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Clean Energy Investment in Developing Countries:

Domestic barriers and opportunities in South Africa

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June 2010

This paper is a product of IISD's "Bali to Copenhagen" Trade and Climate Change Project.

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Abbreviations and Acronyms

ABSA	Amalgamated Bank of South Africa
AIB	Association of Issuing Bodies
BEE	Black Economic Empowerment
CCS	carbon capture and storage
CCT	clean coal technology
CDM	clean development mechanism
CEF	Central Energy Fund
CER	certified emission reduction
CO2	carbon dioxide
CSIR	Council for Scientific and Industrial Research
DANIDA	Danish International Development Assistance
DARLIPP	Darling Independent Power Producer
DBSA	Development Bank of Southern Africa
DEAT	Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DSM	demand-side management
DEAT	Department of Environmental Affairs and Tourism
DNA	Designated National Authority
EIA	Environmental impact assessment
ENE	Empresa Nacional de Electricidade
ESKOM	Electricity Supply Commission of South Africa
FDI	foreign direct investment
GEF	global environment fund
GHG	greenhouse gases
GW	gigawatts
GWh	gigawatt hour
IDC	industrial development corporation
IFP	Inkatha Freedom Party
IMF	International Monetary Fund
IPP	independent power producer
ISES	International Solar Energy Society
KW	kilowatts
LEC	Lesotho Electricity Corporation
LFG	landfill-to-gas
LPG	liquid petroleum gas
LTMS	Long Term Green House Gases Mitigation Scenario Building Process

MFMA	Municipal Finance Management Act
MTPPP	Medium Term Power Purchase Programme
MW	megawatts
NFFO	non-fossil fuel obligation
NEM	National Environmental Management
NERSA	National Energy Regulator of South Africa
NORAD	Norwegian Agency for Development Cooperation
PCF	Prototype Carbon Fund
PetroSA	Petroleum, Oil and Gas Corporation of South Africa
PGWC	Provincial Government of the Western Cape
PNCP	Pilot National Cogeneration Programme
PPA	power purchasing agreement
PPP	public private partnership
PV	photovoltaic
RE	renewable energy
RED	regional electricity distributors
REFIT	renewable energy feed-in tariff
REFSO	Renewable Energy Finance and Subsidy Office
REMT	Renewable Energy Market Transformation Project
REPS	Renewable Energy Portfolio Standards
SABS	South African Bureau of Standards
SAIIA	South African Institute of International Affairs
SANEDI	South African National Energy Development Institute
SANERI	South African National Energy Research Institute
SARB	South African Reserve Bank
SATIB	South African Tradable Renewable Energy Certificates Issuing Body
SAWEP	South African Wind Energy Programme
SHS	solar home system
SOE	state-owned enterprise
SWH	solar water heating
TTGF	Technology Transfer Guarantee Fund
TREC	Tradable Renewable Energy Certificates
TJ	tetrajoules
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United National Industrial Development Organisation
USAID	United States Aid
WWF	World Wide Fund

1. Background

In the midst of current global challenges and a gloomy economic outlook, solar, wind, biofuels, geothermal, hybrid and electric vehicles, and other clean energy-related technologies provide bright spots. The establishment of sustainable energy systems, based on the use of clean energy resources, has become a general pursuit of the global community. The driving force behind the application of renewable energy technologies in Europe and the rest of the developed world has been the drive to clean up the energy sector in terms of its environmental impact and reduce dependence on limited energy resources. Renewable energy technologies are largely used to replace existing fossil fuel-based generation capacity.

In South Africa, clean energy development is at a crossroads. South Africa's highest emissions occur in the following sectors: public electricity and heat production; manufacturing industries and construction; and internal transportation (IEA, 2005). South Africa's carbon dioxide intensity is particularly high (0.18 metric tonnes per thousand USD of GDP in 2006[1]) because it derives so much of its energy consumption from highly carbon-intensive coal. The primary problem is South Africa's dependency on coal and fossil fuels (Fakir & Nicol, 2008). Further, as we shall observe, South Africa suffers from the classic problem of being saddled with a state-owned single distributor and until very recently, sole generator as well.

With huge energy demand a certainty over the long run, development of large-scale renewable energy supply is strategically important for environmental sustainability. However, a plethora of barriers continue to slow the development of clean energy markets in South Africa. Some of them are daunting: imperfect capital markets; resistance by the current monopolistic generator; supplier and distributor, institutional, regulatory and policy barriers; poor market acceptance; financing risks and uncertainties; lack of skilled personnel; and inconsistent quality and assurances.

For the purpose of this study, clean energy investment is defined as investment in energy sources and technologies that are considerably less environmentally detrimental than the baseline. According to Cosbey, Ellis, et al. (2008), clean energy technology comprises four technologies, namely: renewable energy, non-renewable low-carbon, cogeneration processes and energy-efficiency technologies. Renewable energy technologies can be grid-connected or off-grid solutions and harness naturally-occurring, non-depletable sources of energy, such as solar, wind, biomass, hydro, tidal, wave, ocean current and geothermal, to produce electricity, gaseous and liquid fuels, heat or a combination of these energy types. Cosbey, Ellis et al. (2008, p. 9) further point out that "non-renewable low-carbon technologies include clean coal technologies (CCT) and hydrogen and fuel cells. Energy efficiency technologies include a wide range of technologies including consumer end-

[1] World Bank's World Development Indicators.

use technologies such as smart-meters and energy efficient appliances, energy efficient machinery for industrial applications, district heating and power generation, as well as energy efficient technologies in non-energy sectors such as agriculture, waste management, and transportation."

The objective of this paper is to assess the key obstacles to increased clean energy investment in South Africa. The focus encompasses a search for best practice in addressing those obstacles, or in going beyond obstacles to proactive measures to promote such investment. The research is a blend of desk research and interviews with key members of the business community and government officials.

The paper is structured as follows: Section 2 provides a background on South Africa. Trends in energy demand, supply and investment are provided. The section analyzes national policies in relation to clean energy, namely the National Energy Act, 2008 and the White Paper on Renewable Energy 2003. Section 3 looks at the obstacles to investment in clean energy technologies in South Africa. Whereas Section 4 identifies the incentives in relation to clean energy investment, Section 5 examines financing mechanisms. Section 6 provides a brief analysis of international participation in clean energy investment and Section 7 concludes.

2. Country Background

South Africa, like other developing countries, faces the dual challenge of pursuing economic development and environmental protection. Exploitation of its renewable energy resources offers the possibility of doing both. As part of its post-apartheid development path, the South African government embarked on a policy to provide electricity to its entire population. By 2004, approximately 77 per cent of urban households were electrified (State of the Environment, 2008). While successful at household level, this policy did not include increasing the capacity of the national electricity grid, nor did it include diversifying the energy mix to increase the use of renewable energy (The Engineer, 2008). South Africa's abundance of cheap coal poses a major challenge to the successful implementation of clean energy technologies. In 2006, 90 per cent of the country's electricity is generated from coal, which is among the cheapest in the world and 40 per cent of petrol and diesel is manufactured from coal and gas (Visagie & Prasad, 2006).

2.1 Trends in energy supply and demand

The production and distribution of energy contributes 15 per cent of South Africa's gross domestic product (South Africa Online). In 2006, 67.2 per cent of energy generation stemmed from coal, 21.9 per cent from crude oil and 7.7 per cent from renewables and waste. The contributions of natural gas (2.9 per cent), nuclear energy (1.8 per cent) and hydropower (0.2 per cent) are small (South African Online, n.d.).

Total final energy consumption amounted to 2,716,380 TJ in 2006 (see Figure 1 below). While it would appear that mining, in terms of basic extraction activities, contributes little to energy demand, mineral beneficiation falls under the "industry" category, which, together with mining, consumes 51 per cent of the country's total energy, and two times more than the household sector. The transport and services sectors consume approximately 27 per cent and 8 per cent, respectively. The agricultural sector's consumption is the lowest at 2.59 per cent.

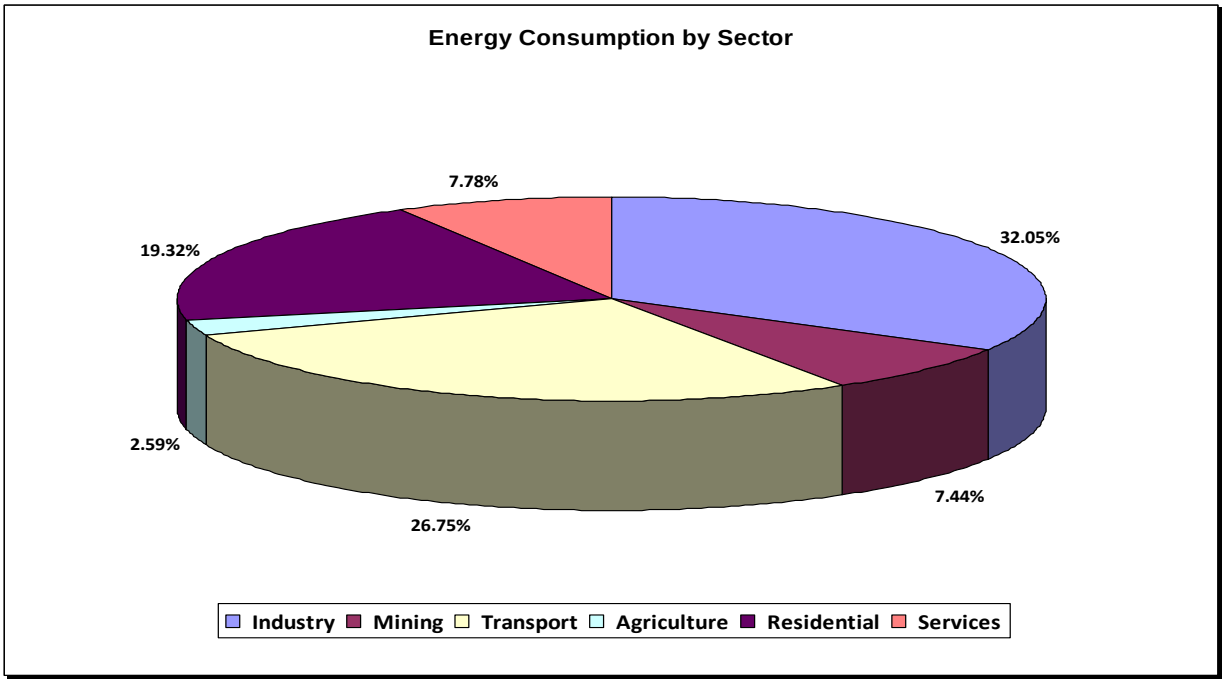


Figure 1: Energy consumption by sector (2006)
Source: DME (n.d.)

According to the Department of Minerals and Energy (DME, n.d.), raising South Africa's total electrification rate from 70 per cent to 100 per cent (one of the government's major social objectives) could be expected to increase overall consumption in the residential sector from 19.32 per cent to 23 per cent of total energy consumption in the country by 2025. Similarly, increasing the volume of South Africa's mineral exports will also increase the country's energy consumption, given the energy intensity of the mineral extraction and beneficiation industries. It is therefore unlikely that an industrial or investment promotion strategy that focuses on the energy-intensive industrial sector in general, would contribute positively to energy security in South Africa.

On a positive note, South Africa is among a few countries worldwide that have set comprehensive targets for energy-efficiency improvements. The Energy Efficiency Strategy compiled by the DME proposes to reduce final energy demand by approximately 12 per cent by 2015 (Department of Minerals and Energy, 2005). Notable in the Energy Efficiency Strategy is the demand side management (DSM) overall target of saving 4,255 megawatts (MW) over a period of 20 years, to mitigate the negative impact on the environment and to support local job creation. There is currently an annual DSM target of 152 MW that will be increased to higher levels as the markets gain momentum in the DSM implementation. This annual target is divided into energy-efficiency and load-management targets for the residential, industrial and commercial sectors.

