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WHITE PAPER ON SUSTAINABLE ENERGY FOR THE WESTERN CAPE PROVINCE

Department of Environmental Affairs and Development Planning: Western Cape

PROVINCIAL NOTICES

The following Provincial Notices are published for general information.

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DIRECTOR-GENERAL

Provincial Building,
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PROVINSIALE KENNISGEWINGS

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Abbreviations

ASGISA	Accelerated and Shared Growth Initiative for South Africa
CCRS	Climate Change Response Strategy
D:EA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism (see DEA below)
DME	National Department for Minerals and Energy (see DoE below)
DoE	National Department of Energy (formerly known as DME)
DTI	Department of Trade and Industry
DEA	Department of Environmental Affairs (formerly known as DEAT)
EE	Energy Efficiency
ESCO	Energy service company
GDP	Gross domestic product
GDS	Growth and Development Strategy
HCDS	Human Capital Development Strategy
IAEA	International Atomic Energy Agency
IDP	Integrated Development Plan
IEA	International Energy Agency
IGRF Act	Intergovernmental Relations Framework Act 13 of 2005
iKapa	Western Cape
ILRP	Integrated Law Reform Project
IPP	Independent Power Producer
Isidima	Sustainable Human Settlements Strategy
LED	local economic development
MDGs	Millennium Development Goals
MEDS	Micro-economic Development Strategy
MTSF	Medium-term Strategic Framework
NERSA	National Energy Regulator of South Africa
NFLED	National Framework for Local Economic Development
NFSD	National Framework for Sustainable Development
NGO	Non-governmental organisation
NIPF	National Industrial Policy Framework
NSDP	National Spatial Development Perspective
OECD	Organisation for Economic Co-operation and Development
IKAPA GDS	Provincial Growth and Development Strategy
PGWC	Provincial Government of the Western Cape
PRS	Poverty Reduction Strategy
PSDF	Provincial Spatial Development Framework
R&D	Research and development
RDP	Reconstruction and Development Programme of the Government of South Africa

RE	Renewable energy
SANERI	South African National Energy Research Institute
SAWEP	South African Wind Energy Programme
SCFS	Social Capital Formation Strategy
SDIP	Sustainable Development Implementation Plan, Western Cape
SIP	Strategic Infrastructure Plan
SOE	State-Owned Enterprise
SPV	Special-Purpose Vehicle
SWH	Solar Water Heater
UN	United Nations
UNIDO	United National Industrial Development Organisation
WC	Western Cape

Glossary of Terms:

Energy units

kWh = kilowatt-hour

GWh = gigawatt-hour (1,000,000 kWh = 1 GWh)

1 GWh = 3600 Gigajoules (GJ)

1 kg coal = 1.89 kWh

I kwh = 0.963 kg CO_2

1 kwh = 1.26 Litres of water used

A kilowatt-hour (kWh) is one unit of electricity; one 60 Watt light bulb burned for one hour will use 0.06 kWh (60 Watts) x (1 kilowatt/1000 Watts) x 1 hour) = 0.06 kWh

Biodiesel	Refers to a diesel-equivalent, processed fuel derived from biological sources, such as, vegetable-oils which can be used in *unmodified* diesel-engine vehicles.
Biogas	Biogas is a low cost form of energy derived from renewable 'waste' resources: animal manures, agricultural residues, industrial wastewater, human waste and other organic material
Biomass Energy	Energy from the burning of agricultural, forestry, and other organic material
Carbon Footprint	A representation of the effect human activities have on the climate in terms of the total amount of greenhouse gases produced (measured in units of carbon dioxide).
Carbon Tax	A tax on energy sources which emit carbon dioxide into the atmosphere. It is an example of a pollution tax.
CFL	Compact Fluorescent Lamp – relatively efficient light bulbs, using about 25% of the power of incandescent light bulbs, for the same light output.
Coal Thermal Power Plant/Station	A power station that generates electricity through the burning of coal.
Co-generation	The simultaneous production by means of a single source of useful energy (usually electricity) and heat (e.g. process steam) that can then be recovered for use as additional energy.
Climate change	A statistically significant difference noted either in the mean state of the climate or in its variability persisting for an extended period of time. Presently, climate change is thought to be caused by human activity, the most prominent being the generation of energy.
Electricity Grid	The electricity supply line system.
Energy	A measure of the ability to do work. E.g. energy is required to lift a bucket of water 10 metres, and a certain amount of energy is required to keep a light bulb alight for 1 hour. Basic unit of measurement is the Joule (J).
Energy Audit	A process whereby the energy use profile of an entity is determined i.e. amounts of energy used, types of energy used etc.
Energy Efficiency	Using less energy to achieve the same objective, e.g. an energy efficient air conditioner uses less energy to achieve the same cooling.
Energy Conservation	Measures to avoid the use of energy services.

ESCO	Energy Services Company. A company that specializes in energy efficiency measures under a contractual arrangement in which the company shares the value of energy savings with the customer.
Fossil Fuel	A fuel such as coal, oil, natural gas, produced from the decomposition of ancient plants and animals.
Fossil Fuel Power Station/Plant	A power station that generates electricity through the burning of any fossil fuel.
Global Warming	An overall rise in the global temperature presently thought to be faster than the natural rate, due to human activity (see Climate Change).
Gigajoules	A gigajoule (GJ) is 1,000,000,000 joules. It is a unit of energy.
Natural Gas	A mixture of hydrocarbon compounds and small quantities of various non-hydrocarbons, widely used as a fuel throughout the industrialized world; it exists in the gaseous phase or in solution with crude oil in natural underground reservoirs.
Hydropower	Energy derived at a variety of scales from water pressure, especially the force or pressure of falling water used to power a water wheel, turbine, and so on.
Nuclear Energy	Energy released by radioactive decay, through a nuclear reaction, or in the course of fission or fusion of atomic nuclei.
Renewable Energy	Energy which can be replenished at the same rate it is used.
Solar Radiation	All the constituents that make up the total electromagnetic radiation emitted by the sun.
Sustainability	An attempt to provide the best social, environmental and economic outcomes for the human and natural environments both now and into the indefinite future.
Solar Water Heater	Water heated by the sun for use in home or other. It can be backed up by electricity so as to heat the water when days are cloudy.
Wave Power	Energy generated by the oceans' wave currents, especially wind-generated waves.
Wind Energy	The energy contained in the movement of air masses; in human energy use traditionally captured by means of the sails of a ship or the vanes of a windmill, and currently by mechanical blades similar to airplane propellers.

Executive Summary

This document is the Western Cape White Paper on Sustainable Energy for the Province. The document has been prepared by the Provincial Department of Environmental Affairs and Development Planning (D:EA&DP) of the Western Cape and its partners. This White Paper sets out the vision, policy, principles, goals and objectives to develop a sustainable energy system which is built around the sustainable development goals aimed at social, environmental and economic development. It also informs the public and the different spheres of government of the Province's vision and how the Province will set out to achieve these objectives as well as informing its stakeholders and organs of their roles in achieving the objectives.

The Western Cape's share of total national energy demand is roughly 10% of South Africa's total energy demand. In 2004, approximately 250 million GJ of energy was consumed in the Province. By 2020, if the economy continues to grow as expected, it is predicted that the demand will grow to 375 million GJ, unless energy consumption patterns are drastically changed.

The Western Cape is heavily dependent on fossil fuels for its energy needs. This is in line with the national demand. The reliance on fossil fuels leaves a significant negative footprint on the environment. The White Paper on Sustainable Energy is an essential first step to move the Western Cape Province on to a more sustainable path of energy production and use. The vision of the White Paper is to contribute towards affordable energy use for all and to minimise the negative effects of energy usage upon human health development and energy use through efficient practices. The three pillars of sustainable development are embraced within the strategic goals and outcomes of The White Paper, these being environmental, social and economic sustainability.

The White Paper on Sustainable Energy is rooted in an integrated set of high-level documents initiated by the Provincial Government of the Western Cape (PGWC) over a period of time, amongst others, the Sustainable Development Implementation Plan (SDIP), 2008: Sustainable Energy Strategy and Programme of Action and the Climate Change Response Strategy and Action Plan prepared in 2008 also formed part of a background document for this White Paper. Most recently, the White Paper was aligned with the 2009/10 Strategic Framework for the Western Cape.

The 2014 Sustainable Energy Vision for the Western Cape is presented as: "The Western Cape has a secure supply of quality, reliable, clean and safe energy, which delivers social, economic and environmental benefits to the Province's citizens, while also addressing the climate change challenges facing the region and the eradication of energy poverty."

To achieve this 2014 vision, the potential for technological, institutional, economic and social change will have to be harmonised in order to create a sustainable energy system, aided by determined energy demand management programmes and support for a mix of renewable and clean energy technologies.

Achieving a sustainable energy system across the Province will require understanding of the present situation and good knowledge of the options and technologies available to bring about the desired changes. Changes are required in both our energy production system, sources of supply and in energy consumption patterns. To bring these changes into effect, the sustainable energy system will need to be supported by appropriate legislation and cost structures as well as

incentive systems such as standards, information, education, financial incentives and availability of technology. In addition, institutional capacity to support the new system must be developed.

The target for electricity from renewable sources in the Province reads as follows: "*15% of the electricity consumed in the Western Cape will come from renewable energy sources in 2014, measured against the 2004 consumption baseline of 63.61 million GJ*"

The White Paper target for energy efficiency is also derived from the Sustainable Development Implementation Plan (SDIP). The energy efficiency target is: "*A final energy demand reduction of 15% by 2014".*

Poverty alleviation is an integrated part of all policies in the Western Cape. Social sustainability is an integrated part of sustainable energy development and needs special attention so that the poverty challenges of people can be addressed.

Therefore, the targets developed in the White Paper will have a cross cutting effect on all aspects of interventions so as to address energy poverty.

The carbon reduction target relates to carbon emissions: **"***The carbon emissions are reduced by 14% by 2014 measured against the 2004 emission levels "*

The White Paper objectives promote the implementation of renewable energy and energy efficiency through technology and behavioural change. There will be a special focus on some technologies in order to gain critical mass of installation sufficient to drive prices down and support permanent employment. This can include both wind and solar energy but also other sources of renewable energy. The focus on some technologies does not mean that other technologies are excluded.

The focus on energy efficiency in the Western Cape is to optimise security of supply for all, minimise the collective carbon footprint and improve the economy. Using less energy for the same production output leads to relative lower energy bills. The implementation of energy efficiency follows the national strategy and initiatives and the PGWC will ensure that programmes and facilities are brought to the Province so that they support the achievement of set targets.

It is well recognised that poverty eradication is a cross cutting issue and the mandate for poverty eradication lies with a number of departments and stakeholders. It is the intention of the PGWC to participate actively in already established fora as well as initiate the establishment of a cross cutting reference and implementation group that can drive a consolidated effort towards energy poverty eradication.

The implementation of the White Paper is the responsibility of the Provincial Government. The Provincial Government will facilitate an environment conducive to smooth implementation through interactive engagement with the municipalities.

The successful implementation of this White Paper also hinges on effective and supportive cooperation with and by all municipalities in the Province. The PGWC will support the development of local energy plans, establishment of data bases and data collection that collectively can contribute to the achievement of the targets set out in the White Paper.

The PGWC will put in place a system for monitoring and continuous updating and registration of progress on energy efficiency and electrical renewable energy generation. A special monitoring system will also be developed to track the efforts and achieve the goals for energy poverty reduction. This White Paper will be reviewed to keep abreast with developing trends and circumstances in the Province.

Introduction

Due to the ongoing energy crises in the Western Cape, a sustainable energy strategy and plan of action was developed and published and has lead to the drafting of this White Paper. It is believed that this process is necessary to ensure that measures to reduce energy consumption and increase the supply of clean, renewable energy be taken as soon as possible.

The PGWC intends to increase its efforts to maximise energy efficiency in the four sector-scenario's outlined in the White Paper, namely residential, commercial and public buildings, transport and industry. The targets and the proposed initiatives are set out in chapter 5 of the White Paper. The failure of world leaders to agree on binding global emissions cuts at the Copenhagen Summit in 2009 makes it all the more important that the country and the Province pushes ahead as rapidly as possible to reduce its energy consumption and take immediate actions that don't require global agreement and that bring economic benefit to the region. Improved energy efficiency can take us a long way towards meeting our commitments to reduce greenhouse gas emissions by 2020, and at the same time will bring significant economic benefits to the Province. With millions of Rands being wasted on the inefficient use of energy by businesses, industry, transport and households every day, the intended goals and targets set out in the White Paper may be accelerated by encouraging improved energy efficiency in all sectors and move towards renewable energy.

Accordingly, the White Paper outlines the key energy concerns and opportunities facing the Western Cape. It proposes a range of policies, strategies and actions that will allow the Province to develop a sustainable portfolio of energy solutions while also reducing pollution and increasing access to energy for all citizens in the Province. Energy efficiency improvements are and will be achieved largely via enabling instruments and interventions. These will include *inter alia* economic and legislative means, energy management activities and energy audits, as well as the promotion of efficient practices. Systems will be put in place in order to periodically monitor progress against targets that will be reviewed at regular intervals.

Energy concerns are cross-sectoral and must be handled in an integrated manner. It is therefore essential for the full range of stakeholders to take ownership of the White Paper from all levels of government and all sectors, including transport, housing, health, social development, and economic development. It is also crucial for the Province's sustainable energy strategy to be integrated into existing and pending policies and strategies for the Province's development, such as the Strategic Infrastructure Plan, the Micro-Economic Development Strategy (MED's), the Spatial Development Framework (SDF) and the Local Economic Development Strategies (LED's).

The Department of Environmental Affairs and Development Planning (D:EA&DP) consulted with stakeholders in government, as well as business and civil society for comment on the proposed approach and strategies. The discussions with key stakeholders, as well as all comments received on draft documents were taken into account in developing the Province's Research Paper for the development of this White Paper.

The Western Cape Provincial Government published its first research document on energy during 2005. The document was a Summary Draft Status Quo and Gap Analysis Report towards the development of an Integrated Energy Strategy for the Western Cape. Since 2005 the Provincial Government has undertaken ongoing research on the production and use of

sustainable energy as part of its mandate to implement climate change mitigation measures. The research paper for the development of the White Paper is one of a suite of documents developed by the Department in order to contribute towards the development of the optimum sustainable energy profile for the Western Cape. Other documents/strategies are

- Demand Side Scenarios and Energy Efficiency Programme for the Western Cape,
- A proposed Renewable Energy Plan of Action for the Western Cape. (Resource Assessment, Scenarios, Proposed Objectives and Actions).

Globally, nationally, provincially and locally climate change is recognised as a threat to the well being of mankind. In addition to the concerns of the Western Cape Provincial Government over the consequences of climate change and the role of production and use of energy in climate change, the social and economic aspects of energy may not be ignored.

South Africa and also the Western Cape are in dire need for an expansion of energy infrastructure and all indications show that energy tariffs will rise significantly in the near future. This situation will influence the competitiveness of the Western Cape with regard to investment and will also affect many people on a social level.

The White Paper is seen as a major milestone for the Western Cape Provincial Government to address energy aspects within the mandates of climate change, social and economic development. Energy is a cross cutting issue and it is the Provincial Government's intention to work closely with stakeholders at national and local government level to realise the goals, objectives and targets in the White Paper.

1. Chapter 1: Overview, Vision and Motivation for a Sustainable Energy White Paper

1.1. Overview of the Energy Profile of the Western Cape

Energy Consumption

In 2004, approximately 250 million GJ of energy was consumed in the Western Cape. By 2020, if the economy continues to grow as expected, it is predicted that the demand will grow to 375 million GJ, unless energy consumption patterns are drastically changed.[1]

As shown in Figure 1, the industrial and transport sectors are currently the largest energy consumers. Combined, these two sectors account for 80 % of the total energy used in the province. The transport sector is heavily dependent on liquid fuels while the industrial sector is the largest electricity consumer, and the second largest petrol consumer.

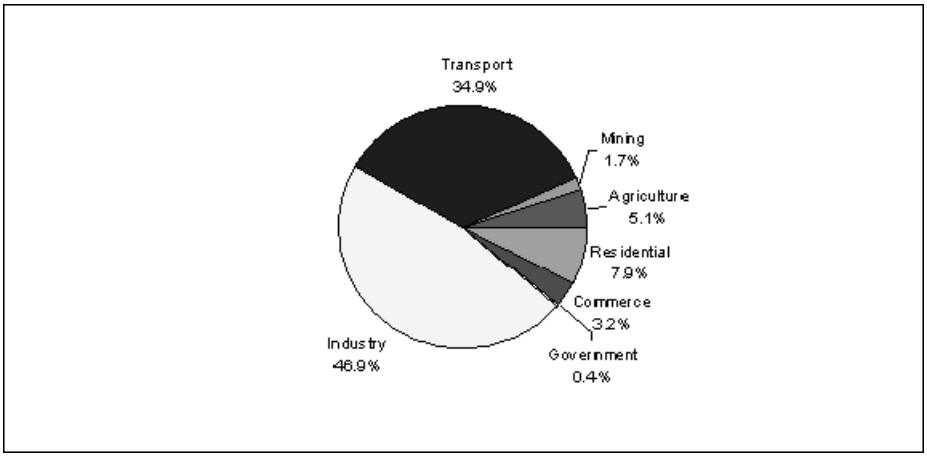

Figure1: Western Cape Energy Consumption by Sector

Currently the Western Cape uses a range of fuels (Figure 2) to fulfil the energy requirements of its people and industry. The greatest final energy demand is for liquid fuels due mainly to their use in the transport sector, but also in industry, commerce, agriculture, mining and the residential sector. The next major final energy carrier is electricity followed by coal and relatively small amounts of wood.

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[1] Growth assumptions for LEAP model

The liquid fuel mix is dominated by petrol (mainly used in the transport sector) followed by large quantities of diesel (which is used in sectors other than transport as well) with far smaller quantities of fuel oil, Liquid Petroleum Gas (LPG) and kerosene (paraffin).

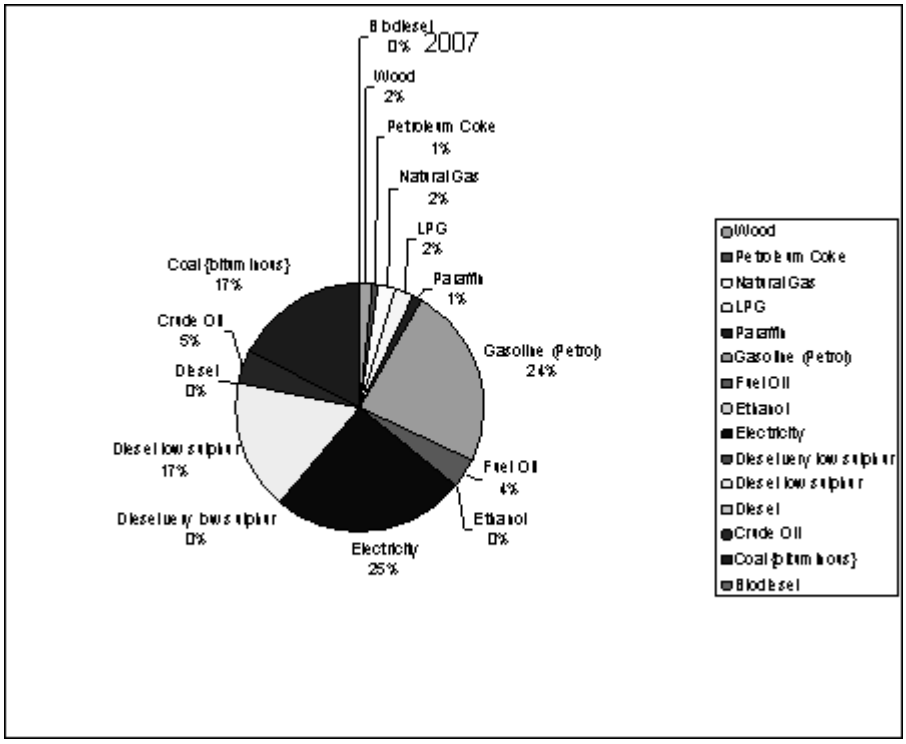

Figure 2: Western Cape Total Energy Consumption in 2007 by energy type

The Provincial share of total national energy demand is 10% at 247,752 TJ. If the Province were to achieve its GDP hi-growth scenario of 6%, energy consumption will grow as follows:

(Million GJ)	**2004**	**2005**	**2006**	**2010**	**2014**	**2015**	**2020**
Total for 2.8% growth	247.751	253.459	259.337	287.512	319.349	327.947	375.248
Total for 6% growth	247.751	253.892	260.24	290.731	325.737	335.287	388.552
% increase in energy consumption	0.0%	0.2%	0.3%	1.1%	2.0%	2.2%	3.5%

Table 1: Energy use implications of a higher (6%) of GDP growth rate

i) Industry (47% of total consumption)

This sector is the largest consumer of electricity and the second largest consumer of other fuels after transport. This is due largely to the petrochemical refineries: Caltex and PetroSA, the Iron and Steel industry, and other sub-sectors using high temperature thermal operations. This

sector also includes the chemical industry, non ferrous metals, non metallic minerals, wood and wood products, food and tobacco and 'other industry' which includes textiles, construction and any other categories not covered by the preceding sub-sectors.

Coal and electricity are the dominant fuels used in industry, with crude oil, diesel and fuel oil making up a significant part of the remaining share.

ii) Transport (35% of total consumption)

The majority of the liquid fuels consumed in the Western Cape are used in the transport sector.

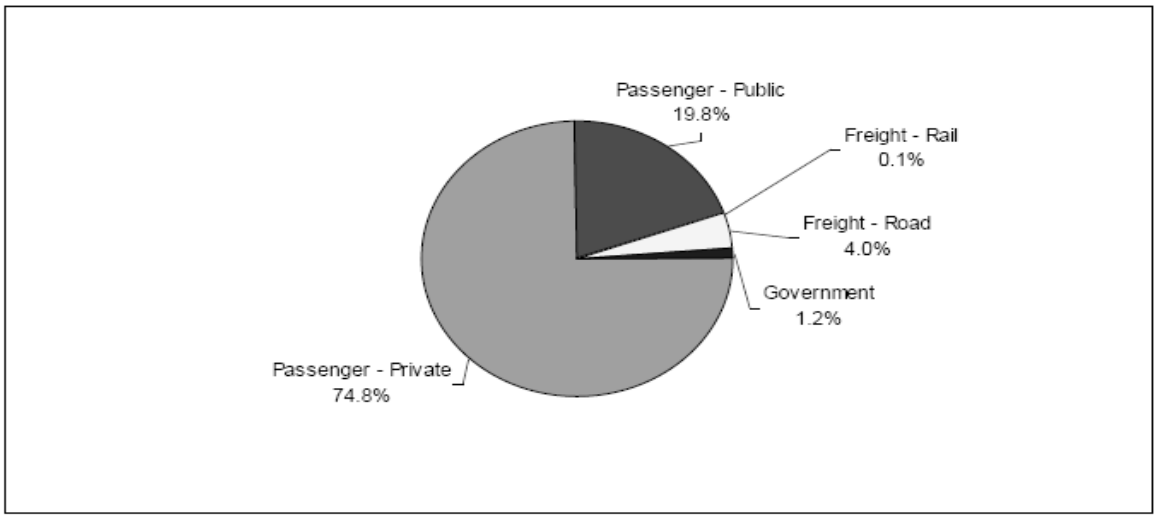

Figure 3: Energy use by transport sector for the Western Cape: 2004

The transport sector energy demand is largely dominated by private passenger use, with most of the remaining energy demand being made up by the public passenger transport sector. This results in the inefficient use of fuel and increased levels of pollution. In the public sector rail has been in a state of decay while minibus taxis have been growing, although rail still remains the backbone for public transport within the Western Cape. The transport sector is responsible for a large portion of the air pollution in the province.

