income households, through electricity consumption • industry can be substantial • built environment broadly is a significant emissions contributing sector • landfill gas can account for as much as 10% of GHG emissions • Municipal activities account for only about 1 – 2% of emissions, but important area for quick wins and 'leadership by example'.	• Critical partner in meeting national energy (security and efficiency) and GHG emissions reduction targets • city economies vulnerable to increasing costs of energy and carbon • majority of the country's poorest now live in cities and larger towns and thus high proportion of the country's energy poverty resides here • need to reduce energy intensity through greater efficiency, renewable energy and encouraging diversification of economic activity and improved mobility • improved mobility (better public transport and transport networks) can also address livelihoods opportunities/economic mobility of people • mid-high income households are large contributors to emissions profile; usually 50% of household electricity in this sector is for water heating, so introduction of solar water heating is critical • enforcing efficient building regulation to improve efficiency of the built environment • engagement with commerce and industry to support more efficient electricity use • unsafe energy use in poorer households contributes to fires and health issues – important to move to 100% electrification • improve thermal efficiency of poor households, possible provision of solar water heating, for greater resilience (better health, reduction of energy poverty) • waste recycling and management of landfill gas is an important area to address • town planning and economic development approaches into the longer term
B3, C1: large town as core, and small towns with largely commercial farms	
Profile	Key issues
• broad profile similar to cities: liquid fuels (mostly for transport) contribute around 50% to energy consumption; but electricity is the largest contributor to GHG emissions • carbon footprint ranging from approximately 2 – 6 tons/capita (4 tons/capital is the global average) • Mid-high income households contribute significantly to electricity emissions	• poor and informal households suffer from energy poverty – thermally efficient houses and access to affordable, modern energy sources and efficient transport/mobility is important • mid-high income households large contributors to emissions profile; usually 50% of household electricity in this sector is for water heating, so introduction of solar water heating critical, but not a primary municipal function (information, endorsement, encouragement role) • waste recycling and management of landfill gas is an important area to address; waste treatment – 'buy back' recycling centres may reduce waste and contribute to

[11] This has been developed from the GHG Emissions and Energy Development Analysis Table in the DEA/SALGA/COGTA 'Let's Respond: Toolkit to integrating climate change risks and opportunities into municipal planning', 2012

• Municipal activities account for from 1 – 2% of emissions, and offer important area for quick wins and 'leadership by example'.	livelihoods
B4, C2: rural villages and largely retail service towns	
Profile	Key issues
• energy consumption constrained – energy for residential and productive development still needed • electrification of rural areas is still major issue • carbon footprint very small (1 – 2 tons/capita) – 'carbon space' for development • transport is large energy consumer • households are the major contributors to electricity consumption; with commerce and agriculture following • Municipal activities account for from 1 – 2% of emissions, and offer important area for quick wins and 'leadership by example', but this should focus on fairly simple interventions, which should be centrally coordinated (e.g. rollout of efficient municipal lighting).	• unsafe energy use (wood and coal fires, paraffin, candles, illegal/poor electricity connections) in poorer households contributes to fires, accidents and poor health which will be worsened by climate change • electricity distribution often 100% in hands of Eskom – need close cooperation to continue with electrification programme • Rollout of off-grid electrification requires intensification as well as information and education amongst recipients • Technical capacity within municipalities is limited • deforestation where wood is used for cooking and heating • economy and welfare held back by intermittent electricity supply and low voltage times • efficiency in lighting and appliances can contribute significantly to energy cost savings • improved thermal quality of housing will reduce need for indoor heating (and related pollution/cost) and improve the health of residents • improved transport networks needed • likely potential for energy from landfill or waste water gas is small; but some emissions savings may be gained through better management and/or technologies deployed in waste management

4. Energy access[12]

4.1 Universal access to electricity, backlogs in delivery and pro poor policies

Access to electricity is determined by physical connection to either the grid, or an alternative off-grid solar system, as well as the affordability of that electricity – poor households need to be able to afford electricity to benefit from its use.

In 1994, a key objective of the newly elected government was universal access to electricity for all of its citizens by 2012. To this end the government embarked on an accelerated national electrification programme, targeted at low-income households under the Integrated National Electrification Programme (INEP). Household electrification was increased from 36% in 1994 to 87% (5.7 million households and mostly in urban centres) in 2012[13], a significant milestone for South Africa and unprecedented internationally.

[12] The information on energy poverty in this section is from a Heinrich Böll Stiftung Southern Africa-funded research project called: **Tackling Urban Energy Poverty in South Africa – A Report,** undertaken and compiled by Sustainable Energy Africa, January 2014.

[13] DoE, 2012

However government recognised that due to infrastructure constraints and increasing growth rates in household's electricity demand, that the goal of universal access would need to be adjusted. The DoE's Electrification Roadmap commits to reach 97% access by 2025.

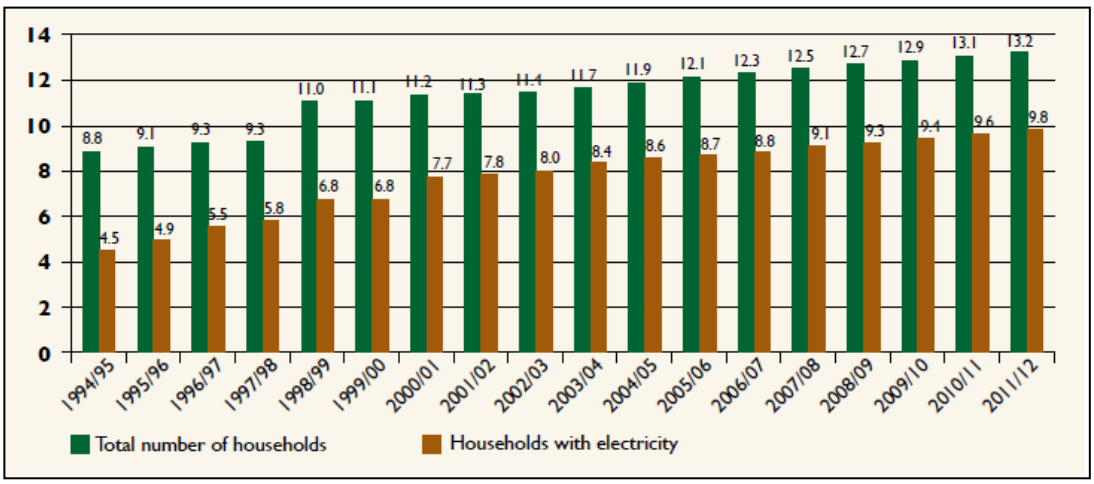

Figure 7: Comparison of total number of households and electrified households electrified in South Africa (in millions) (DoE, 2013)

The current electrification backlog stands at 3.3 million households comprising 1.2 million informal households and 2.1 million formal households requiring an electricity connection[14] and this is expected to grow at 2% on a national average per annum[15]. Access to electricity has been slower in rural areas than in urban centres. South Africa's electrification programme has been grid focussed due to the INEP programme out of, and building on, the Eskom grid-electrification projects of the late 1980s. 'Off grid' electrification, although becoming part of the INEP Programme on its establishment in 2000, has lagged. Between 1994 and 2010 some 46 000 households, 3 000 schools and 345 clinics in rural areas were supplied with non-grid electricity (relative to 5.2 million grid electrified households and 12 000 schools connected during this time)[16].

According to the 2011 census 85% of households have access to electricity based on those using electricity for lighting. This figure includes approximately 1.2 million households that are not metered, such as backyard dwellers. If these households are considered 'unelectrified' (as INEP figures show), then the percentage of households with a metered supply of electricity falls to 77%. This has implications in terms of the actual picture in the country and for government to reach its 2025 target. Resolution of issues relating to informal/illegal connections vests with municipalities.

Government's major poverty energy poverty subsidy is the **Free Basic Electricity** (FBE), which states that every indigent household should receive 50kWh of free electricity per month in order to meet basic energy needs. According to the DoE (2013) 69% of poor households are benefitting from free basic energy policies, however, the indications are that this figure may be lower as the method of measure is unclear – many municipal indigent registers do not include all poor households (for example, in eThekwini, the figure is as low as 37% of the extreme indigent and 13% of all poor households[17]). Some municipalities give FBE based

[14] DoE, 2013
[15] DME, 2007
[16] DoE, 2013
[17] Euston-Brown, Durban Climate Change Response Strategy: Sustainable energy report, 2013

on electricity consumption and in this case there is leakage of the subsidy to wealthier households and where two or more poor households are connected to one meter (as is the case with the backyard dweller) their consumption takes them above the benefit threshold.

Recognising that FBE and electrification will not reach all households in the near future, national government introduced the **Free Basic Alternative Energy** (FBAE) policy in 2007 to support indigent households by providing them with the equivalent of R56.29 per month of alternative fuels/technology such as paraffin and Liquefied Petroleum Gas (LPG). To date the number of households receiving FBAE is small. There are significant challenges for municipalities to roll out FBAE as it is very difficult to administer and monitor.

To address the fact that poor households are spending a far higher proportion of the household income on electricity[18], the National Electricity Regulator of South Africa (NERSA) in 2010 introduced the **Inclining Blocked Tariff (IBT)** to help cushion low income electrified households from the particularly sharp electricity price increases. The system introduces higher per unit charges as the rate of consumption increases. A secondary goal of the IBT was to promote energy conservation through applying high tariffs in the upper consumption brackets. PDG have undertaken fairly detailed research into the impact of IBT in terms of meeting the primary affordability objective. Significant findings include the fact that only some 30% of municipalities have implemented these tariff structures, the rest have continued with other structures – usually flat rates per unit. This may well relate to the challenges in implementing the IBT:

1. Technical constraints to introducing this within the pre-payment metering system.
2. Multiple households share a single meter such as the case of backyard dwellers, which results in the benefits of free or below cost allocation defined by the lower first consumption block of the IBT not being achieved.
3. IBTs may also subsidise wealthier customers with low consumption, as well as irregular users of electricity, such as wealthy customers who own a holiday home.
4. Municipalities may lose important revenue streams from high use customers who would then reduce consumption (elastic demand).