2.2 A brief background on clean energy in South Africa

South Africa is well endowed, with abundant renewable energy resources that can be converted to productive energy uses. At present, however, the application of renewable energy technologies is virtually non-existent in South Africa. Currently less than 1 per cent of the 234,600 GWh of electricity generated in the country originates from renewable sources (see Figure 2 below). An increased focus on biofuels is being partly driven by a requirement in the agriculture sector for new markets for surplus production, and for expanding income sources from traditional food crops.

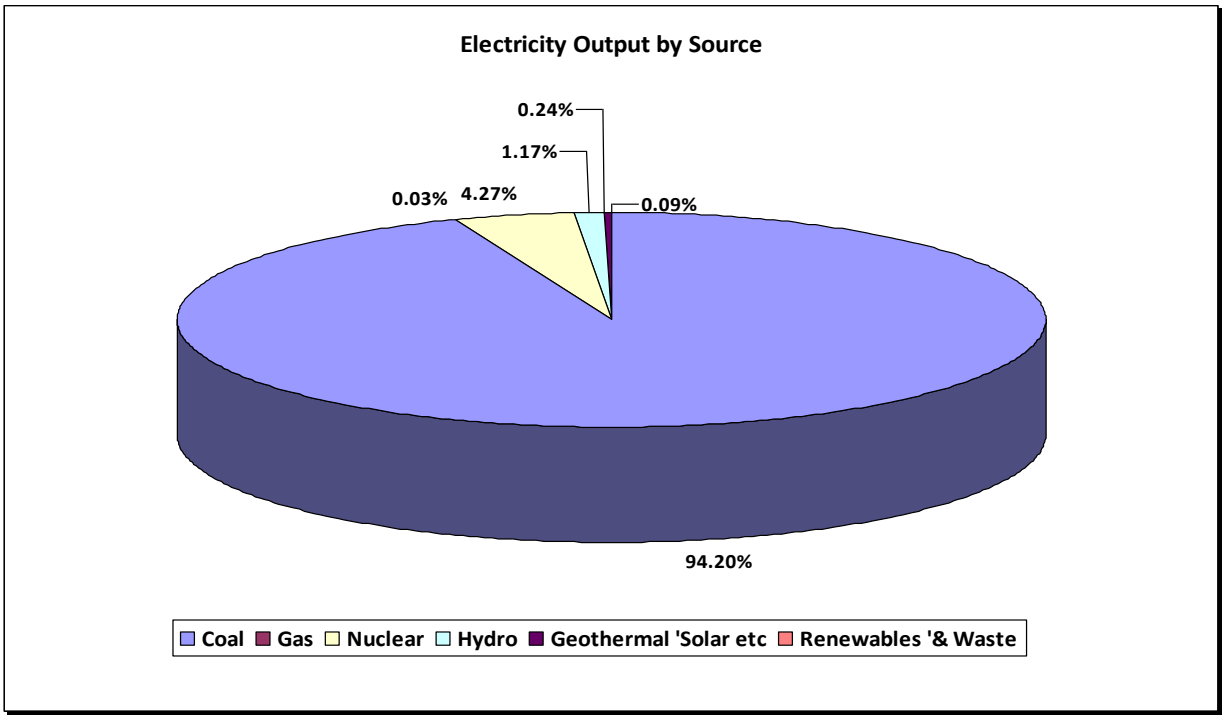


Figure 2: Electricity output by source
Source: DME (n.d.)

The government's 2003 White Paper on Renewable Energy Policy supports the establishment of renewable energy technologies, targeting the provision of 10,000 GWh of electricity from renewable resources by 2013, which is approximately 4 per cent of the projected energy consumption in 2013 (DME, 2003). According to the DME, achieving this target will require a phased, flexible strategy. The department attests that the starting point will be a number of "early win" investments spread across both relatively low-cost technologies, such as biomass-based cogeneration, as well as technologies with larger-scale application such as solar water heating, wind and small-scale hydro, along with a focus on building and fine-tuning the required institutional framework. This will keep

the subsidy requirements manageable. South African funds available for this purpose are constrained by the need to provide funds for high-priority national activities. However, there is a large potential for finance, available from international sources such as the Prototype Carbon Fund (PCF), bilateral assistance and private sector investment as discussed in Section 5.

Off-grid renewable energy

Elsewhere in this report, it is been mentioned that a major section of South Africa does not receive electricity. This was one of the major problems that the Reconstruction and Development Programme sought to address in 1994. However, more than 2 million households, primarily in rural areas, are still not connected to any grid.

The DME attempted to address this issue in 2001 with the Non-Grid Rural Electrification Programme. A "fee-for-service" approach was adopted whereby donors/private companies entered into concessions with the DME for independently setting up their own infrastructure to provide electricity to rural areas in return for a monthly service fee from the end users (DME, 2001). The concessionaire would own the system—which was usually a photovoltaic (PV) generator—which generated the electricity, and the operations and maintenance was the responsibility of the consumers. Furthermore, a subsidy was also provided, which took care of 75 per cent of the capital costs. The National Energy Regulator of South Africa was responsible for overseeing the process. Although the project was a success initially, as there were several installations, there were some shortfalls in the success of the projects. Studies that have examined the program have found that not all rural households could afford a monthly fee of R50 per month, operations and maintenance was not very effective (as the end users had no incentive in the absence of ownership of the systems) and PV systems are not very useful—they cannot be used for purposes such as cooking or heating water (Thom, Annecke & Mavhungu, 2000).

The other major off-grid project that may be implemented on a continuous basis is the sale of commercial solar home systems (SHS) to rural areas. It is common knowledge that a major cause of deaths in rural areas in South Africa is the use of harmful resources such as paraffin for producing heat. However, the primary problem in relation to SHS is the cost of retailing and distributing ultimately shouldered by the end user that makes this venture unprofitable (Martinot, Cabraal & Mathur, 2000). The general grouse in this regard is the lack of electricity cooperatives and a working rural electricity network (Martinot, Cabraal & Mathur, 2000).

There are some factors in relation to the two examples presented that cannot be countered, such as the nature of the PV systems. However, certain other factors may well be arrested. For example, if employment generation could be an additional benefit of an off-grid project, then things would become much easier. In Uganda, for instance, video nights are organized on electricity run on SHS

(Martinot, Cabraal & Mathur, 2000). It is not difficult to think of various uses implements may have. Furthermore, the reduction of operation and maintenance costs through training programs would certainly be helpful. The general argument in relation to off-grid projects is that private participation may be attracted by way of providing the appropriate technology for a price, which may be used by regional governments or informal rural co-operatives to develop into projects. This is where licensing and technology transfer become important criteria to deal with.

The above examples do not mean that off-grid projects have failed. The Schools and Clinics Electrification Programme provided off-grid services relying on SHS (DME, 2001). After the working of the Shell/Eskom Joint Venture, in which SHS electrification was built for 6,000 homes, the size of the private SHS market was estimated at R28 million in 2000 (Spalding-Fecher, 2002). However, the SHS has now taken a backseat pending the award of new contracts (Banks & Schäffler, 2006) due to protracted negotiations among the government, the Electricity Supply Commission of South Africa (Eskom) and the concessionaires. The Sustainable Energy and Climate Change Partnership has noted that mini-grids are ideal for a number of small towns around South Africa (Shearman, 2001, p. 44).

On-grid renewable energy

Other than the off-grid investments discussed above, it may be noted that other investments in clean energy would primarily be investments in relation to generation of electricity and hence subject to regulations and policies that govern electricity in South Africa. The other observation that has been made is that investments would be in relation to generation of electricity as against transmission and distribution. In order to appreciate the problems with investment in electricity in general and transmission and distribution in particular, it would be essential to examine the salient characteristics of the electricity sector in South Africa.

The electricity sector has been dominated by the monolithic company, Eskom, which is South Africa's largest state-owned enterprise (SOE). Eskom is: a) generator of around 96 per cent of South Africa's electricity (Eberhard, 2005); b) sole transmitter; and c) distributor to corporations, municipalities, households, villages. Historically, Eskom had built up a massive surplus capacity on foreign funds, which it used to supply areas of white habitation during the apartheid regime; that is one of the reasons why, despite having a surplus amount, the distribution was concentrated only in a few areas (Fine & Rustomjee, 1996, p. 16). This created an artificial low price and, even today, Eskom supplies the cheapest industrial electricity in the world (Leslie, 2000). However, Eskom has been largely successful in considerably increasing the distribution of electricity across South Africa and is also responsible for a sizable portion of the electricity enjoyed in a number of surrounding states of sub-Saharan Africa, including Botswana, Mozambique, Namibia, Swaziland, Lesotho, Zambia and Zimbabwe (Eskom, 2003). Eberhard (2005) is of the opinion that Eskom as a

distributor is preferable to inefficient municipalities recovering from the apartheid era and the requirement for privatizing the electricity industry was not felt as South Africa felt neither poor utility service nor short-term financial need. In June 1999, the distribution of electricity was proposed to be divided into six regional electricity distributors (RED). However, this proposal was not finalized and there is no formal mechanism of corporatizing distribution to this day.

The other major change that was introduced was by way of the White Paper on Energy Policy released in December 1998 (the "1998 White Paper") which sought to: (i) give customers the right to choose their electricity supplier; (ii) introduce competition into the industry, especially in generation; (iii) permit open non-discriminatory access to the transmission system; and (iv) encourage private sector participation in the industry (DME, 1998). The reasons behind this dramatic change in policy are unclear; there is no doubt that the Black Economic Empowerment (BEE) movement was a factor, as the movement was about the empowerment of black businessmen by devolving stakes in SOEs into their hands. Eberhard (2008) would have us believe that it was the brainchild of a small group of analysts rather than any consultative commissioned process. His scepticism is not completely unfounded, as there was no policy or guidelines issued as to how competition would be introduced and in what manner private participants may have a stake in the electricity industry.

A subsequent Cabinet decision[2] and a strategy evolved at a summit[3] made a few things clear—primarily that *no less than 70 per cent* of power generation would be retained by Eskom and the rest handed over to private investors, and a regulatory mechanism would be put in place to ensure the participation of independent power purchasers (IPP) and diversification of primary energy sources (Eberhard, 2008). However, such decisions did not specify how private investors would bear the incremental costs or how the same would be borne by consumers. Nor did it impose any purchase obligations on Eskom. The Electricity Act of 2006 did not shed any light on this either, other than clarifying that a license for generation, distribution, transmission, trading, import and export of electricity would be required. Thus, the primary problem—that of reducing Eskom's monopolistic sway by the introduction of private generators and the manner in which that was to be achieved—was not addressed. As Eskom continued to enter into joint ventures, even in relation to the 30 per cent generation capacity allotted to private parties (because the wording used was "no less than 70 per cent" to be held by Eskom, hence Eskom could legally overstep the 70 per cent generation capacity allotted to it), any clarity on private participation would be contractual.