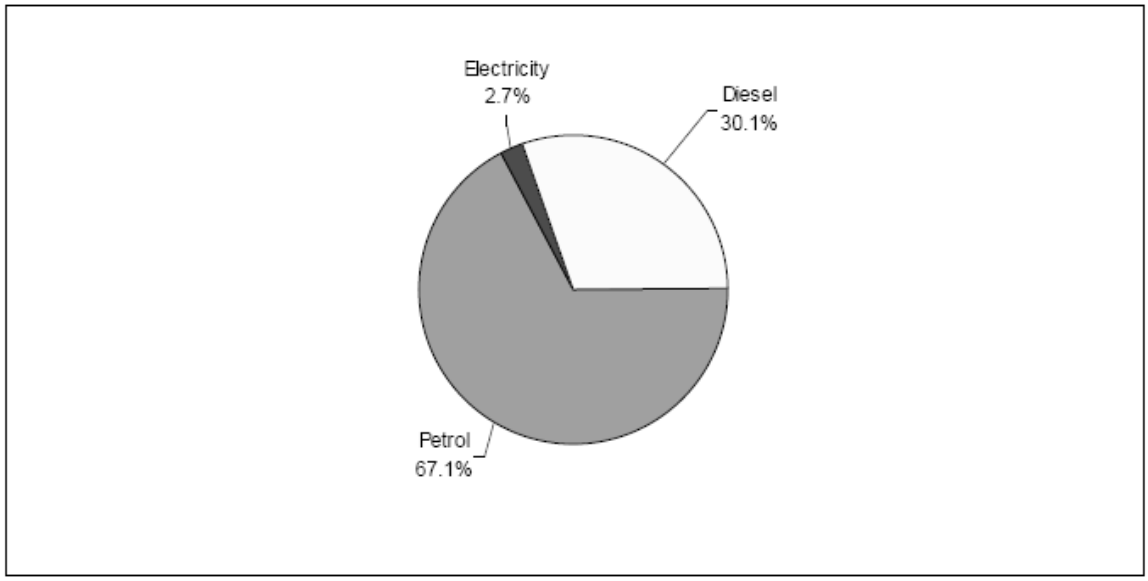

Figure 4: Energy use by fuel for the Western Cape passenger transport sector: 2004

It can be seen from figure 4 that petrol is the major fuel used in the transport sector with diesel making up most of the remaining share. Electricity, predominantly for trains, contributes a smaller amount.

iii) Residential (8% of total consumption)

From demographic and population data (WESGRO, 2004) the residential sector can be split into urban and rural settlements, and low income and med-high income groups.

	Population	Households	Electrified	Unelectrified	% Electrified	% Unelectrified
Rural	546 384	134 218	87 808	46 410	65.4	34.6
Urban	3 977 951	1 039 086	888 084	151 002	85.5	14.5
Total	**4 524 335**	**1 173 304**	**975 892**	**197 412**	**83.2**	**16.8**

Table 2: Household and electrification data for Western Cape: 2004 (WESGRO 2004)

	Urban	Rural	Total	%
Medium-high income	407 776	52 672	460 448	39.2
Low income electrified	480 308	35 136	515 444	44.0
Low income non-electrified	151 002	46 410	197 412	16.8
	1 039 086	**134 218**	**1 173 304**	**100**

Table 3: Household electrification data by income group for Western Cape: 2004 (WESGRO, 2004)

The majority of the population lives in urban settlements with the low income sector making up the largest part. While over 85 % of the urban population live in electrified households, only 65 % of rural households are electrified.

The urban medium-high income sector is the highest user of energy in the province although the urban low income households are far more numerous. This is due to the high energy use in medium-high income households (56.3%) compared to low income households (32.8%). Rural households make up a far smaller share due to the relatively small number of rural households in the Province. Complexities of quantifying the use of energy does exist in the housing sector with about 450 000 individuals not living in formal structures and backlogs in housing allocations still existing.

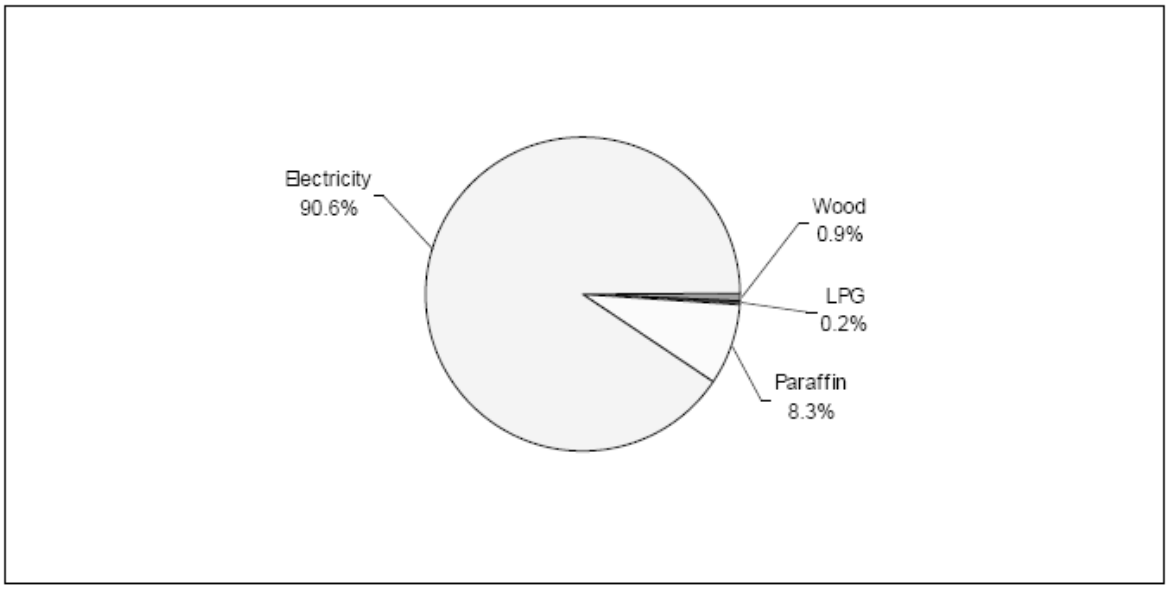

Figure 5: Energy use by sub-sector for the Western Cape residential sector 2004

For the Province as a whole, electricity is by far the dominant fuel used in households although paraffin/kerosene and LPG make up a significant part of the fuel mix. Most of the electricity/energy used in medium-high income households is for water heating, while low income households use a far lower proportion of their energy for this end use.

iv) Agriculture (5% of total consumption)

Although the Western Cape is not rich in minerals, it's agricultural and fisheries potential makes up for this. It is one of the most important food baskets of South Africa.

Diesel is the most important fuel in agriculture but electricity is growing in importance because of the increase of mechanisation.

v) Commerce and Government (4% of total consumption)

The commercial sector consists of office buildings, hotels, financial institutions, shops, educational facilities, hospital and places of entertainment.

Total electricity use in this sector was split as follows: lighting 26% (1/3 incandescent 2/3 fluorescent), VAC 43%, heating 8%, water heating 3%, refrigeration 5.8%, cooking 0.6%, and other 12.8%.

Lighting and HVAC (heating, ventilation and cooling) make up most of the energy use in the commercial sector. Government buildings (local, provincial and national) generally have the same energy characteristics as commercial buildings.

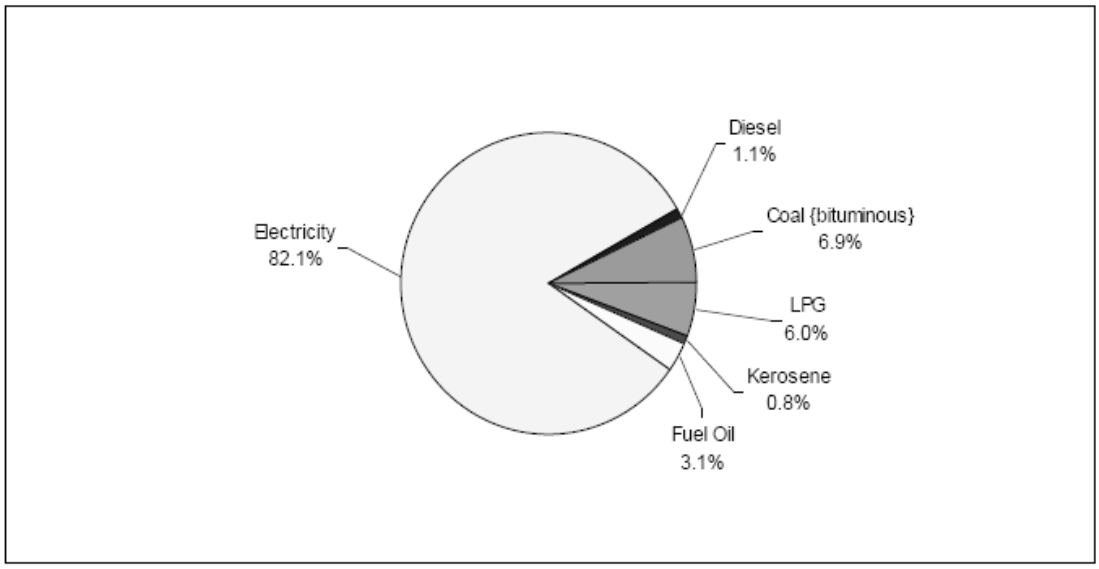

Figure 6: Energy use by end use for the Western Cape commercial and government sectors 2004

Electricity is by far the dominant fuel used in these sectors with coal and liquid fuels making up the remainder.

vi) Mining (2% of total consumption)

The Western Cape is not a mineral rich province, with mainly open cast mining and heavy beach sand operations. The main fuels used in mining are electricity followed closely by diesel.

1.2. The Provincial Sustainable Vision and Intent

i) The Sustainable Energy Vision

The energy profile provides an overview of the status and future projections of the energy sector, more specifically the challenges relating to energy security which have burdened the Province since the energy crisis from 2005. This was a key reason for Province to develop a sustainable energy vision for the Western Cape.

The energy vision for the Western Cape takes its impetus from the goals of the 5 year Strategic Plan for the Provincial Government of the Western Cape, the policy documents such as the Sustainable Development Implementation Plan as well as the national policies.

The Provincial strategic vision is expressed as follows:

The 2014 Sustainable Energy Vision for the Western Cape

The Western Cape has a secure supply of quality, reliable, clean, safe energy, which delivers social, economic and environmental benefits to the Province's citizens, while also addressing the climate change challenges facing the region and eradicating energy poverty.

In order to achieve, this 2014 vision the Western Cape aims to demonstrate how the potential for technological, institutional, economic and social change could be harnessed to create a sustainable energy system, determined energy demand management and support for a mix of renewable and clean energy technologies.

The technologies and options for delivering on this vision largely exist, and with support from the Provincial Government could be brought about in a more focused and rapid fashion. It is thus the Provincial Government's key objective to create an environment within which these technologies and initiatives may flourish in support of achieving the sustainable energy vision.

Achieving a sustainable energy system across the Province will require changes in energy sources as well as a fundamental change in the way the system operates. By changing the demand profile and behaviour across the Province it is envisaged that the delivery of energy services will also change. The Provincial Government will assist in removing a number of the barriers associated with the adoption and commercialisation of clean energy technologies and

initiatives. These are described more fully in the sustainable energy strategy and programme of action.[2]

ii) The Provincial Strategic Intent

The White Paper sets the policy environment for the Western Cape to develop a cutting edge sustainable energy system and begin moving toward the long term vision.

Accordingly, the Provincial strategic intent is articulated as follows:

Sustainable Energy Strategic Intent for the Western Cape

To develop a sustainable energy system that reduces its impact on people's health and the environment whilst contributing to long-term sustainable economic development.

In the medium to long term, the strategic objective is to broaden the energy mix and to lessen the Province's dependence on energy generated from fossil fuels and other polluting sources, and to generate energy closer to the points of use in order to reduce efficiency losses through transmission.

In conclusion, the long term energy vision and intent can be projected as follows:

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[2] 2008: Sustainable Energy Strategy and Programme of Action for the Western Cape

A Long Term Vision: The Energy Picture in the Western Cape in 2020

In 2020, the Western Cape has a modern energy system that is highly efficient and where fossil fuel use and fuel poverty are markedly reduced. Energy efficiency programmes achieve a 15% savings across the various programmes, clean and renewable energy contributes to 15% of the energy mix and emissions reductions of 15% are achieved. Provincial and Local Authorities have an understanding of the impacts of their energy use patterns and play a leading role in implementing the energy strategy across the Province.

Sustainable Energy Use

Innovation in utilisation across all sectors leads to a more efficient use of modern energy sources and which is characterised by:

- a high performance building stock (both public and private sector) brought about by designing new buildings and retrofitting old buildings according to green design principles
- widespread implementation of demand side energy management programmes and technologies in businesses, homes, government and commercial buildings
- greater use of energy efficient appliances are adopted across all sectors
- a modal shift toward lesser polluting transport technologies, fuels and vehicles
- energy services companies that provide effective energy services to the various communities across the province based on the specific needs in the various areas
- solar water heaters, solar photo-voltaic and other demand reducing technologies are implemented across various sectors and across a wide spectrum of communities
- a reduction in fuel poverty, pollution and respiratory illnesses, and safety threats through the use of cleaner, safer domestic fuels

Sustainable Energy Provision

A generation system that recognises a greater portion of energy from renewable sources (15% by 2014) and a high fuel productivity and which is characterised by:

- extensive renewable energy generation across the Province by Independent Power Producers from sources such as wind, wave, biomass, solar, small hydro
- a focus on developing decentralised energy generation systems and micro-generation
- combined heat and power systems operating in a greater number of businesses, homes and industries
- fuel cells and clean propulsion systems dominant in transport, heat and power and which complement renewable energy production
- natural gas and cleaner fuel sources which are to replace coal in the development of power generation projects

Policy and Governance

The market, governance and institutional structures in the Province have developed to include:

- effective leadership and co-ordination of the sustainable energy policy and programme across the province
- a series of new policy and practice guidelines, at local government and Provincial government level prioritising energy productivity in buildings (residential, commercial), vehicles and industrial settings
- effective partnerships development, education and communication strategy implementation with all key role players in the provincial energy system ensuring the Programme of Action is implemented and the targets achieved.

The development of the Sustainable Development Implementation Plan and the focus on creating a sustainable energy future will create a competitive advantage for the Western Cape, contributing to the achievement of the goals of the 5 year Strategic Plan for the Provincial Government of the Western Cape.

1.3. Motivation for a White Paper on Sustainable Energy

The past and ongoing energy crisis in the Western Cape has highlighted the need to develop a plan for sustainable, secure energy provision in the Western Cape. In this regard, the Western Cape has already demonstrated its vulnerability in the energy sector, and the dramatic increase in the price of fossil fuels and the increased global scarcity of resources continues to push prices up and undermines the PGWC's development efforts.

In providing a White Paper on Sustainable Energy for the Western Cape, the Province's sustainable energy and environmental mandate can be formalised. The White Paper will provide a foundation for the development of appropriate and suitable legislation and related policies where there are deficiencies or where the needs may arise around sustainable energy matters in the Province.

Legislation is an essential tool to support the implementation of the White Paper. At provincial level, a White Paper will provide for an overaching framework for the development of legislation and policy. The PGWC will make use of both documents to ensure the achievement of sustainable energy targets as set out in the White Paper.

Although various national efforts are underway to increase energy provision to the Western Cape, the Provincial Government believes that additional efforts need to be made to address the energy challenges facing the Province through determined energy demand management and support for a mix of renewable and clean energy technologies, including the challenges of:

- providing access to energy to all citizens in the province, and
- addressing the numerous health, social and environmental problems associated with our current energy use patterns, and
- reducing the Province's carbon footprint. In this regard, the modal shift should be towards a safe, affordable, accessible and effective public transport system that is less polluting.

These challenges need to be addressed in the context of supporting economic development and job creation in the Province.

i) Energy and Poverty in the Province

Poverty eradication and development remain two key objectives for the Provincial Government. The links between energy poverty and under-development have been clearly established and dealt with extensively in the Status Quo Report. In many instances the poor communities living in un-electrified dwellings in informal settlements or those living in rural and peri-urban areas experience this the most severely. Many of the informal settlements are regularly the scenes of large scale fires caused by the use of paraffin stoves in unsafe conditions. Challenges to gain access to modern, efficient and affordable energy services exist in the Province and need to be addressed.

ii) Energy efficiency and water use in the Province

Energy use and water use are linked in various ways:

- For every kWh of electricity generated, 1,26 litres of water is used – mainly in coal-fired power stations.
- Water pumping requires energy. Typically, around 1.8kWh may be required to supply 1 kl of water to households (and thus account for around 1.6 kg of CO_2)[3]
- A typical mid to high income house can save 20% of water consumption with ease. Since urban water consumption profiles are often dominated by domestic use, water efficiency interventions in households will result in substantial energy savings on a city and provincial scale.
- Through efficient showerhead installation, hot water consumption for showers will be reduced by around 40%. This translates to significant energy savings, since the major consumer of electricity in many households is for heating water.

The above illustrates the interdependence of water and energy efficiency, and reiterates the need for provincial co-ordination and support in moving towards a more sustainable future.

iii) Energy and transport in the Province

Transport is one of the fastest-growing sectors of energy use, with road transport being the major sub-sector. As an example, transport accounts for 54% of total Cape Town energy consumption[4] yet the focus on transport is addressing equity issues at a macro level without a similar emphasis on energy efficiency. The Provincial Energy Scenarios (Borchers et al, 2006) found that the bulk of energy use across the Province can be attributed to electricity consumption and that transport is the second largest energy consumer. The importance of an affordable clean energy public transport system cannot be overemphasized in addressing socio-economic sustainability issues.

iv) Energy Efficiency and Renewable Energy

Energy efficiency offers opportunities for cost savings for businesses and households whilst certain renewable energy applications are on the verge of proving their commercial viability in South Africa. As the demand for clean and renewable energy increases, a range of business and employment opportunities will be created leading to the development of a vibrant clean energy sector.

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3 Alliance to Save Energy: Financial Models for Urban Water Supply Interventions.

4 Provincial Energy Scenarios (Borchers et al, 2006)

v) Climate Change and Energy – a Provincial Perspective

The Climate Change strategy also focuses on the potential impacts of climate change on the agricultural and tourism sectors. Community members employed as seasonal workers on farms, as well as the farming communities themselves, are already bearing the brunt of unusual events such as the massive fires that raged across dry areas of the Province. Added to this, continued water shortages and the potential that the Province may become drier as time goes on, pose additional challenges.

Most of the carbon dioxide released from energy use within the Province comes from electricity production, followed by petrol and diesel use. Industry is the largest user of electricity in the Province, followed by the residential sector, commerce and government. The carbon footprint represented by the tons of CO_2 emitted per annum in the production of electricity mirrors the electricity use in each sector. The global warming emissions of the Province (represented as CO_2 equivalent) originate mainly from electricity use (52% of the total) due to the high CO_2 intensity of South Africa's principal generation source which is coal. On a sectoral basis, industry is responsible for most of the CO_2 emissions.

Sector	thousand ton CO_2/year	% of total
Industry	15,956	47.3%
Mining and Quarrying	751	2.2%
Transport	7,529	22.3%
Agriculture	2,045	6.1%
Residential	5,224	15.5%
Commerce & Public Services	2,259	6.7%
Total	**33,764**	**100%**

Table 4: Carbon footprint for Western Cape electricity use by sector

Fuel	thousand ton CO_2/year	% of total
Electricity	18,311	54.2%
Petrol	4,711	14,1%
Paraffin & jet fuel	145	0.4%
Diesel	3,643	10.8%
Fuel oil	642	1.9%
LPG	375	1.1%
Coal	4,513	13.4%
Other	1.366	4.0%
Total	**33,706**	**100%**

Table 5: Carbon footprint for Western Cape energy use by fuel

The carbon dioxide emissions profile provides clear areas for intervention in the development of the Provincial Sustainable Energy Strategy. Although South Africa does not face an emissions reduction target, it is clear from these figures, as well as from the climate change review conducted by the Provincial Government, that mitigation and adaptation strategies are necessary to deal with the predicted future consequences of climate change. The Provincial Climate Change Response Strategy and Action Plan highlights the nature and potential severity of the impacts of climate change on the Province. Mitigatory actions in the Climate Change Response Strategy and Action Plan form part of the immediate term action programmes in the White Paper.

2. Chapter 2: The Provincial Mandate, The Legal Context, Role of the Province and the Provincial Policy Context

2.1. The Provincial Mandate

The sustainable energy mandate for the Provincial Government of the Western Cape is provided for within the following framework:

2.1.1 National and Provincial Legislative Competence.

The Constitution of the Republic of South Africa, 1996, provides the legal basis for allocating powers to difference spheres of Government and sets out the functional areas of national, provincial and local government competencies in Schedule 4 and 5. Schedule 4 deals with the 'Functional Area of Concurrent National and Provincial Competencies whilst Schedule 5 deals with the 'Functional Areas of Exclusive Provincial Legislative Competence."

The Constitution is silent on the question of energy. It would be fair to incorporate the term 'energy' within the ambit of Schedule 4 and within the term 'environment' as there seems to be little doubt that phenomena such as climate change, partly brought about by energy generation and consumption, is an environmental issue as envisaged in the Constitution.

Schedule 5 does not list any of the environmental issues such as water, mining, energy, pollution control or climate change as an exclusive provincial legislative competence. Reference to environmental issues is found in Schedule 4, and is listed as: agriculture, disaster management, environment, nature conservation, pollution control, regional planning and development and soil conservation. Hence, the items 'Environment', 'Provincial Planning', 'Agriculture', 'Regional Planning and Development' and 'Urban and Rural Development' all have the potential to bring 'sustainable energy' under the ambit of concurrency contemplated in Schedule 4. Further, section 104(4) of the Constitution provides that as regards Schedule 4 (ie, matters of concurrent national and provincial competence), provincial legislation which is '*reasonably necessary for, or incidental to, the effective exercise of power concerning any matter listed in Schedule 4'*, is effectively legislation with regard to a Schedule 4 matter.

Energy is currently a national competency except in the case of electricity reticulation which is a function performed by local government. Local government does so by virtue of its regulation by national legislation. Strictly speaking, therefore, the provincial government has no formal mandate in this regard. There is, however, a clear and demonstrable link between energy and the environment, the latter a concurrent function in terms of the Constitution.

Energy is central to economic growth (the Constitution provides concurrency in relation to trade, regional planning and development, agriculture, i.e. the drivers of economic

growth), social development (the Constitution provides for concurrency in relation to public transport, regional planning and development, urban and rural development and road traffic regulation) and environmental sustainability (the Constitution provides for concurrency in respect of environment and pollution control). Accordingly, it is proposed that national legislation notwithstanding, the Province develop policy and legislation to the extent that it is necessary for the purpose of sustainable development of the Province, which includes its economic, social and environmental obligations.

2.1.2 National Environmental Legislation

The term 'environment' has been defined in the National Environmental Management Act 107 of 1998 ('NEMA') in section 1(1)(xi) as follows:

"*…the surroundings within which humans exist and that are made up of –*

(i) the land, water, and atmosphere of the earth;
(ii) micro-organisms, plant and animal life;
(iii) any part of combination of (i) and (ii) and the relationship among and between them; and
(iv) the physical, chemical, aesthetic, and cultural properties and conditions of the aforegoing that influence human health and well-being."

2.1.3 Obligations of the Provincial Government

Section 24 of the Bill of Rights states that everyone has a right to an environment that is not harmful to their health and well-being. It places an obligation on national and provincial government to protect the environment through legislative and other measures to prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. In this regard, it is not the intention of the Provincial Government to interfere with functions where they belong to national or local government.

In order to meet its obligations, it is submitted that the mandate will enable the Provincial Government to:

(i) ensure that its mandate in respect of economic growth and protection of the environment is realised through sustainable energy policies;

(ii) promote sustainability through sustainable energy generation and use;

(iii) set energy standards for the Province;

(iv) facilitate the production of cleaner energy at local level within the framework of national legislation.

(v) support local government to fulfil their responsibilities with regard to economic growth and sustaining energy efficiency within the Province.

2.2. The Legal and Policy Context

At present, national legislation covers the areas of energy, electricity and liquid fuels. It is envisaged that the Province will enact an appropriately titled framework *'Provincial Sustainable Energy Bill'* which will provide for provisions which are not covered by other legislation. These include sections dealing with financial mechanisms, demand side management and other related topics.

Provincial policy and legislation will be aligned to the national policy and legislative framework insofar as it is relevant to the obligations of the Province in order to develop a comprehensive sustainable energy legal framework for the Province in seeking to achieve the Western Cape's objectives set out in Chapter 3 below.

