

# Generic State of Energy TOR:

## For inclusion in the Terms of Reference (TOR) of a Comprehensive Municipal State of Energy Report



CITY ENERGY SUPPORT UNIT

*a south african sustainable energy and  
climate protection initiative*

### 1. Introduction

Suitably qualified professionals are invited to assist with the preparation and coordination of a comprehensive State of Energy Report on behalf of the local authority.

### 2. Deliverables and Responsibilities

- Identify key energy issues, assets, projects and stakeholders
- Assess energy data limitations and deficiencies
- Develop database of energy related information sources and an analysis of data quality and remaining data gaps
- Capturing all the collected data electronically (database) in a format to be agreed with the client which is compatible with local authority's systems. This energy information system must be made available to local authority officials on completion of the study, complete with references/sources. The data will be housed within a suitably identified department in the local authority.
- A Steering Committee and Reference Group for the development of the State of Energy Report must be set up. The service provider must work closely with the Steering Committee team. The 2 teams should be multi-disciplinary and made up of key stakeholders.
- Set up sectoral working groups (residential, industry, commerce, transport, government, electricity supply...) – people with knowledge of specific sectors - useful for focusing and supporting the information gathering around a particular sector.
- Workshops with a Steering Committee and a Reference Group around key aspects of the State of Energy Report and issues identified.
- Meeting with the relevant internal departments as well as external stakeholders including national and provincial government, environmental groups, and universities to obtain relevant information that may be required.
- Co-ordination of all inputs from relevant line function departments and all other relevant organizations.
- It is the intention of the local authority for the stakeholder engagement process to kickstart the process of building awareness and capacity in energy related issues with these stakeholders. The approach of the service provider must take this into consideration as well as the intention to transfer skills on energy information management to core local authority staff.
- To provide specialized input as appropriate to ensure the establishment of the final outputs
- Provide monthly updates to municipality and arrange a suitable schedule of meetings in this regard.



### 3. Required Data

- A description of the local authority's vision and goals, and priorities reflected by the IDP, environmental and economic plans and baseline documents as they relate to energy and sustainability
- Contextualised international, national and local energy-related issues including identification and brief description of relevant international, national, provincial and local legislation, regulations and programmes for the defined study area (including CDM, Cleaner Production etc).
- Energy efficiency opportunities are to be identified in all sectors, and potential impacts estimated where significant (e.g. efficient lighting, etc)
- List of contact details of all energy-related stakeholders, categorized and alphabetized, with a very brief (1 paragraph) description of each. This should include non-energy-specific organizations where relevant.
- List and brief description of all relevant energy initiatives, projects and plans in the city, or that impact on the city (public, community and private) including their status (current, completed, potential) within local authority.
- Basic data on the local authority area's climate, geography, population, economy, housing, businesses, industry, etc.
- Demand and supply side energy data (see 3.1 and 3.2). A correlation between demand and supply to be made. Discrepancies and data gaps are to be identified.
- As far as possible, all data is to be supplied for a chosen base year. This base year should be as recent as possible, considering data availability.
- CO2 equivalent: calculate CO2 equivalent for relevant sectors, subsectors and overall

#### 3.1. Demand Side Data

- Demand side data to be broken up by sector and subsector where possible.
- Total demand of each energy source for the municipality.
- Total emissions (local and global) for municipality per energy source and per sector.
- Where historical trends in demand over the years are available, this is to be supplied for main consumption categories. If not available, estimates are to be made to the best of the consultant's ability, based on expert knowledge of the sector.
- Energy demand projections: calculate the current growth rate from all sectors and give estimates of energy use at a future target date, preferably 2020 if the data is available. Variables to assist in demand projections:
  - Economic growth/GDP projections (broken down by category of industry where possible)
  - Population projections
  - Household projections
  - Other data which the consultant feels will have a significant impact on energy use in the next 10 or 15 years.