[2] Media Briefing by Minister Phumzile Mlambo- Ngcuka 2001 (cited in Eberhard, 2005)
[3] Presented at: A strategy for implementation of the restructuring of the South African electricity industry, March 2002; the document is not publicly available

It should be noted that 2008 was a devastating year for Eskom: it had a considerable capacity shortage, which resulted in a substantial price increase[4]—this is new to South Africa, which has prided itself on its low electricity prices as a major competitive advantage. While the latter may be explained as the economically unsustainable price starting to give way and a necessary increased cost in investment, the former implies that an additional base-load capacity would now be sought and that the old faithful coal-fired power stations would be resorted to again. In fact, the price rise was announced after severe power cuts plagued South Africa in January 2008, which attracted a lot of international media hype. The Iran Daily, for instance, commented, "The problem, they [the sources] say, is that monopolist Eskom is prepared to pay only half of what it charges for electricity. Investors say they also need certainty. They could build capacity now at relatively high cost only to find Eskom refusing to purchase their power when the crisis eases" (Iran Daily, 2008). Even Eskom's more dispassionate observers, such as Eberhard, wrote a forceful polemic against Eskom's functioning, observing that "in addition to policy, planning and investment failure, Eskom is now incapable of keeping sufficient numbers of its existing generating units running […] there are no rational, transparent or published criteria for allocating new build-opportunities between Eskom and the private sector" (Eberhard, 2008, p. 10).

The huge loan book that Eskom is carrying has resulted in Eskom being unable to see itself getting through the capital cost of these loans without a price increase (Fakir & Nicol, 2008). As a result, the National Energy Regulator of South Africa (NERSA) granted Eskom an average tariff increase of 27.5 per cent for the 2008/09 financial year, which included the 14.2 per cent it had already granted the state-owned power utility in December 2007 (Engineering News, 2008a). To meet the current and future energy demands, Eskom has embarked on a strategy that includes building two more coal-fired power stations, Medupi and Kusile (Engineering News, 2008b). This is part of their strategy to increase its total generating capacity to 80,000 MW over the next 20 years (The Engineer, 2008). However, clean coal technology (such as flue gas denitrification and other denitrification systems) has not yet been installed at current power stations nor has there been any implementation of carbon capture and storage (CCS) (Hildebrandt, 2008).

Shortly after the power shortages, Eskom published the *Bidder's Guide to Power Purchase Programme,* published in May 2008. The document does betray an affinity for traditional power sources when it points out that: "In the short term, demand side initiatives will play an important role. In the medium term, alternative supply side options become feasible and in the longer term, more traditional base load power supply options can be relied on to secure the nation's position as an efficient and low cost power producer." Though Eskom is clear that short-term power supply management by way of demand-side initiatives would be solely the prerogative of Eskom, medium- and long-term supply would have private participation to meet the government directive of "30 per

[4] The NERSA decision in relation to "Eskom Holdings Limited – MYPD 1: 2008/09 Revision Application" is available on http://www.ner.co.za.

cent new generation capacity" to be developed by the private sector; the document declares that "Eskom is embarking on a process to procure approximately 900 MW of commercial cogeneration supply." In order to facilitate private participation, Eskom has developed three programs:

- Pilot National Cogeneration Programme (PNCP)
- Medium Term Power Purchase Programme (MTPPP)
- Base Load Independent Power Producer Programme ("Base Load IPP Programme")

However, the following statement is not very inviting:

> *Bidders should further note that the specific objective of the PNCP is to stimulate cogeneration development in isolation from other types of development initiatives within the electricity generation sub-sector, e.g. renewables. The NERSA is moving ahead on a renewables policy, and the outcome of that initiative would likely provide an additional option for potential power developers. With this in mind, the requirements unique to renewables projects have not been catered for in the PNCP.*

All projects in relation to clean energy have been put squarely on the shoulders of NERSA's renewable policy and initiative. The reference here is to the Feed-in-Tariff mechanism being developed by NERSA and discussed in Section 4.1. This holds good for the MTPPP where "smaller long lived renewables projects might not be well catered for by these Programmes" and NERSA is required to provide a solution "in regard to duration of contracts and ability to secure financing." While the document makes it clear that "these three Programmes do not cater specifically for renewables or low carbon technologies," there is nothing to prevent investors interested in non-coal-based sources of power generation. However, such bidders may not be given preference. When the South Africa Institute of International Affairs (SAIIA) spoke to Dr. Tsakani Mthombeni of the DSM of Eskom, he stated that Eskom currently has a renewable energy desk that is working closely with the DME. What is unclear is the nature of private participation in renewable energy at this point in any project where Eskom is involved.

This does not mean, however, that Eskom has not been concerned with renewable energy. On the contrary, it is involved in a few projects such as the Klipheuwel Wind Farm, the Darling National Demonstration Wind Farm and the Stirling Dish Demonstration Project.

However, it may be noted that, even for bidders who are accepted to enter into power purchasing agreements (PPAs) (irrespective of the source of the power to be generated), the primary difficulty that lies with Eskom from the point of view of an IPP is the lack of negotiability of PPAs. This was pointed out by Christopher Clarke, Director of the Evolution One Fund, the foremost player in private equity investments in clean energy in South Africa. Clarke (2008) did not criticize Eskom or its workings, but did point out that a PPA set in stone might be a problem. Other private players

pointed out that the Eskom PPA is very tightly drafted by renowned international lawyers and is substantially one-sided. For instance, the proceeds from the sale of any certified emission reduction (CER) certificates are due to Eskom, though the standard practice is that such proceeds must flow to the developer.

2.3 Energy policy

South African energy policy priorities have always been closely linked to the respective political situation. Until 1990, the focus was on independence from international energy imports, whereby the concentration was on exploitation of its large coal reserves spearheaded by Eskom and Sasol, where the former was concerned with electricity while the latter on synthetic fuels and natural gas. South Africa has a highly developed synthetic fuels industry, in which state company Petroleum, Oil and Gas Corporation of South Africa (PetroSA) and petrochemicals giant Sasol are the major players. Sasol is the world's largest manufacturer of oil from coal, gasifying the coal and then converting it into a range of liquid fuels and petrochemical feed stocks (Kowalik & Coetzee, 2005). Sasol, by some estimates has the largest point source of carbon dioxide (CO_2) emissions in the world (Wakeford, 2007). Though not directly connected to the production of electricity, the synthetic fuels produced have various industrial uses (Asamoah, 2006), which are particularly relevant to our discussion because of the country's reliance on coal.

Subsequently, energy policy in South Africa has undergone a substantial revision and now focuses on energy for development. A multistakeholder consultation process to redefine priorities and objectives ended with the publishing of a White Paper on the energy policy in South Africa in December 1998.

It depicts the new energy policy priorities, in particular, improving access to affordable energy services for the disadvantaged communities, and delivering cheap energy services for the national development process. In the course of electrification, the structure of the electricity distribution industry turned out to be dysfunctional and inappropriate, as a consequence of which a restructuring process commenced. A further aim is to introduce more competition to the sector, and hence to dismantle, privatize and deregulate the remaining large-scale monopoly structures such as Eskom and the synfuel sector. To this end, long-winded stakeholder processes were implemented, some of which are still under way.

The energy policy framework has been largely declaratory and enabling rather than exhaustive and specific. The most promising policy is the forthcoming feed-in tariff policy discussed later in the paper. Otherwise, there has been the general 1998 White Paper, which was expanded with a concentration on renewable energy in the form of the 2003 White Paper on Renewable Energy. The National Energy Regulator Act, 1999 created the National Energy Regulator of South Africa

(NERSA) but its powers have been largely modified by the Electricity Regulation Act, 2006. Though the 2006 Act is the framework legislation for the regulation of energy, irrespective of its source, it is the National Energy Act, 2008 and the Regulations framed on IPPs under the 2006 Act in January, 2009 that have a specific impact on renewable energy (RE). Other than this framework, which operates at a national level, provinces and municipalities have been quite active in relation to renewable energy; hence their efforts are discussed in section 2.3.4.

The chronological framework in relation to clean energy policies is summarized in Table 1 below.

Table 1: Clean energy policy and regulatory frameworks in South Africa

Name of instrument	Date of Issue	Administering authorities	Authorities created
White Paper on Energy Policy of the Republic of South Africa	December 1998	DME	None
White Paper on Renewable Energy Policy of the Republic of South Africa	July 2003	DME	None
Electricity Regulation Act	January 2006	DME; NERSA	Powers of NERSA laid out
Biofuels Industrial Strategy	December 2007	DME	None
White Paper on Sustainable Energy for the Western Cape Province	October 2008		None
National Energy Act	December 2008	DME	SANERI
Renewable Energy Feed-in Tariff Consultation Paper	December 2008	NERSA	Eskom as Single Point Purchaser; NERSA entrusted with operations, review and also issuer of generation license
Draft Independent Power Producer Regulations	January 2009	DME	Buyer Office working under the auspices of the DME

Among the above, the White Paper on Renewable Energy, 2003, the National Energy Act, 2008, the Draft Independent Power Producer Regulations, 2009 and the White Paper on Sustainable Energy in the Western Cape Province, 2008 are discussed in detail below, while the Feed-in Tariff Policy will be discussed in Section 4.1. The other instruments find mention where relevant.

2.3.1 *White Paper on Renewable Energy, 2003*

This White Paper supplements the White Paper on Energy Policy of 1998 (DME, 2003). It goes further than the latter by emphasizing the importance and potential of renewable energy. Central to its objectives is energy security through diversification of supply; some commentators have observed that energy diversification rather than environmental concerns is the key driver underlying the policy position of the White Paper (Fakir & Nicol, 2008, p. 5). The White Paper has gained popularity primarily in relation to the target set: "10,000 GWh renewable energy contribution to final energy consumption by 20" or "approximately 4 per cent of the estimated electricity demand by 2013." The target has also been considered to be grossly inadequate given the emission reduction commitments found in the Long Term Green House Gases Mitigation Scenario Building Process discussed in Section 2.4.2.

The 2003 White Paper touches upon several aspects, including the benefits of local manufactured renewable energy technologies and a comparative analysis of the shortcomings of different technologies. It calls for a strategic program of action to develop South Africa's renewable energy resources, particularly for power generation or reducing the need for coal-based power generation. The following strategic goals and deliverables have been identified:

1) *To promote implementation of sustainable renewable energy through the establishment of appropriate financial and fiscal instruments*

In order to achieve this goal, the White Paper lays down certain objectives and deliverables. The objectives are laudatory as they include setting targets for directing public resources for the implementation of renewable energy technologies in combination with international sources of funding, introducing appropriate fiscal incentives, extending state financial support systems and institutions and creating an appropriate investment climate for local and foreign investors. The deliverables laid down are as follows:

- *An analysis of the current financial framework and an identification of barriers to the implementation of renewable energy sources.*
- *An investigation into appropriate financial (e.g., subsidies and green certificates) and fiscal instruments/incentives (e.g., low interest loans and tax rebates) to stimulate the implementation of renewable energy technologies and practices.*

- *Incentives and regulations for the promotion of thermally efficient housing in collaboration with the Department of Housing.*
- *Clarify the role of the Central Energy Fund (CEF) in financing the implementation of renewable energy initiatives. The Fund could be used for example to facilitate access to green financing, as well as acting as a loan guarantor to reduce the risks for financing institutions.*
- *Monitor and evaluate the effectiveness of financial incentive schemes.*
- *An equitable electricity tariff structure that will be managed by the National Electricity Regulator that addresses the issue of cost of supply for the different renewable energy technologies, including capital replacement costs for non-domestic users.*
- *Support a national 'green' market survey to ascertain the willingness of customers (households and commerce) to pay a premium for 'green' energy. (DME, 2003, p. 33)*

Other than the equitable tariff structure discussed in Section 4.1, the tradable renewable energy certificates discussed in Section 4.2 and the tax policy addressed in Section 4.5.1, there has not been any proper "investigation" of the other objectives identified above.