These will include:

2.1 **The Constitution of the Republic of South Africa, 1996**: provides the legal basis for allocating powers to different spheres of Government and contains a number of rights specifically relevant to the national energy policy.

2.2 **National Energy Act 34 of 2008**: to ensure that diverse energy resources are available in sustainable quantities and at affordable prices to the South African economy in support of economic growth and poverty alleviation.

2.3 **Electricity Act 41 of 1987:** the National Electricity Regulator (NER) has jurisdiction over the entire industry and regulates market access through licensing of all producers.

2.4 **The Petroleum Products Act 120 of 1977:** Price control is affected by this Act. The Minister remains the liquid fuels industry regulator and may prescribe the price at which any petroleum may be bought or sold, method of trading, publishing of prices and quantities of crude oil or petroleum products to be maintained by any person.

2.5 **The Central Energy Fund Act 38 of 1977:** is the enabling legislation in terms of which, *inter alia*, levies may be imposed on liquid fuels products for collection into of the Central Energy Fund and or the Equalisation Fund.

2.6 **National Energy Regulator Act 40 of 2004 :** establishes a single regulator to regulate the electricity, piped gas and petroleum pipeline industries.

2.7 **National Sea Shore Act 21 of 1935 and National Environmental Management: Integrated Coastal Management Act 24 of 2008** (insofar as wave energy is concerned)

2.8 **Environmental Management : Air Quality Act 39 of 2004**

2.9 **National Building Regulations and Buildings Standards Act 103 of 1997**

2.10 **The White Paper on Renewable Energy Policy of RSA (2003)**

2.11 **National Climate Change Response Strategy for SA (2004)**

2.3. The Role of the PGWC in Sustainable Development for the Western Cape.

i) Facilitation, Support and Leadership

Against its legislative framework and mandate, it is not suggested that the Provincial Government should act as a reticulating or generating authority of energy, but rather that it should act in a capacity which facilitates and stimulates the economy, combats climate change, improves public transport, promotes sustainable practices and supports local government. In this context, promoting renewable energy and energy efficiency is well within the Provincial Government of the Western Cape's (PGWC) mandate.

Energy concerns impact on a full range of sectors and activities and this issue is a prime example of an area requiring co-operation between the different spheres of government. The PGWC is actively seeking to co-operate with other government bodies around energy concerns, and proposes to provide assistance, support, and leadership. Through a process of internal discussion as well as public participation, the Provincial Government is attempting to ensure that its efforts to develop the renewable energy sector and promote energy efficiency are co-ordinated with the efforts of other spheres of government relating to energy.

The Provincial Government can also play a leadership role in this area, by ensuring that its internal functioning promotes energy efficiency, and that it supports research, development and implementation of cleaner energy production, distribution and consumption.

The kind of role that the PGWC wishes to adopt in relation to energy is consistent with the roles adopted by provincial governments across the world[5], and the PGWC is taking some direction in this matter from the governments with which it has twinning arrangements.

ii) Ensure Sustainable Development of the Province

The Provincial Government's objective is to have a Sustainable Energy Strategy and Programme of Action around economic and social development, housing, provision of public transport and environmental protection. The use of energy impacts on other natural resources such as water. If the Province takes a more sustainable approach towards energy it will impact on more sustainable resource consumption in general.

Accordingly, its role in the sustainable development of the Province can be seen as follows:

"*Sustainable development that will be achieved through implementing integrated governance systems that promote economic growth in a manner that contribute to greater social equity and that maintains the ongoing capacity of the natural environment to provide the ecological goods and services which socio-economic development depends on."* (SDIP, 2007)

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5 Flaunders, Belgium; Sao Paulo, Brazil; California, USA; Galicia, Spain.

The following principles are essential for sustainable energy provision:

- Development must link and enhance synergies between social justice, secure livelihoods, economic prosperity, community well-being and environmental integrity;
- Environmental justice and equitable access to resources should be promoted;
- An appropriate regulatory and policy framework should ensure that environmental and social costs are fully accounted for;
- Economic growth and development must stay within the ecological limits of the Province's natural resource base; and
- The participation of all interested and affected parties in governance should be promoted.

The implementation of these principles needs to include the following cross-cutting behavioural fundamentals and roles:

- Sustainability considerations should be mainstreamed into all policy, planning and decision-making processes;
- Appropriate institutional arrangements should be in place to ensure effective co-ordination and integration of sustainability considerations within all levels of government and other relevant organisations;
- Reliable and transparent reporting, monitoring and evaluation systems should be implemented and co-operative governance should be facilitated; and
- Good understanding, commitment and governance amongst all stakeholders should be promoted based on the principles of transparency, access to information, accountability, shared responsibility and empowered participation.

The implementation will need to be based on:

- Leadership through action;
- Building effective partnerships;
- Stimulating the market for renewable energy and energy efficiency;
- Implementing effective financial mechanisms; and
- Supporting local government.

In summary, the White Paper promotes a vision for sustainable development and concomitantly the Province's role in the implementation of its sustainable energy strategy for the Western Cape.

2.4. The Provincial Policy Context

The White Paper on Sustainable Energy has been developed against a set of high-level documents initiated by the PGWC, in particular, the Western Cape Provincial Growth and Development Strategy (IKAPA GDS) of 2007, the Sustainable Development Implementation Plan (SDIP) and the Provincial Strategic Agenda but more importantly the 2009/2010 5 year Strategic Framework of the Western Cape. The former studies have been followed by the drafting of the internal Sustainable Energy Strategy in 2007 and the Climate Change Response Strategy and Action Plan in 2008 whilst 2009/2010 Strategic Framework for the Western Cape provides the impetus for the development of the White Paper. In turn, the focus of each of these documents is spelt out below:

The 2009/2010 5 year Strategic Framework for the Western Cape

This document has not yet been published. Careful consideration has been given to the draft document and consequential amendments and alignment to the current White Paper. The White Paper will be amended if need be once the Strategic Framework document has been approved and formalised.

The Provincial Growth and Development Strategy ("iKapa GDS")

The Provincial Growth and Development Strategy's focus is on:

1. Growth of the economy and shared benefits thereof through key interventions - *inter alia* priority sector development, tourism, oil and gas industry expansion, renewable energy promotion, waste recycling, creative industries, and sustainable agriculture. The goal includes poverty reduction and second economy initiatives.

2. The evolution of a more equal and caring society through integrated human settlements, skills development and social transformation.

3. Ecologically sustainable development that includes an appropriate climate change response strategy with special reference to renewable energy and energy efficiency.

4. Greater spatial and transport integration.

5. Effective governance and institutional strengthening through good governance practices.

Sustainable Development Implementation Plan (SDIP).

The SDIP aims to provide a clear and sufficiently challenging action plan for sustainable development that focuses on those issues on which the Provincial Government can lead and take action. The primary emphasis of the SDIP is on identifying priority actions that integrate economic, social, and environmental concerns relating to the activities of the Province. A

particular focus is on identifying and responding to gaps in existing or emerging Provincial strategies.

The SDIP's primary focus is on:

- Sustainable human settlements;
- Energy provision and climate change mitigation;
- Sustainable water use and management;
- Sustainable waste management;
- Biodiversity management; and
- Sustainable transport provision.

One of the means to ensure implementation of the SDIP has been the drafting of the Climate Change Response Strategy and Action Plan in 2008, which has as one of its key outcomes a reduction of the province's carbon footprint.

Climate Change Response Strategy and Action Plan - 2008.

The Climate Change Response Strategy and Action Plan goals aim to strengthen the Province's resilience and its adaptive capacity to climate change. The Response Strategy and Action Plan is built on the following prioritised programmes:

- An integrated water supply and infrastructure management programme that integrates climate impacts and risks.
- Establishing clear links between land stewardship, livelihoods and the economy.
- Establishing a focused climate change research and weather information programme.
- Reducing the Province's carbon footprint – energy efficiency, development of renewable and alternative sustainable energy resources, effective waste management strategies and cleaner fuel programmes.

The White Paper translates the identified PGWC priority areas on sustainable energy into strategic measurable goals. It also forms the basis for establishing legislation and specific regulations that will enhance implementation and achievement of the strategic vision and goals. Hence, the White Paper is a document that is more specific than the SDIP and the Climate Change Response Strategy and Action Plan, but is not detailed at a micro level of implementation.

3. Chapter 3: Western Cape Sustainable Energy Goals

Energy security plays a crucial role in ensuring that the Province can meet its economic, social and environmental objectives, and that it will remain an attractive destination for investment. To this end, the Western Cape has six goals set out to achieve its sustainable energy objectives. These goals are grouped under Economic, Environmental and Social Areas and are outlined below.

3.1. Social Sustainability

Goal 1: Alleviate energy poverty

The links between energy poverty and under-development clearly exist. While the poor do have electricity, households either have no or few electrical appliances. If they do these are typically very inefficient appliances for example old refrigerators or hot plates for heating and cooking. Many of the informal settlements are regularly the scenes of large scale fires caused by the use of paraffin stoves in unsafe conditions. The cost of preparing meals or heating a room is typically higher for the poor than for people who can afford efficient and appropriate technologies. Time spent to access energy also disadvantages the poor.

Goal 2: Improve the health of the nation

Energy efficiency and increased use of renewable energy reduces the atmospheric emission of harmful substances such as smoke, oxides of sulphur and oxides of nitrogen. Such substances are known to have an adverse effect on health and are frequently a primary cause of common respiratory ailments. The health of the nation includes improving the health of the individual through improved indoor climate as well as the outdoor climate. Poor air quality (pollution) impacts on health and contributes to increases in respiratory diseases.[6]

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6 SDIP

3.2. Environmental Sustainability

Goal 3 : Reduce harmful emissions

Improved energy efficiency and increased use of renewable energy are cost effective methods to reduce greenhouse gas emissions, thereby combating climate change. Addressing climate change opens the door to utilising additional finance mechanisms such as the CDM to reduce CO_2 emissions.

Goal 4: Reduce negative footprints in our environment

The use of fossil fuels has a documented negative impact on the regional and local environment and biodiversity. The negative impact includes but is not limited to, ground water pollution and air pollution. Any reduction in the use of fossil fuels through switching to cleaner energy sources and more efficient energy uses is a success.

3.3. Economic Sustainability

Goal 5: Enhance Energy Security

The South African power black-outs that started first in the Western Cape in early 2006 alerted the Province to its energy vulnerability. It is essential that the Western Cape increases its resilience against external energy supply disruptions and the massive price fluctuations caused by national or international decisions.

Goal: 6 Improve economic competitiveness and job creation

It has been demonstrated internationally that one of the ways to improve economic competitiveness is by improving industrial and commercial energy efficiency. Support of industrial best practice energy management as a tool to stay competitive and improve the economy is important.

4. Chapter 4: Future Demand Side and Energy Efficiency Scenarios

4.1. Introduction

The production and use of energy does not take place in isolation. The Provincial Government of the Western Cape (PGWC) acknowledges the Province's current over-reliance on fossil fuels and high energy consumption per GDP output. This mirrors the national reliance on fossil fuels. The Western Cape has already demonstrated its vulnerability in the energy sector. The dramatic increase in the price of fossil fuels and electricity and the increased global scarcity of resources has pushed and continues to push prices upward.

The global position can be illustrated as follows:

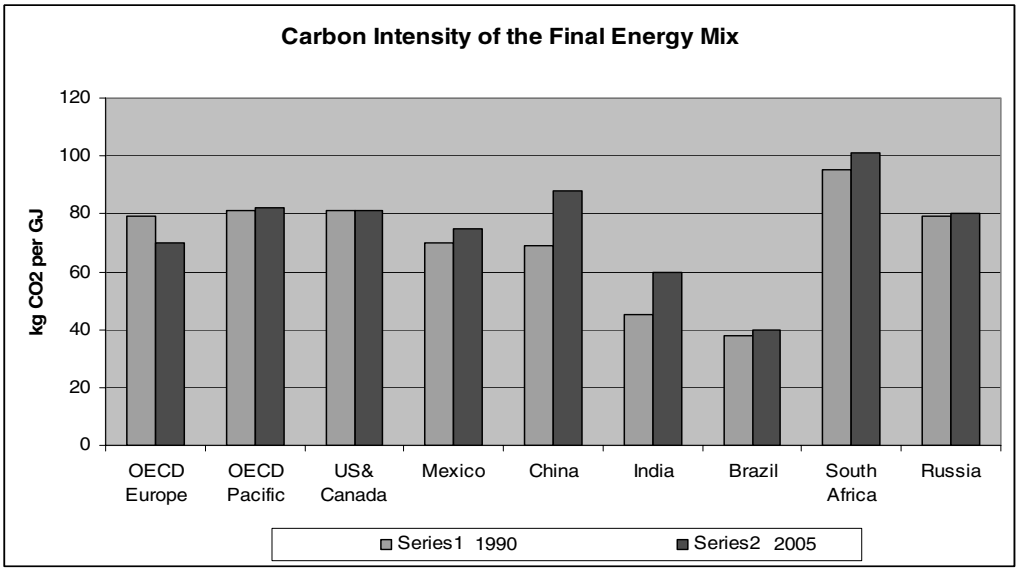

Figure 7: International Carbon Intensities.

Globally, participation on sustainable energy matters occurs through forums such as the United Nations where South Africa is a signatory to the Kyoto Protocol, whilst nationally the PGWC participates in alliances and strategic partnerships. This provincial initiative is, therefore, in alignment with the National White Paper on Energy. At the provincial and municipal level the PGWC also participates in partnerships in order to achieve the goals of the Sustainable Energy White Paper.

Against the above energy demand profiles an investigation into energy efficiency scenarios and options for the Western Cape was followed.

4.2. Energy Efficiency Scenarios for the Western Cape

The following future energy scenarios were created using the Long-Range Alternative Energy Planning modelling software.

Long-Range Energy Alternative Planning (LEAP) modelling

The simulation model, the Long-Range Energy Alternatives Planning (LEAP), was used to simulate how energy might develop in the Western Cape over the next 20 years. LEAP is an accounting framework, which rather than trying to optimise a system's behaviour, it helps the user account for the implications of "what if" questions. These developments are driven not only by the nature of the energy sector itself, but also by broader factors, notably population growth, household size, economic-growth (which may vary by sector) and other factors. Various 'scenarios' were developed and entered into the model based on the strategy targets, in order to assess the implications of meeting the targets. The target scenarios were then compared with the reference case – or 'business as usual', where no such interventions were pursued. This sometimes led to the revision of targets to be more realistic.

A range of implementation scenarios were modelled to assess their impact and feasibility. The following sectors are under discussion, namely transport, industry, commerce and government, and residential.

i) Transport

The energy profiles in Chapter 1 highlight the fact that liquid fuels and the transport sector make up a large portion of the total energy use in the province. There is significant scope for intervention in this sector that would have significant environmental and financial impacts. Some of the possible future transport interventions are illustrated below.

(a) Institutional Clarity[7]

The roles and responsibilities for the various transport modes (and infrastructure) have been delegated to different government spheres and parastatals by the Constitution, legislation or by national government. In terms of Schedule 4, Part B municipalities control municipal roads, bus and minibus-taxi infrastructure, and execute law enforcement. Commuter rail operations are controlled by SARCC/Metrorail. In terms of Schedule 4 and 5 respectively, Provincial government is responsible for provincial planning, roads and traffic.

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7 Schedule 4 and 5 of the Constitution 108 of 1996

(b) Modal shift

In the base year (2004) passenger-km[8] splits for passenger transport were 38 % private vehicles and 62% public transport. This is in contrast to the fuel use splits for 2004 where private transport uses approximately 78 % of the energy in passenger transport. A shift in transport use from private to public modes is necessary to ensure a more energy efficient sector.

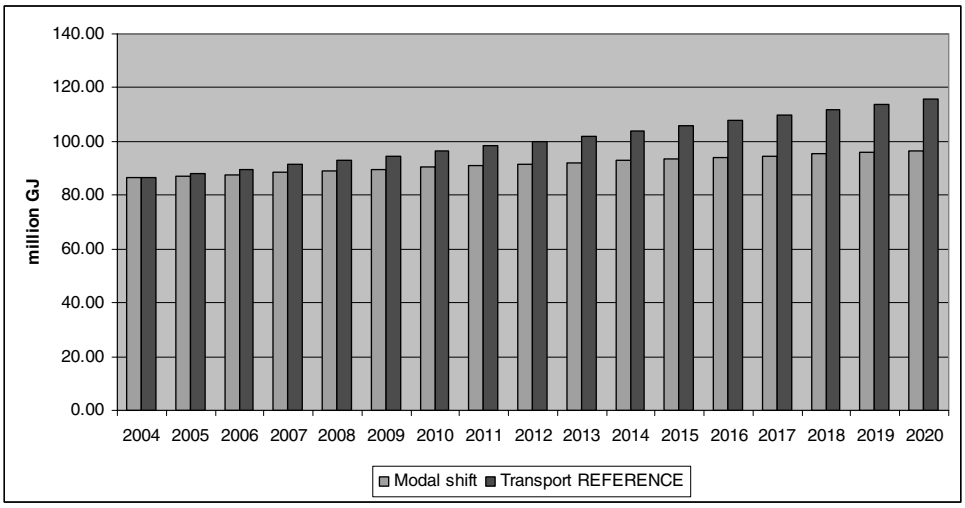

Figure 8: Energy use in passenger transport for the reference and modal shift scenarios

Such a shift implies massive changes in infrastructure, the costs of which are not reflected here but are addressed in the Strategic Infrastructure Plan. The cumulative financial savings for the modal shift scenario is calculated in figure 11 below.

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8 Passenger-km: number of passengers times by number of km over which they travel (a common transport analysis unit)

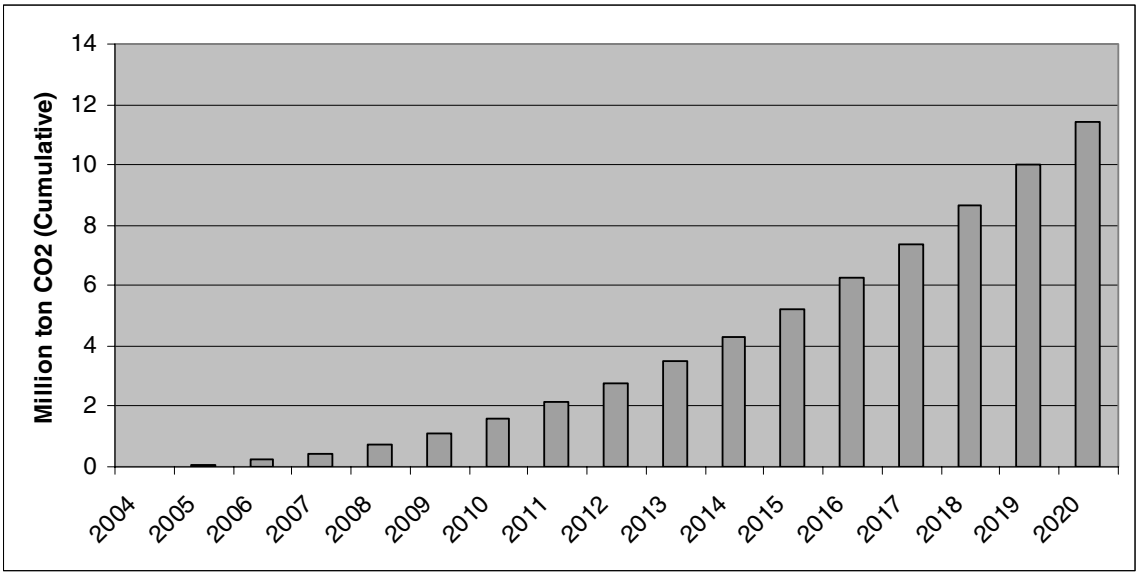

Figure 9: CO_2-eq emissions in passenger transport for the reference and modal shift scenarios

Similar trends can be observed for CO_2-eq emissions for the modal shift scenario. Note that the above figure on scenario CO_2eq reductions includes refinery emissions, not only emissions that occur where the fuel is combusted.

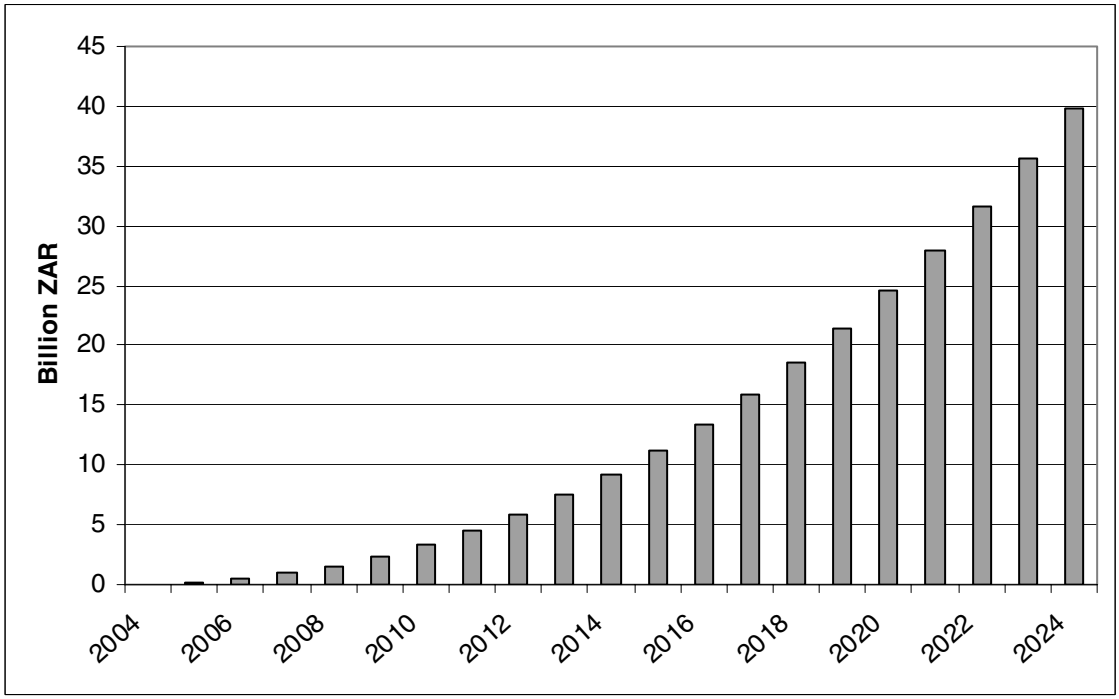

Figure 10: Cumulative financial savings for the modal shift scenario

The cumulative savings for the modal shift scenario are massive and reach almost R40 billion by the end of the time horizon. The cost of the infrastructure changes required for this modal shift have not been calculated but clearly the fuel savings alone could help subsidise those changes.

- **Taxi shift to diesel**

This policy option simulates the effects of a shift from petrol to diesel minibus taxis (which is the intention with the 'taxi recapitalisation' programme). It is assumed that this policy results in diesel taxis increasing their share from 38.2 % in the base year to 100% by the end of the time horizon.

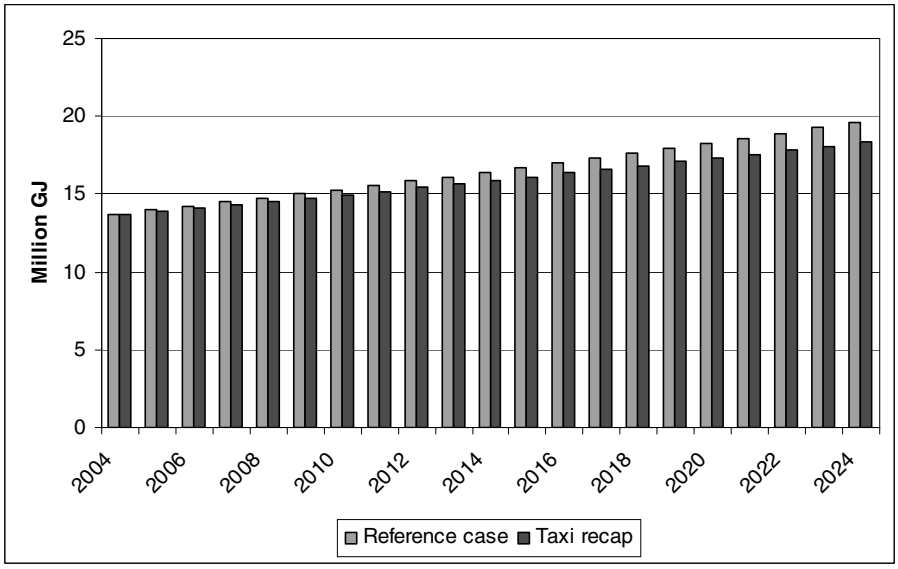

Figure 11: Energy use by minibus taxis for the reference and modal shift scenarios

It can be seen that there is a gradual increase in annual energy savings when comparing the scenario of taxis shifting to diesel with the reference case. This is due to the increased energy efficiency of diesel vehicles as opposed to petrol vehicles.