An example of a more detailed profile of demand side data to be collected:

### **Residential**

- Total population
- Total households, broken down into (1) mid-hi income and (2) low-income
- Number of electrified households
- Typical average consumption (quantified) of each energy source (electricity, wood, paraffin, etc) for three categories of household – (1) mid-hi income, (2) low-income electrified and (3) low-income unelectrified:
  - broken down (in quantity and proportion) into different end-uses (lighting, cooking etc), and by type of appliance (e.g. gas ring or stove, paraffin primus or flame, elec hotplate or stove/oven, elec incandescent or CFL light, etc).
  - proportions of households using particular energy sources and appliances is to be given for the above categories, as far as this data is available.
- Average expenditure on energy, by source, for the above categories of household
- Prices of different energy sources
- Quality of housing (relating to energy efficiency)
- Trends in electrification
- Access to energy sources
- Trends in other fuel use
- Any data/statistics which clarifies the health, safety and environmental impact of energy use

### **Industrial**

- Number of different industries, broken down into standard categories (mining, food & beverages, pulp & paper, etc).
- Total consumption per energy source for sector
- Average consumption of different industry categories (quantified by energy source)
- Proportions of industries using different energy sources with categories.
- Relative energy intensity
- Employment
- Output

### **Commercial**

- Number of commercial users
- Average energy source profile (in a few different sub-categories where users differ greatly in characteristics):
  - broken down (in quantity) into different end uses (HVAC, lighting etc) and type of appliance (fluorescent, CFL, incandescent lighting, etc) as far as possible.
  - proportions of users using particular energy sources and appliances is to be given, as far as this data is available.
- Average expenditure on energy source, by source, per user (or user sub-category)
- Relative energy intensity
- Employment



- Output

### **Government**

- (Note: integrate data already collected on local government, and include government transport in the below data)
- Number of government users
- Average energy source profile (in a few different sub-categories where users differ greatly in characteristics):
  - broken down (in quantity) into different end uses (HVAC, lighting etc) and type of appliance (fluorescent, CFL, incandescent lighting, etc) as far as possible.
  - proportions of users using particular energy sources and appliances is to be given, as far as this data is available.
- Average expenditure on energy source, by source, per user (or user sub-category)

### **Transport**

- No. vehicles (broken down into petrol, diesel, other)
- Vehicle-km (or passenger-km for passenger transport)
- Trip length and time
- Cost and subsidies
- Modal splits for passenger transport, in division of rail/bus/taxi/private.
- No. Freight vehicles, and average freight ton-km
- Energy used by each transport mode, quantified by energy source.
- Emissions (global and local) from energy sources (per unit as well as total)
- Emissions by transport mode
- Trends in vehicle types, energy demand and modal splits

### **3.2. Supply Side Data**

- Breakdown of all fuel supply (e.g. coal, liquid fuels, renewable, gas, electricity, etc)
- Electricity supply and context (IPPs, REDs, ESI restructuring, etc)
- Energy sources for electricity production (fossil fuels, hydro, nuclear, other)
- Level of dependence on oil, coal, renewable energy sources, natural gas, etc
- Identify renewable energy options, opportunities and constraints within the municipality
- Solid waste: tons of waste generated/recycled and city recycling goals
- Sewage: millions of litres per day

An example of a more detailed profile of demand side data to be collected:

### **Electricity Supply**

- Total supply
- Supply sources
- Details of local generation plant characteristics.
- Cost of different sources
- Emissions from different sources



- Trends in total supply

### **Liquid Fuels** (including natural/piped gas)

- Total supply per fuel type
- Supply sources
- Details of supply plant characteristics (capacity, quantities, emissions, growth potential, etc).
- Cost of supply of different sources
- Emissions from different sources
- Trends in total supply

### **3.3. Data Sources**

- Data can be sourced via various stakeholders (municipality officials and key organizations), secondary data sources (reports) and estimates from various other sources.
- Census 2001 data included increasingly detailed energy info and is likely to constitute one of the most important future info sources
- Statistics SA compiles a survey of Quarterly Financial Statistics of Local Government Institutions covering all district and metropolitan municipalities as well as sample of local municipalities in SA. Data is collected on income generated for electricity and gas, purchases of electricity, gas and water, intergovernmental transfers and subsidies and sale of electricity, gas and water.
- The Energy Research Institute at UCT has a database on energy data demand and supply on a national and provincial level.

