



renewable  
energy  
& energy  
efficiency  
partnership

# The Republic of South Africa

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## Section 1: Energy provision

### 1.1 Fuel sources for direct use and power generation, including reliance on imports

In 2007, South Africa reportedly generated 261,476,482,600 kWh<sup>1</sup>. South Africa has an abundance of coal, which is the main fuel source for the generation of electricity. In 2007, South Africa had proved coal reserves of 48 000 million tonnes<sup>2</sup>, produced 283 million short tons of coal and consumed 203 million short tons of coal<sup>3</sup>. It exports approximately 28% of all coal mined<sup>4</sup>.

As of January 1 2008, South Africa had proved oil reserves of an estimated 15 billion barrels, and according to 2007 estimates produced approximately 199 100 bb/day and consumed approximately 505 000 bb/day<sup>5</sup>. It is estimated that in 2005, 267 700 bbl/day were exported and 319 000 bbl/day were imported in 2006<sup>6</sup>.

Natural gas reserves were estimated at 27.16 million cu m in 2007, with 2.9 billion cu m being produced in 2006 and 3.1 billion cu m consumed in 2006<sup>7</sup>. South Africa has one of the largest Gas-to-Liquid (GTL) refineries in the world, operated by PetroSA (Pty) Ltd, the parastatal responsible for South Africa's commercial assets in the petroleum industry<sup>8</sup>. SASOL is a South African company involved mainly in the liquid fuels production business as well the synthetic fuels business<sup>9</sup>.

The main generator of electricity, approximately 95% of all electricity, in South Africa is the state energy company ESKOM<sup>10</sup>. ESKOM has a generating capacity of 36 200MW, of which

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<sup>1</sup> <http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622>

<sup>2</sup> Ibid.

<sup>3</sup> [http://www.eia.doe.gov/cabs/South\\_Africa/Profile.html](http://www.eia.doe.gov/cabs/South_Africa/Profile.html)

<sup>4</sup> <http://www.dme.gov.za/energy/coal.stm>

<sup>5</sup> Ibid.

<sup>6</sup> <https://www.cia.gov/library/publications/the-world-factbook/geos/sf.html>

<sup>7</sup> Ibid.

<sup>8</sup> <http://www.petrosa.co.za/>

<sup>9</sup> <http://www.dme.gov.za/energy/liquid.stm>

<sup>10</sup> South African Energy Statistics, 2008, available at <http://www.dme.gov.za/energy/statistics.stm>

coal fired capacity constitutes 32 100MW<sup>11</sup>. Municipalities in South Africa produce 2 400MW, and private companies currently provide 800MW<sup>12</sup>.

ESKOM also operates South Africa's only nuclear power station, Koeberg (1 800MW), two gas turbine generators (340 MW), six conventional hydroelectric plants (600 MW), and two hydroelectric pumped-storage stations (1 400 MW)<sup>13</sup>. Due to the power crisis of 2007 / 2008, ESKOM has decided to return several coal-fired power stations back to service after being mothballed in the nineties<sup>14</sup>. ESKOM has also commissioned several future projects to attempt to reach a capacity of 80 000 MW by 2026<sup>15</sup>.

In terms of renewable energy, renewable energy currently only produces approximately 1% of the electricity generation<sup>16</sup>. The White Paper for Renewable Energy has set a target of 10 000 GWh by 2013, or essentially 5% of the electricity mix. Towards this end, a Renewable Energy Feed-in Tariff (REFIT) has been introduced by the National Energy Regulator of South Africa, although this is currently only a guideline, and no legislation has been provided as of yet<sup>17</sup>. Wind, Solar power, hydro and biomass are the most common sources of renewable energy, although the biofuels sector has not been fully exploited due to concerns regarding food security<sup>18</sup>.