The second major finding of the study is that, where it has been applied, the IBT system has had a very small impact on affordability: the impact on bills compared to the flat rate tariffs applied previously is marginal and yet a large amount of cost and effort has been required to implement these new tariffs.

Finally, the study concluded that the poor have not been insulated from increases in electricity tariffs. The way forward would be to allow for flexibility with regard to the IBT tariff structure (those who have applied it continue to do so, those who have not yet, maybe continue with flat rate) and focus efforts on keeping the bill for low income consumers as low as possible[19].

4.2 Household Energy Use Patterns

According to the survey undertaken by the DoE[20] in 2012, 47% of South Africans are energy poor as they spend more than 10% of their income on energy needs. Energy poverty is also manifest in the persistent multiple fuel use patterns displayed by poor households across South Africa despite being electrified (see

[18] PDG, 2013
[19] PDG, 2013
[20] This was a nationally representative survey undertaken by the DoE in 2012 to gather information on energy related behaviour and perceptions in South Africa with a particular focus of energy poverty.

Figure below). This means that almost 7 million households continue to largely rely on unsafe, unhealthy forms of energy such as paraffin, coal and biomass, when they cannot afford to buy electricity.

Household energy use patterns emerging over the last 10 years show an increased uptake in electricity to fulfil basic household energy needs over time particularly with respect to lighting and cooking– see Table 6 below. The use of electricity for cooking has shown the largest increase (23%) relative to other end uses.

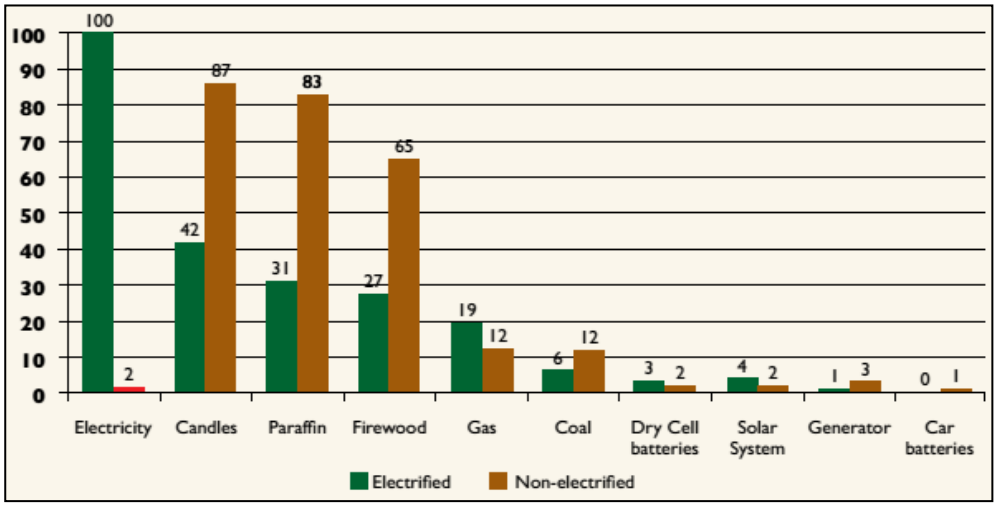

Figure 8: Multiple energy sources used by electrified and unelectrified poor households (Source: DoE 2012).

According to the DoE 2012 survey a breakdown of household energy patterns shows:

Lighting:

- Electrified households across South Africa almost exclusively use electricity for lighting (97% of the survey sample) with a small component of households continuing to rely on candles.
- Two thirds of unelectrified households rely on candles as the main lighting source while the remaining third rely mainly on paraffin.

Cooking:

- 76% of households use electricity for cooking. In formal urban areas this is as high as 91%.
- In urban informal settlements two thirds of households use electricity for cooking (68%), while close to third (27%) of households rely on paraffin.
- 8% of electrified households continue to rely on firewood for cooking.
- Non-electrified households use paraffin and firewood as the dominant energy source for cooking (50% and 40% respectively).

Space heating:

- Two thirds of South African households (65%) utilize an energy source for this end use, the remaining third keep warm by dressing up warmly and using blankets.
- 38% of households use electricity as the main source of energy for space heating. In households in formal urban areas electric heating predominates (50%).
- 12% of households use paraffin and 9% use firewood. Coal, gas and other sources are utilised by less than 5% if households.

- In non-electrified households 40% use firewood, 4% coal and 18% use paraffin.
- Urban informal areas tend to use paraffin for heating (20%), while 5% use firewood.

Rural households tend to rely more on biomass resources than those living in towns: an estimated three quarters of households in rural, traditional authority areas and 60% of rural farm dwellers use firewood as an energy source, compared to only 11% of households in formal urban areas, and 17% in informal settlements[21].

Urbanisation and informality

South Africa continues to experience rapid urbanisation, with approximately 64% of the country's population currently residing in urban areas (Figure 8 below) of which 40% are located in the metropolitan municipalities, the rest in smaller towns and peri-urban settlements. Urban populations are forecasted to reach 70% by 2030 and 80% by 2050[22]. The national census data of 2001 and 2011 reveal that the metros (South Africa's largest cities) are growing in population size on average at a rate of 2% per annum, and the number of households is also increasing at a rate of 3%.

Despite national government's enormous progress in universal access to free and basic services, municipalities are struggling to keep pace with the increasing demand of their fast growing populations. Research has pointed to trends in developing countries where urbanisation, if managed well will generate significant opportunities for growth, poverty reduction and environmental sustainability and if not will lead to increasing levels of poverty leaving many people without access to basic services.

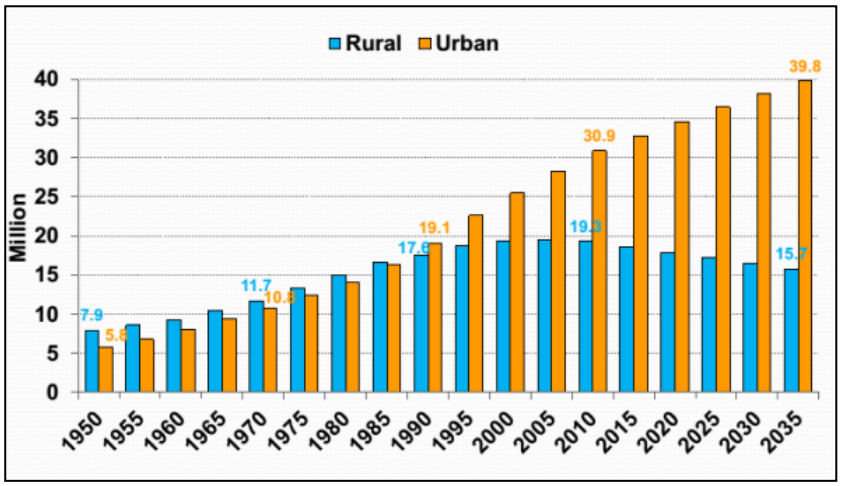

Figure 9: Urban versus rural population growth in South Africa from 1950-2035 (Source: Institute for Futures Research, University of Stellenbosch, 2013)

Informality commonly occurs in situations of rapid urbanisation. South Africa has some 1.96 million households living in informal dwellings[23]. This equates to approximately 13.6 % of the national population. Energy poverty is particularly prevalent in informal settlements (usually situated on land unauthorized or not zoned for residential development), which includes those households living in backyard shacks of formal properties in overcrowded conditions. The majority of informal settlements are situated on the

[21] DOE/HSRC Household Energy Survey, 2012
[22] NDP, 2011; SACN, 2011, COGTA, 2013
[23] An informal dwelling defined by Statistics South Africa is a "Makeshift structure not approved by a local authority and not intended as a permanent dwelling. Typically built with found materials (corrugated iron, cardboard, plastic, etc.)…"

periphery of cities and many do not have formal access to Eskom or Municipal distributed electricity. Those that are electrified are generally receiving electricity through illegal connections although there is a drive to electrify informal settlements.

5. Energy efficiency and Demand Side Management

Extensive work has been undertaken to explore the energy efficiency potential within municipalities (with a focus on the dense urban component) in order to understand the role of local level action towards national and local goals and targets[24]. Given the frequently raised barrier to efficiency uptake – that it will impact negatively on revenue in already cash-strapped municipalities – the research has also explored the implications of efficiency uptake on municipal electricity consumption and related revenue impacts.

5.1 Potential impact of interventions in terms of energy savings on a Municipal level

Research and modelling (drawing predominantly on data derived through the M&V process within the Eskom IDM Programme) provide an indication of the kind of savings that could be expected from tried and tested energy efficiency interventions. Figure 10 below indicates which interventions will make the greatest impact on electricity use reductions within a typical metro city, i.e. of the total possible efficiency, which interventions contribute what proportion. In this regard solar water heaters (25%) and efficient lighting (9.6% + 12.2% = 21.6%) for the residential sector are the dominant interventions, with HVAC (13.2%) for the commercial sector and efficient motors (7.6%) for the industrial sector also carrying some weight. It does need to be noted that further, detailed data analysis is required on the efficiency output of solar water heating as this intervention is highly behaviour dependent, and M&V data has indicated lower than anticipated efficiency results[25].

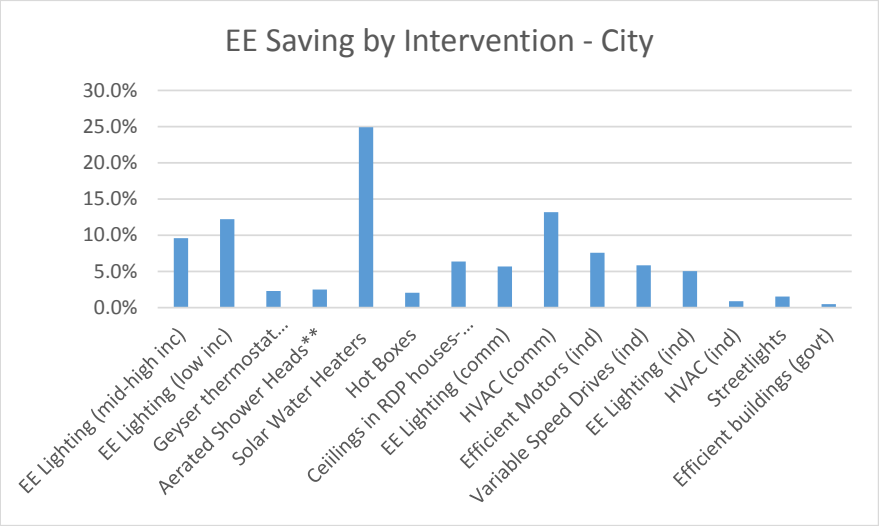

Figure 10: Relative contribution of different interventions towards energy efficiency potential within a typical metro (SEA, 2014)

The impact by intervention for a typical smaller town is still dominated by SWHs and efficient lighting, but even more so than in a typical city's case. These results are indicated graphically in Figure 11 below.