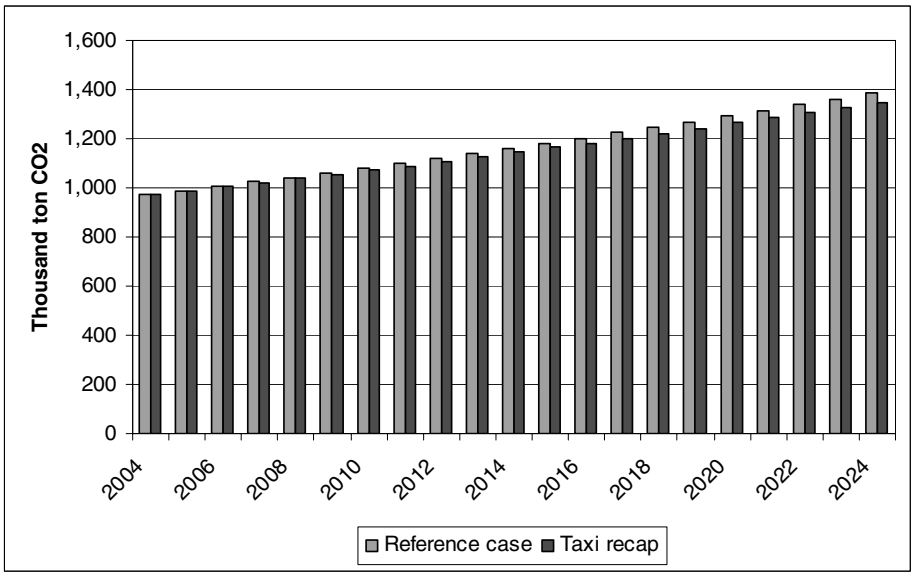

Figure 12: CO_2-eq emissions from minibus taxis for the reference and modal shift scenarios

Similar trends occur for CO_2-eq emissions for the taxi recapitalisation/shift to diesel scenario. The total CO_2-eq cumulative emissions savings would be just over 1.2 million tons in 2020. This includes refinery emissions, not only emissions that occur where the fuel is combusted.

The cumulative savings for the taxi recapitalisation scenario may be significant and could reach over R3 billion by the end of the time horizon. The cost of the infrastructure changes required for this scenario has not been calculated.

(c) Key Issues and Challenges in respect of the transport sector for the Province.

An effective transport policy that is based on the principles of sustainability and energy efficiency will need to be addressed amongst the different role-players. The Province faces the following issues and challenges:

- Integrated public transport system: Support the integration of all public transport modes to operate effectively and efficiently as an integrated public transport system

- Modal Split: The challenge is to dramatically improve the modal split in favour of public transport with supply and demand-side interventions. The National White Paper proposes a 80:20 split.

- Transport Demand Management: An effective strategy should be developed to manage the dramatic increase in private car trips through a package of interventions.

- Transport Funding: Public transport has been under-funded resulting in much higher transport costs to the economy through private transport costs (perceived and real) and indirect costs such as parking, road accidents, emissions etc.

- Non-motorised transport: Improve public transport and prioritise non-motorised transport to reduce dependence on motor cars and fossil fuels.

- Re-shape Cities: This is a long term challenge to densify cities, reduce transport demands and shorten travelling distances.

(d) Options for the Province in respect of the transport sector

The overall objective is to increase mobility and access to opportunities, and in so doing, to improve the quality of life in a sustainable manner. To this end, in order to address the challenges outlined above, the following options have been identified:

- *Public Transport*: Improve public transport and infrastructure to reduce dependence on motor cars and fossil fuels; create an environment for the modal shift from reliance on private transport to public transport; introduce efficient government fleet management options and policies for the government motor transport service; support for the establishment of integrated public transport systems in the Province; enhance and facilitate the coordination of processes for planning, design, funding and/or implementation of projects; enhance and support transport infrastructure and services within the communities.

- *Air Quality:* Initiate clean transport initiatives; cleaner fuels; reduce transport pollution by exploring significant potential for innovative programmes and projects with the aim of reduction the brown haze and pollution; reduce, and where possible eliminate, pollution from a variety of sources especially vehicular emissions.

- *Institutional Arrangements:* Implementation of sustainability principles in all transport related policies, plans and projects; identify the role of various government agencies in the development of a sustainable transport system; indicate the commitment of the PGWC to improving mobility through Non Motorised Transport Systems for example and supporting local and district municipalities; the policies and programmes should demonstrate the importance of supporting the programmes and services for getting maximum benefit from investment and infrastructure.

- *Non Motorised Transport Systems (NMTS):* Non motorised transport (NMT) includes all forms of transport that are human or animal powered, eg. cycling, per-ambulating, bicycle taxiing, rickshaw riding etc. Enhance investments in infrastructure to promote NMT; support the development of infrastructure to enable the use of NMT such as the construction of bicycle and pedestrian networks; facilitate the implementation of the NMT system; provide and support the rolling out of NMT projects.

- *Education and Awareness:* raise the level of awareness and education.

ii) Industry

- **Energy efficiency**

In this scenario industry has a 20% improvement in energy efficiency by 2015, which increases linearly from the base year, 2004. After 2015, the energy intensity of all industries remains constant. The efficiency improvements occur in electricity demand devices as well as suppliers of thermal heat. The improvements are likely to come from lighting, compressed air, motors, variable speed drives, improved boiler efficiency as well as steam system efficiency.

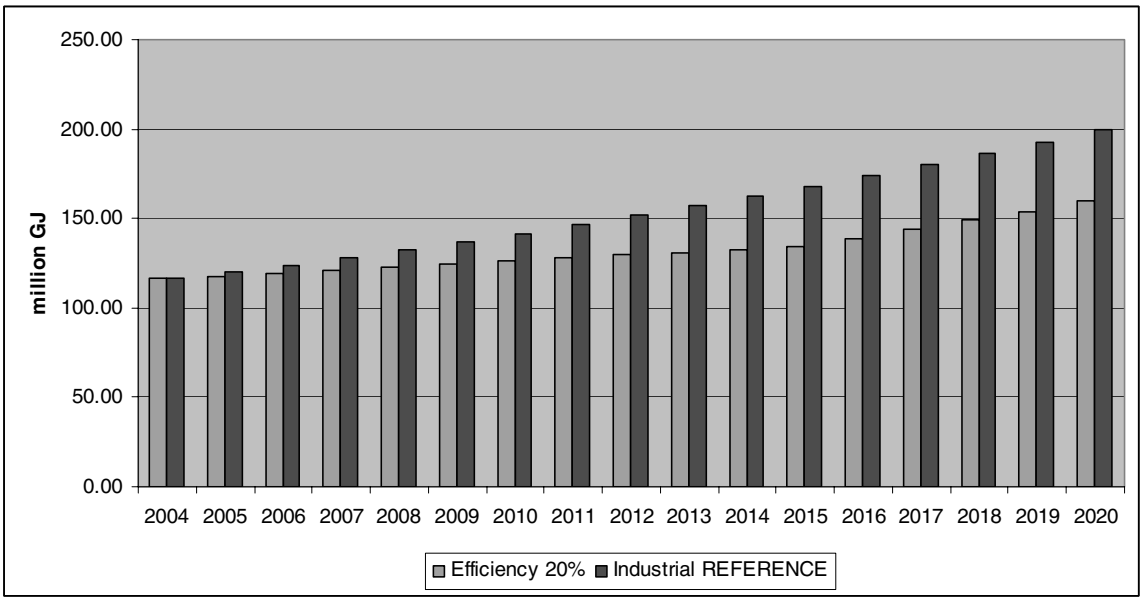

Figure 13: Energy use in the industry sector for the reference and energy efficiency scenarios

A significant increase in annual energy savings can be observed when comparing the energy efficiency scenario to the reference case. The cumulative energy savings by 2020 for the energy efficiency scenario was more than 367 million GJ when compared to the reference case.

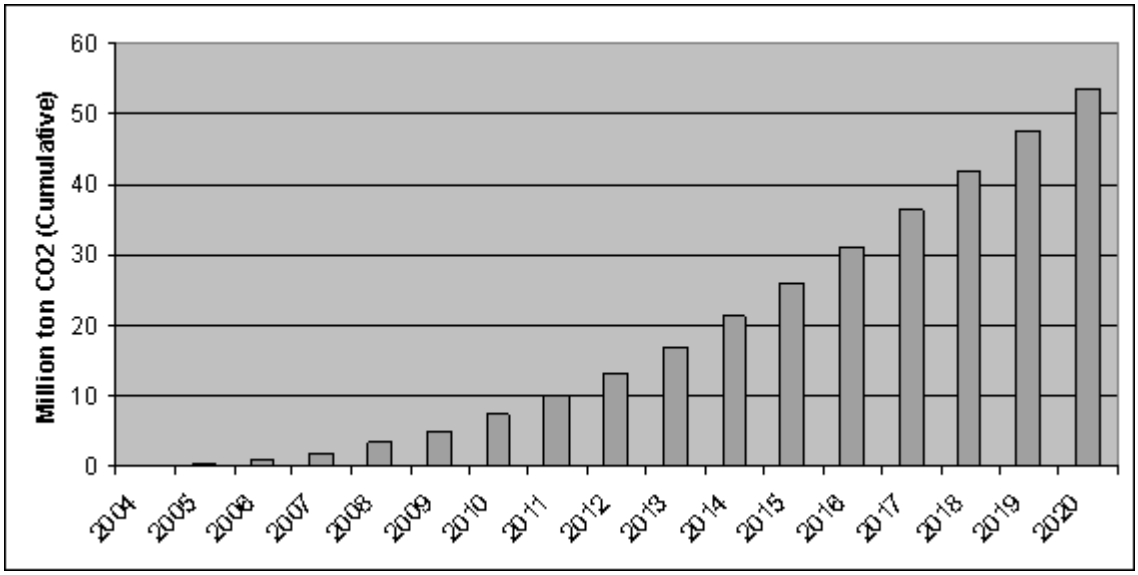

Figure 14: CO_2-eq emissions from the industry sector for the reference and energy efficiency scenarios

Similar trends can be observed for CO_2-eq emissions when comparing the energy efficiency scenario to the reference case resulting in a cumulative CO_2-eq emissions savings of more than 35 million tons.

- **Fuel switching**

In this scenario fuel switching takes place between coal and natural gas only. The scenario takes effect in 2004 and by 2024, the end of the time horizon, half of all thermal energy demand supplied by coal is replaced by natural gas.

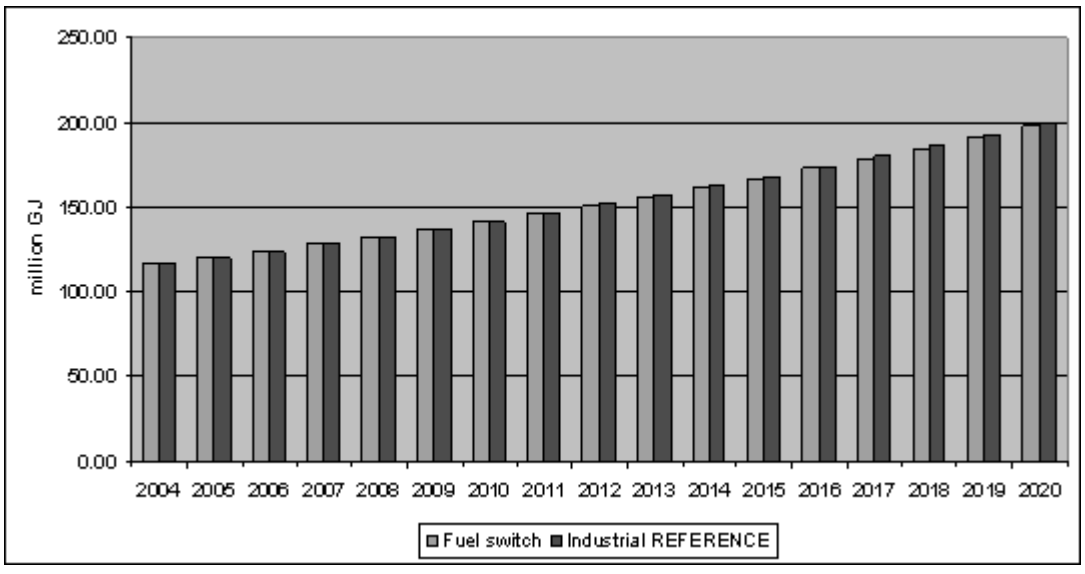

Figure 15: Energy use in the industry sector for the reference and fuel switching scenarios

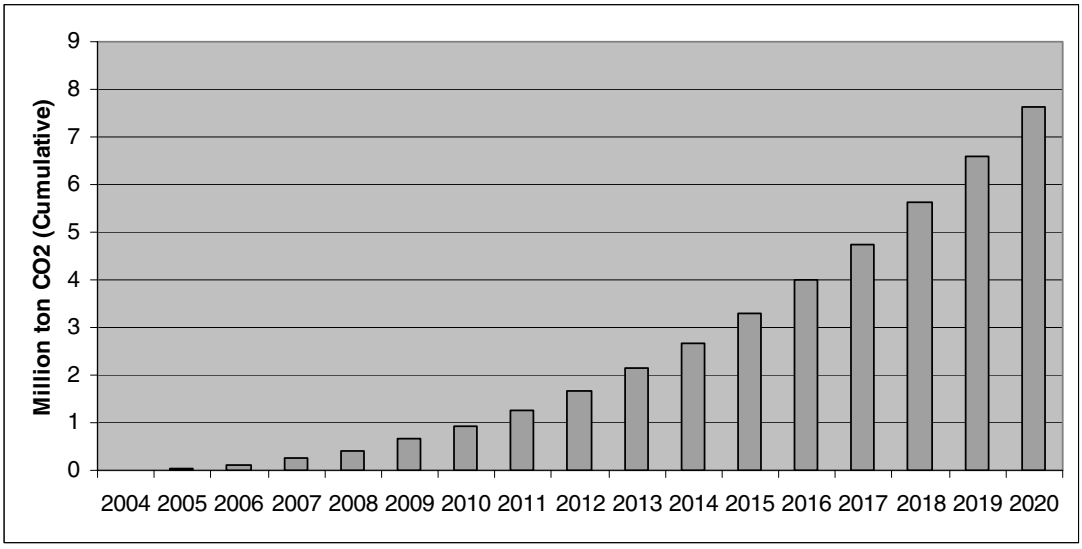

Figure 16: Cumulative CO_2-eq emissions savings from the industry sector for the reference and fuel switching scenarios

A more significant decrease can be seen in CO_2-eq emissions when comparing the fuel switching scenario to the reference case. A cumulative CO_2-eq emissions savings of just over 7 million tons could be expected for the fuel switching scenario

The fuel switch to renewable energy has not been fully explored. The challenge in respect of the transport sector is its high energy consumption. The transport sector accounts for 54% of the total of Cape Town consumption.[9], the second largest energy consumer. The importance of an affordable clean energy public transport system cannot be overemphasized in addressing socio-economic sustainable issues.

III) Commerce and Government

- **Lighting**

In commercial and government buildings, both fluorescent tubes and 'regular' lighting is currently used. Regular incandescent light bulbs may be replaced by the more efficient compact fluorescent lights (CFLs).

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[9] October 2008 : Sustainable Energy Strategy and Programme of Action for the Western Cape

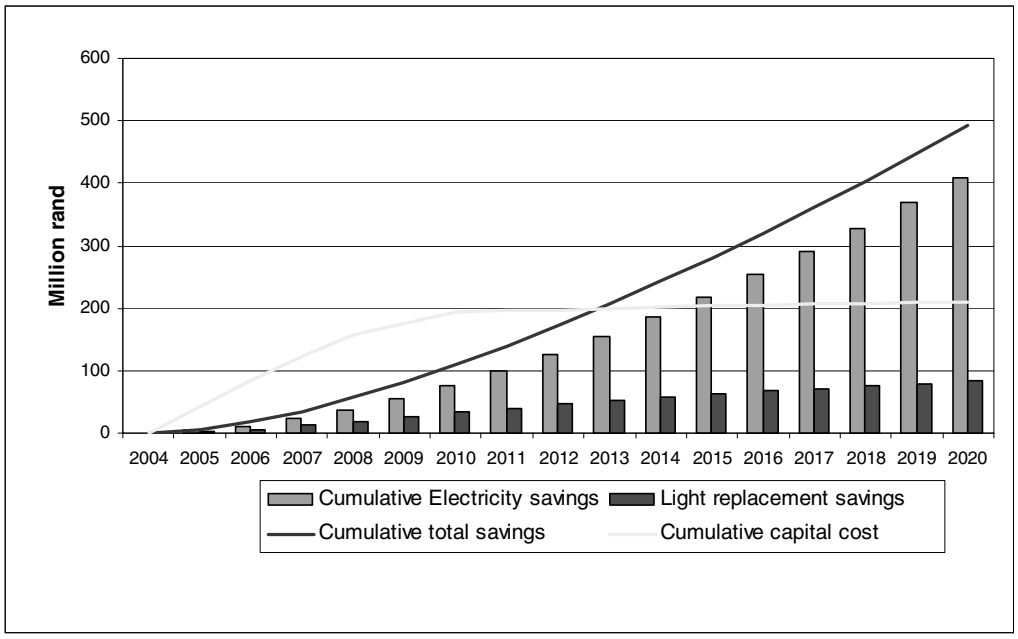

Figure 17: Cumulative costs and savings for the lighting scenario in the commercial sector relative to the reference case

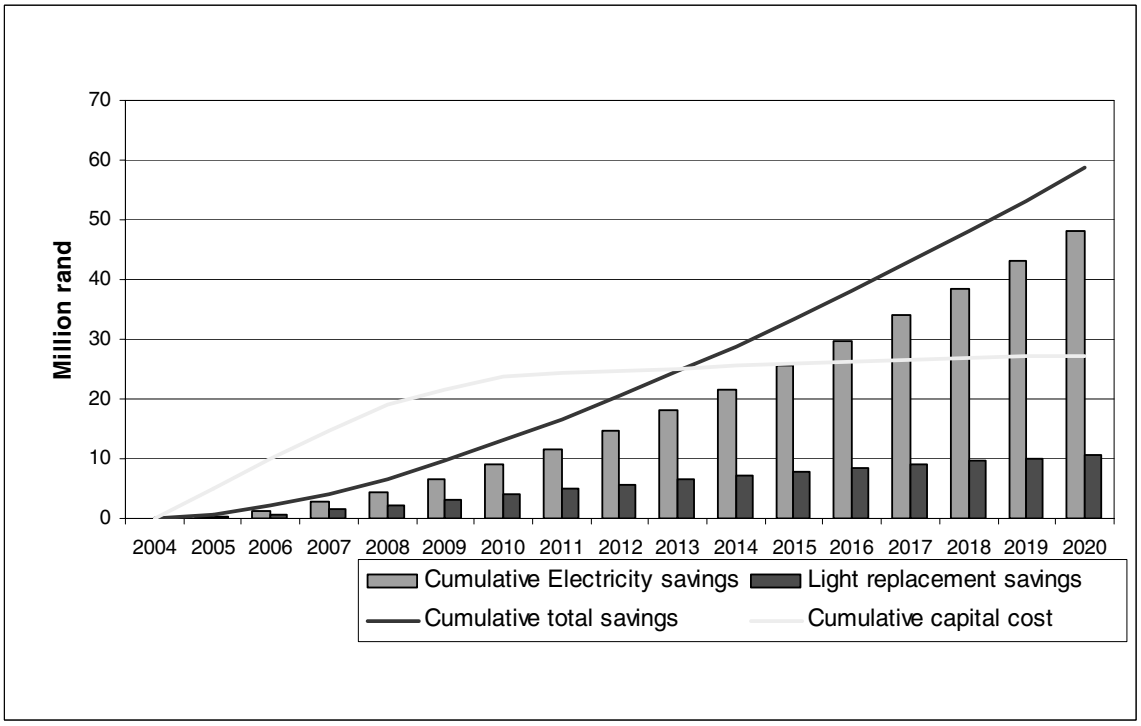

Figure 18: Cumulative costs and savings for the lighting scenario in the government sector relative to the reference case

It can be seen that the lighting scenario results in large savings in both the commercial and government sectors. The combination of the energy savings from using more efficient devices and the light replacement savings from the longer lifespan of the CFLs compared to the

incandescent light bulbs far outweigh the higher cost of the CFLs compared to the incandescent light bulbs.

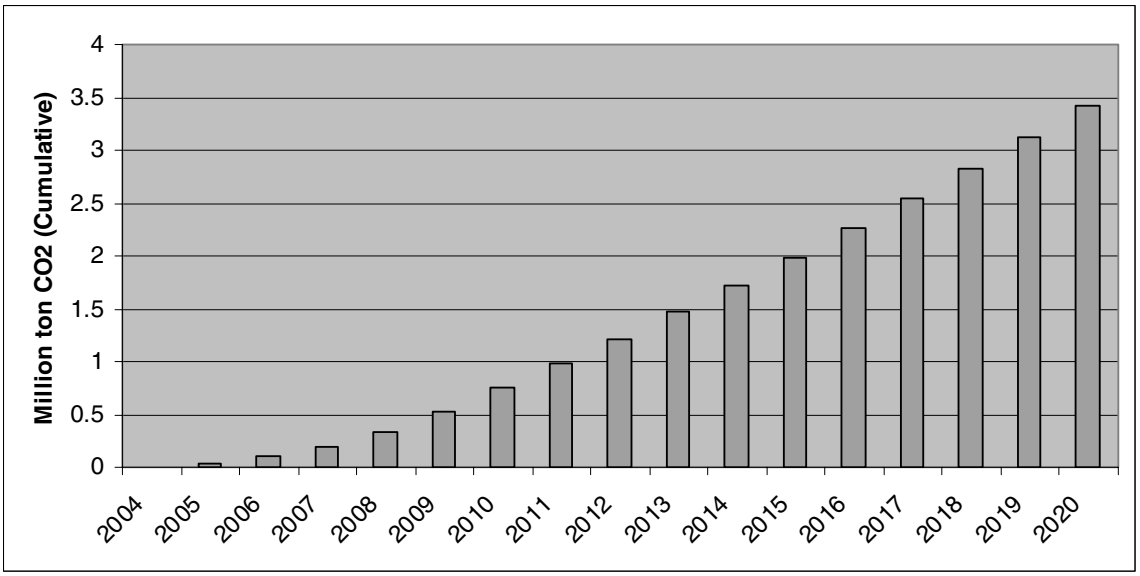

Figure 19: Cumulative CO_2-eq savings for the commercial sector for the lighting scenario relative to the reference scenario

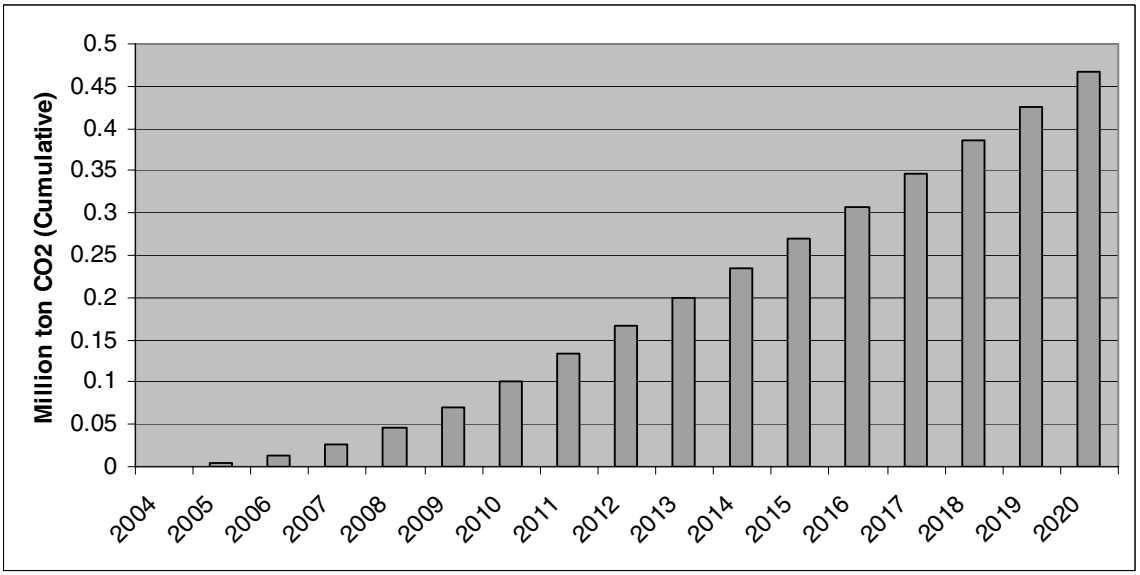

Figure 20: Cumulative CO_2-eq savings for the government sector for the lighting scenario relative to the reference scenario

Significant savings in CO_2-eq emissions can be observed in both the commercial and government sectors for the lighting scenario.