## **1.2 Extent of connection to electricity network (households and businesses; rural and urban)**

The national transmission grid covers 27 000km of South Africa<sup>19</sup>, and there has been a massive drive through the Integrated National Electrification Programme (INEP)<sup>20</sup> since 1994 to increase the extent of the population with access to electricity from 36% to approximately 71% in 2004, in order to address the imbalance of electricity supply due to apartheid<sup>21</sup>. The Government, through the former Department of Minerals and Energy, implemented a Free Basic Electricity programme, which provides that qualifying households that are connected to the national grid will receive 50kWh of electricity free per month. Various guidelines and tariffs, such as the National Electricity Basic Services Support Tariff Policy, have been created to assist and achieve the implementation of the INEP<sup>22</sup>. However, due to the fact that there are many communities and households that are not connected to the grid, the Government in 2003 instituted the Free Basic Alternative Energy (FBAE) Policy, which is to work hand in

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<sup>11</sup> Ibid.

<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

<sup>14</sup> <http://en.wikipedia.org/wiki/Eskom>

<sup>15</sup> [http://www.eskom.co.za/live/content.php?Item\\_ID=5981](http://www.eskom.co.za/live/content.php?Item_ID=5981)

<sup>16</sup> <http://www.energyrecipies.org/reports/reports/061127%20Recipies%20-%20South%20Africa%20RE%20potential%20report.pdf>

<sup>17</sup> <http://www.nersa.org.za/NewsFull.aspx?Article=37>

<sup>18</sup> National Biofuels Feasibility Study 2006.

<sup>19</sup> South African Energy Statistics, 2008, available at <http://www.dme.gov.za/energy/statistics.stm>

<sup>20</sup> [http://www.dme.gov.za/energy/elect\\_inep.stm](http://www.dme.gov.za/energy/elect_inep.stm)

<sup>21</sup> [http://www.southafrica.co.za/energy\\_and\\_water\\_92.html](http://www.southafrica.co.za/energy_and_water_92.html)

<sup>22</sup> Ibid.

hand with the INEP and the Free Basic Electricity Programme<sup>23</sup>. FBAE is implemented by municipalities to qualifying households.

Most of the connections are in the urban areas, while the rural areas tend to be off grid. Those households which have been assisted by the INEP, the FBAE and the Free Basic Electricity programme, are also connected, either to the main grid or are off grid, depending on whether there is infrastructure available in the area to connect them to the grid. Even though there are many households and areas that are not connected, South Africa is well above the Southern African Developing Community (SADC) average of 20% of households being connected<sup>24</sup>.

### **1.1 Any capacity concerns (power generation and/or transmission/distribution)**

As mentioned above, ESKOM is suffering from capacity generation problems due to demand outstripping supply in 2007 and 2008. As a result, ESKOM introduced "load shedding", or scheduled black outs that try to preserve the grid when demand is too high<sup>25</sup>. Prior to the onset of the load shedding crisis, ESKOM embarked on a massive expansion programme up to 2026 including the development of several new coal-fired power stations, and transmission lines. This programme will ultimately cost more than a trillion rand<sup>26</sup>. A barrier to the implementation of more renewable energy sources is the fact that electricity is generally very cheap in South Africa due to the abundant coal supplies<sup>27</sup>. However, ESKOM has requested further increases to the electricity tariff dramatically to cover the costs of its expansion programmes and rising coal costs<sup>28</sup>.

### **1.2 Potential for renewable energy, energy efficiency and co-generation (i.e. any authoritative assessments)**

South Africa has, in general, been very slow to develop its renewable energy potential, mainly due to its cheap electricity. This is despite the presence of several government policies and decisions, such as the Renewable Energy Feed In Tariff. South Africa's greatest renewable energy potential lies in the solar energy and wind energy fields<sup>29</sup>. The renewable energy sector is gathering speed, and tax incentives for energy efficiency were introduced in the 2009 Budget as well as in the Income Tax Act 58 of 1962<sup>30</sup>.

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<sup>23</sup> <http://www.dme.gov.za/pdfs/energy/electricity/Free%20basic%20alternative%20energy.pdf>

<sup>24</sup> <http://www.mbendi.com/indy/power/af/sa/p0005.htm>

<sup>25</sup> <http://en.wikipedia.org/wiki/Eskom>

<sup>26</sup> [http://www.eskom.co.za/live/content.php?Item\\_ID=5981](http://www.eskom.co.za/live/content.php?Item_ID=5981)

<sup>27</sup> <http://www.southafrica.info/business/economy/sectors/energy.htm>

<sup>28</sup> <http://www.busrep.co.za/index.php?fArticleId=4311089>

<sup>29</sup> <http://www.energyrecipes.org/reports/reports/061127%20Recipes%20-%20South%20Africa%20RE%20potential%20report.pdf>