[24] This draws on over fifteen years of peer reviewed project work of Sustainable Energy Africa, based also on Eskom M&V figures. Most recent calculations presented here are derived from with completed in a REEEP-funded project exploring the impact of energy efficiency and renewable energy on municipal revenue.
[25] Pers com. Eskom IDM Programme (John Philby) and City Power (Paul Vermeulen), March 2014.

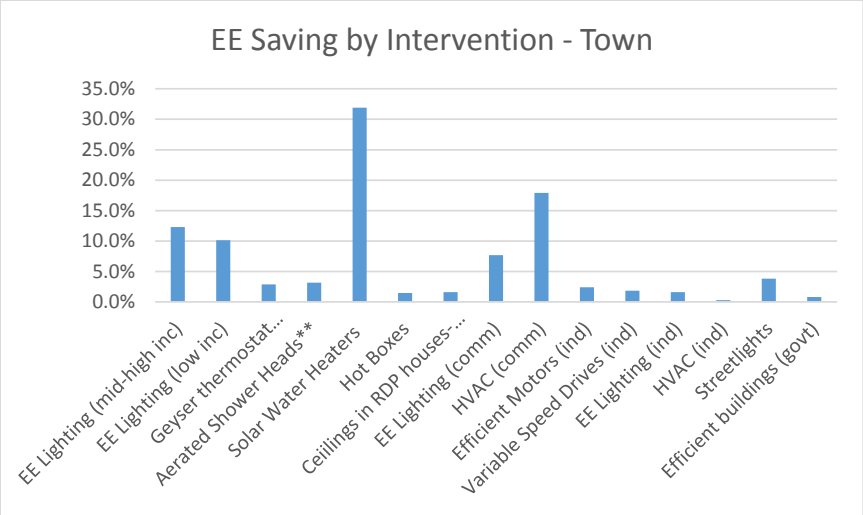

Figure 11: Relative contribution of different interventions towards energy efficiency potential within a typical smaller town (SEA, 2014)

Strategically important energy efficiency interventions, considering municipal 'reach', impact on energy savings and addressing poverty, are:

1. efficient lighting in low income housing
2. ceiling retrofit (thermal efficiency) in existing low income housing stock
3. efficiency retrofit (SWH or heat pump) of residential mid-high income water heating appliances – through endorsement and other schemes
4. efficiency retrofit of HVAC systems in commercial sector – through information and other schemes
5. efficient lighting across all sectors.

5.2 Potential impact of interventions in terms of effective demand management for municipalities

Load management is particularly important for municipal electricity distribution business. A trend in the larger cities is a decrease in total demand against a 'business as usual trajectory' (in many cases we are seeing demand sitting at 2006 or 2007 levels), but this is not accompanied by a reduction in maximum demand, or peak. This is largely driven by the growth in residential sector connections. Low income household electricity consumption is relatively small, and few efficiency opportunities exist as poor households do not waste electricity. However, these households drive a short, sharp morning and evening spike in demand which is extremely costly to Municipal distributors as these customers are cross-subsidised from revenue from wealthier customers and at peak this electricity is at its most expensive to supply.

This makes demand management of peak within low income households an important area of energy management. The indications are that water heating is a large component of this peak, as well as cooking, making the rollout of low pressure solar water heating and possibility of expanding gas usage for cooking, something that needs to be pursued.

5.3 Potential impact of efficiency on electricity sales at a Municipal level

Municipalities around South Africa are currently experiencing a drop in electricity sales, particularly in the residential sector. While it is not completely clear why the sales are dropping, it is most likely due to

implementation of more energy efficient interventions, and behaviour change, in response to rapidly increasing electricity prices.

To determine the potential impact of energy efficiency and behavioural interventions on electricity sales, a spreadsheet has been developed by Sustainable Energy Africa (SEA), the results of which are presented below for both a typical city, and a typical smaller town[26].

Table 4 below indicates that if all sectors (residential, commercial, industrial and municipal) were to implement energy efficiency and behavioural interventions (100% implementation), electricity sales would reduce by 21.2%. However a complete rollout will take time, and it is estimated that uptake in 10 years' time will be of the order of 50%-85% (Rogers curve estimation). Based on this assumption, a reduced electricity sales impact of 10.6%-18% is expected.

Table 4: Impact of energy efficiency on city electricity consumption and related revenue

City	Potential total energy reduction			Uptake by 2024		Impact as % of all interventions
	Technology	Behavioural	Total	Low (50%)	High (85%)	
Residential (34% of total consumption)						
EE Lighting (mid-high inc)	1.8%	0.3%	2.0%	1.0%	1.7%	9.6%
EE Lighting (low inc)	2.1%	0.5%	2.6%	1.3%	2.2%	12.2%
Geyser thermostat adjusting (10 degrees)	0.0%	0.5%	0.5%	0.2%	0.4%	2.3%
Aerated Shower Heads	0.5%	0.0%	0.5%	0.3%	0.4%	2.5%
SWH	5.3%	0.0%	5.3%	2.6%	4.5%	24.9%
Hot Boxes	0.4%	0.0%	0.4%	0.2%	0.4%	2.0%
Ceiilings in RDP houses-isoboard	1.3%	0.0%	1.3%	0.7%	1.1%	6.4%
Sub Total	**11.5%**	**1.2%**	**12.7%**	**6.3%**	**10.8%**	**59.9%**
Commercial (16% of total consumption)						
EE Lighting	0.7%	0.5%	1.2%	0.6%	1.0%	5.7%
HVAC	1.9%	0.9%	2.8%	1.4%	2.4%	13.2%
Sub Total	**2.6%**	**1.4%**	**4.0%**	**2.0%**	**3.4%**	**18.9%**
Industrial (41% of total consumption)						
Efficient Motors	1.6%		1.6%	0.8%	1.4%	7.6%
Variable Speed Drives	1.2%		1.2%	0.6%	1.0%	5.8%
EE Lighting	0.8%	0.2%	1.1%	0.5%	0.9%	5.0%
HVAC	0.1%	0.0%	0.2%	0.1%	0.2%	0.9%
Sub Total	**3.8%**	**0.3%**	**4.1%**	**2.0%**	**3.5%**	**19.3%**
Municipal (3% of total consumption)						
HPS Streetlights	0.3%		0.3%	0.2%	0.3%	1.5%
Efficient buildings	0.1%		0.1%	0.0%	0.1%	0.5%
Sub Total	**0.4%**	**0.0%**	**0.4%**	**0.2%**	**0.4%**	**2.0%**
Total	**18.2%**	**2.9%**	**21.2%**	**10.6%**	**18.0%**	**100.0%**

A similar study was performed on a small town, and the results in Table 5 show a potential drop of 13.5% - 22.9% in electricity sales by 2024. This figure is higher than a typical city due to the higher percentage of overall consumption by the residential sector where the EE gains are the greatest

Table 5: Impact of energy efficiency on 'smaller' town electricity consumption and related revenue

[26] An interactive tool has also been developed through the SEA REEEP-funded project. This enables a municipality to input their own data and evaluate the impact of various efficiency scenarios. The tool is available on: http://www.cityenergy.org.za/category.php?id=2#1.

Town	Potential total energy reduction			% uptake by 2024		Impact as % of all interventions
	Technology	Behavioural	Total	Low (50%)	High (85%)	
Residential (45% of total consumption)						
EE Lighting (mid-high inc)	2.9%	0.4%	3.3%	1.7%	2.8%	12.3%
EE Lighting (low inc)	2.0%	0.8%	2.7%	1.4%	2.3%	10.1%
Geyser thermostat adjusting (10 degrees)	0.0%	0.8%	0.8%	0.4%	0.7%	2.9%
Aerated Shower Heads	0.9%	0.0%	0.9%	0.4%	0.7%	3.2%
SWH	8.6%	0.0%	8.6%	4.3%	7.3%	31.9%
Hot Boxes	0.4%	0.0%	0.4%	0.2%	0.3%	1.5%
Ceiilings in RDP houses-isoboard	0.4%	0.0%	0.4%	0.2%	0.4%	1.6%
Sub Total	**15.1%**	**2.0%**	**17.1%**	**8.6%**	**14.6%**	63.6%
Commercial (27% of total consumption)						
EE Lighting	1.2%	0.8%	2.1%	1.0%	1.8%	7.7%
HVAC	3.2%	1.6%	4.8%	2.4%	4.1%	17.9%
Sub Total	**4.5%**	**2.4%**	**6.9%**	**3.4%**	**5.9%**	**25.6%**
Industrial (17% of total consumption)						
Efficient Motors	0.7%		0.7%	0.3%	0.6%	2.4%
Variable Speed Drives	0.5%		0.5%	0.3%	0.4%	1.9%
EE Lighting	0.3%	0.1%	0.4%	0.2%	0.4%	1.6%
HVAC	0.1%	0.0%	0.1%	0.0%	0.1%	0.3%
Sub Total	**1.5%**	**0.1%**	**1.7%**	**0.8%**	**1.4%**	**6.2%**
Municipal (7% of total consumption)						
HPS Streetlights	1.0%		1.0%	0.5%	0.9%	3.8%
Efficient buildings	0.2%		0.2%	0.1%	0.2%	0.8%
Sub Total	**1.3%**	**0.0%**	**1.3%**	**0.6%**	**1.1%**	**4.7%**
Total	**22.2%**	**4.5%**	**26.9%**	**13.5%**	**22.9%**	**100.0%**

Strategically, it is important for municipalities to accept that rapidly increasing energy efficiency intervention uptake is a market driven reality over which they have little control. In this light, a municipality needs to be adopt approaches to manage this reality in such a way that it optimally benefits their community. These approaches include:

1. Facilitating energy efficiency programmes that support local manufacture, sales, installation and maintenance of EE interventions (e.g. the City of Cape Town SWH installer accreditation programme, which endorses installers of good quality locally manufactured product, and raises awareness around the technology). Such programmes grow the local economy and create jobs.
2. Saving on municipal energy costs by implementing energy efficiency in street and traffic lights and municipal buildings
3. Seeing the freed up electricity demand as an opportunity for growth and densification within the municipality, which will increase sales again.
4. Acknowledging that money saved by end users from EE interventions can feed back into the local economy and grow it further

Amongst the built environment (commercial, residential and industrial) all new building development is now subject to the new, energy efficient building regulations captured in SANS 10400-XA. This requires that a specified efficiency per square meter is met in the building design, and a minimum of 50% of heating requirements must be met through solar water heating/heat pump. Challenges in enforcing the new regulations need to be addressed for the full effectiveness of these regulations to be realised.