- **Heating, ventilation and cooling (HVAC)**

Experience with audits in the government and commercial sectors has shown that improving efficiency of HVAC use by 10% by user behaviour change (such as switching off lights and equipment when not in use) can relatively easily be achieved (Monamodi & Borchers 2003).

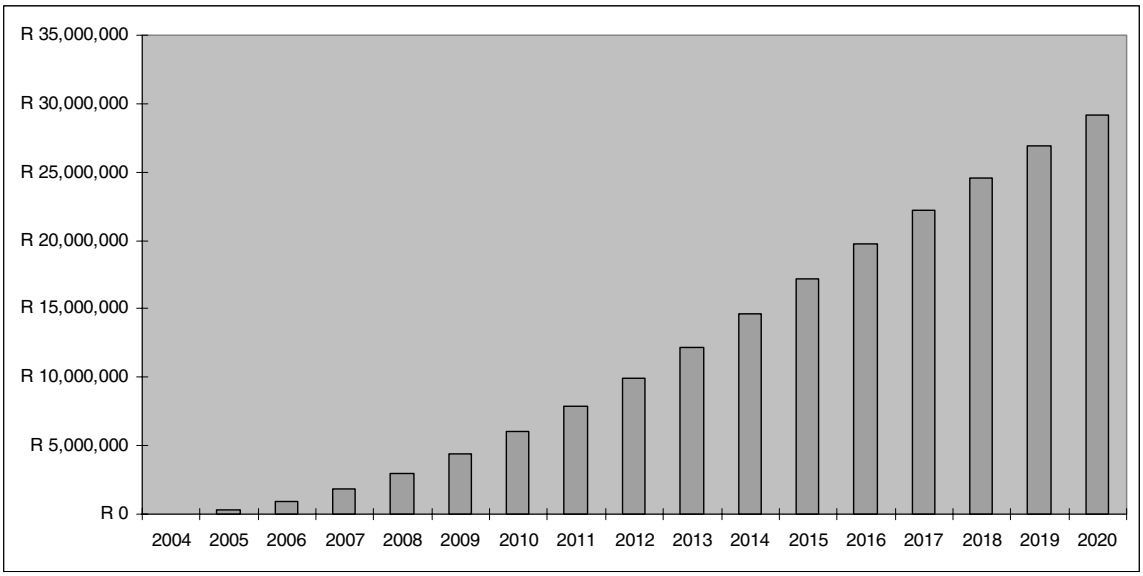

Figure 21: Cumulative energy savings for the HVAC scenario in the government sector relative to the reference case

Cumulative energy savings of over 200 million rand in the commercial sector and 29 million rand in the government sector could be expected for the HVAC scenario by 2020.

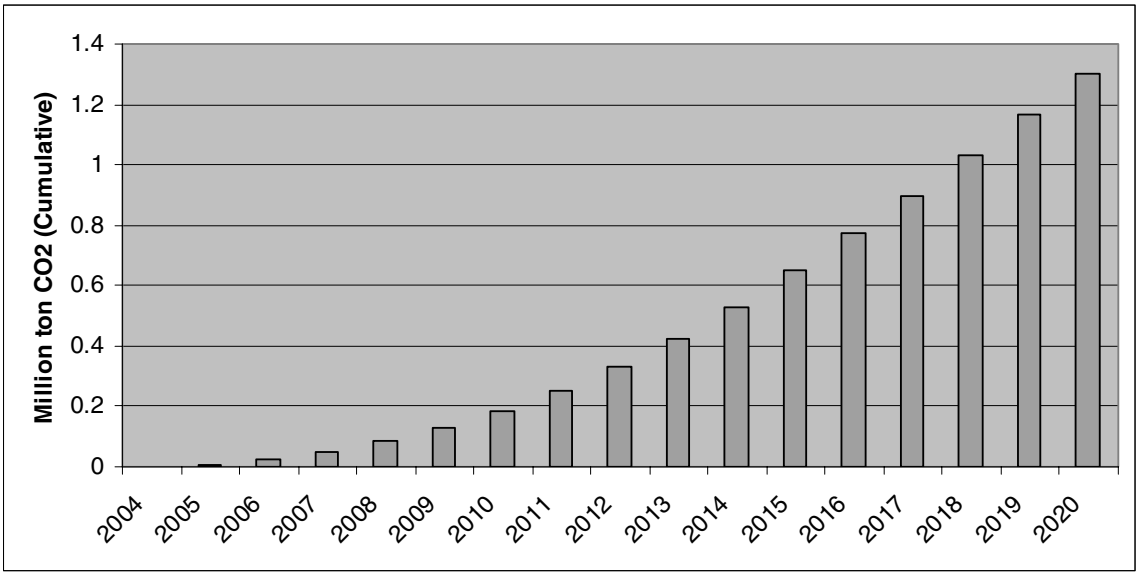

Figure 22: Cumulative CO_2-eq emission savings for the commercial sector for the HVAC scenario relative to the reference scenario

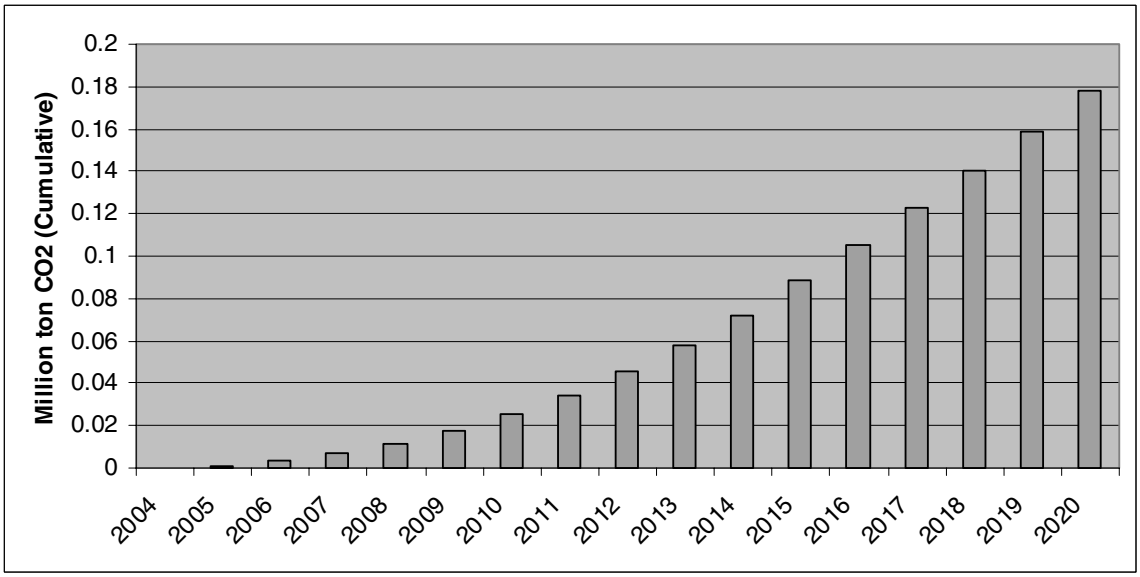

Figure 23: Cumulative CO_2-eq emission savings for the government sector for the HVAC scenario relative to the reference scenario

Cumulative savings in CO_2-eq emissions of over 1.2 million tons in the commercial sector and 180 thousand tons in the government sector could be expected for the HVAC scenario by 2020.

iv) Residential

- **Solar water heaters**

The solar water heater (SWH) scenario assumed that 10 % of electric geysers were replaced by solar water heaters by 2015 in electrified households, and 50% by 2024. For low income households, a solar fraction of 80% was assumed due to the typically reduced hot water use of such households and therefore the greater ability of the SWH to meet most water heating needs.

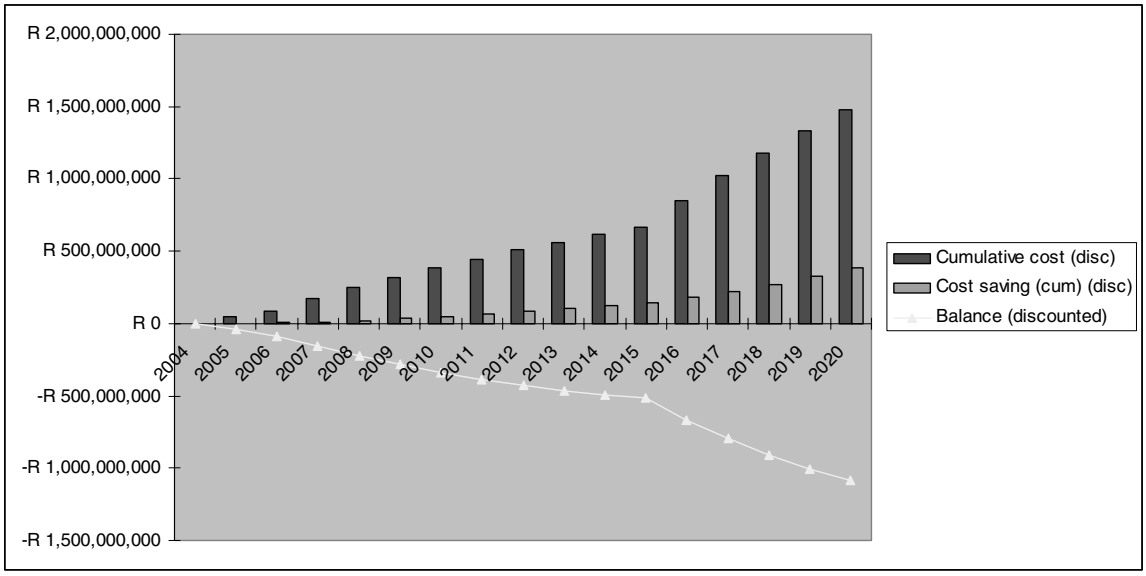

Figure 24: Cumulative costs and savings from rolling out a mass SWH programme

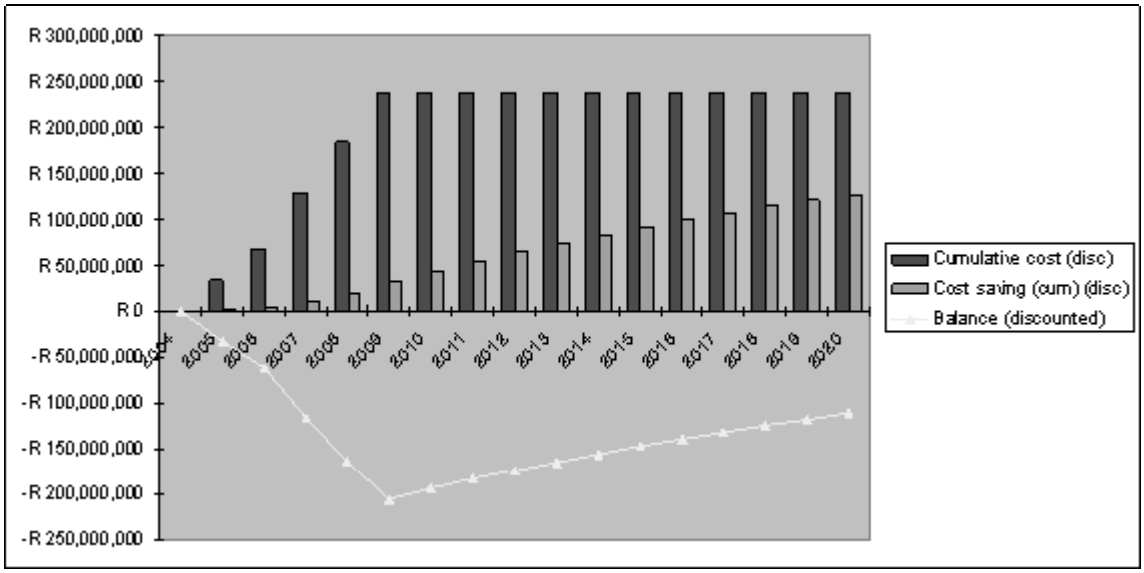

Figure 25: Cumulative costs and savings from a mass SWH programme – where investment in new systems stops at 2010)

The financial viability of installing solar water heating systems in low income as opposed to med-high income households is shown in the below figures.

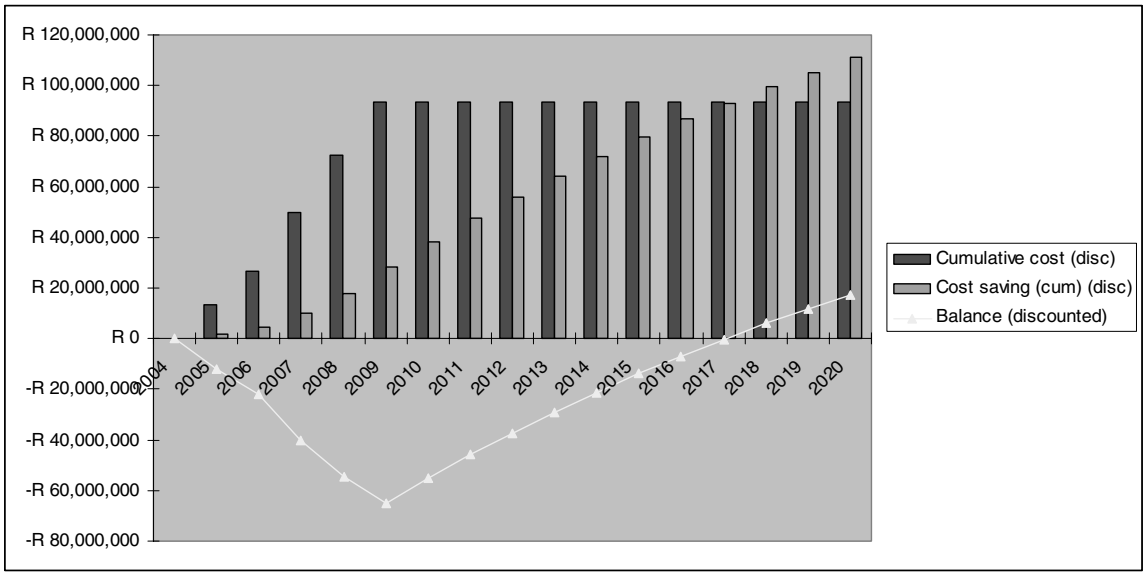

Figure 26: Cumulative costs and savings from a mass SWH programme – where investment in new systems stops at 2010 – <u>med-high income</u> sector only

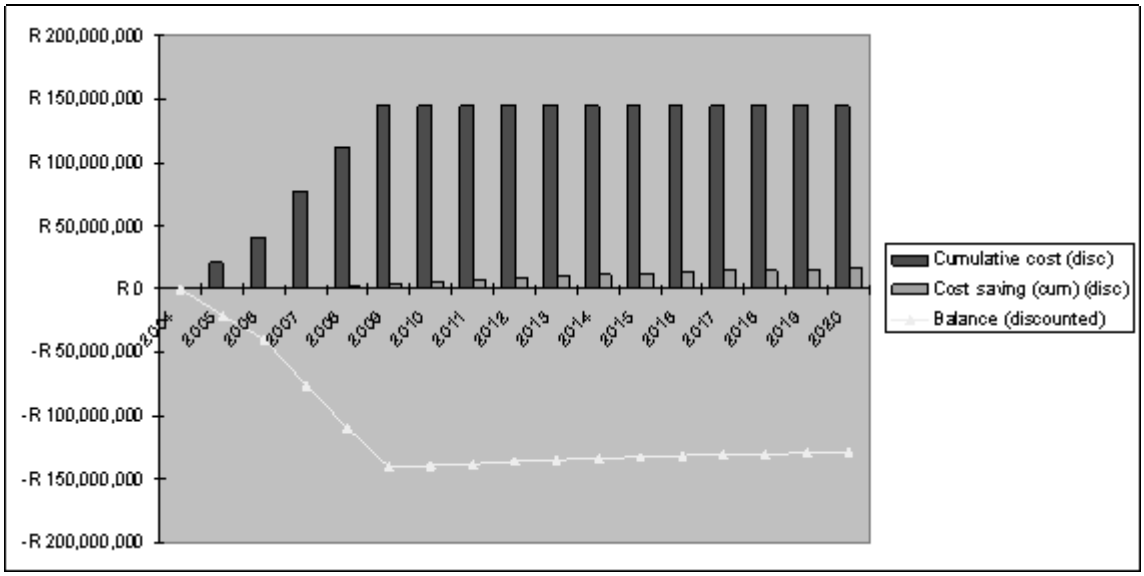

Figure 27: Cumulative costs and savings from a mass SWH programme – where investment in new systems stops at 2010 – <u>low income</u> sector only

The results for implementing a solar water heating programme in the low income households may not be financially attractive, in contrast to the medium-high income sector as low income

households use less electricity for water heating than medium-high income households. There are also numerous other benefits to installing SWH's in this income group, including health and welfare benefits.

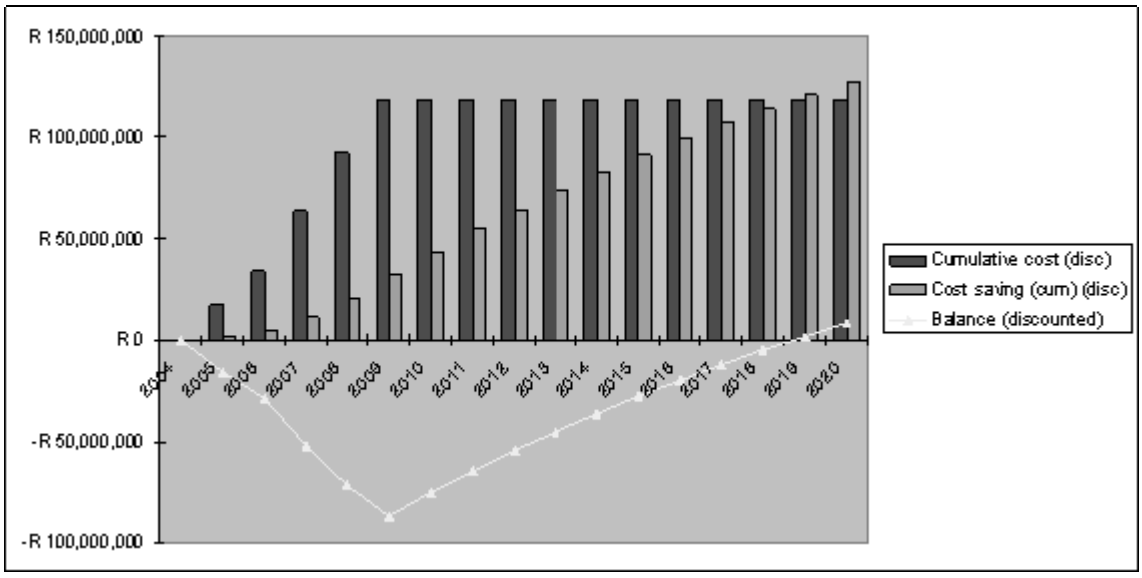

Figure 28: Cumulative costs and savings from a mass SWH programme – where investment in new systems stops at 2010 – system cost of R3000 achieved.

If however the cost per solar water heating unit was reduced to R3000, the programme savings would become positive by 2018 for the residential sector as a whole.

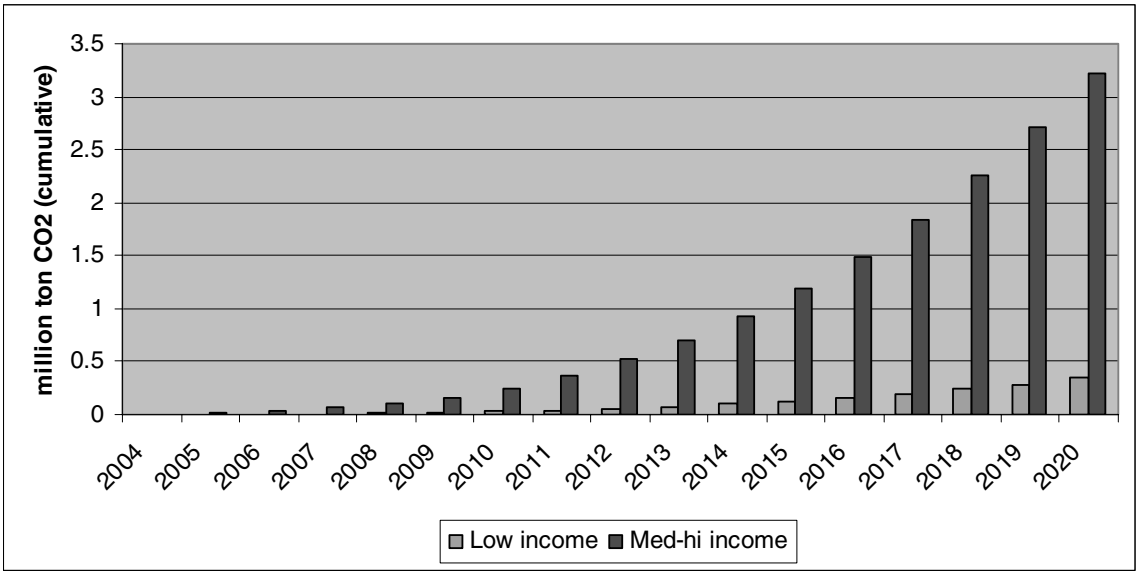

Figure 29: Cumulative CO_2-eq emission savings from a solar water heater programme in the residential sector

A cumulative savings of over 3 million tons of CO_2-eq emissions by 2020 would result from implementing a solar water heating programme in the medium-high income sector, as well as a cumulative savings of over 340 thousand tons of CO_2-eq emissions in the low income sector.

- **Residential lighting**

This scenario simulates a shift from incandescent lights to CFLs in all electrified households by 2010. A two bulb retrofit was assumed for low income households (1x16W and 1x11W) while a four bulb retrofit was assumed for medium-high income households (4x16W).

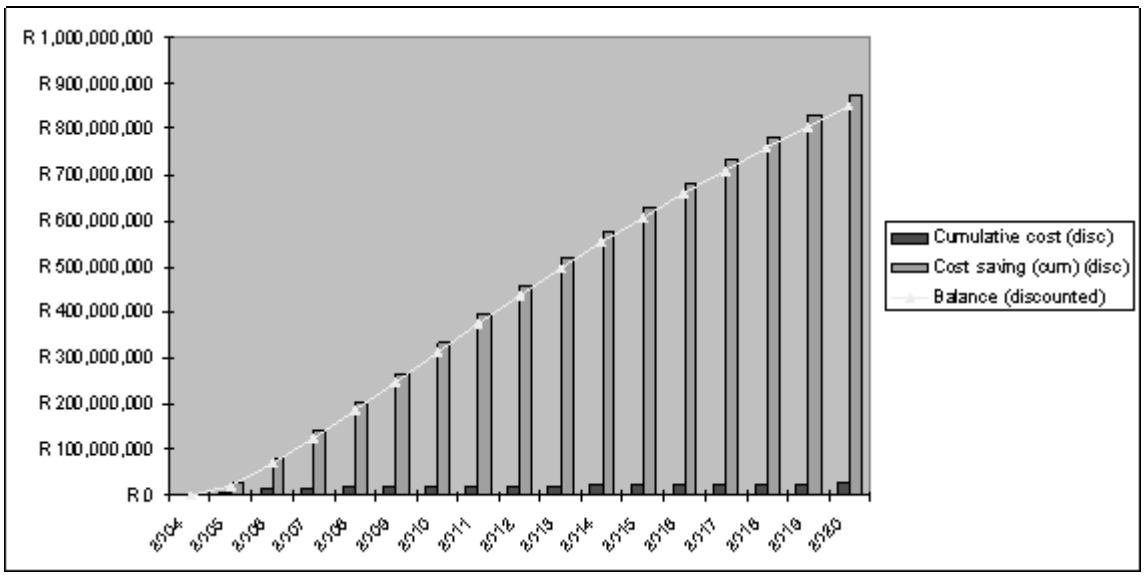

Figure 30: Cumulative costs and savings for the residential lighting scenario in all income group households relative to the reference case

The residential lighting scenario results in enormous energy savings in both the medium-high and low income sectors. The combination of the energy savings from using more efficient devices and the light replacement savings from the longer lifespan of the CFLs compared to the incandescent light bulbs far outweigh the higher cost of the CFLs compared to the incandescent light bulbs.