<sup>30</sup> <http://www.mg.co.za/article/2009-02-16-how-green-is-our-budget>

## Section 2: Energy market

### **2.1 Ownership (state/municipality/private/mixture) of electricity and gas utilities and other sources of energy**

Although ESKOM does not have exclusive generation rights in South Africa, it does have the practical monopoly on the bulk of electricity in the country, and it maintains the national grid<sup>31</sup>. In 2002, ESKOM was converted into a public company<sup>32</sup>, although it is de facto a parastatal. In 2003, Cabinet made a decision to increase private-sector participation in the electricity industry by dividing power generation between ESKOM and independent power producers, or IPPs, although ESKOM still has the majority of the generation rights. The DME is the government department responsible for ensuring IPP participation, and in order to fulfil this mandate a power generation investment plan was drawn up. Also during 2003, ESKOM revised its business model to prepare for the restructuring. Of importance here is that in terms of this restructuring, power generation remains with ESKOM, as does the transmission division. The distribution division has been severed, and has been merged with the electricity departments of municipalities to form regional electricity distributors, or REDS<sup>33</sup>. The first RED was established in the Western Cape in 2005. The REDS will buy electricity from ESKOM at a tariff set by the National Energy Regulator of South Africa (NERSA) and will offer the electricity at a competitive price and efficient services<sup>34</sup>.

In terms of natural gas, PetroSA is the parastatal that owns of South Africa's gas reserves. Its mandate is to commercialise all the state-owned assets in the Petroleum sector and to manage them as a profitable business for the benefit of all South Africans<sup>35</sup>.

### **2.2 Extent of competition in power generation and energy retail**

Although the Government has introduced plans to reduce ESKOM's monopoly on the electricity sector, ESKOM is still the main player in the electricity generation and retail arena<sup>36</sup>. PetroSA has the monopoly on the gas sector, although the South African company, SASOL, also operates GTL facilities. SASOL has the monopoly on the Coal-to-Liquid (CTL) sector in South Africa.

### **2.3 Structure: Extent of vertical integration of generation / transmission / distribution / retail**

The electricity sector in South Africa is essentially totally vertically integrated due to the continued existence of ESKOM's monopoly of approximately 95% of the market. ESKOM is involved in practically every area of the electricity sector, from generation, transmission and retail<sup>37</sup>. Furthermore, any IPPs need to connect to the national grid operated by ESKOM in

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<sup>31</sup> <http://www.dme.gov.za/energy/electricity.stm>

<sup>32</sup> Ibid.

<sup>33</sup> Ibid.

<sup>34</sup> [http://www.dme.gov.za/energy/elect\\_distrib.stm](http://www.dme.gov.za/energy/elect_distrib.stm)

<sup>35</sup> <http://www.petrosa.co.za/>

<sup>36</sup> [http://www.dme.gov.za/energy/elect\\_distrib.stm](http://www.dme.gov.za/energy/elect_distrib.stm)

<sup>37</sup> [http://www.eskom.co.za/live/content.php?Category\\_ID=14](http://www.eskom.co.za/live/content.php?Category_ID=14)

order to distribute their electricity. SASOL can be considered to be vertically integrated<sup>38</sup>, while PetroSA is not, as it does not have a retail presence<sup>39</sup>.

## Section 3: Energy Policy framework

### 3.1 Existence of an explicit policy framework and key policies– what role is envisaged for renewable energy?

South Africa has a well developed environmental and energy policy and legislation framework. All of the sub-sectors of the Energy sector have received attention in the form of policy and / or legislation and regulations promulgated in terms of the governing legislation. There is the over-arching White Paper on Energy Policy of South Africa, 1998 which describes the government's general policy for the supply and consumption of energy until, approximately, the year 2010. This policy sets out the path for development of renewable energy and improvement of energy efficiency with the ultimate goal to reach a more sustainable energy mix to facilitate the achievement of South Africa's macro-economic goals, while the White Paper on Renewable Energy, 2003 lays the foundation for widespread implementation of renewable energy and sets a target of 10 000 GWh of renewable energy contribution to final energy demand by 2013. Recently, in March 2009, the National Renewable Energy Summit was held to review the White Paper on Renewable Energy and to determine the way forward beyond the target date of 2013<sup>40</sup>.