5.4 Municipal 'own' consumption

Comprehensive data on energy used by municipalities within their facilities and operations is often difficult to obtain as municipalities do not always record electricity consumed, or record of this is included in the broad commercial sector tariff category. Comparison of average consumption by category of use (per

municipal operation) is also difficult as each municipality may record slightly differently. On average, 'own' energy consumption for municipalities (metro and smaller) is between 1 – 2% of total energy consumed in the municipality. Although this is a relatively small proportion, municipalities are often the single largest consumer in an area. They have control over this domain and can show leadership by example, making it an important potential area for energy efficiency implementation.

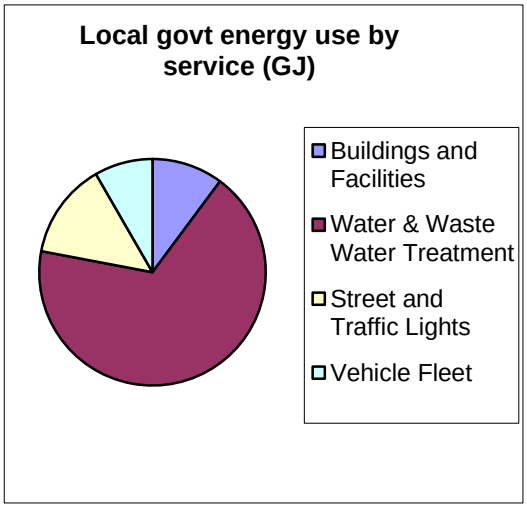

Figure 12: Illustrative example of the spread of energy consumption between typical municipal operations

A detailed study, commissioned by the SA Cities Network, is underway to explore the energy savings potential of these sub-sectors in more detail[27] and data emerging from the DoE Municipal EEDSM programme should also provide insight into savings that can be achieved. Based on information available to date, the following is indicated:

1. **Traffic lighting**: LED lighting has become the standard efficient retrofit technology. Where incandescent and halogen light bulbs require replacement every four months, LED traffic light fitting last 5 – 8 years, substantially reducing maintenance costs. Operating costs are substantially reduced due to lower wattages and payback periods are short. LED technology is easy to retrofit as it fits the existing aspects.
2. **Street lighting**: this often represents a sizeable portion of municipal 'own' consumption and savings of 20% within the sub-sector can be achieved. It is important to get all the aspects of lighting right – lamp, reflector, ballast and power switch – in order to achieve maximum efficiencies and procurement specifications should ask for the unit price and output of a Lighting Scheme rather than of the luminaire only. Municipalities are exploring a range of efficient technologies, including high pressure sodium, LED, induction and CFL.
3. **Building efficiency**: the results of a detailed study[28] examining 3 classes of public buildings (medium sized multi-storey office blocks, single storey, multi building compound and large multi storey office block), indicated that:
    a. Single storey compounds offer the least efficiency savings potential (13 – 22% as opposed to 17 – 35%);

[27] Report is to look at the nine SA Cities member cities. Report is due June 2014.
[28] Analysis Report: Baseline, energy savings potential and energy efficiency Programme in Public buildings in South Africa, prepared by Sustainable Energy Africa for GIZ V-NAMA Programme, 2012.

b. Maximum efficiency benefits would come from retrofitting the large multi-storey office blocks typically found in cities and larger towns;
c. In terms of intervention choice, efficient lighting should be prioritised due to its high savings potential in all building types and ease of implementation (easy to apply even in capacity constrained municipalities);
d. All on-ground building engineering staff noted that capacity to monitor and manage energy buildings is critical; as is the knowledge to ensure that new build and refurbishment of public buildings adhere to all efficiency regulation.

Table 6: Municipal building efficiency target recommendations

Municipal type	Programme	Interventions	Potential savings
Metro and larger towns	All multi-storey office buildings; Larger building compounds	Full suite of interventions (lighting, HVAC, water heating)	17 – 35% off baselines
'Smaller' municipalities	All office buildings above 1 000sq m	Efficient lighting	13 – 16% off baselines

Source: Analysis Report: Baseline, energy savings potential and energy efficiency programmes in Public buildings in South Africa, prepared by Sustainable Energy Africa for GIZ V-NAMA Programme, 2012.

4. **Water pumps**: this is a new area of interest and data should shortly be forthcoming.
5. **Fleet management**: municipalities indicate that substantial savings can be achieved in liquid fuel consumption through: Procurement of efficient vehicles, improved driving skills, reorganisation of trips and trip management. Savings potential has yet to be developed.

5.5 Management of losses

Technical and non-technical electricity losses are an important aspect of municipal electricity efficiency that requires attention[29]. Reports of losses of as much as 1/5th of all electricity entering a municipal area have been recorded. Non-technical losses are often as much within industrial and commercial areas, as much as it is an issue of illegal household connections. Loss management requires a tightening up of billing systems and administrative management, and electricity infrastructure that is well maintained and managed. Distribution businesses must include investment in grid infrastructure development and maintenance.

6. Renewable Energy

Large-scale renewable energy supply is a national government function. Local renewable energy generation is, however, starting to become financially viable. Local government distributors and Eskom distribution have only recently started developing frameworks to allow small generators to connect to, and feed into the grid in a way that is feasible for both the distributor and small-scale generator. The regulatory system remains unclear regarding the need for licensing of small generators (between 100kW-1MW). NERSA guidelines issued in 2011[30] indicate that generation 'for own use', below 100kW, does not require a license. This guidance requires greater legal clarification, including the definition of 'own use' (the working assumption is that this is based on annual net generation being lower than net consumption).

[29] SACN State of Municipal Finances looks at this in some detail.
[30] NERSA: Standard Conditions for Embedded Generation within Municipal Boundaries (less than 100KW), 2011

There are concerns regarding the impact on municipal revenue of large-scale adoption of solar PV and other small scale embedded generation options. Appropriate tariffs will need to be developed and implemented to avoid this situation. However, there is work underway (led by DoE and Eskom) to design a standard offer approach in line with the national REIPP Programme that would purchase energy from embedded generators at a set prices so as to render municipalities indifferent between their Eskom supply and embedded generators (IRP 2010 Update Report, 2013).

Because capital investment for embedded generators is borne by the owner and not government or the national utility, and job creation potential in this industry is significant, promotion of such generators has the potential to be economically very beneficial for municipalities and the country as a whole. This is reflected in the IRP 2010 Update Report, 2013, which explores a fairly aggressive local PV uptake. Limits will need to be set to ensure grid stability. The draft NRS097-2-1 (which governs small scale embedded generation and is set to replace the existing NRS097 sometime this year) limit PV installations to 25% of maximum demand of each site in most circumstances. Given capacity factors this effectively limits total contribution of grid linked PV to 10% of total demand.

Municipalities themselves have potential renewable energy resources, including landfill gas, sewage methane and micro-hydro on water distribution systems. Landfill gas electricity generation has potential to be an economically feasible and important low carbon supply option. However experience shows that implementation and ongoing operation is demanding. Its feasibility therefore needs investigation before being pursued by individual municipalities.

Sewage methane electricity generation, usually for on-site electricity requirement reduction, holds promise as being a financially attractive low carbon energy option in many cases. Again, the threshold feasibility of this generation option needs to be clarified so that municipalities can be guided regarding its pursuit. Micro-hydro installations, sometimes embedded in the water supply network of municipalities, can be viable in certain circumstances. Clarity is needed on conditions for viability.

Some Provinces (KZN, Eastern Cape, and Western Cape) have identified small scale renewable energy projects that could be developed by municipalities and are developing support activities. Whether municipalities can themselves be Independent Power Producers within REIPP requires clarification.

Biofuels are an important component of a low carbon energy trajectory for urban areas. However promotion of liquid fuel mix changes largely rests with national government, not local government.

7. Municipal sustainable energy development underway

Substantial energy efficiency and renewable energy development is underway in South African municipalities. Some 13 cities/towns in South Africa have Energy and Climate Change Strategies either developed or underway. These are mostly within metros and secondary cities. Provincial strategies, with local municipal support programme, are also in place in the Eastern Cape, Western Cape and Gauteng Provinces. Substantial institutional development has accompanied these strategies, with at least 3 cities having developed new units employing from 2 – 10 dedicated staff. The figure below provides a visual indication of the kind of institutional and governance growth in this area from 2006 – 2014 (as the field develops, the kind of indicators in fact need adjustment, but included here as is for purposes of demonstrating institutional expansion/growth).