### **3.4. Potential Data Problems**

- May find in many areas data has never been systematically collected
- Might have to rely on ad-hoc studies, old data, or make assumptions based on national or provincial data.
- No/inaccessible data
- Good energy supply info, but poor demand (user) info
- No centralized collection of data on energy
- Data not collected in units you need
- Data by region, not by city
- Good data on one sector for one year, but for no other sectors for that year
- Very basic info on facilities may be lacking
- Different departments don't communicate with each other



### 3.5. Data Conversion Factors

To compare energy sources units are converted to Joules or Giga-Joules (GJ), the standard energy unit. Conversion factors are given in the below table.

Energy Source	Available Units	GJ Conversion	
Electricity	kWh	0.0036	GJ / kWh
Coal (Bituminous)	Kg	0.031	GJ / kg
Anthracite	Kg	0.029	GJ / kg
Coke	Kg	0.034	GJ / kg
Heavy Furnace Oil	Litres	0.040	GJ / Litre
Diesel	Litres	0.037	GJ / Litre
Paraffin	Litres	0.036	GJ / Litre
Wood	Kg	0.019	GJ / kg
Wood waste	Kg	0.019	GJ / kg
Gas (Natural)	m <sup>3</sup>	0.039	GJ / m <sup>3</sup>
LPG	m <sup>3</sup>	0.025	GJ / m <sup>3</sup>
Waste	m <sup>3</sup>	0.011	GJ / kg
Petrol	Litres	0.034	GJ / Litre

Source: Energy Information Administration, USA, 2001

### 3.6. Emission Coefficients

Local Air Pollutants and Greenhouse Gas Emissions are calculated by multiplying fuel and electricity consumption data by emission factors. Emission factors given below for local air pollutants are EPA factors (US Environmental Protection Agency), SA electricity coefficients and IPCC (IPCC Guidelines for National Greenhouse Gas Inventories, 1996).

Local air pollution coefficients

Fuel Type	Units	SO <sup>2</sup>	Particulates	NOx
Anthracite	kg/ton	19	170	9
Waste	kg/ton	1.25	15	1.5
HFO	kg/1000L	62.7	2.75	5.72
Coal	kg/1000L	8.5	1.2	1.5
Diesel	kg/1000L	8.8	13.2	8.47
Woodwaste	kg/ton	0.2	15	5
LPG	kg/m <sup>3</sup>	0.006	0.22	1.45
Wood	kg/ton	0.2	15	5

Source: Coefficients used by Cape Town Air Pollution Control



CO<sub>2</sub> coefficients (tons/GJ)

Electricity	0.3056
Paraffin	0.0717
LPG	0.063
Coal	0.0944
Petrol	0.0692
Diesel	0.0739
HFO	0.0772
Wood	0

Source: IPCC

#### 4. Expected Competencies and Experience of Consultant

- Sufficient professional capacity and experience to undertake all tasks that may be required to execute the work successfully in terms of this document.
- Experience and knowledge of the principles and practice of sustainable development, and energy's role in this.
- Detailed experience and knowledge of the energy sector.
- Knowledge of city development and environmental management.

#### 5. Proposal Content

- Detailed outline of proposed methodology and approach within the set timeframe
- Flow chart programming all aspects of work to be undertaken and associated deliverables
- Total budget, with budget breakdown in terms of work stages or activities.
- Person-days estimated for activities/work stages, with individual consultant rates.
- Outline of the consultant team, and team member competencies and roles in the project.
- CV's of team members.
- Organisational profiles.
- Previous experience in processes of a similar nature carried out by your team
- Any special input of expertise that you may offer