As mentioned previously, the Government launched the Integrated National Electrification Programme to provide greater access to electricity for the population of South Africa, as well as the Free Basic Electricity programme, and the Free Basic Alternative Energy policy applies for the off-grid connection projects that provide energy to the households that qualify for the free basic energy.

### 3.2 Any current energy policy debates / developing legislation

Apart from the electricity crisis, renewable energy has been receiving much attention both from the Government and from the media. Despite this, no new legislation or policy has been created to give effect to the White Paper on Renewable Energy of 2003, except for the publication of the REFIT Guidelines in March 2009. The development of a biofuel industry is still be debated, due to concerns around food and water security despite the fact that the Biofuels Industrial Strategy of the Republic of South Africa, 2007 calls for maize to be excluded due to its status as a staple food source.

### 3.3 Any specific policies / programmes promoting sustainable energy

There are several policies and strategies that support and promote sustainable energy, such as:

- White Paper on Energy Policy, 1998;

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<sup>38</sup> <http://quote.morningstar.com/Quote/Quote.aspx?ticker=SSL>

<sup>39</sup> <http://www.compcom.co.za/resources/newsletter%20-%20dec05/html/pages/3%20SasolEngen.htm>

<sup>40</sup> [http://www.dme.gov.za/energy/Renewable\\_Energy\\_Summit\\_2009.stm](http://www.dme.gov.za/energy/Renewable_Energy_Summit_2009.stm)

- White Paper on Renewable Energy, 2003;
- Energy Efficiency Strategy for the Republic of South Africa, 2005;
- Biofuels Industrial Strategy, 2007

There are also several programmes promoting sustainable energy, such as:

- Urban Sustainable Energy for Environment & Development Programme (SEED), focussing on energy efficiency;
- Renewable Energy Market Transformation Programme (REMT) run by the DME focussing on removing the barriers and reducing the implementation costs of renewable energy technologies, and also promoting on-grid electricity for renewable energy sources<sup>41</sup>
- REFIT run by NERSA focusing on remunerating IPP's for renewable power they feed into the national grid<sup>42</sup>.

The South African National Energy Research Institute (SANERI), a wholly-owned subsidiary of the Central Energy Fund (Pty) Ltd, is the public entity tasked with coordination and undertaking of public interest energy research, development and demonstration, in areas such as Energy Infrastructure Optimisation, Energy Efficiency and Demand Side Management, Cleaner Fossil Fuel, Stimulating Socio-economic Development through the Productive Use of Energy, Renewable Energy, Alternative Energy (mainly Fuel Cells and the Hydrogen Economy), Understanding the Impact of Energy Use on the Environment, Energy Modeling and Planning, and Energy Policy Research. It is under the joint custodianship of the Department of Minerals and Energy and the Department of Trade and Industry<sup>43</sup>.

### **3.4 Any major network / sustainable development energy studies available**

Two main studies, apart from the White Papers on Energy Policy and Renewable Energy, seem relevant in this context:

- National Biofuels Feasibility Study, 2006;
- "Renewable Energy in emerging markets and developing countries: Current situation, market Potential and recommendations for a win-win for EU industry, the Environment and Socio-economic development" (RECIPE) Country Report on South Africa.

### **3.5 Role of government in energy policy**

The Department of Minerals and Energy (now known as the Department of Energy) is the government department mandated to develop and implement policy relating to the energy sector, most notably the Electricity and Nuclear Branch and the Hydrocarbons, Energy Planning and Clean Energy Branch<sup>44</sup>.