2) *To develop, implement, maintain and continuously improve an effective legislative system to promote the implementation of renewable energy*

The conceptualization of an effective legislative system includes the development of a legal and regulatory framework to incentivize investment by way of pricing (incorporating environmental externalities as well) and tariff structures, grid-connection and wheeling of electricity from renewable sources and also to integrate IPPs into the existing electricity system. Specific mention has also been made of providing "clear rights for property owners to capture solar radiation onto their property" (p. 34) developing a legislative framework to integrate producers of liquid fuels and gas into their systems and along similar lines, framing regulations for the accommodation of bio-diesel and ethanol into the petroleum industry.

The Renewable Energy Feed-in-Tariff (REFIT) discussed in the paper covers a number of the above-mentioned deliverables. The Biofuels Industrial Strategy formulated by the DME in December 2007 (the "Biofuels Strategy") initially aims to develop the biofuels industry to achieve a market penetration of 2 per cent of road liquid transport fuels. This would contribute 30 per cent to the national RE target for 2013. The way this is to be achieved is by specific incentives including an off-take by petroleum wholesalers based on discounting, a 100 per cent fuel levy exemption for bio-ethanol (as against a 50 per cent fuel levy exemption for bio-diesel), development of agricultural infrastructure and management. However, clear rights for capturing solar radiation and effecting changes in the petroleum industry are yet to be undertaken.

3) To promote, enhance and develop technologies for the implementation of sustainable renewable energy

The objectives and deliverables in relation to renewable energy technologies centre on developing appropriate system standards, promoting research and development of new technologies, implementation of existing technologies and strengthening international connections by way of technology and skill transfers.

In furtherance of the above, the White Paper expresses the DME's intent to revise government tender procedures to include standards for renewable energy technologies, investigate cost-effective energy storage mechanisms and integrate research and development into a National Energy Research Institute.

Effectively, other than the establishment of South African National Energy Research Institute (SANERI), the other goals have not been met.

4) To raise awareness of the benefits and opportunities of renewable energy

Notable in relation to enhancing information flows and awareness of renewable energy development and use is the objective to improve communication between national, provincial and local government institutions in relation to renewable energy policies, involving women in decision-making and establishing a network of renewable energy information centres that would conduct training as well.

The objective of improving communication between the different levels of government is interesting, as it is debatable as to whether they operate more efficiently given a certain level of autonomy.

5) To establish technology support centres within existing research and development institutes

The objectives under this goal re-iterate the requirement of establishing technology support centres within research and development institutes and the proposed National Energy Research Institute.

Other than the strategic goals and deliverables mentioned above, there is a discussion on the overlap between renewable energy and energy efficiency. The overlap is primarily in relation to the inefficient dependency on coal, paraffin and liquid petroleum gas (LPG). Furthermore, the White Paper mentions that while small-scale energy-efficiency measures may be more urgent, cost and economies of scale prevent the implementation of projects such as solar water heating of commercial and industrial buildings. However required investments in heat insulation and air tightness measures, replacement of electric geysers by solar water heaters, compact fluorescent lights

have been mentioned, which would be supported by government housing subsidies; moreover, energy-efficient standards are sought to be enforced by way of labelling of electrical appliances.

2.3.2 *The National Energy Act, 2008*

The National Energy Act which was approved by the Parliament on November 24, 2008 (the "Energy Act") is the first legislation in South Africa that mentions and addresses the issue of investments in clean energy. The following are the relevant provisions:

Section 18. *The Minister may, for the purposes of ensuring security of supply, direct any state-owned entity, in a prescribed manner, to -*

(a) undertake security of supply measures;
(b) provide for adequate investment in energy infrastructure;
(c) invest in critical energy infrastructure; and
(d) ensure upkeep of all critical energy infrastructure.

Section 19. *(1) The Minister may, after consultation with those Cabinet Ministers whose areas of responsibility will be affected by the proposed regulations, without derogating from his or her general regulatory powers, by notice in the Gazette make regulations regarding -*

(a) the publication of energy statistics or information;
(b) the type, manner and form of energy data and information that must be provided by any person;
(c) the form and manner of the link between the energy database and information system to any other system within the public administration;
(d) minimum contributions to national energy supply from renewable energy sources;
(e) the nature of the sources that may be used for renewable energy contributions to the national energy supply;
(f) measures and incentives designed to promote the production, consumption, investment, research and development of renewable energy;
(g) minimum levels of energy efficiency in each sector of the economy;
(h) steps and procedures necessary for the application of energy efficiency technologies and procedures;
(i) labelling for energy efficiency purposes of household appliances, devices and motor vehicles;

What is clear from the above is that any measures taken to improve investments in renewable energy are entirely at the discretion of the Minister, exemplified by the use of the term "may." Furthermore, there are no guidelines issued in relation to how the Minister may arrive at his decisions and there are no consultative bodies mentioned other than the South African National Energy Development Institute (SANEDI) discussed below. The Preamble to the Act does mention "energy planning,

increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure" as some of its objectives. Moreover, the Statement of Objects and Reasons mentions "[The development of] measures and incentives designed to promote the production, consumption, investment, research and development of renewable energy" as one of its aims. The Energy Act therefore provides an enabling framework for the formulation of executive regulations and policies in relation to renewable energy. It may be argued that a number of the concerns raised and identified in the 2003 White Paper may have been translated into statutory mandates by way of the Energy Act.

The Energy Act is also designed to address certain others deficiencies in the energy industry. One of the primary problems that South Africa has been facing for the longest time is the availability of accurate, verifiable energy information. The 1998 White Paper provided that the "Government will ensure [that] the necessary resources are made available to establish structures, systems and legislation to facilitate the specification, collection, storage, maintenance and supply of energy data, and energy-related data, according to the requirements of integrated energy planning and international standards." However, in 2000, the Minister of Minerals and Energy, Lindiwe Hendricks, pointed out that there has not been much progress on reliable energy data and stated that this problem would be solved by way of an energy bill (Cooper & Prinsloo, 2002, p. i). The Energy Act makes it mandatory (as against the discretionary language used in relation to renewable energy) for energy data to be provided. Section 3(1) states:

> *The Minister must establish mechanisms to ensure -*
>
> *a) provision of any data and information reasonably required for the purposes of conducting analysis required for energy planning from any person and the time period for the provision of such data and information, where such data is not already made available to any other public institution; and*
>
> *b) connection to any data and information management system, or any other system within the public administration, for the acquisition of energy data and information, in accordance with the Promotion of Access to Information Act and the Statistics Act, 1999 (Act No. 6 of 1999) where such data or information is collected by that public institution.*

Among the interviews conducted, 20 per cent of the interviewees had read the Energy Act or had even considered it to be of any significance. None of the people who had read it were members of the private sector or donors or were parties interested in investments in clean energy. Dr. Masangani of SANERI had taken great interest in the Energy Act and she was quick to identify the consolidation of energy data to be its primary focus. SANERI is an organization worth looking out for. It is a state-sponsored research organization and has now been brought into greater prominence

by virtue of the Energy Act whereby it has been re-christened as SANEDI with a broader mandate and a loftier role. It is a subsidiary of the Central Energy Fund, which is a SOE. The mandate of SANERI is to: fund, encourage and support policy-oriented energy research that is theoretically rigorous, empirically sound and technologically innovative. SANERI's renewable energy research areas include solar, biomass, wave/ocean energy, energy storage and second-generation technologies for biofuels. SANERI is accountable to both the DME and to the Department of Science and Technology.

Based on the interview conducted with Dr. Masangani (November 2008), it is, however, disappointing to note that SANEDI did not appear to have a clear plan in place to considerably enhance their scope of work in the near future. Thus, if nothing else, it is unclear as to how the consultative process is going to function: would the DME consult only SANEDI in matters of energy investment? Is there going to be a public consultation for any such activities? Among others, these are some of the questions that remain mostly unanswered by the Energy Act. It may be too premature to assess the efficacy of SANEDI at this point, but it would be important to keep a close watch on their activities. It would, however, have been helpful if the Energy Act provided clear guidelines in relation to proposed activities and publishing regular reports.

2.3.3 The Independent Power Purchaser Regulations, 2009

The draft regulations released on January 30, 2009 (the "IPP Regulations") under Section 35(4) of the Electricity Regulation Act, 2006 relate to the governing of IPPs by the DME. They are not yet finalized. The IPP regulations apply to renewable and co-generation technologies other than nuclear power generation technology. The objectives of the IPP Regulations include attracting IPP investments and regulating agreements entered into between an IPP and Eskom. This set of regulations may be beneficial, as a free contract with Eskom as a party would disincentivize small IPPs from investing in renewables. This is because Eskom still remains the monopoly purchaser as discussed in Section 2.2.4. Regulation 11 provides that no PPA can be concluded without the prior approval of the DME and the National Treasury. This might appear to pose serious administrative costs, but would assist in the formulation of fair and balanced agreements, as it is possible for Eskom to have the upper hand at the negotiating table; unfair clauses may be arrested by a DME review. Furthermore, overseeing the "allocation of financial, technical and operational risk between Eskom and the IPP" would ensure that IPPs do not have to bear all the operational costs in addition to the substantial capital cost burden. However, the IPP Regulations are not clear on implementation.

These Regulations have attracted a fair amount of criticism, primarily along the lines of a competitive tendering process as required by the IPP Regulations being inconsistent with the National Energy Regulator Feed-in Tariff system discussed in Section 4.1. Further, there is scope for

red-tapism. Ruth Rabinowitz, a Member of Parliament, has commented: "Now the regulations offer yet another level of bureaucracy, patronage and potential for corruption through a buyer who will decide who will receive tenders to produce what, where and when" (Groenewald, 2009). Saliem Fakir has come out very strongly against the IPP Regulations, observing that "there is no better illustration of how muddled the implementation of national energy policy is than the recent gaffe by the DME when it put out regulations calling for a tender process to beef up renewable energy supply [. . .] [which is] diametrically opposite to the feed-in tariff set in motion by NERSA" (Fakir, 2009). Clearly, it is difficult to reconcile the existence of a Feed-in Tariff along with a competitive tendering system, especially during the early stages of renewable energy's career in South Africa.

It is submitted that the draft IPP Regulations do not, in a number of respects, complement NERSA's REFIT. On a procedural level, public participation in affecting the IPP Regulations have been cut off prior to NERSA releasing its final policy. Thus, any meaningful suggestions towards reconciliation of the IPP Regulations and the REFIT policy have been pre-empted. This may have serious consequences for the final renewable energy regulatory framework; for instance, what several organizations and businesses urged for at the REFIT hearings is for Eskom to assume a "priority obligation," that is to say, they would give priority to renewable energy generators over other fossil fuel generators. Considering the modest generation capabilities of potential renewable energy generators, this proposal would not put a dent on the existing electricity production of fossil fuels. Eskom's generation reserve margin has fallen below 10 per cent and renewable energy generators can at best make that up in the near future. The competitive bidding process not only does violence to the suggestion of giving priority to renewable energy generators, but also effectively ensures that it never sees the light of day by putting all sources of electricity competitively at the same pedestal. While it is possible to complement a competitive bidding process with regulatory supervision to favour certain technologies/sources at the Request for Proposal and the Request for Qualification stages, the same cannot be ensured if generation projects are selected on an ad-hoc basis. Minister Buyelwa Sonjica, DME, recognized the importance of NERSA's REFIT at the Climate Change Summit on March 3, 2009 when she said: "On the supply side, the National Energy Regulator of South Africa has recently carried out consultations on a Renewable Energy Feed-In Tariff in South Africa. This Feed-In Tariff could play an important role in stimulating the renewable energy market in South Africa, diversifying our energy mix, and promoting the development of Independent Power Producers." However, the IPP Regulations erode the purpose of the REFIT, as fossil fuel generators would potentially out-bid renewable energy generators.