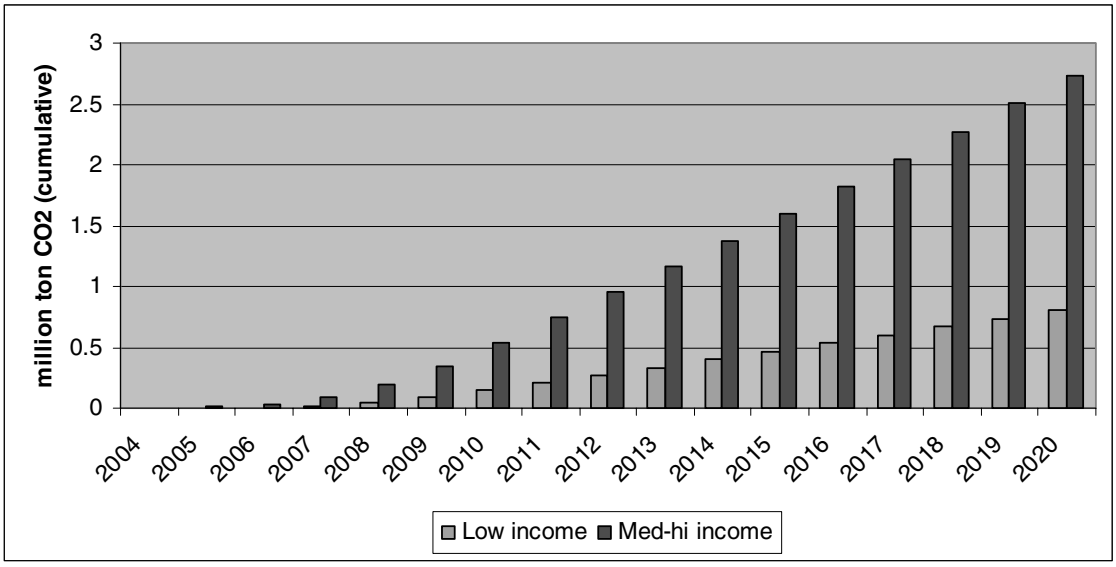

Figure 31: Cumulative CO_2-eq emission savings for the residential lighting scenario relative to the reference case

Cumulative CO2-eq emission savings of 2.7 million tons could be expected in the residential lighting scenario in the medium-high income sector and almost 0.8 million tons in the low income sector by 2020. The installation of ceilings in low income households would result in less thermal energy being required which in turn would lead to less electricity and other fuel being consumed for space heating.

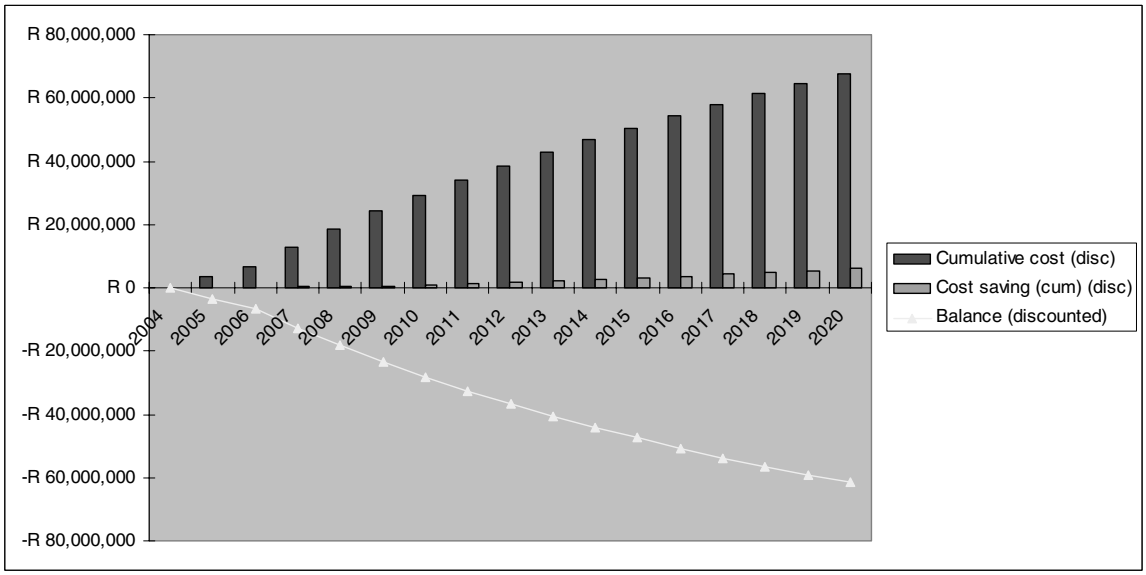

Figure 32: Cumulative costs and savings for the residential ceiling scenario relative to the reference case

The energy savings in the residential ceiling scenario do not outweigh the capital cost of the ceiling installation and result in a cumulative cost of over 60 million Rand by 2020. Against this financial assessment must be weighed the significant health and comfort benefits of ceilings in households.

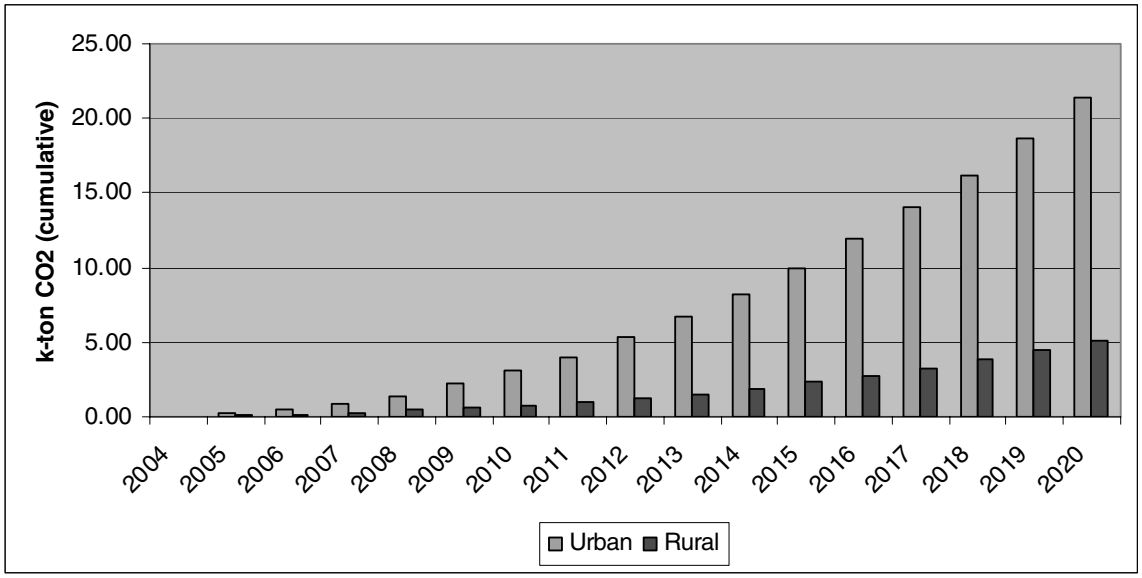

Figure 33: Cumulative CO_2-eq emission savings for the residential ceiling scenario relative to the reference case

The residential ceilings scenario resulted in a cumulative savings of 21 thousand tons of CO_2-eq emissions in urban households and a cumulative savings of 5 thousand tons of CO_2-eq emissions in rural households by 2020.

4.3. The Role of Provincial Government

(i) Facilitating the Process and Programmes:

Many of the interventions explored can be promoted and implemented directly by individual municipalities. Province is thus an important catalyst in the process of driving the processes and programmes to develop a sustainable energy system as is envisaged in the *Provincial Sustainable Energy Strategy.*[10]

[10] October 2008: Sustainable Energy Strategy and Programme of Action for the Western Cape.

(ii) Facilitating the development of a Demand Side and Energy Efficiency Programme through Policy Choices.[11]

The following policy choices will promote demand side management, renewable energy and energy efficiency programmes:

- Promote and implement Integrated Public Transport Systems to ensure an integrated, accessible, well-managed and maintained transport system throughout the Western Cape, which is recognised as making efficient uses of resources and being socially just, in a way that advances broader developmental aims and objectives. Support the integration of all public transport modes to operate effectively and efficiently as an integrated public transport system. Active promotion of public transport modes, implementation of public transport and modal shift plans, and support to municipalities around implementation of smaller-scale public transport initiatives.

- Dramatically improve the modal shift from private transport to public transport.

- Promote the use of non motorised and public transport to enable access to social, economic and recreational resources at affordable levels, especially the poor. Improve public transport and prioritise non-motorised transport.

- Develop Institutional Arrangements and Developments. Information development and dissemination on strategies, financial benefits thereof, and programme implementation. Facilitate bulk supply of products where appropriate; support local government with implementation via development of pro-forma by-laws, regulations and guidelines.

- Facilitate the development of financing mechanisms for solar water heaters, and liaising with national government in this regard.

- Develop and support Clean Energy Development Mechanisms or other province-wide projects to secure carbon revenue and lowering of transaction costs.

- Promote the switch from fluorescent tubes and regular lighting to more efficient compact fluorescent lights.

- Improve efficiency of HVAC use by user behaviour change through education programmes.

- Facilitate and support effective projects such as wind farms and other renewable energy projects.

- Increase research and development into energy efficient interventions and sustainable energy use. Improve and create supporting services such as training and education.

- Increase and raise the focus on information dissemination.

- Introduce incentives for energy efficient interventions and initiatives where possible.

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[11] The challenges and barriers of the Policy Choices discussed are dealt with under separate chapters. See chapters 4.4 and 5.

(iii) Supporting Local Government Programmes and Initiatives

This initiative will ensure that the key targets and initiatives that require the full participation of municipalities are effectively implemented.

The role of municipalities primarily revolves around implementation and municipalities will be supported to undertake energy related climate change programmes and initiatives such as:

- Municipal actions to implement demand side and energy efficiency programmes.
- Actively embarking on a sustainable energy path, through developing specific sustainable energy plans and strategies.
- Development and dissemination of information specific to the municipality (using resources provided by Province).
- Implementation of efficient lighting in residential, commercial and government sectors.
- Promotion of efficiency in industry.

(iv) Research and development of a Western Cape Provincial Sustainable Energy Act

A Western Cape Energy Act will be developed under the provincial mandate of climate change to regulate the following:

- Provision of data by municipalities to assist PGWC to reduce greenhouse gases.
- Energy related planning by municipalities such as zoning approvals to include energy measures and energy efficiency in industrial and commercial buildings.
- The promotion of solar water geysers.
- The promotion of bicycle and foot paths.
- The establishment of institutional arrangements for clean energy in the Western Cape.

(v) The role of local government

Local government in the Western Cape forms an integral part of the development and implementation of the White Paper. Building on the efforts of the Department, local government must aim at identifying its communities and sectors that are most vulnerable to climate change and economic loss in an attempt to minimise potential impacts.

Local Government's role may be seen as:

- Assessing the short to medium term impacts of climate change in its respective areas by determining the degree to which existing systems can adapt in response to changed climatic conditions. This includes an assessment of the direct impact on natural resources, as well as secondary impacts on the socio-economic environment and the livelihood of communities.

- The Province together with local government, local partners and national government will be required to develop energy baseline studies and effective integrated sustainable energy strategies.

- Local government must work in cooperation with the PGWC so that the Provincial energy targets can be achieved. Areas of cooperation may include:

    1. Increase energy efficiency in all municipal buildings: Embark on energy conservation measures to be applied in all local government owned and used buildings; audit of existing energy consumption in buildings; identification of potential measures for improved energy efficiency; systematic use of more efficient techonologies and energy consumption practices.
    2. Increase the public transport share of total transport modal shift, decrease the number of private vehicles into the city centre: focus on improving quality of public transport to the city centre; develop 'park and ride' facilities around the city centre; improve public transport within the city centre; and explore disincentives for private vehicles.
    3. Assist in providing non motorised transport: develop and implement a non motorised transport strategy; bicycle plan, information and awareness campaigns to encourage the use of bicycle and pedestrian pathways.
    4. Assist in installing solar water heaters in municipality owned housing.
    5. Assist in improving energy efficiency in the residential sector through energy efficient water heater by-law legislation, facilitating of the creation of EE mass roll out businesses, information dissemination campaigns.
    6. Assist in improving energy efficiency in industrial and commercial facilities: information dissemination campaign on efficient lighting use in partnership with organised business.
    7. Embark on initiatives to drive renewable energy supply and reduce CO_2 emissions.
    8. Assist Province to support economic competitiveness and increasing employment through its energy strategies and initiatives.
    9. Assist in meeting the Province's energy needs in a sustainable way thus fulfilling its constitutional and global responsibilities.
    10. To promote and advance sustainable energy.[12]

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[12] This is not an exhaustive list of options or interventions.

4.4. Viability and Challenges of the Energy Efficiency Measures

Table 5: Viability of Energy Efficiency Measures

	Efficiency Measure	Financial Feasibility	Social Benefit	Environmental Benefits	Implementation Priority	Challenges
Residential	SWH	✓	✓	✓	Immediate	Establishing suitable financing mechanisms may be institutionally demanding. Also, appropriate standards for equipment and operation need to be in place; increasing electricity consumption at household scale.
	CFL	✓	✓	✓	Immediate	Dissemination of CFLs and information poses a minor challenge. Creating means for effective disposal of CFLs.
	Ceilings	✓	✓	✓	Medium-Term	Installation costs are alternative in the low-income residential sector. To use insulated panel construction in the low income residential sector.
Commercial & Government	CFL Spot Lighting	✓	✓	✓	Immediate	Information dissemination poses a minor challenge; information and education to ensure behaviour changes; training to professionals
	HVAC efficiency	✓	✓	✓	Immediate Medium to long term	Information dissemination to ensure behaviour change poses a minor challenge. Training to professional industry

Industry	Efficiency Operating efficiency	-	✓	✓	Immediate	Information dissemination to ensure behaviour change poses a minor challenge.
	Industry fuel switch	-	✓	✓	Medium to Long	Totally sector dependent; dangers of gas v electricity; explosion risk; introduce small scale retail systems. The costs may be an inhibited factor.
Transport	Modal shift	✓	✓	✓	Immediate Long-Term Duration	Infrastructure and planning demands are significant to realise a significant modal shift. Infrastructure costs are likely to be huge; to reduce the dependence on private transport; mindset switch from the utilisation of private motor vehicles to public transport through incentives and deterrents;
	Taxis to diesel	?	✓	✓	Medium to Long	Challenging to realise changes in a poorly regulated industry such as this.
	Bio-diesel fuel switch	✓	✓	✓	Medium-Term (Immediately start with promotion strategy)	Inclusion of bio-diesel in the supply network poses an institutional challenge, however the oil companies can undertake this with relative ease.
	Non Motorised Transport (NMT)	✓	✓	✓	Medium to Long Term	Improve public transport systems, prioritise non motorised transport, establishment of integrated public transport systems; implementation of sustainable principles in all transport related policies, plans and projects, enhance investments in infrastructure to promote NMT; facilitate the implementation of the NMT system

? = unknown, needs further investigation
✓ = yes
- = neutral
× = no

5. Chapter 5: Targets for the Western Cape

5.1. Introduction

Achieving a sustainable energy system across the Province will require understanding of the present situation and good knowledge of the options and technologies[13] available to bring about the desired changes. Changes are required to our energy production system, sources of supply and in energy consumption patterns. To bring about these changes, appropriate legislation, cost structures and other measures such as the building of institutional capacity must be supported. Progress and innovation through standards, information, education, financial incentives and technology will need to be vigorously pursued. It is important that the targets are both challenging and achievable.

To date, only a handful of countries have set comprehensive targets for energy efficiency improvements due to the complexities of the task. Amongst others, these countries include Slovenia, Japan, the Netherlands and New Zealand. The World Energy Assessment, published by the UN and the World Energy Council, suggests that specific energy usage in industrialised countries could be effectively reduced by 35% over a period of 20 years, if supported by effective policies. In the United States, the Electric Power Research Institute (EPRI) has proposed an energy efficiency improvement target of 2% per annum. It can thus be concluded that with effective policies, strategies and legislation energy demands and usage improvements can be achieved. Therefore, it is strongly proposed that a White Paper and consequential legislation are critical tools towards the sustainable growth of the Province in areas of social, economic and environmental development.[14]

The Provincial Government intends to adopt a portfolio-based approach strategy which focuses on securing a range of energy generation and management options including demand and supply side options. This approach promotes a range of energy efficiency and conservation measures and the diversification of the energy supply mix, with a focus on sustainable and clean energy sources.[15]

This White Paper provides for the implementation of sector programmes in a phased approach timed over a short term to a long term phase. The White Paper sets a provincial target for energy efficiency improvement of 15% by 2014. This target is expressed in relation to the forecast provincial energy demand at the time, having regard also to the national energy demands, and therefore allows for current expectations of economic growth. It can be accepted that this target will be challenging, but at the same time it is considered to be readily achievable through the means described in the following pages.

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13 See chapter 1

14 See chapter 3: WC Sustainable Energy Goals and Objectives.

15 Demand Side Scenarios and Energy Efficiency Programme for the Western Cape, 2007

The targets which the Provincial Government of the Western Cape aspires to meet will be discussed in the context of the following framework:

- Brief analysis of the sectors;
- Baseline Statistics;
- Sustainable Energy Targets;
- Implementation Issues and Concerns;
- Costing;
- Review of Targets; and
- Conclusion.

5.2. Brief Analysis of the Sectors[16]

The Western Cape Province includes some of the more affluent parts of South Africa such as the City of Cape Town as well as some of the poorest areas such as the Central Karoo. Energy consumption patterns will differ between these areas as well as the approach and abilities to achieve sustainable energy targets. The areas most vulnerable to the impacts of climate change are those that are most dependent on agriculture, forestry and fishing. Although poorer regions may not have high rates of energy consumption, they will be those most significantly affected by the negative consequences of non-sustainable energy consumption which contributes to climate change .

An analysis of the energy consumption by sector reveals that industry and transport are currently the largest energy consumers in the Western Cape. Industry uses 46% of the total energy in the Province, and industry and transport combined account for 80% of the total energy use.[17] Industry is the largest consumer of electricity and the second largest consumer of other fuels after transport. This is largely due to the petrochemical refineries, Caltex and PetroSA, the iron and steel industry, and other industries using high temperature thermal operations: chemical industry, non ferrous metals, non metallic minerals, wood and wood products, food and tobacco as well as textiles and construction.

The transport sector is heavily dependent on petroleum, while the industrial sector is the largest electricity consumer, and the second largest petroleum consumer.

The residential sector accounts for only 8% of the total energy consumption[18], and it is estimated that 56% of this 8% is consumed by the urban medium to high income households. Although the poor do not consume much in relative terms, their consumption is typically far more expensive

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16 See also: detail overview of sectors in Chapter 1.1
17 Chapter 1, figure 1
18 Chapter 1, figure 1

(cost of paraffin versus electricity) and far more unhealthy (burning of wood and fuels indoors versus use of electricity).

Industry and transport are collectively responsible for 69.9% of the carbon emissions; the residential sector is responsible for 15.5% of the carbon footprint.[19]

5.3. Baseline Statistics

The baseline statistics in the White Paper have been set against 2004 figures.

At this juncture, it is important to state that reliable and accurate data across the various sectors is lacking in a Provincial context insofar as it pertains to baselines, targets and costs. There is a paucity of energy data and this will impact on the strategy and implementation of the White Paper, both directly and indirectly in terms of justifying targets and monitoring the effectiveness of the initiatives once implemented. This is critical in making the implementation meaningful in terms of measuring the impact of the interventions. One of the aims of this White Paper is to establish an Act which will enforce data collection on a municipal level in an effort to gain more reliable provincial energy information and to establish an effective data base for the Province.

It is the vision of the Province to ensure that the Western Cape has a secure supply of quality, reliable, clean energy which delivers social, economic and environmental benefits to the Province's citizens, while also addressing the climate change challenges facing the region and eradicating energy poverty.[20] It is therefore intended that via interventions introduced by Provincial Government in order to support National initiatives, where required, as well as facilitate, collaborate and support local government initiatives that energy in the Province will be significantly improved in the future.

Based on the research done for this White Paper, the 2004 figures can be expressed as follows:

- **Energy Consumption**

The baseline for the Provincial energy consumption was approximately 250 million GJ in 2004.[21]

- **Energy Efficiency**

It is extremely complex to establish a 2004 baseline for the impact of energy efficiency in the Province. The main energy efficiency interventions are around solar water heaters, efficient lighting; space heating and cooling in commercial buildings and variable speed drives. The majority of these interventions had not been implemented to any meaningful degree in 2004. It is therefore fair to assume that the 2004 energy efficiency baseline was minimal.

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19 Chapter 1, table 4

20 The Energy Vision of the Province – 2008: Sustainable Energy Strategy and Programme of Action for the Western Cape at page 52

21 Demand Side Scenarios and Energy Efficiency Programme for the Western Cape 2007

- **Use of Renewable Energy**

In the 2004 baseline year, no substantial renewable energy interventions were in place in the Western Cape Province. No biomass figures are available for this period. Biomass in this sense is largely the use of wood for fires. It can therefore be assumed that based on the above (with the exclusion of biomass), that the baseline figure for renewable energy generation in the province is minimal.

5.4. Sustainable Energy Targets and Policy Choices

In order to meet modern day challenges such as mitigation and adaptation to climate change, high energy usages, carbon emissions and the like, most industrialized countries have established measurable targets for the generation of renewable energy, energy efficiency and carbon emission reduction. South Africa has a target of 10,000 GWh of electricity or equivalent to be produced from renewable energy by 2013 and a national energy efficiency improvement target of 12% by 2015.[22]

The national government policy on renewable energy is concerned with meeting the following challenges:[23]

- Ensuring that economically feasible technologies and applications are implemented through the development and implementation of an appropriate programme of action.
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
- Addressing constraints on the development of the renewable energy industry.

As part of the Sustainable Energy Strategy, the PGWC agreed to targets for electricity from renewable sources and for energy efficiency to be achieved by 2014. There will also be instruments to ensure appropriate interventions are initiated to achieve the targets. The targets for the White Paper are coupled with timelines to ensure implementation.

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[22] 2003: White Paper on Renewable Energy Policy of RSA.

[23] October 2008 : Energy Efficiency Strategy of the Republic of South Africa

PROPOSED SUSTAINABLE ENERGY TARGETS SUMMARY:[24]

No.	Action	Target	Date
1.	**Renewable energy generation (electricity only) in the Western Cape off the 2004 consumption baseline of 63.61 million GJ**	**15%**	**By 2014**
2.	**Overall energy efficiency against business as usual scenario**	**15%**	**By 2014**
2.1	Industry energy efficiency	20%	By 2014
2.2	Residential energy efficiency	10%	By 2014
2.3	Commercial Energy Efficiency	11%	By 2014
2.4	Transport Energy Efficiency	12%	By 2014
2.5	Government	12%	By 2014
3.	**Overall energy efficiency against business as usual scenario**	**15%**	**By 2020**
4.	**Carbon dioxide emission reduction (in 2004 levels)**	**14%**	**By 2014**
5.	**Carbon dioxide emission reduction (in 2004 levels)**	**15%**	**By 2020**
6.	**Renewable Energy purchased by Provincial Government**	**10%**	**By 2020**

The targets reflect the change in the energy sector which the Province aspires to reach. The targets have been developed using an internationally acknowledged modelling tool and are based on the 2004 baseline data and realistic economic and population growth projections. These targets are based on the data currently available. They will be subject to revision as more detailed data becomes available and other viable interventions are introduced. Achieving these targets will require bold leadership, legislative interventions and aggressive plans from the Provincial Government and will contribute towards achieving its strategic objectives[25] or high level objectives around sustainability in the Western Cape.