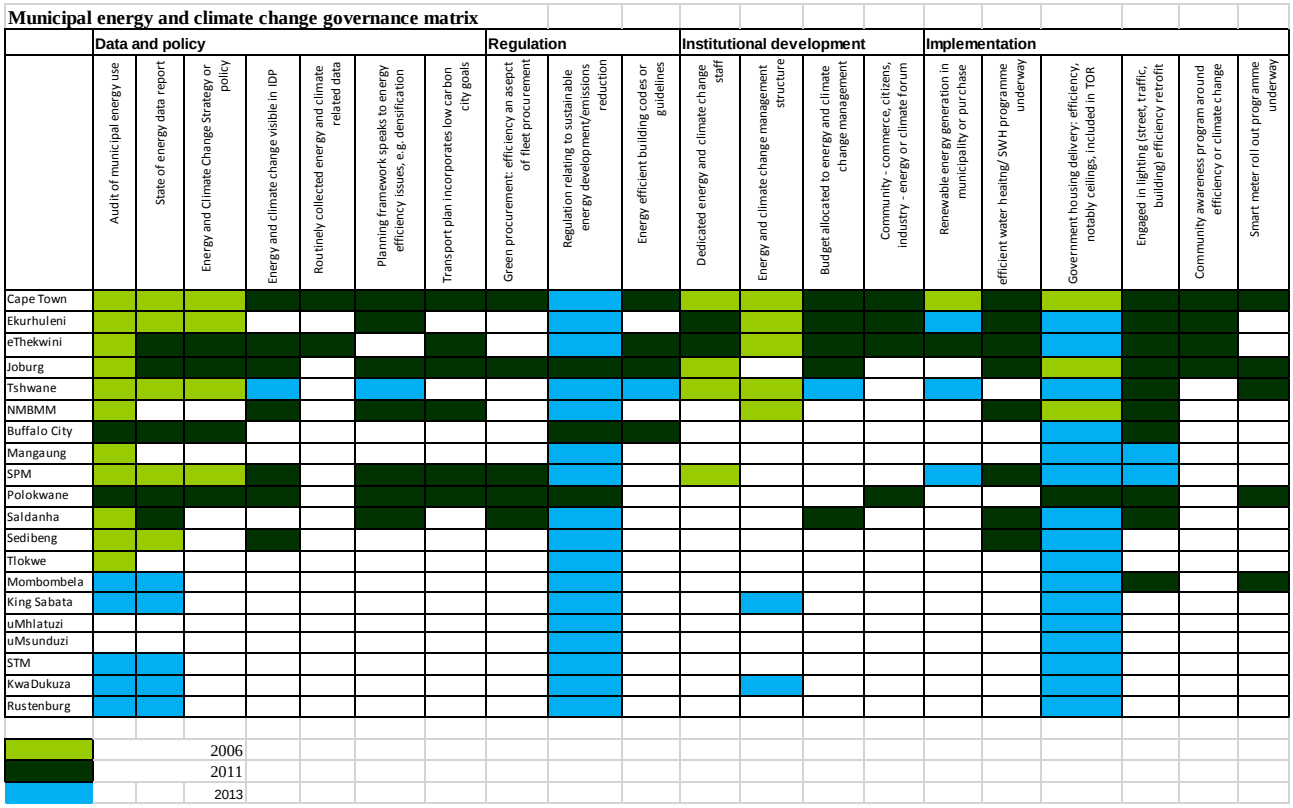

Figure 13: Source: Sustainable Energy Africa, State of Energy in SA Cities, 2011

Although metros are pioneering this area of work at a substantial scale, the sense is that a great many secondary cities and smaller municipalities are engaging with the issues and beginning to address efficiency/renewable energy related work. Work underway includes[31]:

1. policy development and the inclusion of energy efficiency and renewable energy into IDPs
2. municipal 'own' consumption: building and facility efficiency retrofit; efficient street and traffic lighting retrofit
3. energy efficiency: commercial energy efficiency activities (real time metering, communications forum); behaviour campaigns; solar water heating rollout, geyser ripple control, enforcement of new EE building regulations
4. energy poverty: thermally efficient low income housing delivery
5. renewable energy: waste to electricity, renewable energy purchase
6. transport: bus rapid transit, non-motorised transport support (pavements, pedestrian walkways or bridges, bicycle lanes/schemes)
7. urban/spatial planning and efficient development planning processes.

Currently the major programme supporting Municipal 'own' energy efficiency is the DORA-funded Municipal EEDSM Programme, run by the Department of Energy. This programme, begun in 2009, has now been running for nearly five years, and has supported some 20 – 30 municipalities across all types (A-B) in the retrofit of traffic, street and building lighting, as well as the audit of buildings and increasingly also in the area of municipal water pumping. Increasingly, there are applications by residents and businesses to feed in renewable energy source power to the local distribution grid.

[31] See Appendix 1 for a more detailed, though still partial, overview of renewable energy and energy efficiency projects underway across the country.

No comprehensive register of energy efficiency and renewable energy projects at the local level exists. The Eastern Cape Province is busy developing a registry for its local municipal areas. This will be an important pioneering document for the country. The table below outlines projects underway that were presented within the municipal consultation process relating to this strategy development. It is extremely important that the experience developed here is expanded and built upon.

Table 6: Overview of energy efficiency and renewable energy projects currently underway in South African municipalities.

Energy Efficiency	
Municipal EEDSM funded projects	• A number of municipalities have been part of the DoE municipal EEDSM Programme. Street and traffic lighting projects as well as energy efficiency awareness programmes have been funded through these funds.
Eskom projects	• Eskom has carried out its residential CFL mass rollout programme in a number of municipalities.
Municipal funded projects	• Some municipalities indicated that they have used their own funds for lighting retrofits in municipal owned buildings.
Renewable Energy Projects	
Municipal waste-to-electricity	• A number of municipalities have conducted, or are in the process of conducting, feasibility studies on landfill gas to electricity. However, one municipality that has completed such a study indicated that no developers seem interested in carrying out the project although the feasibility study indicated a potential for this. • SALGA & GIZ are providing assistance to Umjindi municipality on developing a waste to electricity project. • Studies on generation of electricity for on-site operations from wastewater indicate feasibility.
Solar water heater installation	• Low pressure solar water heaters are being installed in some municipalities as part of the national solar water heater programme run by Eskom & the DoE. • High pressure SWH campaign being run by City of Cape Town (endorsement programme).
Solar PV installations	• Some larger municipalities (and provinces) are installing PV on municipal building rooftops for grid feed-in.
Solar PV traffic lighting	• Pre-feasibility studies are being carried out on the installation of solar PV panels on traffic lights in a couple of municipalities.
Hydropower	• Hydropower generation being developed at the municipal owned Witbank dam. • Micro hydro feasibility studies have been done on the water distribution pipes in eThekwini and a project under development.
Rural Off-Grid PV electrification	• Most rural municipalities indicated that their municipalities are recipients of the national small-scale solar PV installation programme being run by Eskom & the DoE.
Wave energy/power	• One coastal municipality indicated that it was investigating generating 40GW electricity from the Agulhas Current System (Indian Ocean)
Bio-fuels	• Feasibility studies on potential bio-fuel projects have either been conducted or are in the process of being carried out in some municipalities. Some of the municipalities are working with sugar producers and Eskom around development of such projects. While some are community run projects.

The institutional framework

There are a number of national, provincial and local structures that either have a bearing on, or offer potential towards, local energy development.

Sphere	**Organisation /Area of relevance for local energy development**

National sphere	**Policy, regulation, monitoring, funding, capacity support**
Government departments	Department of Energy (SANEDI, SAGEN), Environment, Cooperative Government and Traditional Affairs (MIG, MISA), Trade and Industry (SANS), Public Works, Human Settlements, Science and Technology, National Treasury (Green Cities, DORA, MFMA, ADAM, Transverse), Presidency (SIPS)
Government regulatory or state-owned enterprise	NERSA, Eskom
Provincial sphere	**Representation in national sphere, strategy, monitoring, forum/networking, information support and capacity**
Provinces	Relevant provincial departments (Economics, Environment, Local government)
Intergovernmental representation	South African Local Government Association (SALGA) Provincial Offices
District level	**Shared services/capacity, forum/networking, strategy**
District municipalities	
Intergovernmental representation	National department 'deployed' staff (DEA, DWA) and can host 'shared services'; DoE via INEP hosts District Energy Forums, AMEU branches, Eskom regional offices.
Local level	**Strategy and implementation, technical and capacity support**
Municipalities	
Technical and capacity support	*National government*: COGTA-MISA, academic institutions, range of private training organisations (e.g. CEM training); *Municipal associations*: South African Local Government Association (SALGA), Association of Municipal Utilities (AMEU), Institute for Municipal Engineers (IMESA); *NGOs*: SA Cities Network, Sustainable Energy Africa, ICLEI, National Business Initiative

A concern relates to the fairly large number of players within the sector and across spheres of government and a need to simplify and clarify institutions so that Municipalities have a clear line of access to support. SALGA is seen by municipalities as providing a critical platform for local government to engage with national institutions around this area of work. A recently developed Memorandum of Understanding between SALGA and the AMEU provides a strong and functional working relationship between these two bodies.

Conclusion: Strategic Issues to be addressed

Based on the status quo data analysis and the issues raised within the consultation process[32], it is clear that multiple energy issues reside at the local level and that the rapidly changing energy landscape requires that municipalities engage and manage these issues towards strengthening national energy security and climate response, addressing poverty alleviation and ensuring sustainable service delivery. There is a strong commitment and desire amongst local government to do this; however, circumstances are challenging and coordinated support is required.

The following key issues must be addressed within the Municipal Energy Efficiency and Renewable Energy Strategy:

Leadership and political direction

- Build on and develop the existing strength of feeling and commitment towards tackling these issues
- Energy efficiency and renewable energy must be 'translated' into the language of local government, i.e. basic service delivery
- Must address local priorities – poverty alleviation – hence energy poverty/access issues must be included
- Must be visible, with tangible benefits (pilot projects recommended)
- Greater engagement between national and local government in policy development
- SALGA has key role to play here

Mandates, institutions and governance

- Role of municipalities must be made clearer in national policy and guidance (directive) issues as to the articulation of the policy at local level
- This must also address the capacity of municipalities in meeting these responsibilities
- New or clarified responsibilities must be integrated into the system – job description of Municipal Manager and into IDP requirements and related systems
- Internal energy for municipal own facilities and operations: start here
- Strengthen the SALGA platform for municipalities in this area of work, and the SALGA-AMEU working relationship
- Municipal revenue models that can support this work

Energy planning and Electricity business within municipalities

- Data to do proper energy and electricity planning must be available
- Electricity service delivery must be sustainable and requires better planning, billing, metering and for this – capacity is needed
- Address capacity shortages and particularly within technical positions
- Clarify regulatory framework, particularly relating to embedded generation
- Streamline data reporting requirements
- Grid maintenance
- Revenue protection (including eradication electricity theft), grid stability relating to RE uptake

Implementing energy efficiency and renewable energy projects

[32] A full set of minutes from each workshop is available from SALGA, and a summation of all issues raised can be found in Appendix 1.