2.3.4 The role of provincial and local governments

In order to appreciate the legal framework in relation to clean energy, it is important to be clear on the system of governance followed in South Africa. As per the Constitution of South Africa, there is the national government, then the provincial governments and finally the local government.

As the work undertaken by the Western Cape Province and the eThikwini Municipality demonstrates, the reason why this constitutional structure is important to clean energy is because the provincial governments are more effective in ensuring progress in renewables than the national government. This is supported by the fact that natural resources and the sources of clean energy are unevenly distributed in South Africa (please refer to Appendix 1), which makes it more practical for provincial governments to identify and implement clean energy projects. However, as shown below, provincial governments and municipalities do not have complete freedom in effecting their own laws and developing projects of their choice. Nonetheless, even within such limitations, they have done well for themselves. Notable among the provinces is the Provincial Government of the Western Cape (PGWC), which is the most progressive unit of governance in relation to clean energy. Among the municipalities, the eThekwini Municipality, Durban has been making progress in clean energy, though it has been subject to some amount of controversy. These two case studies are presented below.

Western Cape Province

Schedule 5 of the Constitution of South Africa sets out the areas that are the exclusive responsibility of the provincial and local spheres of government, while Schedule 4 sets out areas of concurrent competence. While electricity and gas reticulation is listed as the concurrent responsibility of national and local government, broader energy concerns are not specifically addressed. However, the provincial government has a clear mandate for economic development, housing, provision of public transport and environmental protection. In this regard, the Department of Environmental Protection and Development in the PGWC has observed that "it is not proposed that the Provincial Government should act as a reticulator or generator of energy, but rather that it should act in a capacity which 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 PGWC's mandate" (Department of Environmental Protection and Development Planning, 2007, p. 3). This view has not been challenged to date.

The PGWC had also toyed with the idea of having a separate Renewable Energy Act for the province, as the national government was not making any advances towards the same. They have not drafted one yet but have opted for a Renewable Energy Strategy articulated in the White Paper on Sustainable Energy for the Western Cape Province released in October 2008 (the "Western Cape White Paper"). The Western Cape White Paper recognizes that while there is no specific policy regulating the production of electricity at a local or regional level, there are "no real legal barriers preventing the production and sale of renewable electricity within the reticulation areas of municipalities […] it is the mandate of the Provincial Government to support the Local Governments to fulfil their responsibilities also with regard to energy provision" (Department of

Environmental Affairs and Development Planning, 2007, p. 20). The Western Cape White Paper concentrates on supporting municipal governments in effective implementation of renewable energy projects.

eThekwini Municipality: Landfill projects[5]

All successful clean energy projects to date in South Africa, including IPPs, have been because of municipal incentivization. This includes the Bethlehem hydropower project, the Darling Wind Farm and the Nelson Mandela Bay Renewable Energy Project. As Govender (2008) observes, "These projects were structured by a combination of incentive mechanisms: Clean Development Mechanism, Tradable Renewable Energy Certificate (TREC), grant financing and a premium power purchase price. Municipalities agree to a higher purchase price for green power that has been facilitated through a PPA, then sell this electricity as green power at a premium price to a willing buyer (i.e. corporations). By securing agreements with corporate purchasers of green power, they are able to offset the higher costs of renewable energy." This scenario would hopefully be complemented by the REFIT with IPPs being able to participate in generation without municipal incentives.

Other than provision of incentives to IPPs, there has also been direct municipal involvement in clean energy promotion and development. The potential for the participation of municipalities in enhancing the generation and use of renewables is substantial, especially with regard to landfill-to-gas (LFG) projects. South Africa possesses 20 top sites for LFG with the potential to produce 74 MW of electricity and reduce greenhouse gas (GHG) emissions by about 20 million tons of CO_2 emissions (Olver, 2007, cited in Fakir and Nicol, 2008). Further, a LFG project involves lesser capital cost compared to the other renewable energy sources and has the potential for considerable CER earnings, given that reducing methane emissions earns higher credits than reducing CO_2 (Olver, 2007, cited in Fakir and Nicol, 2008). However, there are a number of obstacles to the same, most of them posed by the Municipal Finance Management Act, 2003 (the "MFM Act"); the legal restrictions contained therein have caused entrepreneurs to forfeit many opportunities. Fakir and Nicol (2008) observe that the primary problem is the lack of autonomy of municipalities and national control imposed through the MFM Act (p. 31). This manifests into the following obstacles, among others:

(i) the imposing role of National Treasury in setting budgeting guidelines and approving municipal budgets;

[5] See Strachan L.J., et al. (2005) Realising landfill gas potential for climate change and renewable energy goals. Proceedings of IWMSA Landfill 2005 Seminar. KwaZulu-Natal; Rampersad et. al. (2003), Viable landfill gas to electricity generation projects through a CDM: A first for Africa. Proceedings, Ninth International Waste Management and Landfill Symposium, S. Margherita di Pula, Italy, 6-10 October 2003. Italy: CISA (Environmental Sanitary Engineering Centre, Italy). See also http:// www.resource india.net/LFG_to_energy_CDM_South_Africa__RCouth-Sardinia_2003.pdf.

(ii) there are stringent rules for capital expenditure;
(iii) pricing and tariffs must follow national stipulations;
(iv) special Treasury permission is required if municipalities want to enter into contracts beyond the three-year limit set by the MFMA; and
(v) any debt incurred to finance new projects needs special approval and cannot exceed what has been budgeted for and what is within the means of the municipality.

Notwithstanding the obstacles noted above, there have been some landfill sites producing power and CERs, notably the eThekwini Municipality-sponsored Bisasar Landfill Project. The project consists of enhanced collection of landfill gas and the use of the recovered gas to produce electricity, which is then fed into the municipal grid. It is envisaged that this project will be operational beyond 2020. It is estimated the project currently collects up to 2,500 tonnes of waste per day and flares only a portion of the methane generated for local, site-specific reasons.

At present 4 MW of capacity has been installed, and is operational. There is the potential to expand this capacity to 8MW by 2012. The project has applied to the Designated National Authority to be registered as a Clean Development Mechanism (CDM) Project, with a 21-year carbon-funding period comprising three 7-year renewal periods. It is estimated that over the course of the initial seven-year carbon funding period the CO_2 equivalent reduction of 378,623 tonnes of methane per annum is predicted. The project has thus positive effects on air and groundwater quality. It also reduces the adverse impacts related to transportation of coal and coal mining (dust and acid mine drainage). Near the landfill site, the project improves the air quality by further reducing the amount of landfill gases released into the atmosphere and thus reduces the risk of exposing neighbouring residents to odour. This is particularly relevant as the Bisasar Road landfill site is located close to a residential area. All gas-capturing wells installed have been equipped for leachate removal, which contributes to the protection of groundwater.

However, it may be noted that the Bisasar Landfill Project is not free from controversy. The waste that is being harnessed has allegedly caused cancer in nearby residences, causing commentators to reflect on the problems with the profitability of carbon credits (Reddy, 2005). According to studies, the limits of waste emissions considered potentially hazardous were exceeded at Bisasar Road many times over: hydrogen chloride by 50 per cent, cadmium by 200 per cent, and lead by more than 1,000 per cent, which makes it a health hazard (Reddy, 2005). The argument in relation to Bisasar is that the municipality had long promised to clean up the dump but has retained it for the purpose of converting it to a landfill project. Though the amount of methane released is greatly reduced, it has been argued that the generators (coupled with poorly managed leaching) produce 95 tons of nitrogen dioxide and 319 tons of carbon monoxide, as well as benzene and formaldehyde, which would result in various respiratory ailments (Bond & Dada, 2007). What may be learnt from this experience is the necessity to have a buffer zone in the event a landfill gas project is being operated

in a residential area, along with ensuring that proper leaching is carried out.

2.3 Investment trends

2.3.1 Global trends: An overview

New global investments in clean energy technologies—including venture capital, project finance, public markets, and research and development—have expanded by 60 per cent from $92.6 billion in 2006 to $148.4 billion in 2007, according to the research firm New Energy Finance (2008).[6] Asset finance (to build sustainable power generation and biofuels capacity) accounted for 57 per cent of new investment in 2007. Public market investment more than doubled in 2007 with $23.4 billion of new money raised. Convertible bond issuance increased eightfold in 2007, reflecting progressively less stable stock market conditions. Wind continues to attract the most investment, mainly for new capacity building, but solar investment took off in 2007 - $28.6 billion in new investment flowed into solar, which has grown at an average annual rate of 254 per cent since 2004 (New Energy Finance, 2008).

[6] All dollar figures are in U.S. currency unless otherwise noted.

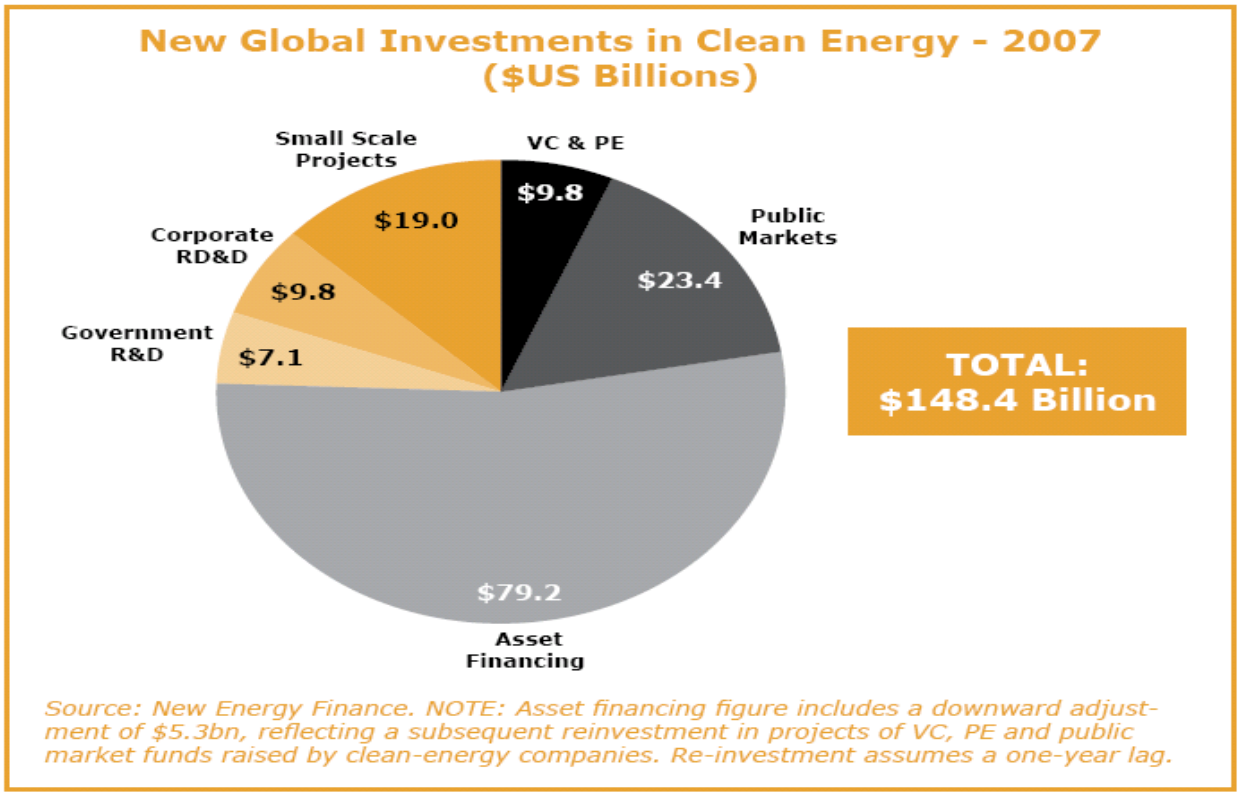


Figure 3: New global investments in clean energy (2007)

Notwithstanding this new investment, the International Energy Agency has estimated that $16 trillion needs to be invested in energy per se by 2030 (IEA, 2008) to meet the projected growth in demand for new electricity and fuel sources worldwide. According to New Energy Finance (2008), investment between now and 2030 is expected to reach $450 billion a year by 2012, rising to more than $600 billion a year from 2020.