The Province aspires to meet six overall goals. The goals set out here under are the high level expressions of the PGWC's commitment on a number of social, economic and environmental goals that collectively express the vision for sustainable energy development. It is essential to

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[24] Demand Side Scenarios and Energy Efficiency Programme for the Western Cape, 2007

[25] Chapter 5; para 1.5

support the vision with something tangible and measurable. In what follows are firstly, the outcomes for expressing the targets for the first five year period up and until 2014 and secondly, the targets to achieve the outcomes.

5.4.1 Outcomes

Projected Outcomes by 2014	
White Paper Goal	**Outcomes**
Goal 1: Alleviate energy poverty	1. Long-term employment opportunities increased by reducing costs in commerce and industry 2. Employment opportunities increased within the energy efficiency sector and related activities. 3. Access to affordable energy services improved by promoting low energy alternatives in the market place. 4. Lower energy costs for households by improving domestic energy efficiency. 5. Optimise energy costs to cater for the poor, the residential and the industry sectors, the agriculture and the mines, the green and the willing buyer through differentiated tariffs and security of supply.
Goal 2: Improve the health of the nation	6. Health benefits realised through reduced atmospheric pollution and improved living conditions, in particular a reduction in respiratory-related illnesses.
Goal 3: Reduce harmful emissions	7. Atmospheric pollutant levels reduced by a reduction in fossil fuel combustion in industry, commerce and in homes. 8. Transport-related atmospheric pollutant levels reduced by a reduction of waste; increased focus on public transport and support for low energy individual transport system.
Goal 4: Reduce carbon footprints on our environment	9. Western Cape CO_2 emissions reduced by increasing share of renewable energy use and improving energy efficiency across all economic sectors.
Goal 5: Enhance Energy Security	10. Increased resilience against electricity supply disruptions by improving the energy efficiency thus reducing the load placed upon power distributions systems. 11. Increased resilience against national supply disruptions by improving the provincial supply through supply of sustainable energy from IPPs and implementation of energy efficiency measures and use of Solar Water Heaters (SWH) within the boundaries of the WC. 12. Increased individual resilience against electricity and oil price fluctuations by increasing use of renewable energies and reducing the reliance on private transport.

Goal 6: Improve economic competitiveness	13. Improved industrial and commercial profitability by controlling and minimising energy losses from waste of energy, inefficiencies and prices. 14. Improved international acceptability of WC products (agricultural, industrial and manufacturing) by minimising the environmental impact of their manufacture and compliance with agreed standards for energy use.

By achieving these goals, there will be a positive contribution to broader cross-cutting issues such as job creation and economic development. Increased provision of sustainable energy will also achieve social development goals in the Province.

5.4.2 Sustainable Energy Targets

PGWC will strive to achieve the targets listed below. However, due to a lack of data, these targets are not set against scientific baselines but they do provide PGWC with a basis against which data can be recorded and upon which improvements can be measured.

(i) Energy Efficiency

Baseline: No baseline has been established. In or during 2004, interventions in energy efficiency were non existent.

Targets 2014 – 15% of the overall energy demand be reduced by focussing on the following targets for the different sectors:

- Industrial energy efficiency to be improved by 20% by 2014
- Residential energy efficiency to be improved by 10% by 2014
- Commercial buildings, schools, hospitals and other public buildings energy efficiency to be improved by 11% by 2014; and
- Transport energy efficiency to be improved by 12% by 2014.

Methods

- Industry: improve energy efficiency by improving electricity demand devices used for lighting and compressed air; improve boiler efficiency and steam system efficiency. and use of energy control systems such as variable speed drives.
- Residential Energy Efficiency: Improve energy efficiency by the introduction of solar water heaters, alternative lighting options..

- Commercial, public and government buildings: improvement of energy efficiency by utilising more efficient heating and cooling systems, and implementing alternative lighting options, for example light emitting diodes (LEDs).

- Building legislation and guidelines for energy efficiency either at a national or local level.

- Transport: improve energy efficiency by supporting modal shifts from private transport to public transport and/or non motorised transport, changes in infrastructure, support and facilitation on non motorised transport systems and projects.

Discussion

The White Paper targets for energy efficiency are based on the research conducted leading up to the development of this White Paper. The energy efficiency target[26] has been broken into sub-targets for the different sectors, namely:

- **Industrial energy efficiency**:

This sector is the largest consumer of electricity and the second largest consumer of fuels after transport. As illustrated by Figure 1, Industry uses 46% of all energy in the Province.

The energy efficiency improvements are envisaged to occur in electricity demand devices as well as supply of thermal heat. Efficiency can be improved in lighting, compressed air, motors, variable speed drives, boilers and steam systems.

The target is to improve industry energy efficiency by 20% by 2014 [27]

- **Residential energy efficiency**:

From demographic and population data[28] the residential sector can be split into urban and rural settlements, and low income and med-high income groups. The majority of the population lives in urban settlements with the low income sector making up the largest part.

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[26] The target is expressed as a percentage reduction against the projected provincial energy usage in 2014. The forecast is derived from the Long range Energy Alternatives Planning tool (LEAP) utilised for developing the National Integrated Energy Plan for South Africa, The National Energy Efficiency target and used by the PGWC for the Sustainable Energy Strategy. The following assumptions are made:
- Population growth: 1,3% per annum)
- GDP growth: 2.8% average per annum growth over the period
- Economic growth: 2.8% over the period
- Fuel switching limited apart from general increase in electricity consumption in residential sector.

[27] The actual projection is in the Strategy document ; p 21

[28] Wesgro, 2004

While over 85% of the urban population live in electrified households, only 65% of rural households are electrified.

The urban medium-high income sector is the largest user of energy in the province although the urban low income households are far more numerous. This is due to the high energy use in medium-high income households compared to low income households.

The residential target supports the domestic users of the Western Cape to save energy. Energy saved is money saved and the 10% target is a win-win situation for individual households as well as society. For example, in terms of household demand, it is estimated that households in Cape Town account for 15% of total energy (electricity, paraffin, gas, coal, wood and candles) consumption and 38% of total electricity consumption. In case of poorer households, energy consumption can take up to 25% of household income. For poor households, there is then, an economic incentive to save energy. Middle and high income homes, on the other hand, use approximately two times more energy than low income homes, which only costs 3 to 5% of household income. The implication of that is that there may be a limited economic incentive for middle and high income homes to save energy.[29]

The target is to improve energy efficiency by 10% by 2014. This can be achieved by the introduction of solar water heaters, alternative lighting options and promoting behavioural change.

- **Commercial and public buildings**:

The total electricity use in this sector is 4 % of total consumption. The commercial sector consists of office buildings, hotels, financial institutions, shops, educational facilities, hospital and places of entertainment. Electricity is by far the dominant fuel used in this sector with coal and liquid fuels making up the remainder. In commercial and government buildings, both fluorescent tubes and regular lighting is currently used. Regular incandescent light bulbs may be replaced by the more efficient compact fluorescent lights. The use of efficient HVAC systems and solar water heaters will assist in achieving this target.

The main objectives are to reduce energy consumption and carbon dioxide emissions from buildings in the commercial and government sectors through energy efficiency behavioural changes, and building retrofitting and to ensure that new buildings in the commercial and government sectors are energy efficient.

The target is to improve energy efficiency by 11% in commercial and public buildings by 2014. This may be achieved by the introduction of energy audit and retrofit programmes; incentive programmes for energy efficiency; PGWC Pilot Solar Programmes; developing and implementing green design programmes and green procurement policies.[30]

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29 T van Heerden 2009. Household and individual resource conservation in the Western Cape: Socioeconomic characteristics & intrinsic motivations. Department of Agriculture, Western Cape.

30 A Guide to Energy Management in Public Buildings – Provincial Government of the Western Cape DEADP. 2008 page 6

- **Legislation and Guidelines**

Incorporating energy efficiency into the national building codes will ensure that all future buildings in the country will be energy efficient. Currently a national non mandatory standard for building efficiency, SANS 204 is in place. It is anticipated that this will be the document which will be incorporated into the building codes to make energy efficiency in buildings mandatory. Many cities have developed green building guidelines, and the City of Cape Town is in the process of developing an energy efficient water heating bylaw, an approach which is in line with several international cities. This will ensure that efficient water heating systems such as solar water heaters (SWHs) are installed in all new buildings in the City. Local Government has the power to pass their own efficient building bylaws, provided they do not contradict the national building codes. These could be passed as an interim measure until national legislation is in place.

- **Transport energy efficiency:**

The consumption in this sector is 35%. The transport sector is heavily dependent on liquid fuels and the largest user of petrol and diesel in the Western Cape. Consequently, the transport sector is responsible for a large proportion of the air pollution in the Province. The transport sector energy demand is largely dominated by private passenger transport. This results in the inefficient use of fuel and increased levels of pollution. In the public transport sector rail remains the backbone for public transport within the Western Cape, although this service is in a state of decay. The number of minibus taxis in the Province has been growing.

There is significant scope for intervention in this sector that would have dramatic environmental and financial impacts. Some of the interventions which will be dealt with in the Province's strategic plan and programme of action will be the following:

(a) Modal Shift: the shift from private transport to public transport. Such a shift implies massive changes in infrastructures and fuel costs savings. A further policy option may be the shift from petrol to diesel minibus taxis (which is the intention with the 'taxi recapitalisation' programme).

(b) Government Fleet: The use of more efficient vehicles with low emissions in the provincial government fleet will show the Province leading by example. Changes in the procurement policy for these vehicles should be made to include sustainable transport criteria.

The target is to have improved energy efficiency of 12% by 2014.

(ii) Energy Supply Mix

Baseline: The baseline for renewable energy generation is effectively zero.[31] The electricity use in the Province for the baseline year was 63.61 million GJ (gigajoules)

Targets: Renewable energy electricity generation in the Western Cape must equal 15% of the baseline energy consumption by 2014. This is effectively 9.45 million GJ or 2650 GWh.

Methods

Faciliate the use of renewable energy sources such as wind energy, solar, biomas, hydro and wave energy.

Discussion

Electricity use in the Western Cape in 2004 was measured at 63.61 million GJ or 17 669 GWh, of which 15% of this figure is 9.45 million GJ or 2650 GWh and is the target for renewable energy generation in Western Cape by 2014. In real generation terms this equates to 302MW of consistent base load power-effectively which is a 1/6th of the Koeberg nuclear power station generation. However, in reality, to generate this amount of electricity from an intermittent renewable source, which in the Western Cape will predominately be wind, would require more capacity on the ground – in the region of 832MW. Based on figures from a study for this White Paper which looked into potential usable renewable energy resources in the Western Cape, a mix of renewable generation techonologies will contribute to the target by 2014. These are listed as:

Wind (680MW), Ocean energy (11MW), solar PV (100MW), Landfill gas (13MW), Hydro (13MW) and Biomass (15MW).

The Darling wind farm currently has a generating capacity of 5.2MW. The wind farm component of the targeted mix would theoretically be equivalent to 130 Darling Wind farms.

Renewable energy will contribute to the diversification of energy resources through the implementation of a properly managed programme of action that will provide sufficient incentive for the sustainable development of the renewable energy based industries. The renewable energy resource assessment and scenarios underpin the Plan of Action which clearly outlines the challenges of meeting a 15% 'Renewable Energy' target by 2014.

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[31] See para 1.2 above.

The national feed-in tariff introduced by NERSA in March 2009 will contribute to meeting this target. The feed-in tariffs proposed for the different renewable energy technologies is supported by provincial government and will be implemented by NERSA in two phases. The first phase includes a feed-in tariff for wind, small hydro, landfill gas and concentrated solar power. The second phase includes a feed-in tariff for biomass, biogas, solar photovoltaic, concentrated solar power without storage, concentrated solar photovoltaic and concentrated solar power with central tower.

It is the intention of the Department to fast-track the Programme of Action in order to initiate the development of a vibrant renewable and clean energy sector in the Province against the following initiatives that will be considered:[32]

- **Wind**

  Wind resources in the Western Cape are substantial – amongst the best in the country. The South African Wind Energy Programme's initial assessment of key areas along the West Coast as well as the interior (Karoo) and the Southern Cape highlight the strong energy potential.[33] Initial assessments show it will be possible to accommodate 2800MW of wind energy in the Western Cape transmission grid without any immediate challenges. The region also leads the country in terms of implementation experience with the establishment of the Darling Wind Farm north of Cape Town and the Eskom Klipheuwel Wind Turbine Testing Facility.

- **Solar PV**

  Although solar photovoltaic (PV) generation prices have been reducing over the decades, it is still an expensive option for electricity in this country – generally far too expensive to consider as a mass generation option. It remains appropriate for applications isolated from the grid, such as rural clinics or homesteads, and for special projects where users are prepared to pay a premium for solar power. With grid-synchronised solar PV systems now available in the country, there is a steady increase in installations in urban areas, although they will only provide a tiny contribution to the overall energy mix into the medium-term. While solar radiation levels in the province are reasonably high, they are not the highest in the country. Although a tariff for large-scale solar PV has been included in the REFIT programme, they are likely to be located elsewhere in the country for this reason.

- **Other biomass**

  There may be scope for electricity or heat generation from biomass waste from sawmills, or from pulp plants, in some specific locations within the province. Cost competitiveness and energy quantities are not known. Investigations indicate that electricity generation from landfill methane gas sites is feasible, largely because of the carbon revenue

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[32] 2008: Sustainable Energy Strategy and Programme of Action for the Western Cape pg 40

[33] SA Wind Energy Programme, UNDP 2005; Wind Atlas, DME 2003

available for methane emissions reduction. This opportunity is being exploited in the country's biggest landfills, and could be available for smaller sites in the future.

- **Hydro**

  There are likely to be several sites where small scale hydro is feasible – mainly in the mountains of the wetter regions of the Province. Large seasonal variations in water flow can be a problem with this energy source. The generation potential of this resource is not known, although it is considered unlikely to be a significant contributor to the energy mix. Its application is expected to be mainly for sites remote from the grid. The DME resource maps for small scale hydro are used as a basis for assessment. The department will continue to explore this generation option.

- **Pumped storage**

  Pumped storage is not a source of net generation, but rather a means of smoothing out load peaks. It is typically around 70% efficient – comparing input pumping energy to generated energy. Eskom has a large pumped-storage site in the Province, at Palmiet, which it uses to regulate peaks on the national grid, and the City of Cape Town has a smaller site at the Steenbras Dam for its own use. Little attention is given to pumped storage as an option within the Province.

- **Wave energy**

  Wave energy development is still in its infancy but holds much promise as a source of bulk renewable energy. Whilst the Western Cape has a long coastline and preliminary results show that the wave resource is substantial, no large scale commercial projects are yet in place. The department will continue to encourage private developers to explore options for large scale generation of the Cape coastline however the potential environmental impacts that this technology may have on marine ecosystems must be taken into consideration.

5.5. Implementation Issues

5.5.1 Barriers

In general, the technologies and options for delivering on this White Paper already exist, and numerous reports have argued the rationale behind the White Paper. However, the systematic change towards more sustainable energy supply and use has not yet happened.

The Western Cape Province can start to overcome the barriers that prevent individuals, business and stakeholders from changing behaviour only when the nature of the barriers is understood, including both the self-evident and real barriers as well as the perceived or 'convenience' barriers. The purpose of the White Paper is to enable the PGWC to create an environment in which these technologies and initiatives may flourish in support of achieving the Western Cape's Sustainable Energy Vision.

The PGWC will assist in removing a number of the barriers currently preventing the adoption and commercialisation of clean energy technologies and initiatives.

The barriers discussed here are not necessarily a complete list of all barriers. Existing barriers may change and new barriers will emerge. It is also essential to focus capacity efforts on addressing new barriers. An on going capacity assessment will measure how well this is achieved.

(i) Energy Pricing

This is a perceived barrier that stems from South Africa's historically low unit price of coal and electricity, although there will be a steep and incremental rise in energy prices over the next few years. However, this barrier still holds strong amongst the mind-set of many commercial and industrial organisations that argue that medium and high-cost interventions cannot be justified due to the paybacks involved.

Current cheap conventional energy prices that exclude the costs of externalities such as health and environmental costs are a perceived barrier to fuel switching or a change to renewable energy sources. With recent price increases in fossil fuels and electricity, this misconception is starting to change and renewable energy is if measured in immediate energy costs becoming more competitive.

Many also argue that energy efficiency is not cost effective. That is a misperception. It is also a misperception that energy is cheap. The cost per kWh of electricity might still be low compared to other countries, but the bills tend to be higher than they need be simply because there is an over-consumption of energy in all sectors in the economy.

There have already been significant hikes in electricity prices from 2007 and Eskom has announced further price increases for many years to come. The cost for fuels, especially diesel but also petrol and paraffin, has also increased dramatically over the past 3 years. While fluctuations can be expected in global markets, the upward trend is likely to persist due to supply/demand factors.

Energy efficiency makes good economic sense under both the current and even more so under future high energy pricing scenarios. Payback on investment is frequently less than three years for both industrial sites and commercial sites. The importance is to approach energy management correctly and education and awareness programmes are some of the first and key activities to be promoted by the PGWC.

(ii) Low Investment Confidence

Achieving optimum energy performance sometimes involves the installation of costly plant and equipment, and investors may be reluctant to tie-up financial resources in long-term projects. Recent history has seen a degree of uncertainty, both nationally and internationally, due to the fluctuations in the strength of our currency. Given the present investment climate in South Africa, the Western Cape can not isolate itself from issues such as increasing interest rates; postponed decision-making regarding the future of the energy sector in South Africa; crime; a large un-skilled and semi-skilled labour force and the effectiveness of ports and transport. South Africa is

also perceived to be the gateway to the rest of Africa, and the 2010 Soccer World Cup is also a huge attraction and opens a multitude of investment opportunities. The White Paper is presented within the context of these factors.

The investment dilemma is an ongoing problem, and investors as well as local stakeholders and institutions should be encouraged to cost all externalities when considering energy efficiency investment opportunities. The notion of introducing incentives on energy efficient appliances and equipment will be considered during the implementation of this White Paper.

(iii) Insufficient Knowledge and Understanding of Technologies

Energy efficiency opportunities are frequently overlooked due to the simple fact that industry, consumers and the general public are unaware that they exist. It is the intention of the Province to enhance awareness in such matters and to bring knowledge and understanding into the various sectors. This will be achieved through awareness campaigns, demonstration programmes, audits and education, and publicising stakeholder commitment programmes, and public building sector energy efficiency implementation initiatives. Use of the media and electronic options such as websites will be fully explored to publicise energy-saving tips, energy management tools and best practice methods.

In industrial plants for example, the complexity of energy options requires highly skilled energy auditors who are not always available. Also often perceptions of renewable energy are linked to an image of inferior or defective solar home systems in townships. The importance of using properly qualified staff and having the right management information is essential in order to overcome the barrier of a lack of knowledge. The PGWC will design its capacity building efforts so as to reduce barriers around this gap of limited access to information, skill and knowledge.

(iv) Institutional Barriers and Individual Resistance

Institutional barriers and individual resistance often stem from lack of information or ignorance. Often there is a misconception that renewable energy is not modern energy. Or that energy efficiency will disrupt industrial processes and lead to productivity losses and that residences will end up in darkness. This indicates a lack of information and awareness.

It is essential to lead by example and the PGWC will ensure that systematic information and education is developed and implemented to overcome this barrier.

(v) The practice of 'bounded rationality'

Decision making with limited management resources requires the use of imperfect, or incomplete, information and less than fully rational procedures. This is significant as the majority of energy consumers currently have imperfect information regarding the range and performance of energy efficient products. This fact inevitably results in poor decision-making when purchasing goods or specifying equipment.

5.5.2 Monitoring and Measurement

There is a need to establish a system for continuous updating and registration of figures and data relating to energy efficiency, in particular, indicators for efficiency measurement. A formalised system, with the assistance from Municipalities, for collecting, managing and calculating indicators is necessary for monitoring the implementation and success of activities and interventions as part of the strategies for energy efficiency.

It is the department's responsibility together with Municipalities to establish such a monitoring and verification system and ensure that it is implemented. The department will take responsibility to ensure that progress towards targets are reviewed and monitored on a continual basis.

The success of such a system will inevitably depend on using a multi-stakeholder approach, including consultation with representative bodies within each sector.

5.5.3 Education, Information and Awareness

Information and generic awaress are key elements to achieve success in terms of changing the Province into a more energy efficient society.

Awareness-raising starts with pre-schooling education and runs through all learning fields into the adult education system. The Province will engage with the institutions responsible for education and support, and facilitate the inclusion of appropriate education on energy efficiency.

5.5.4 Research and Technology

Technological options represent significant potential for energy efficient improvements and, in many instances, are well researched and already developed. However, the majority of these technologies are not manufactured locally and require importation. The latter point will represent a challenge to the Province, particularly as the drive to promote energy efficiency gains momentum.

The White Paper will support appropriate research and the possible adaptation of internationally and locally available technologies and processes.

5.5.5 Energy Audits

Energy audits have internationally been used across all sectors to identify efficiency measures that can be implemented in a cost-effective manner. However, to be effective it has often required both the audits as well as the implementation of measures to be compulsory and to be paid for by the client. The White Paper will promote energy audits as a means of improving efficiency.

5.6. Costing/Financial Implications

The White Paper sets targets for both renewable energy generation and energy efficiency in the Province.

Most of the energy efficiency interventions provide a favourable payback period for the end user and will not require additional government funding, particularly at a provincial level. Renewable energy is being financially incentivised in the Province through the national Renewable Energy Feed in Tariffs (REFIT).

The PGWC will play a faciltatory and awareness raising role in ensuring that renewable energy and energy efficiency is rolled out in the province. This will include:

1. Lobbying national government for legislation and regulatory changes around RE and EE (for example, energy efficient building legislation, tax incentives around RE and EE)

2. Supporting the implementation of RE generators in the Province (EIA approval process, facilitating incentives such as CDM)

3. Supporting local government to collect energy data to establish local government energy and climate change baselines and strategies, pass relevant legislation (EE building and efficient water heating bylaws) and initiate rollout programmes.

These tasks will be driven internally under Climate Change Directorate of PGWC. Implementation costs will therefore amount to operational costs and not capital costs. Sufficient budget should be allocated to this Directorate to ensure the effective implementation of the White Paper.

The tasks to implement the White Paper fall under the broader Climate Change Strategy and Action Plan of the Department of Environmental Affairs and Development Planning.

5.7. Review of Targets

A review of the provincial targets will be undertaken at regular intervals so as to achieve a baseline where none exists or to update the data where necessary or to adjust the data to more acceptable levels where circumstances and scenarios have changed in a substantial way.

The review will be carried out by the Department and where necessary will be done in collaboration with stakeholders with the objective of assessing progress towards targeted outcomes and to address any areas where additional input may be required from stakeholders.

5.8. Conclusion

In summary, the Western Cape Provincial Government's energy efficiency and renewable energy targets are more ambitious than national targets.

It is important to note that the Western Cape Provincial Government only has direct influence on the Government sector but will play a supportive and facilitatory role in attempting to achieve the targets in the other sectors. The transport sector is covered broadly by this White Paper as it is an integral part of the sustainable energy use in the Province. However, a separate detailed implementation plan will be compiled in conjunction with the lead departments for transport. The transport efficiency cannot be improved without massive infrastructure investments. While industrial, commercial and residential energy efficiency can be achieved largely through moderate investments, any shift in the transport sector will require substantial and long term planning and finance. Hence, the transport sector has been reserved for special attention for engagement with the relevant stakeholders.

In conclusion, it is important that the targets for renewable energy consumption and for energy efficiency in the industrial, commercial, residential and government sectors are challenging but achievable. .