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<sup>41</sup><http://www.engineeringnews.co.za/article/dme-dbsa-create-fund-to-boost-renewable-energy-investments-2008-11-07>

<sup>42</sup> [http://www.tradeinvestsa.co.za/feature\\_articles/897480.htm](http://www.tradeinvestsa.co.za/feature_articles/897480.htm)

<sup>43</sup> Information obtained from the SANERI website: <http://www.saneri.org.za/index.html>

<sup>44</sup> [http://www.dme.gov.za/ministry/whatwedo\\_dme.stm](http://www.dme.gov.za/ministry/whatwedo_dme.stm)

## Section 4: Energy regulation

### 4.1 Energy regulator

The National Energy Regulator of South Africa, or NERSA, established by the National Energy Regulator Act 40 of 2004, is charged with regulating the energy industry of South Africa, including Piped Gas, Electricity and Piped Petroleum Products in accordance with government laws, policies, standards and international best practices in support of sustainable development, as well as having a licensing role<sup>45</sup>. The composition of the Regulator consists of four full-time and five half-time members who are appointed by the Minister of Minerals and Energy. The Chief Executive Officer, the Chairperson and the Deputy Chair are all appointed by the Minister. The Regulator is funded by funds set aside by Parliament, levies imposed by or under separate legislation, funds collected under separate legislation, charges for dispute resolution and other services rendered in terms of the National Energy Regulator Act, as well as licence fees.

The Nuclear Sector is regulated by the National Nuclear Regulator, established by the National Nuclear Regulator Act 47 of 1999. Its role is to provide for the protection of persons, property and the environment against nuclear damage through the establishment of safety standards and regulatory practices, to exercise regulatory control related to safety over various aspects of the nuclear sector, as well as having a licensing role<sup>46</sup>.

### 4.2 Degree of independence of the regulator from government

NERSA is considered as being independent, due to the fact that it plays an advocacy role to the more government controlled entities of ESKOM and PetroSA. Furthermore, its establishing legislation, the National Energy Regulator Act, provides that, in terms of the duties of the members of the Energy Regulator, the members must act in a justifiable and transparent manner whenever the exercise of their discretion is required; at all times act in the interests of the Energy Regulator and not in their own or sectoral interests; act independently of any undue influence or instruction; recuse themselves from and refrain from voting on or discussing any matter, pending before the Energy Regulator in which they have a direct or indirect pecuniary interest; act in a manner that is required and expected from the holder of a public office; and act in the public interest. When such utilities wish to increase their tariffs, or conditions of service, they must apply to NERSA which must independently ensure that such an increase or change is merited by the facts<sup>47</sup>. However, due to the fact that it is partially funded by the Government, and the fact that its members are appointed by the Government, leaves the issue of independence open to debate.

### 4.3 Regulatory framework – legislation, duties, powers (any references to environment, sustainable energy)

As previously mentioned, South Africa has a very well developed environmental legal framework (which will not be discussed here), as well as numerous energy-based legislation, policies and regulations. What follows is a very brief overview of the most relevant policies and legislation in the context of **renewable energy** and **energy efficiency** only. It must be

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<sup>45</sup> <http://www.nersa.org.za/AboutUsProfile.aspx>

<sup>46</sup> <http://www.nnr.co.za/default.aspx#>

<sup>47</sup> <http://www.nersa.org.za/AboutUsProfile.aspx>

noted that there are also several policies, strategies and pieces of legislation focussing on electricity and nuclear power, although these too are not dealt with in this report.

The following national policies are regarded as the most relevant in the context of renewable energy and energy efficiency:

- **White Paper on the Energy Policy of the Republic of South Africa, 1998**, that describes the government's general policy for the supply and consumption of energy until, approximately, the year 2010. This policy sets out the path for development of renewable energy and improvement of energy efficiency with the ultimate goal to reach a more sustainable energy mix to facilitate the achievement of South Africa's macro-economic goals.
- **White Paper on Renewable Energy, 2003**, that lays the foundation for the widespread implementation of renewable energy and sets a target (currently not mandatory, only a policy objective) of ten thousand (10 000) gigawatt-hours of renewable energy contribution to final energy demand by 2013.
- **Energy Efficiency Strategy of the Republic of South Africa, 2005 (reviewed 2008)**, that sets out a national target (currently not mandatory, only a policy objective) for energy efficiency improvement of 12% by 2015 and provides for a number of "enabling instruments".
- **National Biofuels Feasibility Study, 2006**, that investigates the feasibility of establishing a biofuels industry in South Africa. The study sets out to determine whether a biofuels industry is justified in South Africa, and what incentives and regulatory environment is required to support the creation and ongoing operation of a potential biofuels industry in an optimal manner in order to maximise the national benefits<sup>48</sup>.
- **Biofuels Industrial Strategy of the Republic of South Africa, 2007**, that proposes the adoption of a 5 year pilot programme to achieve a 2% penetration level of biofuels in the national liquid fuel supply. It further proposes the utilisation of certain crops for the production of biofuels, and excludes others on the grounds of food security. It recommends the use of a fuel levy exemption for biodiesel and bioethanol.
- **National Cleaner Production Strategy, 2004**, that seeks to "to enable SA society and industry to develop its long term full potential by... adopting the principles of Cleaner Production... and promoting the practices of sustainable consumption."<sup>49</sup>