Investment in new technology has also broadened and deepened. This is partly in response to changing supply/demand patterns (e.g., continuing silicon shortages, or the controversial competition between food and fuel from food-based ethanol feedstocks), but also reflects improved efficiencies and decreasing costs as renewable technologies strive to reach grid parity. Furthermore, the mainstream capital markets are now fully receptive to sustainable energy companies, supported by a surge in funds destined for clean energy investment. At the other end of the spectrum, specialist financing has also opened up with the development of innovative financing structures for distributed renewable generation and demand-side management.

The year 2007 also saw renewable energy investment shifting away from industrialized to developing countries. The latter's share of new investment grew from 13 per cent ($1.8 billion) in 2004 to 23 per cent ($26 billion) in 2007. China, India and Brazil together accounted for 82 percent of this investment. In recent years, sustainable energy investment in China has been largely for manufacturing expansion as an export industry. In 2007, however, the 2008 Beijing Olympic Games sharpened the country's political resolve and strengthened programs to promote cleaner generation and cut energy intensity. During 2007, investment in renewables capacity (excluding large hydro) in China increased by 91 per cent to $10.8 billion (New Energy Finance, 2008).

Acceptance of sustainable energy also became more widespread in the United States, extending beyond its traditional heartland of California. A new administration in 2009 is expected to make renewable energy and energy efficiency a political priority and in recent months, regulatory uncertainty in the U.S. (particularly over the possible introduction of a carbon tax) has put a number of coal-fired generation plants on hold.

2.3.2 *South African trends*

Figure 4 reveals that, in spite of its relatively liberalized trade and investment environment, South Africa has attracted very low levels of foreign direct investment (FDI), barring large deals in 1997 (the partial privatization of Telkom) and 2001 (the unbundling of mining houses De Beers and Anglo-American). Corporate activity spiked in 2005 due to Barclays Group's $4.2 billion purchase of Absa Bank and Vodafone's $3 billion acquisition of a stake in mobile phone operator Vodacom. These deals, however, constituted foreign acquisitions of South African firms, rather than investment in greenfield projects.

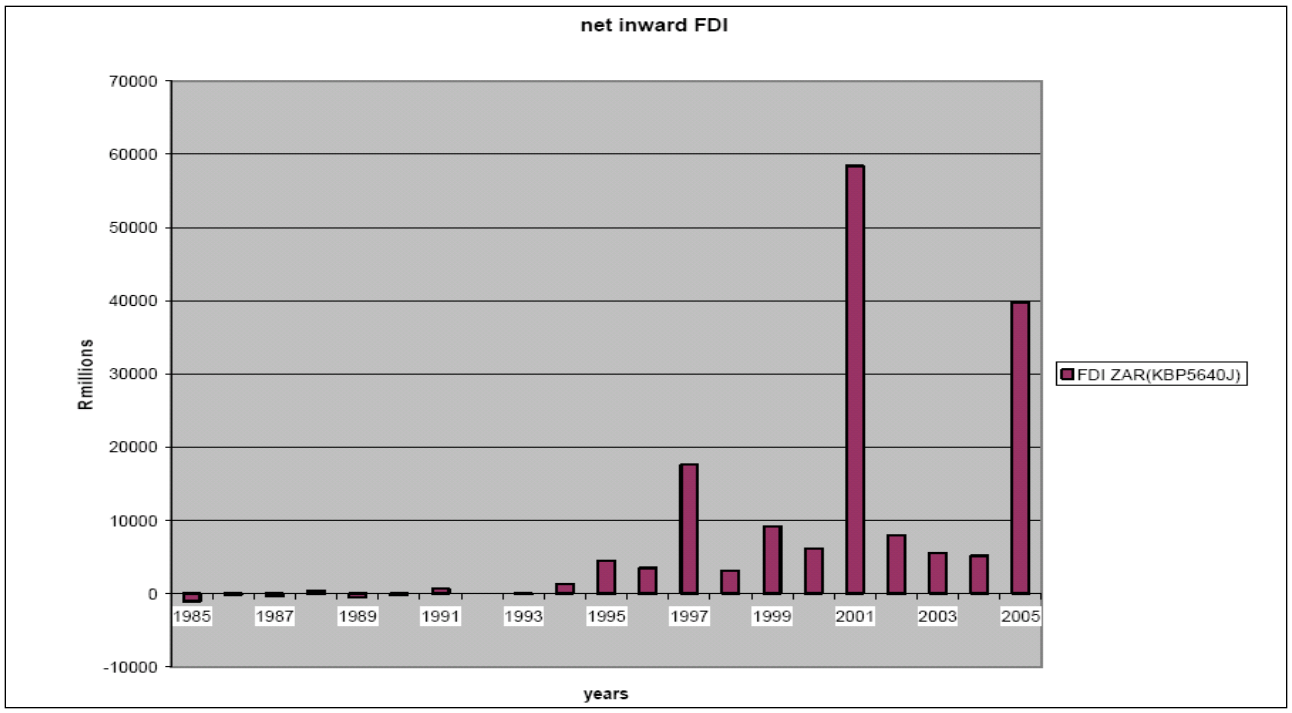


Figure 4: South Africa inward FDI

Source: SARB online statistical enquiries

In 2006, inward investment by foreign companies into South Africa totalled $2.6 billion, according to the South African Reserve Bank (SARB), as opposed to $4.95 billion in disinvestment. This disinvestment occurred largely in the mining sector as Barrick of Australia and Russian group Polyus sold their stakes in the South African gold mining industry for $1.4 billion and $2.9 billion respectively.

Figure 5 below shows the sectoral composition of foreign investment. The financial sector is the major recipient of foreign investment, followed by the mining and manufacturing sectors respectively. The financial sector's share is 33 per cent, followed by mining with 30 per cent and manufacturing with 28 per cent.

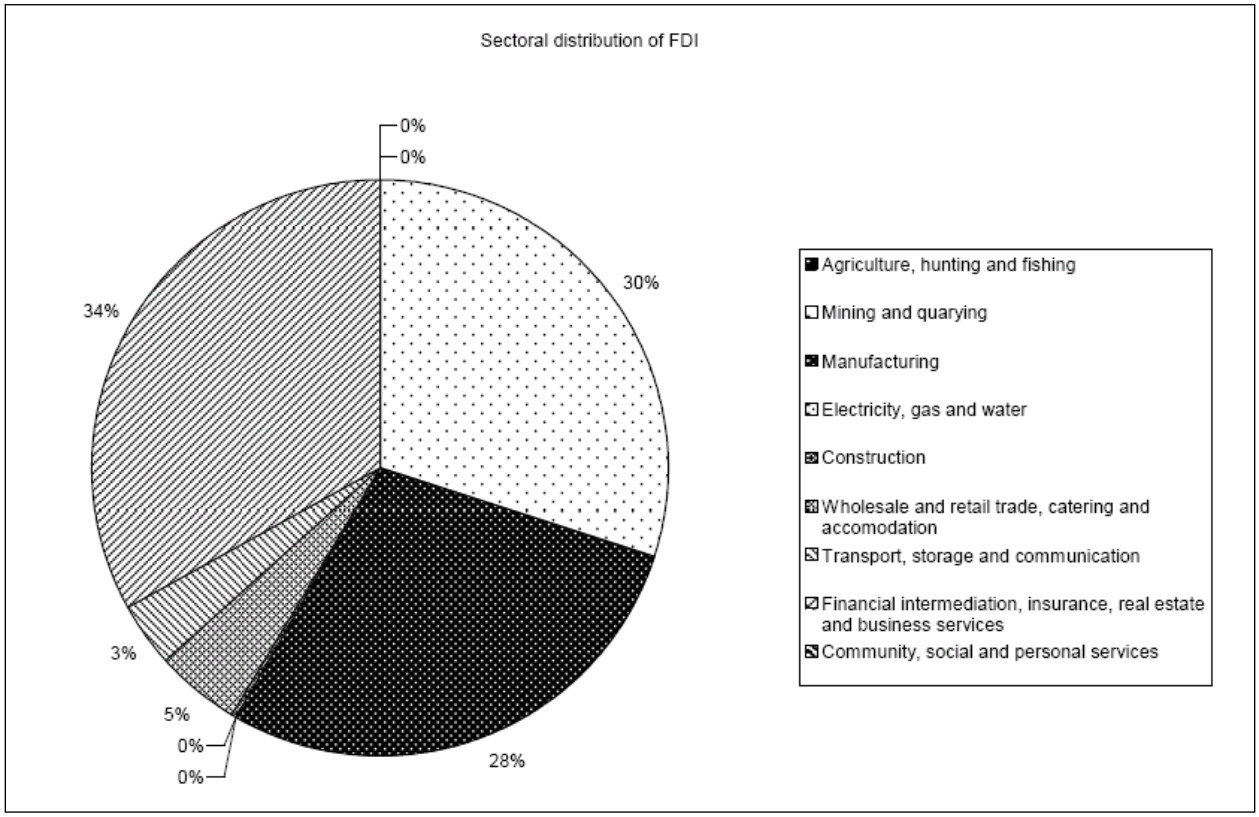


Figure 5: Sectoral distribution flows of FDI (2005)
Source: Gardner-Rusike (2007) (figure 3.4)

Electricity and community sectors have attracted very little FDI over the past years, with each of the percentage shares close to zero. The emergence of the financial sector as an attractive investment sector is mainly due to the political emancipation and subsequent liberalization of the sector, together with the confidence of investors. This has resulted in the shift of FDI from the traditional mining and manufacturing sectors. The trend could suggest the possibility of a shift in terms of the motives of FDI from natural resource-seeking to market- and efficiency-seeking FDI.

A noteworthy investment in the renewable energy sector was a wind farm opened in May 2008 by Darling Wind Power—an IPP. The farm has four wind turbines that can supply 5.2 MW of electricity. All the electricity produced will be sold to the City of Cape Town as part of a long-term power purchase agreement. Key participants to the project include the private developer Darling Independent Power Producer (DARLIPP), CEF and the Development Bank of Southern Africa (DBSA). A portion of the funding was provided as a grant by the Danish International Development Agency (DANIDA). The green electricity facility also qualifies for a United Nations Global Environment Fund guarantee scheme, managed by the South African Wind Energy

Programme (SAWEP) of the Department of Minerals and Energy.

2.4 Environmental regulation

While attempting to chart out the environmental policy framework within which clean energy would be situated, a mistake that is often made is limiting the discussion to the relevant statutes, namely the Environment Conservation Act, 1989, the National Environmental Management Act, 1998 and the National Water Act, 1998.[7] This is because, other than statutory regulation, the Department of Environmental Affairs and Tourism (DEAT) has been quite active in the field of emission reduction and have formulated policies accordingly. The CDM (discussed in section 5.2) has also been embraced in South Africa, albeit at a slow pace (as discussed in Section 5.2). The focus should be on how environmental policy incentivizes clean energy and disincentivizes traditional coal-based energy.