6. Chapter 6: Implementation plans and instruments

The implementation of the White Paper is the responsibility of the Provincial Government. However, municipalities will play a vital part in achieving the actual successes. It is the role of the municipal sector to ensure the distribution and reticulation of energy and therefore also the role of the local government to ensure that such provision is sustainable. The Provincial Government will facilitate an environment conducive to smooth implementation through interactive engagement with the municipalities.

6.1. Sustainable Development

Sustainable development is defined as '*the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations*'[34] The provision for reliable and affordable energy for business and the domestic market, underpins everyone's quality of life.

6.2. Enabling Environment

The uptake of renewable energy requires an enabling environment. The relatively high capital cost of most renewable energy technologies makes them commercially uncompetitive in the short to medium-term. The establishment of an appropriate enabling environment through the development of fiscal, financial and legislative instruments will therefore be required to stimulate increased utilisation of these technologies. This includes government support for renewable energy to help establish an initial market share and non-discriminatory open access to the electricity grid and other energy infrastructure.

Many of the renewable energy technologies are currently under-developed or not fully commercialised compared with conventional options and hence costs tend to be high. There is a reluctance to invest in what are sometimes considered to be risky investments. By undertaking demonstration projects with stakeholders these risks can be clarified and options to address them tested.

In 2009, the national energy regulator, NERSA, produced a tariff structure tailored to incentivise the growth of renewable energy in the country. This tariff structure, known as the Renewable Energy Feed in Tariff or REFIT specified attractive purchase rates for renewable energy from various sources including wind, concentrated solar thermal, photovoltaics, landfill gas, micro hydro and biomass generation amongst others. There are still uncertainties around the quantities of renewable energy that will be purchased, and around the technology selection process. There are also concerns around Eskom being the single buyer of the renewable energy. However, if

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[34] National Environmental Management Act, 1998

managed correctly, the REFIT process will ensure that renewable energy generation technology will become a reality in South Africa within the next few years.

Fossil fuels represent a concentrated form of energy, while renewable energy normally uses dispersed sources with low energy concentrations. Renewable energy typically has a different cost structure to conventional energy sources. For some technologies the initial capital cost is high but the operation and maintenance costs are low and the fuel is free or of low cost.

6.3. Energy Supply Options for the Western Cape

Future options for energy generation in the Western Cape include a range of renewable energy sources, its source, potential and sustainable issues are in turn are investigated below.

Energy Source	Potential	Sustainability issues
Coal generated electricity	• High potential. • SA has significant coal reserves and new technologies for clean coal (gasification) are being developed. • Will produce base load. • Line strengthening to Western Cape will be essential.	• Building new generation capacity will see an increase in electricity prices that may not make it financially sustainable unless heavily subsidised. • Fluctuations in commodity prices increase financial risk. • Accompanying CO_2 increase is not desirable in light of South Africa's ratification of the Kyoto Protocol and the National Climate Change Response Strategy. • There are concerns regarding health-related issues in Mpumalanga. • Increased coal usage will also jeopardise the City of Cape Town and other cities' commitments to clean energy targets.
Nuclear energy	• Significant potential. • Costly. • Long development lead times will not see plants on stream in time to meet envisaged shortages in the Western Cape in the short-term.	• Nuclear energy is viewed as controversial yet is seen as cleaner than coal, although not carbon neutral. • No clear, acceptable strategies and options exist for disposal of radioactive waste. • Decommissioning of old Nuclear Power plants is extremely costly. • Heavy subsidisation to industry is necessary. • Public resistance for health and safety concerns may increase times to development. • Can be produced locally, although it will feed into national grid and be used nationally
Natural gas	• High potential if sufficient resources of gas are discovered. • Importing gas is an option if no sufficient domestic sources are available. • Supplies are currently not confirmed.	• Natural gas is a cleaner fossil fuel-based option than coal. • It is less controversial than nuclear energy and can provide base load capacity. • Options for local job creation are high. • Can be generated locally
Wind energy	• High potential (3000 MW approx.) in the Western Cape, but resources need to be confirmed.	• Clean option. • Intermittent supply and storage issues need to be resolved.

Energy Source	Potential	Sustainability issues
	• Technology & capital costs are reducing rapidly. • Low maintenance. • High job creation potential	• Cannot supply base load unless working with hybrid solutions. • Can be quickly installed in areas needing new supply. • Can be generated locally
Biomass	• Medium potential: 1 to 50 GJ/ha/pa. • Insufficient assessment of commercial potential in Western Cape. • Opportunities for small biomass projects particularly within forestry and agricultural industry. • No clear assessment of other biomass potential e.g. sewage wastes.	• Renewable resource. • Job creation in downstream and upstream industries. • Lower emissions if sound technology is used. • Producers obtain their own energy requirements from this source, therefore lessening the demand on the grid.
Solar radiation	• Medium to high potential. • Radiation varies from 6,501- 7 000 MJ/m2/pa across the province. • Solar PV technology is expensive. • High job creation potential – manufacturing, installing, distributing; • Significant potential for SWH projects either at large residential scale or individual level.	• A clean technology from a renewable source • Small business opportunities exist • Few local manufacturers of PV & SWH to meet expected increased demands • Possibility of subsidisation from national bodies • Will be generated locally; does not need a grid connection
Wave power	• High potential. • Significant resources along West Coast particularly Cape Columbine through to the Cape Agulhas area. • Availability of appropriate technology to be assessed. • High capital costs.	• Renewable energy source • No CO_2 emissions but may have high ecological impact. • Job creation potential not quantified but is significant. • Can be generated locally
Waste	• High potential for energy recovery from waste – landfill gas in particular (e.g. 6 sites in Cape Town). • Capital investment high.	• Controversial in the case of incineration of certain wastes. • Landfill gas projects are viable and can benefit from the Clean Development Mechanism (CDM) financing support. • Financial viability marginal but new technology may improve this. • Can be generated locally
Hydropower	• Low potential. • Depending on resource assessments, potential for small-scale stand-alone projects may exist. • These will not be suited for grid connection.	• Renewable resource but impact may be high especially in sensitive aquatic systems. • Financially not viable without significant subsidies or innovative financial engineering. • Can be generated locally

The implementation of the White Paper will facilitate a combination of generation options. There will be a special focus on some technologies in order to gain critical mass of installation sufficient to drive prices down and support permanent employment. This can include both wind and solar energy but also other sources of renewable energy. The focus on some technologies does not

mean that other technologies are excluded. It means that some technologies will have additional special attention during this first phase until 2014.

The implementation will be facilitated within the legal mandate of the Western Cape where current mechanisms are insufficient legislation may be prepared. The implementation will also be supported with necessary financial instruments that will be discussed separately. Implementation of renewable energy also faces other capacity constraints. These will be identified through capacity assessments and addressed accordingly. This includes support to establish local manufacturing capacity.

6.4. Energy Efficiency

Different agendas can drive energy efficiency. It is essential that we have energy security to sustain growth and that we use energy efficiently to leave as little footprint as possible and facilitate reduced expenses for energy.

A power utility might approach energy efficiency from a Demand Side angle, namely attempting to level the load and balance the system over the 24 hour cycle. Seen from the industries' or consumers' point of view there are also two main agendas that drive the motivation for energy efficiency, namely energy security and energy affordability.

The focus on energy efficiency in the Western Cape is to optimise security of supply for all, minimise the collective carbon footprint and improve the economy. Using less energy for the same production output leads to relative lower energy bills. The implementation of energy efficiency follows the national strategy and initiatives and the PGWC will ensure that programmes and facilities are brought to the Province to support the achievement of set targets.

Energy efficiency implementation includes a combination of 'carrot and stick' approach interventions as shown in the following table:

Management:	Energy must be treated as an expense that can be managed and optimised. Special focus will be given to support and promote industrial energy management but also management of energy in buildings. International studies[35] show average industrial savings between 16% and 26% through management only.
Audits:	Energy audits are used across all sectors to identify efficiency measures that can be implemented in a cost-effective manner. The DoE has initiated this process through audits of public buildings. Other initiatives such as the upcoming UNIDO industrial management programme focuses on industrial audits. The PGWC will support the auditing of industries and buildings in the Province by certified auditors as a first step to manage and measure the potential savings.

[35] IEA: Energy Efficiency World Data, 2008

Norms, Standards and Labelling:	Promotion of norms, standards and labelling of energy use in particular in motors, systems, appliances, processes and designs. These activities are largely driven from the national level and no special standards, norms or labels are envisaged. A special attention will be given to new building regulation and the option to ensure inclusion of use of solar as and where appropriate. PGWC will also support green labelling of buildings.
Certification and Accreditation:	Compliance monitoring is essential to ensure quality and optimal use. The DoE in collaboration with SABS drives these activities and the PGWC will promote optimal support and use of certified and accredited professionals.
Communication, Education, and Awareness:	The PGWC will supplement appropriate national initiatives with special campaigns and awareness programmes. The importance of long term systematic awareness to support sustainable development is recognised and coordinated efforts will be ensured.

The implementation of energy efficiency includes a number of action plans that will be specified for each sub-sector. The PGWC will initiate establishment of forums where necessary to promote and support implementation of energy efficiency in the different sub-sectors.

6.4.1. Reduction of Energy Poverty

The PGWC will in a consultative process with all relevant line departments as well as the local municipalities address the unique sustainable energy issues facing the poor. This includes:

- Development of a baseline from where to define and measure the energy poverty among the poor both in terms of access as well as in terms of price per energy output.
- Develop a methodology for monitoring energy poverty
- Oversee and facilitating implementation of the monitoring system
- Develop a catalogue of interventions that can address the energy poverty
- Develop a catalogue of interventions that can address the energy poverty and facilitate barrier removals to relieve energy poverty. This can include improved building standards for RDP houses or improved tender processes to ensure that construction of houses optimise clean energy solutions. It can also include facilitation of finance mechanisms to support installation of solar water heaters despite these not necessarily being financially viable in traditional banking terms.
- Facilitating information activities and capacity building initiatives that enhances achievement of the energy poverty reduction goals.
- Promoting the safe use of paraffin.

It is well recognised that poverty eradication is a cross cutting issue and the mandate for poverty eradication lies with a number of departments and stakeholders. It is the intention of the PGWC to participate actively in already established fora as well as initiate the establishment of a cross cutting reference and implementation group that can drive a consolidated effort towards energy poverty eradication.

6.5. Optimisation of the Transport System

Transport is one of the fastest growing sectors of energy use, with road transport being the major sub-sector. As an example, transport accounts for 54% of total Cape Town energy consumption. The Provincial Energy Scenarios found that the bulk of energy use across the Province can be attributed to electricity consumption and that transport is the second largest energy consumer. The importance of a sustainable transport system in the future scenario for Western Cape is essential and a separate detailed implementation plan will be prepared. The 2010 Soccer World Cup has already placed special emphasis on transport and the long term implementation will greatly benefit from the capital investments acquired.

Transport energy can be reduced through an emphasis on modal shift from private to public transport, non motorised transport alternatives and more energy efficient vehicle standards.

6.6. Legal Support Mechanisms

Legislation is an essential tool to support the implementation of this White Paper. Legislation is relevant both as a “stick” used, for example, by setting technical standards that specify energy performance and technology choices and as a “carrot” to allow the PGWC to encourage specific behaviour. The PGWC will make use of both to ensure achievement of Sustainable Energy targets as set out in the White Paper.

The PGWC has a constitutional mandate to promote the socio-economic wellbeing of its citizens, and this includes the adoption of a White Paper on Sustainable Energy. Furthermore, municipalities have a constitutional obligation to supply electricity and other services to its residents, thereby emphasising the close link between the Provincial sustainable energy mandate and municipal electricity reticulation obligation.

6.7. Financial Support Mechanisms

Financial support mechanisms are essential to drive changes in power generation. Renewable Energy is typically supported through feed-in tariffs or top-up feed in tariffs for grid connected solutions. Other support systems include once-off grant systems for typically smaller installations such as solar water heating. It is essential to recognise the need for financial support mechanisms but also accept that it might not be prudent for the Western Cape to establish a system that is delinked from national financial support structures. PGWC will promote and enable investment conditions.

The formulation and implementation of the White Paper is geared towards self-finance, positive savings and job creation. Energy efficiency improvements will primarily materialise through the implementation of standards, regulation and management tools which at the end of the day lead to short pay back periods for the individual enterprises, house owners and government.

It is foreseen that costs related to investments in equipment or refurbishing of production flows, houses and so forth are to be borne by the direct beneficiaries. For the PGWC, the real costs to implement the White Paper relate to information and coordination requirements as well as pilot project initiatives to achieve targets and goals.

At this stage of South Africa's development it is difficult to justify government subsidies for energy efficiency when there are so many other pressing needs in the province and nationwide. However, the continuous process of fiscal reform does present opportunities to promote energy efficiency as part and parcel of the reform process. Furthermore, donor funding received for key interventions would allow for further implementation.

6.8. Stakeholder Interaction

The South African energy arena is characterised by a number of diverse role players each with a mandate within the fields of energy supply, conversion, efficiency and regulation. Only through well- coordinated initiatives and promotion to activate the different role players will the Province be able to effectively promote energy efficiency.

This White Paper on Sustainable Energy will thus be implemented in close collaboration with partners and stakeholders locally, nationally and internationally. The PGWC will play a leadership role by ensuring appropriate policies, legislation and regulations for the effective application of renewable energy and improvement of energy efficiency. It is the role of the PGWC to ensure that its policies are within the framework of the National Constitution and the mandate of the local governments within the PGWC's jurisdiction.

6.8.1. **Internal Provincial Government**

The Department of Environmental Affairs and Development Planning is responsible for the formulation and implementation of the White Paper. The Department will ensure that – in line with the guidelines on policy implementation in the Western Cape - all relevant Provincial Departments are involved as partners, reference points or stakeholders. This includes in particular the Provincial Treasury, The Department of Economic Development and Tourism, the Department of Local Government, the Department of Housing and the Department of Transport and Public Works.

6.8.2. **National Government**

While the implementation of this White Paper is a matter of provincial and local jurisdiction, it is nevertheless essential to engage the national stakeholders such as National Treasury, the Department of Energy (DoE), the Department of Trade & Industry (DTI), the Department of

Environmental Affairs (DEA), the National Energy Regulator (NERSA) and the power utility to ensure financial, legal and technical support. It is also essential that the Provincial activities can function as integral parts of possible national activities.

The PGWC is responsible for ensuring that all activities are effectively coordinated and optimised in relation to national initiatives, legislation and finance.

6.8.3. Local Government

The successful implementation of this White Paper also hinges on effective and supportive cooperation with and by all local governments in the Province. The PGWC will support the development of energy plans that collectively can contribute to the achievement of the targets set out in the White Paper. Local government is the sphere of government which can have the greatest impact on sustainability with respect to energy. For example, municipalities can pass by-laws or establish building approval guidelines which make it compulsory for all new buildings to be fitted with solar geysers.

The mandate for reticulation and sale of electricity rests with municipalities. The PGWC will facilitate removal of legal and financial barriers currently preventing the uptake of renewable energy. Through effective communication and liaison with local governments the PGWC will support the development of necessary local capacity to engage in the renewable energy market. This includes training of local labour and development of appropriate monitoring systems.

In support of energy efficiency targets, the PGWC will support the development of industrial, commercial and residential energy efficiency plans and their implementation.

The energy poverty eradication efforts will be closely coordinated both within the responsible Provincial Department/s as well as with the relevant local governments. This includes:

- Local mapping of energy poverty against the agreed provincial baseline methodology;
- Local mapping of appropriate interventions (such mapping can be supported through facilitated input from the PGWC as appropriate);
- Monitoring of energy poverty;
- Focussed implementation of activities which could include, for example, restrictions on construction by allowing only energy efficient housing designed for the Western Cape's different micro climates; support of solar hot water roll-out; or support of programmes to promote improved cooking facilities that reduce energy consumption and improve the indoor climate.

In addition, in the implementation of the White Paper, the PGWC can play a pivotal role in assisting municipalities with regards to the following:

- Play a leading role in developing standardised building guidelines to aid municipalities;
- Improving consistencies in statistics and information to enable municipalities to do effective plan and track progress in service delivery and meet delivery targets.
- To engage with municipalities in the process of annual engagement on planning and budgeting in the Local Government Medium Term Expenditure Committee

(LGMTEC). The LGMTEC allows legislative prescripts 'that planning undertaken by a municipality must be aligned with, and complement, the development plans and strategies of other affected municipalities and other organs of state' and the principles of co-operative government contained in section 41 of the Constitution. This integrative approach between provincial and municipal planning and budgeting is found in Section 24 and 25(1)(e) of the Municipal Systems Act, 32 of 2000 and Sections 35,36 and 37 of the Municipal Finance Management Act, 56 of 2003.

- Larger municipalities seem to be able to make headway with implementing energy-related initiatives. It is important that the implementation of the White Paper takes on the challenge to capacitate particularly the smaller municipalities. Municipalities in general are dependent on income from electricity sales for their cash flows and to assist them in subsidising various activities within their jurisdictions.

6.8.4. Other Stakeholders

Public communication will be facilitated to address the awareness and education on the use of renewable energy, energy efficiency and eradication of energy poverty.

Coordinating efforts with the Industrial and Commercial sector is essential to ensure adequate supply of the appropriate quality of both renewable energy generation including solar water heaters as well as energy efficient appliances and systems. Thus Industrial and Commercial sector covers the hardware producers, hardware suppliers, installers as well as the consulting firms who can support optimisation of processes and use of energy.

The NGO sector is an essential part of the stakeholders' engagement in the implementation of the White Paper. The NGO sector plays an important role as implementer, trainer, communicator, agitator and watchdog.

6.9. Research and Skills Development

The research facilities in the Province, nationally and internationally are essential to support the use of appropriate technologies and optimisations of systems. Hence the research entities will be encouraged to support the implementation through focused research and development.

Various facilities already exist in the Province and elsewhere in the country for undertaking vital research activities. A number of key research entities are briefly described below:

- SANERI is a state-funded research company that focuses energy R&D on a number of energy subjects including renewable energy, energy efficiency, energy policy and the impact of energy on the environment

- SAWEP focuses on the publication of a wind atlas. The programme is largely funded by international donors.

- Site visits can be made to the Darling Wind farm and the Eskom Klipheuwel Wind Turbine Testing Facility.

- Universities in the Western Cape in particular the Energy Research Centre at the University of Cape Town, the Centre for Sustainable and Renewable Energy Studies at the University of Stellenbosch and the Cape Peninsula University of Technology perform essential and recognised research in the field of sustainable development and sustainable energy.

- A number of trusts, NGOs such as Sustainable Energy Africa and South South North and consulting companies also play a key role in sustainable energy research.

Funding for sustainable energy research is also available through bilateral and multilateral donor programmes. This White Paper on Sustainable Energy does not require separate or additional research funding as it is expected that existing and forthcoming resources will be sufficient and more sustainable to support longer term research activities.

7. Chapter 7. Monitoring and Evaluation

The SDIP stipulates that an annual provincial sustainability review will be prepared and published by the D:EA&DP. This annual review is to include dedicated reporting on all of the priority actions and targets indentified in the SDIP. This means that key performance areas linked to sustainable energy will be monitored on an annual basis.

The PGWC must also be able to measure the effectiveness and efficiency of programmes and actions implemented and it must be able to sustain this capacity.

The PGWC will put in place a system for continuous updating and registration of statistics related to energy efficiency and electrical renewable energy generation. A special monitoring system will also be developed to track the efforts and achieve the goals for energy poverty reduction.

A formalised system for collecting and managing data, calculating indicators and reporting will be established. This will inform on progress being made and guide implementation and necessary adjustments in order for the Province to successfully achieve the targets for sustainable energy.

The PGWC has embarked upon a process to develop detailed methodologies for the monitoring and tracking of sectoral targets. Where regulation is necessary to collect data, the PGWC will prepare the necessary legislation and regulations to prescribe to institutions, enterprises and individuals to keep and supply the necessary data.

The PGWC will also undertake institutional capacity assessments as part of monitoring. By understanding the institutional capacity and the barriers, PGWC will be enabled to address the gaps.

Independent external parties may be used to verify or provide independent views and findings related to the methodologies and results monitored and reported by the PGWC.

Conclusion

The White Paper has detailed the approach the Western Cape Provincial Government is taking in ensuring sustainable energy provision and use thereof in the province. Through the implementation of the energy policy options and cooperation with stakeholders at national and municipal level, the Western Cape Provincial Government will strive to reach the targets and goals it has set in the White Paper.

Appendices

7.1. Appendix 1: Process and Participation in the Energy policy development in the Western Cape 2005 – 2008

This White Paper on Sustainable Energy is a result of a long process of policy development as well as participation activities.

The policy formulation of this White Paper on Energy is an integrated and logical result of the IKAPA GDS and the SDIP.

Prior to those policy documents, the PGWC had drafted what is now called the Sustainable Energy Strategy, which is an internal department document. The Sustainable Energy Strategy Process started in 2005 with the development of a status quo document outlining the energy issues in the Western Cape. From the status quo document followed research that could provide facts around options and the actual energy situation.

The support documents included the Energy Profile of the Western Cape based on 2004 data, the Renewable Energy Scenarios and Action Plan and Energy Efficiency Scenarios and priorities. This formed the Sustainable Energy Strategy Compendium. This was also summarised into the current Sustainable Energy Strategy.

Throughout the process there has been engagement with stakeholders.

In 2006 a series of Workshops endorsed by the PDC and advertised in the local newspapers were held for the following sectors: local government; labour; NGOs; business and the public.

The draft strategy was finalised based on the comments received.

During that process the above-mentioned Sustainable Development Implementation Plan was also being developed. Energy was one of the areas defined and this was clearly linked to the strategy. Through their consultation process the energy issue and strategy was discussed and noted by stakeholders through the PDC.

The process included one-on-one meetings with internal stakeholders on the potential impact of the proposed strategy on their area of work – for example from the Health Department to the Economic Development Department. That process was complimented by the engagement of the multi-stakeholder Energy Risk Management Committee which was set up around the time of a crisis relating to electricity shortages.

This process was followed in 2007 by a conference on climate change and energy. The strategy was presented and a call for legislation that would entrench the outcomes of the conference and the strategy was proposed. At this conference the draft strategy document was made available.

The draft climate change strategy, its supporting documents as well as popular brochures of the energy profile and strategy have been made available on the special purpose website www.wcapeenergy.net.

The participation process on the development of the White Paper on Sustainable Energy has included:

- internal consultations;

- establishment of a reference group and consultation;
- external consultation with local municipalities, national departments, business and Labour; and
- Public hearings.

The White Paper process complied with the PGWC guidelines on formulation of policy and legislative documents.

7.2 Appendix 2: Key Stakeholder Roles for Development of WCPG Sustainable Energy Framework 2008-2014

Role/ Stakeholder Groups	Policy	Legislation/ Standards	Enforcement	Implementation	Finance	Research	Education/ Awareness	Monitoring	Other roles
WCPG	V	V	V	(V)			V	V	
Local Government	(v)	V	V	V	V		V	V	V
National Government	(V)	V			(V)		(V)		V
NERSA		V	V						
User Group: Industry	(v)			V	(v)		V		
User Group: Buildings	(v)			V	(v)		V		
User Group: Residents	(v)			V	(v)				
Organised Labour	(v)								
IPPs				V	V				
Eskom				V	V				
ESCOs				V					
NGOs	(v)					V	V		V
Donors					V				V
Universities						V			
Consultants				V					
Individuals / Others	(V)					V			V
V = Key role and (v) = Consultation role									

7.3 Appendix 3 List of key documents

Brundtland Commission “Brundtland Report” 1987

D:EA&DP “Renewable Energy Resource Assessments” 2007.

D:EA&DP: Sustainable Energy Strategy Year 2008

DME: National Energy Efficiency Strategy 2005-2015

DME: White Paper on Renewable Energy 2002

IAEA, IEA, UN, Eurostat and European Environmental Agency: “Energy Indicators for Sustainable Development – Guidelines and Methodologies” 2005

IEA: Key World Energy Statistics 2006

NERSA Annual reports 2004, 2005 and 2006

Western Cape Provincial Government “Climate Change Response Strategy and Action Plan” 2008

Western Cape Provincial Government “Sustainable Development Implementation Plan” 2007