- Capacity support, possibly through technical unit (technical, financial)
- Funding streams to be expanded (including ring-fencing of efficiency savings, inclusion of embedded generation within the RE Independent Power Producers Programme (REIPPP) funding streams, private-public partnerships, amongst others)
- Training of existing staff (e.g. in enforcing SANS 204)
- Supporting partnership development for renewable and efficiency development (PPPs)
- Networking platforms, innovation hubs, knowledge sharing
- Importance of practicality and viability of projects; avoidance of any technology dumping

Implementation Priorities

- Internal energy for municipal own facilities and operations: start here
- Alignment of bulk infrastructure projects across departments and inclusion efficiency within all projects
- Access to energy for the poor including: thermal efficiency low income housing; Energy packages for poor: electrification (on and off grid), improved wiring, FBE/FBAE, tariffs, efficient lighting and alternative/clean appliances/ technologies for cooking, lighting
- Clarity of where this mandate lies within municipalities as it is not within the licensed mandate of utility distribution licenses under NERSA/the Electricity Regulation Act
- Built environment – enforce new energy efficiency regulations
- Spatial planning to stem urban sprawl and inefficient growth
- Non-motorised transport and public transport support
- Community awareness and education

The support required is extensive and, although this strategy is to be held by municipalities and led by SALGA, achievement of the strategy will require enormous levels of cooperation and partnerships across government and between government and the private sector and the NGO/academic/research sector.

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Appendix 1: Compilation of EE and RE work underway amongst municipalities represented within the consultation process

Note: this list is limited to capturing some of the input received and gathered in the consultation workshops, rather than a comprehensive audit (this was not formally covered in each workshop). Even with these serious limitations, it provides an indication of just how extensively involved municipalities already are in this area of work.

Kwa-Zulu Natal	
Municipality	**EE and RE Initiatives underway**
Dannhauser LM	• Internally funded rural PV installation Programme **RE** • Biofuel generation potential (feasibility studies conducted) **RE**
Hibiscus Coast LM	• **EE** awareness programme being run with Eskom – including rollout of CFLs • Ocean Current power generation (potential 40GW within the Agulhas Current) – **RE** • **EE** retrofits of municipal's own buildings including the Mayor's Office • UGU District Municipality's 20-year **Growth and Development Strategy** incorporates **RE & EE** development
EThekwini	• **EE** awareness campaign still ongoing • Solar PV facilitation – **RE** • **EE** street & traffic lighting retrofits (EEDSM funded Programme) • Metro engaging sugar producers around biofuel & electricity generation but most plantations fall outside the metro's boundaries **RE** • EThekwini developing a programme for selling "Green Power" as a different product so as to deal with the MFMA restrictions.
Emnambithi/Ladysmith LM	• Rural PV electrification project by the DoE (KES |Energy Services) **RE** • Waste-to-energy biogas project proposed **RE**
iLembe DM	• Peaking power plant being built by French company (air-to-electricity) **RE** • Enterprise iLembe – part of the COGTA funded "Corridor Development Project"
Mandeni LM	• Rural Cooperatives have been established to produce biofuels from the *Moringa* tree **RE** • SAPPI looking into installing gas turbines to generate power **Fuel switching**
Msunduzi LM	• Private developer looking at installing a 1MW PV system to feed into the municipal grid
Ingwe LM	• Proposed development of Biofuels plant **RE**
Endumeni LM	• CCC Biogas project (cow dung/chicken waste etc.) **RE**
Umvoti LM	• Biofuels production from sugar cane **RE**
Umzinyathi DM (Endumeni & Nquthu LMs)	• Municipalities part of DoE's Rural PV electrification programme being implemented by KES Energy Services **RE**
Eastern Cape	
NB: a detailed registry is available in the Province	***Summary of work underway*** • In Province logging of all EE/RE policy and projects has been made, capacity support has been provided to some of the municipalities.

	• Waste management in smaller municipality has been implemented • Alien plant species are currently eradicated and there will be solar panels installed which will onset "off-grid electrification" in one small municipality (Cofimvaba). • Climate change and renewable energy strategies has been developed in BCM. • There are biogas and biomass projects that are under way which would generate electricity and sell it to ESKOM. The biogas comes from the concept of "zero waste." • There is hydro scheme currently under development. • Wind energy is also under development. • Free basic access to energy has also been implemented in some smaller municipalities, in others is under exploration to move away from paraffin to other cleaner and safe sources like electricity and LPG. • Internal EE has been implemented with possible exploration of Solar PV. • EE buildings and street lighting retrofitting is also under implementation. • ESKOM has provided supply of FBE and provided technical support on SWH, CFLs and Demand Side Management.
Mpumalanga	
Chief Albert Luthuli LM	• 400 low pressure solar water heaters installed by Eskom & DoE
Msukaligwa LM	• Eskom's residential CFL mass rollout programme was implemented **(EE)** • Streetlight retrofits internally funded by municipality (dead inefficient lights being replaced with EE ones) **(EE)** • Municipality currently considering installing solar PV panels **(RE)** for its traffic lights (however solar might not be a viable solution considering weather variability in the Ermelo region). Mountainous and located in high pressure area
Emalahleni LM	• Landfill gas-to-electricity feasibility study completed and found that there is sufficient methane but no developers seem interested in taking the project further. One company was interested but due to tedious process of stakeholder engagement and applications the project fell through. Not sure how to gain interest of private investors. They would like a national programme to support them in obtaining such investments and possibly an ease of legislation to increase the attractiveness of such projects. Engage MESA on this issue to practically go and do these studies for opportunities **(RE).** • EEDSM funding for street and traffic lighting retrofits **(EE)** • **EE** awareness programme has also been initiated using the EEDSM funds • Municipality in collaboration with Tshwane University of Technology (TUTs) currently working on a hydropower generation project **(RE)** from the municipally owned Witbank Dam *(biggest municipal owned dam in the Southern Hemisphere)* o Water extraction permit has been granted by the DWEA (water use rights reside with DWEA, as the State owns all water/dams) o This project is being developed as an educational (research) project with the university o Funded by the Swedish/ German government (not sure on

	funders) ○ Electricity to be used to power the municipality's own Water Pumping stations (Bulk Water Supply) ○ Emalahleni Municipality – provides the infrastructure (piping, buildings etc.) and allows for the use of its dam • Ripple Control project funded by Eskom is also being implemented within the municipality (demand-side management) – the switches being installed cost R800/unit. • Municipality currently developing an ENERGY MASTER PLAN – funding is currently being sort. This PLAN will be separate from the Electricity Plan. • As part of the Ripple Control Project Emalahleni Municipality has a contractual agreement with Eskom to shed 10MW between 0600 – 0800 (morning) and the same between 1800 – 2000 (evening time)
Mbombela LM	• Hydropower project might be developed mentioned in SoE Report (**RE)** • Munic also received funding under the DORA EEDSM programme for street and traffic lights retrofits
Umjindi LM (though not present @ workshop)	• SALGA & GIZ assisting municipality in developing a waste-to-energy project
IMESA	• MoU between SALGA and the IMESA providing support to Free State municipalities project funded by COGTA
Gauteng	
Tshwane	• Smart grid metering – off balance sheet financing • Scale public transport and NMT • Building by-laws • PVT sector leverage – waste to energy recycling • Financial sustainability impact
Midvaal	EEDSM, 7 million for street lighting, 5 million for buildings.
Western Cape	
NB: a full registry is under development within the province	

Appendix 2: Objectives, priorities and possible actions or intervention Programmes as emerging from the municipal consultation process

Priorities: Poverty alleviation, job creation, energy access, environmental protection, economic growth, reduce stress on municipal distribution grid, security of supply

- **Uptake of EE**
    - Municipal buildings have EE measures
    - Street and traffic lighting is EE: again, guidance to be provided (is an existing guide, but to update this with more detail now that several municipalities have been developing experience of different technologies) in response to concerns articulated about the efficiency and cost and reliability of LED lighting.
    - Consider possibility of Eskom incentivising the street lighting tariff to promote efficient technology; and whether there cannot be some form of premium charge where municipalities are inefficient or cannot account for usage.
    - Must use the planning approval process to ensure that radically new and more energy efficient ways of doing things are built into new developments from the outset – in the primary design. Where lack of capacity, this should be developed or supported.
    - Projects must be viable and practical
    - Uptake of electric vehicles
    - Efficient fuels for cooking (and stabilisation LGP price through regulation)
    - Education /awareness
    - Support from Eskom: rollout of CFLs, SWH, DSM and provision of technical support
    - Consideration of time zones to decrease the electricity peak loads
    - Get EE into the planning phases of all municipal projects, e.g. low income housing development, transport planning, etc.
    - Build EE into procurement processes
    - Involve SABS in ensuring that technology uptake is sensible, viable and based on sound technologies (avoid technology dumping).
- **Alternative sources of energy that are environmentally friendly - RE**
    - Solar rooftop PV on municipal buildings
    - Waste to energy projects/ biogas/ biomass
    - Micro hydro energy generation
    - Development of inexpensive electricity storage devices
    - Regulation of LPG to stabilise price and facilitate rollout to poor under FBAE
    - Need to include small scale supply at the local level within national energy and electricity plans. For instance, can these schemes receive funding through the national REIPP Programe, i.e. be included in the IEP and IRP and have funding streams come down to them – that way local government can draw in private partnerships for their development. It does not make sense for local government to get into complex wheeling agreements so that small-scale embedded can benefit from REBID funding stream via the Eskom Single Buyers Office.
    - National government, via the IEP and Electricity Regulation Act (ERA) must provide greater clarity on 'grey areas' relating to local, embedded, small scale RE ('own use') that must be handled by municipalities.