2.4.1 Relevant environmental legislation

The importance of the Environment Conservation Act, 1989 (the "EC Act") arises out of the fact that it lays down the mechanism for conducting an Environmental Impact Assessment (EIA). Per Section 21, Part V of the EC Act, in order to ensure "Control of Activities which may have a Detrimental Effect on the Environment," the Minister of Environment may identify and declare activities that would warrant an EIA and submission of reports prior to authorizing the carrying out of such activities. Pursuant to the same, further regulations have been formulated, namely a set of two schedules identifying activities that would require an EIA,[8] rules to be followed in relation to identified activities[9] and specifying the appropriate bodies responsible for implementing such regulations.[10] The reason why this set of regulations become particularly relevant to our discussion is because an EIA is required for the "construction or upgrading of facilities for commercial electricity generation and supply."[11] It is therefore clear that any private generators would need to undertake an EIA, and when the REFIT comes into existence, they would need to do so in order to obtain a generation license. It is unclear whether any project for the generation of electricity that does not have a profit motive would require an EIA. However, one factor that may be noted is that there is no distinction made between the generation and supply of electricity. Thus, if Eskom is the distributor of a project and if there is a donor funding the construction of facilities for the generation of electricity, it may well require an EIA as Eskom, though a SOE, is a profit-making body. It would appear therefore that, given the current framework in relation to transmission and distribution of electricity, an EIA would be necessary for all projects. What would differ are the

[7] See Glazewski (n.d.) and REEEP guides.
[8] Regulation 1182 titled "The Identification under s 21 of Activities which may have a Substantial Detrimental Effect on the Environment"
[9] Regulation 1183 titled "Regulations Regarding Activities Identified under s 21(1)"
[10] Regulation 1184 titled "Designation of the Competent Authority who may issue Authorisation of the Undertaking of Identified Activities"
[11] Item 1 of Regulation 1183

costs incurred and the time taken for obtaining of an authorization in relation to the same depending on the authority issuing such authorization and the level of detail required in the concerned EIA report.

The National Water Act, 1998 (the "Water Act") is relevant to us because water is an essential resource, is a raw material for most renewable energy projects and is required at various stages of the project. This is especially important in the light of the fact that hydro-energy projects have been highly incentivized under the REFIT. Under Chapter 4 of the Water Act, which endorses the jurisprudence of public trusteeship, a relevant license would have to be obtained for the "use of water." There are various uses of water that have been identified—including storage, diversion, taking water—and hence a prior license for such activities would be required.

On the subject of usage of water, it would be interesting to note the environmental concerns in connection with water consumption by coal based power stations. Sparks (2006) notes the following three points: "The first is degradation of the water quality of associated water sources - for example coal mining affecting the ground water quality in coalfields. The second is the excessive amount of water required by power stations. The third relates to the price paid by Eskom for water, and whether this reflects the actual opportunity cost of water" (p. 92). In relation to the last point, as Eskom (rather than the Department of Water Affairs and Forestry) has paid for the construction of water infrastructure in a number of cases, it is difficult to assess the costs (Spalding-Fecher & Matibe, 2003). However, what can be concluded is that the quantity of water required for coal-based power stations is substantial,[12] and such power stations lead to environmental degradation. Furthermore, it is unclear whether such degradation is taken into account when assessing an EIA Report, as the Water Act does not address it. Thurton (2006) has observed that declining water quality and scarcity of usable water has fuelled considerable violence in South Africa and the steady reduction in investment in water infrastructure may well exacerbate the problem. Hence, while one of the nation's primary concerns is the quality and quantity of water supply, it would not serve well to have water-inefficient power stations and would certainly have to be addressed.

The National Environmental Management Act, 1998 (the "NEM Act") gained prominence because it was the first legislation to define and articulate the components and concerns of "sustainable development," including "that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource" and the rather vague "that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is

[12] A coal-fired power plant normally requires 25 gallons of water for each KWh generation. Further, wastewater from power stations can significantly impact the cost, quality and availability of local water (Hampton, 2008). Eskom is one of the biggest consumers of water in South Africa, accounting for approximately 1.5 per cent of SA's water consumption. Though Eskom has implemented innovative water management strategies, the consumption is still substantial. See Pather (2000). By comparison, renewable sources are far more water sustainable. Evans, et al. (2009).

jeopardized." Any guidelines as to how to determine the jeopardization of integrity of ecosystems and renewable sources or how to measure the level of integrity have not been provided. The term *sustainable development* has since been defined in the Energy Act and does feature in the bylaws of the Province of the Western Cape. However, it would be interesting to note that unless otherwise specified, the understanding of sustainable development is as provided for in the NEM Act and the 2003 White Paper refers to the NEM Act while discussing sustainable development. This is important because any EIA conducted that requires identifying the contribution to sustainable development would refer back to its understanding in the NEM Act. Furthermore, the understanding of sustainable development is important from the point of view of CDM approvals by the designated national authority (DNA). This is because in order to attain the DNA's approval, a PDD needs to contain certain details, among which are specifications as to how a CDM Project contributes to sustainable development.

The most recent environmental legislation is the Air Quality Act, 2004 (the "Air Act"), which lists priority pollutants and activities, requires pollution prevention plans to be submitted and controls the use of certain fuels. Though in line with international instruments and endorsing a "polluter pays" principle, it does not really provide strong disincentives for the usage of unclean energy sources and does not capture the usage of any economic instruments to enhance air quality.

2.4.2 *Long Term GHG Mitigation Scenario Building Process*

Dr. Peter Lukey, Director of Air Quality and Climate Change, DEAT, remarked in the Parliament that the Long Term Green House Gases Mitigation Scenario Building Process (LTMS) is the first document to be published by the DEAT that spoke of climate change.[13] In March 2006, the South African Cabinet commissioned a process to examine the options available to mitigate its GHG emissions and the document capturing the LTMS was presented and accepted in 2008. The LTMS states that "the actions required in South Africa to mitigate emissions will be driven by policy, both domestic and international, and by investment in new technologies, building a new definition of competitive advantage," with a focus on "attendant costs of each option [for mitigation]."[14] The long-term mitigation date is fixed at 2050 and a target of 1300 Mt CO_2 is set. It is important to note that clean energy is a major focus with the primary methodology adopted "Using the Market," which has identified economic instruments to be more beneficial than regulatory instruments. "Using the

[13] Parliament proceedings website, http://www.pmg.org.za

[14] Report on the Long Term Green House Gases Mitigation Scenario Building Process, available at http://www.pmg.org.za/files/docs/080610ltms1.pdf. The document is publicly available, however, contains a disclaimer that it is subject to finalization.

Market" is Strategic Option 3 of the four-step process envisaged in the LTMS, which may be briefly described as follows:[15]

(i) Strategic Option 1 ("Start Now"): The document recognizes that "certain quantifiable strategic mitigation options are immediately implementable, even if they require significant effort." There is recognition of the fact that there would be initial "net-negative cost wedges" due to the high upfront costs incurred during most mitigation steps, the most costs incurred on "efficiency in industry and transport (greater vehicle efficiency and shifts from private to public transport) as well as in more renewable sources and nuclear sources for electricity." However, the study demonstrates how savings over time outweigh such initial costs. Following the measures in this phase, it is predicted that it would reduce emissions by 43 per cent by 2050.

(ii) Strategic Option 2 ("Scale Up"): "Scale Up" adds more cost resulting in a cost of "R39 per ton of CO_2" but reduces emissions to 64 per cent by 2050. It is interesting to note that, despite the cost-addition in the interim, the mitigation costs are well below the benchmark suggested by the Stern Review (i.e., 0.8 per cent of the GDP of South Africa as against the 1 per cent opportunity cost suggested by the Stern Review). The measures to be introduced centre on "industrial efficiency," including a shift to renewable and nuclear sources, introduction of electric vehicles and CCS for synfuels.

(iii) Strategic Option 3 ("Use the Market"): This option is perhaps the most significant as it seeks to enhance private participation in emission reduction primarily through appropriate regulations. "The key driver of 'Use the Market' is a CO_2 tax [. . .] the rising tax level is designed to approximate a phase of slowing emissions growth, stabilising emissions and ultimately reducing absolute emissions through a high carbon tax of R750 in the last decade." This option also requires that no new coal plants be built to ensure a decline of coal power supply such that only 4 GW of coal capacity is left by 2040, while 25 GW of nuclear power is added by 2040 and 118 GW from renewable sources. The other requirement is that of "revenue recycling," that is to say, using the revenues earned from the taxes to incentivize renewables through subsidies. The adoption of this option, however, implies a distortion introduced by the tax resulting in a 2 per cent negative impact on the Gross Domestic Product of South Africa by 2015 and the document recognizes that measures to ensure economic growth, creating jobs and improving income distribution "need further work."

(iv) Strategic Option 4 ("Reaching for the Goal"): This final stage seeks to level out all costs and achieve its emission reduction targets by 2050. This is proposed to be achieved by

[15] The following is adapted from the Report on the Long Term Green House Gases Mitigation Scenario Building Process, supra n. 74

introduction of new technology, resource identification in relation to the same (imported hydro energy from the Congo or East Africa and natural gas from Kalahari and elsewhere have been identified), people-oriented measures (such as modal shifts to public transport, urban planning, demographic shifts and greening of towns) and introduction of structural adjustments to South Africa's carbon-intensive economy.

It is interesting to note that one recommendation is to develop a tax on CO_2 emissions (the suggestion is R100 per ton of carbon dioxide emitted) and use the revenues generated by the same for providing a subsidy for electricity generation from renewable energy, enhancing use of biofuels and solar water heaters.[16] More discussion on steps initiated by/desired of the Treasury of South Africa is discussed in Section 5.4.1. The LTMS is something to look out for as DEAT, though immensely inclined towards enhancing the renewable energy industry, has carefully studied and arrived at efficient means of doing so. In addition, major studies on costs incurred to implement renewable energy projects or to use renewable energy technologies follow the models used and adopted in the LTMS (Marquard, Merven & Tyler, 2008). Thus, the LTMS now serves as the primary mechanism for assessing the environmental costs incurred in power projects.

[16] Section 3: Use the Market Strategy

3. Obstacles to Clean Energy Investment

This section of the report examines obstacles to clean energy investment in South Africa. A tailored questionnaire (see Annex 1) was designed and a survey conducted among government, business and interested parties. Among other questions, the questionnaire requested interviewees to rank the following disincentives to investment in South Africa:

i. Lack of skilled labour
ii. Labour market regulations
iii. Inflation and loan interest rates
iv. Inadequate trade credit to finance capital costs & new investment/working capital
v. Problems with bank-financed investment (including security enforcement)
vi. Externalities such as crime and corruption
vii. Tax rates and tax administration
viii. Uncertain legal policy
ix. Inadequate investment regulations
x. Problems with business licensing
xi. Infrastructure (transportation, electricity, telecommunications etc.)
xii. Anticompetitive practices
xiii. Broad-Based Black Economic Empowerment (BEE)

Among the above factors mentioned, the most cited disincentives were anticompetitive practices, inflation rates and lack of skilled labour, while interviewees almost unanimously concurred that infrastructure was one of the greatest incentives for investment in South Africa. This is corroborated by a KPMG report (2000), which concluded that the primary drivers behind investment in South Africa are well-developed communication, energy and transport infrastructure. BEE has been under discussion because all IPPs should have a minimum of 25 per cent shareholding from BEE groups to qualify for government support and approval. This fact is crucial for any foreign investor contemplating investment in South Africa and wanting to raise capital for projects in South Africa (Faqir & Nicol, 2008, p. 11).