The following statutes are regarded as the most relevant in the context of renewable energy:

- **The Constitution of the Republic of South Africa Act 108 of 1996**, that provides for the "environmental right" under section 24;
- **The National Environmental Management Act 107 of 1998 (NEMA)**, is the most significant single piece of legislation dealing with environmental management in South Africa. Section 2 of NEMA reflects certain key principles of the National Environmental Management Policy for South Africa and establishes a set of National Environmental Management Principles (the NEMA Principles) which apply throughout the Republic to the actions of all organs of state that may significantly affect the environment. Such

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<sup>48</sup> See page i of the Study document.

<sup>49</sup> See page 5 of the Strategy document.

principles are very relevant in the context of renewable energy and therefore cognisance of these principles should be taken.

- **The Electricity Regulation Act 4 of 2006**, which, apart from providing the relevant licensing and tariff provisions, the objects of which are *inter alia* to promote the use of diverse energy sources and energy efficiency. Section 34 of the Act provides for new generation capacity. Of relevance to renewable energy is that section 34(1)(b) provides that the Minister may determine the sources from which electricity is to be generated, as well as the percentages of electricity that must be generated from such identified sources. The REFIT derives directly from this provision.
- **The Energy Act 34 of 2008**, that is aimed at ensuring 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, taking into account environmental management requirements and interactions amongst economic sectors. The Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment, appropriate upkeep and access to energy infrastructure. The Act also establishes an institution to be responsible for promotion of efficient generation and consumption of energy and energy research; and to provide for all matters connected therewith. In terms of section 4 of the Act, the Minister may, after consultation with the Minister of Trade and Industry, the Minister of Labour and the Minister of Environmental Affairs and Tourism, adopt measures not contemplated in any other legislation, to minimise the negative safety, health and environmental impacts of energy carriers. In terms of section 6 of the Act, the Minister must develop and, on an annual basis, review and publish the Integrated Energy Plan in the Gazette. The Integrated Energy Plan must deal with issues relating to the supply, transformation, transport, storage of and demand for energy in a way that accounts for: (a) security of supply; (b) economically available energy resources; (c) affordability; (d) universal accessibility and free basic electricity; (e) social equity; (f) employment; (g) the environment; (h) international commitments; (i) consumer protection; and (j) contribution of energy supply to socio-economic development. In terms of section 19 of the Act the Minister may make regulations regarding *inter alia* minimum contributions to national energy supply from renewable energy sources; the nature of the sources that may be used for renewable energy contributions to the national energy supply; measures and incentives designed to promote the production, consumption, investment, research and development of renewable energy; and minimum levels of energy efficiency in each sector of the economy. At the date that this Policy Review was conducted, no relevant regulation (in the context of renewable energy) has been passed under the Act. It is anticipated that the regulations under this Act will stimulate/require energy efficiency, energy conservation and the development of renewable energy.
- The Electricity Pricing Policy Regulations promulgated under the National Energy Regulator Act 20 of 2004.

#### **4.4 Regulatory barriers to sustainable energy identified?**

There has been much speculation as to why the renewable energy sector in South Africa has so far not been successful. Possible barriers include the fact that the target set by the White

Paper on Renewable Energy is too low to stimulate investment, while there are too few fiscal incentives for energy efficiency and renewable energy. As mentioned previously, the cheap electricity available in South Africa is a further barrier to the implementation of more expensive renewable energy technology. There is also a need for clearer direction from national government on the future of renewable energy and energy efficiency, in terms of legislation and regulations, as well as greater co-operation between the government departments and the private sector. Renewable energy technology also tends to be expensive, and thus does not promote investment.