- Changes in national supply approaches should be mapped as these have implications for local government that need to be considered and when national energy planning requires new approaches from local government, the appropriate skills and resources for new capacity development must be considered and provided – e.g. of natural gas coming online and how municipalities will need to reticulate this.
- Regulation and processes must be in place relating to small-scale RE feed in to local grids and this is a challenge for all local government, but particularly smaller (concerns around additional time in relation to grid maintenance should there be feed-in taking place can be alleviated given that inverter technologies can build in automatic islanding processes; however this is why it is so important that feed-in takes place in a regulated and 'legal' manner rather than 'cowboy' style). Need SABS guidelines on technologies for metering, inverters, etc.
- The actual type of meter and the billing/accounting process makes the process of embedded feed in more or less difficult. Some areas do not have technology or systems that can easily accommodate the new approaches required by RE feed-in. Support will be required here.
- Address issues of power storage relating to rooftop PV or other systems.

- **Access to electricity / 'safe/ modern' energy for all**
  - Fair and transparent electricity pricing system
  - Capacity building in communities to understand efficient and safe use of energy
  - Explore Electrification, LPG or PV as alternative to paraffin distributed under FBAE
  - All housing delivery MUST ensure that funding is allocated to include thermally efficient measures, as required by SANS 10400, and these aspects are included in housing delivery.
  - Location of housing should not relegate the poor to the furthest margins thus reducing access to jobs, information, education resources, etc.
  - Subsidy allocation – concern that with indigent policy many of the poor are not being reached; also, with 'illegal' connections the poor don't receive the subsidy, so informal areas should be connected (SEA resource).
  - Strategy: Within low income – important to continue to electrify (formally so that receive subsidy), awareness, thermally efficient homes, wood in rural municipalities (KSD, Thulamela, Polokwane).
- **Energy security, and the institutions to manage it**
  - Eradication of electricity theft
  - De-link municipal revenue and electricity revenue to ensure money retained for maintenance of infrastructure and that efficiency is pursued
  - Grid expansion and maintenance plans important (integrate with development plans, etc.). Currently there is an erosion of infrastructure – 6% of revenue meant to go to maintenance, but this is not ring fenced, so can end up being far less in practice. There is an NMBMM GIZ research study which can provide some detail on the issues.
  - Appointment of expert to look at tariff structures (possibly via Eskom).
- **Integrated energy planning and systems**
  - Integrated planning across departments, this relates to housing, transport, spatial development, electricity, etc. – again must build into IDP system, but even this not enough – still planning in silos – so beyond and work out ways to integrate and align separate funds and processes (e.g. electricity planning, housing and street planning).
  - Need better access to data
  - Establishment of smart grid and net-metering, hybrid mini grids: exploration of this, where applicable, where not; cost vs benefits. SANEDI/MISA done studies on this. This information

should be drawn on and a guide provided to all municipalities as to the application of this technology. This could also use case studies, for example, Tshwane is in the process of rolling out a smart meter programme.
    - Alignment of investment for bulk infrastructure projects across all spheres of government (particularly transport, housing); does the ADAM programme, looking to address infrastructure backlogs, and the MIG, offer opportunities here?
    - Engagement of local government with national energy and electricity planning processes: local government are often called on to distribute or implement aspects of the plan, or are affected (tariffs, cost recovery, capacity, mandate, and revenue) by aspects of the plan and their issues must be represented and heard within the planning process.
- **Good town planning in support of efficiency and mobility**
    - Paths for cycling and walking
    - Location of new urban developments – reducing sprawl and improving healthy densification
    - Noted that spatial form has a large impact on fuel consumption, and this must be taken into account in all infrastructure and development planning
    - Institutionally – consider close alignment between transport and urban planning
    - Functional regional planning: Planning should increasingly be based on functional units and not only geopolitical boundaries (case in point being transport planning across Gauteng).
- **Efficient transport**
    - Improved public transport
    - Freight to rail
    - Large public transport programmes are developed by national government and goals may not align with local government – SALGA needs to have these discussions at national level
    - Noted that efficiency often only considers electricity – need to make specific message to bring in Transport into this area.
    - Public transport needs to be desirable.
    - Challenge of smaller towns – people commute from rural areas into urban centre, or from one urban centre into another – how address this transport challenge – currently taxis.
    - Consideration of regulation around private transport, e.g. congestion charging.
- **Policy and mandates**
    - Messaging: climate change is not a good message for local government. The message should be in terms of local government business, which is first and foremost service delivery, and it should balance social, environmental and economic aspects.
    - Clarify mandate – SALGA has a role here – must detail what local government should be doing (for example, is it the mandate of local government to get involved in electricity or energy supply, or just the reticulation of it?). As noted below, this should include comment on interpretation of the MFMA in relation to EE and RE for guidance to Finance Departments.
    - SALGA support to create platform between local government and provincial and national government.
    - Layered mandates: some areas must become part of business as usual, others can be pursued on more voluntary basis
    - Well defined strategy to address EE/RE and clear roles and responsibilities
    - Resources to match responsibilities

- Political and top management buy-in: this urgent and highest priority – must be able to 'make the case' (value of tangible, real pilots, e.g. EE in government buildings)
- Must build into municipal systems: IDP, KPIs, Procurement, planning approval processes
- Consider de-linking EE and RE: phased approach with EE as the priority
- Reporting on EE/RE: as per Eastern Cape, Provinces could play a role in 'logging' all municipal EE and RE projects underway and monitoring and providing capacity support required; also if brought into the IDP, then there is a requirement to report on projects listed in the IDP and their budgets and KPIs.
- With changing energy landscape and the increasing emphasis on demand/energy consumption as well as more diverse and often embedded supply systems, it is important that local government are more actively involved in the national policy process. Smaller local governments noted that they often don't have the capacity to engage in this and this could be a support role performed by SALGA.

- **Institutions and capacity**
  - Possibility of an energy unit established at the District level and filtered down to the municipalities with one rep of the unit sitting in each municipality
  - Also technical expertise units – along lines of the MISA, possibly within MISA
  - Knowledge sharing platforms, coordinated by SALGA, bringing together Metros, Eskom and the District municipal offices
  - Training, capacity and awareness building of new staff within units; and awareness raising of all staff.
  - Information portal (note SALGA-SEA urban energy support web platform underway)
  - Draw on SALGA capacity and develop this further, particularly in relation to supporting the unlocking of funding streams
  - FET programmes to address municipal need for technical and policy skills in these new areas
  - Resource mobilisation: funds and human capacity, development for start-up motivation to senior management. There is a need to generate incentives to take new approaches on board.
  - Local level energy strategies useful, these need to be approved by council, included within IDPs and KPIs.
  - SALGA to provide an overarching Municipal EE and RE Strategy (under development here) and this should be rolled out via the Working Group and adopted by municipalities via the Municipal Manager. This should then hold municipalities accountable. SALGA would play the role of monitoring and facilitating implementation.
  - There is a need for the transformation of the weighting of Key Performance Assessment (KPAs) and SALGA could provide support towards this.
  - Municipalities need to ensure that they are able to retain important technical skills and capacity
  - In natural gas comes online, appropriate training/skills provision for municipalities that must reticulate this.
  - Noted that financial compliance is the priority in municipalities and all resources go into this, rather than budgets towards technical skills. National government, with SALGA, need to emphasise the need for municipal job creation in area of technical staff.
  - Lack of 'new' capacity and little, or no, succession for technical/engineering positions. SETAs are failing and there are lots of 'dis-enablers' in the education sector.

- Possibility of re-initiating the system of municipal bursaries for technical courses/degrees.
- Artisanal training (pre dating SETAs) was considered effective: local people were trained up and were thus more likely to be retained by the municipality.
- Streamline data requirements by national government. This is considered a Big Jo, but important – creation of one reporting/data system that lines up requirements from IDP, NT, DoE, NERSA, Eskom, DEA, etc.
- SANEDI can act as innovation hub to share and test new approaches.
- Call for SALGA to support communication with DoE in the EEDSM Programme as there have been experiences of challenges to communication (in both directions).

- **Financing/ funding**
  - The savings from EE measures should be ring-fenced for expansion of programmes
  - Need to develop a new financing model that does not depend on electricity revenues in local governments – urgent need for government to develop and funding and revenue model that can support this work
  - Primarily, the EE/RE work must be linked to core business of the municipality and be aligned to the main funding processes
  - MIG could offer additional funding
  - Partnerships with private sector for investments beyond the core business of municipality
  - What is the scope of inclusion of small-medium scale, embedded Municipal RE projects within IRP so that funding streams for more expensive RE come down to the local level
  - Funding for innovation and new approaches to overcome rigid system
  - NT to provide clarification note on MFMA in relation to EE and RE procurement: what is 'value for money', is it just cheapest option, or is there a more nuanced opinion. Direction needs to be given to Finance Departments who take the more conservative view point.

➢ An approach proposed:
  - Lead by example / high level buy in – achieve this through tangible pilots, such as EE in government buildings (strong agreement that municipalities must lead by example in their own buildings and facilities),
  - Secondly, EE/RE within municipalities must address the area of highest priority/ need – poverty reduction – and undertake passive thermal housing interventions.

These two areas therefore should be primary, beyond this, more voluntary and flexible approaches to be adopted as and where there is interest, motivation, opportunity.

Appendix 3: Full data sets with data source

Munic	Electricity	Coal	Petrol	Diesel	Paraffin	LPG	Natural Gas	HFO	Jet Fuel	Aviation Gas	Wood	TOTAL	Source	Base Year
Buffalo City														
Agriculture	24 686	-	3 346	359 292	135 356	-	-	-	-	-	-	**522 680**	SoE in SA Cities 2011	2007
Commerce	310 027	13 122	-	-	-	4 279	-	-	-	-	-	**327 428**	SoE in SA Cities 2011	2007
Government	159 388	14 580	28 171	38 807	-	-	-	-	-	-	-	**240 946**	SoE in SA Cities 2011	2007
Industrial	2 563 911	1 647 540	-	46 629	878 838	9 983	-	378 228	-	-	-	**5 525 129**	SoE in SA Cities 2011	2007
Residential	1 579 896	11 562	-	-	1 027 129	14 262	-	-	-	-	177 179	**2 810 028**	SoE in SA Cities 2011	2007
Transport	14 204	-	6 885 192	5 081 780	23 398	-	-	-	-	-	-	**12 004 574**	SoE in SA Cities 2011	2007
Losses	3 722											**3 722**	SoE in SA Cities 2011	2007
TOTAL	**4 655 834**	**1 686 804**	**6 916 709**	**5 526 508**	**2 064 721**	**28 524**	**-**	**378 228**	**-**	**-**	**177 179**	**21 434 507**	SoE in SA Cities 2011	2007
Cape Town														
Agriculture	612 614											**612 614**	DEADP	2009
Commerce	8 299 430					937 035						**9 236 465**	DEADP	2009
Government	588 241											**588 241**	DEADP	2009
Industrial	17 091 565	3 055 991				1 874 069		3 967 139				**25 988 764**	DEADP	2009
Residential	17 712 886				2 034 767	937 035						**20 684 687**	DEADP	2009
Transport	680 768		41 620 196	30 064 496					18 338 382	46 892		**90 750 733**	DEADP	2009
International Marine				44 815 082								**44 815 082**	DEADP	2009
Losses	3 317 875											**3 317 875**	DEADP	2009
TOTAL	**48 303 379**	**3 055 991**	**41 620 196**	**74 879 578**	**2 034 767**	**3 748 138**	**-**	**3 967 139**	**18 338 382**	**46 892**	**-**	**195 994 461**	DEADP	2009
Ekurhuleni														
Agriculture	6											**6**	ICLEI	2011
Commerce	9 680 176					146 518						**9 826 695**	ICLEI	2011
Government	2 410 904			262 362								**2 673 266**	ICLEI	2011
Industrial	13 244 259					293 037		617 331				**14 154 626**	ICLEI	2011
Residential	12 053 010				1 265 870	146 518						**13 465 398**	ICLEI	2011
Transport	636		36 041 124	26 495 283					76 215 789	80 804		**138 833 636**	ICLEI	2011
Losses	2 158 878											**2 158 878**	ICLEI	2011
TOTAL	**39 547 868**	**-**	**36 041 124**	**26 757 646**	**1 265 870**	**586 073**	**-**	**617 331**	**76 215 789**	**80 804**	**-**	**181 112 506**	ICLEI	2011
EThekwini														
Agriculture			596 932	3 059 036	415 554							**4 071 522**	eThekwini GHGI, LEAP	2010
Commerce	10 243 287			1 812	1 302 610	2 358 650		35 355				**13 941 714**	eThekwini GHGI, LEAP	2010
Government	1 329 154		187 082	461 834				10 881				**1 988 951**	eThekwini GHGI, LEAP	2010
Industrial	16 900 905	6 829 230	260	660 919	30 522			2 021 928				**26 443 764**	eThekwini GHGI, LEAP	2010
Residential	12 050 700				2 892 001	129 131					889 033	**15 960 865**	eThekwini GHGI, LEAP	2010
Transport	130 181		35 224 942	37 220 720				174 752	1 749 195	202 741		**74 702 530**	eThekwini GHGI, LEAP	2010
International Marine				1 341 263				50 898 888				**52 240 151**	eThekwini GHGI, LEAP	2010
Losses	1 773 241											**1 773 241**	eThekwini GHGI, LEAP	2010
TOTAL	**42 427 468**	**6 829 230**	**36 009 216**	**42 745 585**	**4 640 686**	**2 487 780**	**-**	**53 141 805**	**1 749 195**	**202 741**	**889 033**	**191 122 738**	eThekwini GHGI, LEAP	2010
Johannesburg														
Agriculture			3 968	36 388	168 187	1 133						**209 676**	SoE in SA Cities 2011	2007
Commerce	2 017 872					2 407						**2 020 279**	SoE in SA Cities 2011	2007
Government	1 118 835	58 320	11 254	46 555	4 942							**1 239 906**	SoE in SA Cities 2011	2007
Industrial	24 989 407		15 300	1 588 418	190 801	7 505		40 430				**26 831 861**	SoE in SA Cities 2011	2007
Residential	20 924 741	4 082 400			1 049 856	3 115						**26 060 112**	SoE in SA Cities 2011	2007
Transport	3 442 957		54 578 060	28 144 486	84 917							**86 250 420**	SoE in SA Cities 2011	2007
Losses												-	SoE in SA Cities 2011	2007
TOTAL	**52 493 812**	**4 140 720**	**54 608 582**	**29 815 847**	**1 498 703**	**14 160**	**-**	**40 430**	**-**	**-**	**-**	**142 612 254**	SoE in SA Cities 2011	2007
King Sabata														
Agriculture												-	Ozone SoE 2013	2011
Commerce	570 265			19 646	6 142	134 870					4 066	**734 989**	Ozone SoE 2013	2011
Government	78 006		6 636	9 567								**94 209**	Ozone SoE 2013	2011
Industrial	8 582		188	29 665	36 135	187		53 044				**127 801**	Ozone SoE 2013	2011
Residential	286 275	6 667			411 207	65 053					4 370	**773 572**	Ozone SoE 2013	2011
Transport			2 242 272	1 040 044					11 089			**3 293 405**	Ozone SoE 2013	2011
Losses	31 507											**31 507**	Ozone SoE 2013	2011
TOTAL	**974 635**	**6 667**	**2 249 096**	**1 098 922**	**453 484**	**200 110**	**-**	**53 044**	**11 089**	**-**	**8 436**	**5 055 483**	Ozone SoE 2013	2011
KwaDukuza														
Agriculture	40 848											**40 848**	ICLEI SoE 2013	2012
Commerce	575 884											**575 884**	ICLEI SoE 2013	2012
Government	53 269		8 616	3 207								**65 093**	ICLEI SoE 2013	2012
Industrial	556 328							19 691				**576 019**	ICLEI SoE 2013	2012
Residential	812 453				1 363							**813 816**	ICLEI SoE 2013	2012
Transport			1 855 799	1 127 313								**2 983 111**	ICLEI SoE 2013	2012
Losses	260 241											**260 241**	ICLEI SoE 2013	2012
TOTAL	**2 299 023**	**-**	**1 864 415**	**1 130 520**	**1 363**	**-**	**-**	**19 691**	**-**	**-**	**-**	**5 315 012**	ICLEI SoE 2013	2012
Mangaung														
Agriculture												-	SoE in SA Cities 2006	2004
Commerce												-	SoE in SA Cities 2006	2004
Government												-	SoE in SA Cities 2006	2004
Industrial												-	SoE in SA Cities 2006	2004
Residential												-	SoE in SA Cities 2006	2004
Transport												-	SoE in SA Cities 2006	2004
Losses														
TOTAL	**5 042 761**	**248 000**	**6 110 847**	**5 919 478**	**364 472**	**211 459**		**47 645**	**217 062**		**1 900**	**18 163 624**	SoE in SA Cities 2006	2004
Mbombela														
Agriculture			31 685	215 562	18 632	1 734						**267 613**	SoE in SA Cities 2011	2007
Commerce	116 062					3 685						**119 747**	SoE in SA Cities 2011	2007
Government			12 672	27 801	548							**41 021**	SoE in SA Cities 2011	2007
Industrial	607 946		916	73 084	21 137	11 489		790 646				**1 505 219**	SoE in SA Cities 2011	2007
Residential	480 928				116 306	4 769						**602 003**	SoE in SA Cities 2011	2007
Transport			4 881 155	4 258 135	9 407							**9 148 697**	SoE in SA Cities 2011	2007
Losses												-	SoE in SA Cities 2011	2007
TOTAL	**1 204 936**	**-**	**4 926 428**	**4 574 582**	**166 030**	**21 678**	**-**	**790 646**	**-**	**-**	**-**	**11 684 300**	SoE in SA Cities 2011	2007
Msunduzi														
Agriculture			127 247	772 756	17 185	66 152						**983 341**	SoE in SA Cities 2011	2007
Commerce						140 574						**140 574**	SoE in SA Cities 2011	2007
Government			37	1 077	505							**1 619**	SoE in SA Cities 2011	2007
Industrial				78 176	19 495	438 259		335 267				**871 198**	SoE in SA Cities 2011	2007
Residential					107 270	181 919						**289 189**	SoE in SA Cities 2011	2007
Transport			4 990 097	2 784 809	8 676							**7 783 583**	SoE in SA Cities 2011	2007
Losses												-	SoE in SA Cities 2011	2007
TOTAL	**6 447 101**	**8 518 389**	**5 117 382**	**3 636 818**	**153 132**	**826 903**	**-**	**335 267**	**-**	**-**	**-**	**25 034 993**	SoE in SA Cities 2011	2007
Nelson Mandela Bay														
Agriculture			29 852	130 397	51 348	12 555						**224 151**	SoE in SA Cities 2011	2007
Commerce	1 562 662					26 678						**1 589 340**	SoE in SA Cities 2011	2007
Government	2 138 400		41 759	73 643	1 509							**2 255 311**	SoE in SA Cities 2011	2007
Industrial	4 646 831		2 776	879 715	58 252	83 170		999 570				**6 670 315**	SoE in SA Cities 2011	2007
Residential	2 785 752				320 525	34 524						**3 140 801**	SoE in SA Cities 2011	2007
Transport			9 574 588	8 083 804	25 926							**17 684 318**	SoE in SA Cities 2011	2007
Losses												-	SoE in SA Cities 2011	2007
TOTAL	**11 133 645**	**626 940**	**9 648 975**	**9 167 559**	**457 560**	**156 927**	**-**	**999 570**	**-**	**-**	**-**	**32 191 176**	SoE in SA Cities 2011	2007
Polokwane														
Agriculture			17 397	509 693	14 257	210						**541 557**	SoE in SA Cities 2011	2007
Commerce						447						**447**	SoE in SA Cities 2011	2007
Government			12 471	20 758	419							**33 648**	SoE in SA Cities 2011	2007
Industrial			1 995	331 650	16 175	1 393		40 844				**392 057**	SoE in SA Cities 2011	2007