The leading local domestic banks were also among the interviewees and were asked specifically to elaborate on their opinion in relation to investment regulations and enforcement of debt instruments. They did not express any concern in relation to the same; Standard Bank, in fact, mentioned that the Public Finance Management Act, 1989 was a robust legislation and the exchange control regulations did not pose too much of a problem in relation to repatriation (Meissner, 2008).

3.1 South Africa's investment climate

The World Bank did a study in 2007 on the investment climate in South Africa and asked two pertinent questions:

(i) Why was investment and growth in South Africa low between 1994 and 2003?
(ii) Is the investment climate going to remain stable after 2005?

The study revealed that the exchange rate had been unstable; the cost of labour in South Africa is high, especially for skilled workers; labour regulation is burdensome; and the cost of crime is high. Since 2003, interest rates and inflation fell dramatically and there was a decrease in tax rates. Overall, there was an increase in profits, which enhanced the investment rates. Underpinning this is South Africa's widely acknowledged sound macroeconomic policy and associated stability.

It is therefore clear from the above that unless South Africa is heavily affected by the recession in the near future, the investment climate in general is favourable. The World Bank-International Finance Corporation *Doing Business Report 2009* provides the following South Africa rankings among 182 countries compared (see Table 2).

Table 2: Doing business in SA

Ease of...	Doing Business 2009 rank	Doing Business 2008 rank	Change in rank
Doing Business	32	35	+3
Starting a Business	47	57	+10
Dealing with Construction Permits	48	47	-1
Employing Workers	102	96	-6
Registering Property	87	78	-9
Getting Credit	2	2	0
Protecting Investors	9	9	0
Paying Taxes	23	65	+42
Trading Across Borders	147	137	-10
Enforcing Contracts	82	83	+1
Closing a Business	73	71	-2

Source: World Bank Doing Business 2008 & 2009

Thus, investor protection and getting credit in South Africa is highly recommended, though trading across borders is not very high up on the list.

The World Bank, in a recent study, compared the investment climate in South Africa, Brazil and India and identified the several business constraints (see Table 3).

Table 3: Comparison of business constraints in Brazil, India and South Africa

Brazil		India		South Africa	
Constraint	*Percent*	*Constraint*	*Percent*	*Constraint*	*Percent*
Tax rates	84	Corruption	37	Skills	35
Macroeconomic instability	83	Electricity	29	Macroeconomic instability	34
Policy uncertainty	76	Tax rates	28	Labour regulations	33
Cost of finance	75	Tax administration	27	Crime	29
Tax administration	66	Policy uncertainty	21	Tax rates	19

Source: World Bank (2008). Note: Percentages represent the share of respondents citing the characteristic as a "major"' or "very severe" obstacle for the "operation and growth of businesses."

3.2 Barriers to clean energy investment

The framework conditions that affect the viability of the renewable energy (RE) industry are not completely unique to South Africa and are summarized in Table 4.

Table 4: Framework conditions affecting viability of South Africa's RE industry

Institutional	• Too many agencies involved in approvals (DME, DEAT, NERSA, the Department of Water Affairs and Forestry, the provincial and local authority) • Time taken to process approvals for licenses, EIAs or negotiation of PPAs • Identifying the right public sector finance partner • CDM process is expensive and long • Approval of the right tariff
Policy and legal framework	• EIA laws, the Public Finance Management Act, the MFMA, wheeling rights and PPAs • Rights of access to property or resource • IPPs may be unable to sell on grid • Transmission access and pricing rules penalize smaller producers and utilities may set onerous connection conditions • Permitting requirements and citing restrictions can be excessive • Requirements for liability insurance may be excessive
Financial	• Identifying institutions that offer development grants • Identifying suitable lenders • Securing equity partners • Insurance
Energy sector competition and bias	• Low cost of energy from conventional sources • Price distortions from existing subsidies and unequal tax burdens between renewable and other energy sources
Market performance	• Lack of environmental externality cost in the current price of fossil fuels • Market barriers such as inadequate information

Source: Adapted from *Fakir and Nicol (2008)*

The gamut of obstacles identified above is similar to the obstacles identified by a UNEP-BASE/SEFI study in relation to renewable energy barriers (Imbert & Brown, 2008). The UNEP-BASE/SEFI study points out the following hurdles that would have to be overcome while contemplating investment in renewables:

(i) *Structural barriers,* including information asymmetries, high up-front costs and high transaction costs;

(ii) *Path-dependant market failures,* including inexperienced financiers and inadequate risk

management solutions; and

(iii) *Fossil fuel subsidies,* including transmission grid support, tax exemptions, price caps and direct support to consumers.

The problems identified by Fakir and Nicol (2008) can well be put into the same categorization; the structural barriers, however, get fused with the fossil-fuel subsidies as it is Eskom, a monopolistic organization, that has artificially kept the prices of electricity generated from fossil fuels rather low. Information asymmetries exist because the current legal and regulatory framework supports such a system, thereby disallowing private parties to be competitive and incur the same costs as Eskom. Eberhard (2002) has identified the absence of a competition-inducing framework (from a supply as well as a demand side) as the primary obstacle to investing in renewable energy.

In addition to and in elaboration of the points captured in Table 5 above, Fakir and Nicol, in their authoritative work on barriers to renewable energy, make some observations, which may be summarized as follows:

1. The Renewable Energy financial markets are nascent and private investors have been risk-averse in this regard.
2. For smaller IPPs trying to make a breakthrough in the renewable energy market, the biggest hurdle is finding the initial pre-feasibility and feasibility finance.
3. Most RE projects fail because developers do not budget adequately and do not realistically determine the return on investment for an initiative, and in so doing do not take profit margins and cash flow scenarios into account for the duration of the project.

Mr. Hermann Oelsner, the CEO of the Oelsner Group, which is the primary shareholder of Darling Independent Power Producer (DARLIPP), has pointed out that the operations and maintenance expenses are unmanageably high for renewable energy projects in South Africa. He further mentioned that most of the equipment has to be imported; this is not because South Africa lacks the technology but that it is not cost-effective for a manufacturer to produce machine parts and ancillary equipment as there is limited demand from independent power generators; in his opinion, a proper feed-in tariff would have a ripple effect and serve to alleviate the domestic impasse.

In an undeveloped market, private hesitancy is obvious, which has led the United Nations Industrial Development Organisation (UNIDO, 2008) to observe that in Africa, public funds are expected to catalyze private funding. This appears to be true for South Africa as well. Peet du Plooy (2008) of the WWF has observed that South Africa must carefully guard against opting for attractive short-term subsidies as it would neither allow local private players to be self sufficient in the long run nor would it allow the DME to explore innovative partnerships. This is a very interesting observation and was articulated in greater detail by Colin King, a senior Project Finance consultant with

Amalgamated Bank of South Africa (ABSA) Business and Corporate Bank, one of the "big five" local banks and has been involved with renewable energy for decades. King was optimistic and said that the number of renewable energy deals is starting to increase and offshore participants have been inquisitive after the feed-in tariff has received much-overdue attention. He was of the opinion that Eskom Power PPAs have not been conducive to investment and, as such, the process of issuing tender and detailing the process right through to the off-take and procurement in relation to energy is not at all attractive in South Africa. King further commented that "due process should be followed in sensitive projects," and was clear that with (i) appropriate tariffs and (ii) PPAs negotiated in good faith, renewable energy deals should come flowing in, especially because the international demand for CERs is on the rise. Further problems concerning PPAs are discussed in Section 4.1.

Foster-Pedley and Hertzog (2006) are of the opinion that innovative and imaginative financing can alleviate a number of the hurdles discussed above. For instance, multi-stakeholder financing mechanisms may be resorted to where "a number of different finance sources are solicited for a single project."

However, the omnipresence of Eskom and its preference for fossil fuels is largely considered to be most compelling obstacle to developing a renewable energy market in South Africa. Earthlife/Oxfam (2009) observes that "Eskom has no meaningful plans to use renewable energy as a resource" (p. 36). Eskom's new expansion plan, to be completed by 2016 and estimated at R1 trillion, includes the establishing of two open-cycle gas turbines (OCGT), three new coal-fired power stations, two pumped storage schemes and a single wind farm. Out of a proposed increased generation of 16,304 MW, the wind turbine would contribute 100 MW (Eskom, 2008, p. 66). Earthlife Africa (2008:2) has observed that "we can have wind and solar energy in place of coal-fired power stations for the same amount of money," taking into account Eskom's long-term expansion plans. This has led Holm, et al. (2008) to conclude that:

> *The main constraints [to renewables] are neither resource availability nor techno-economics but a limiting mindset focussed on the supply-side, partial energy costing, low (indirectly subsidised) energy prices and short-term thinking favouring low initial costs. Dominance of the state-controlled power monopoly and the influence of vested interests (particularly of the mineral sector) on key stakeholders are exacerbated by a lack of awareness and informed leadership as well as a real shortage of person power. It is concluded that the most important constraint is not money, men, machines, materials or management, but the motivation, the inspired political will. (p. 2)*

The incentives described in the following section do serve to clarify some of the obstacles discussed.

4. Incentives for Clean Energy Investment

4.1 Feed-in tariff

The feed-in tariff mechanism is the preferred mechanism for attracting private investment in renewable energy in most nations that have a renewable energy policy (Mendonca, 2008). According to NERSA, "Feed-in Tariffs are, in essence, guaranteed prices for electricity supply rather than conventional consumer tariffs. The basic economic principle underpinning the FITs is the establishment of a tariff [price] that covers the cost of generation plus a 'reasonable profit' to induce developers to invest. This is quite similar to the concept of cost recovery used in utility rate regulation based on the costs of capital" (NERSA, 2008). Thus, a feed-in tariff is a price at which a distributor is obligated to purchase electricity from renewable energy generators. While there are different models of feed-in tariffs embraced in different parts of the world (Klein, et al., 2006), NERSA has closely modelled the South African Feed-in Tariff on the German mechanism. Under this model, to take a hypothetical example, a power generator would choose the preferred source of renewable electricity generation, sell it to Eskom at a pre-decided price, Eskom would distribute it to consumers and the extra incremental cost would be passed on to all consumers who are connected to the Eskom grid. Before indulging in a detailed discussion on the South African Feed-in Tariff, a short discussion on the different policy options for incentivizing long-term finance in renewable energy projects is warranted.

The 2003 White Paper contains a short discussion on the subject and compares possible policy options, as per Table 5 below.

Table 5: Policy options

Tool	Advantages	Disadvantages
Investment incentive (e.g., USA "Renewable energy generator tax credit")	Overcomes high first cost barrier	Encourages investment, not production
Production incentive (e.g., Germany "feed-in tariff")	Easy to implement Easy for developers Encourages RE production	Does not directly address high first cost barrier Can be abused if incentive too high
Renewable set-asides (e.g., USA "Renewable Portfolio Standard")	Allows control over amount of renewable capacity added Competitive bidding encourages cost reductions	Can be very bureaucratic Bids may be controlled by one entity May lead to lumpiness in installations

Source: DME 2003

Although the 2003 White Paper does not expressly rule out any of the above options, it further discounts set-sides by pointing out that they entail an expensive bidding process and capacity additions may prove to be difficult (DME, 2003, p. 29). Harold Winkler, one of the foremost scholars on renewable energy in South Africa, did a seminal study on the policy options for renewable electricity in South Africa. According to the study, the primary question to be answered is whether such policy should be centred on a *feed-in tariff*, a *portfolio standard* or a *renewables obligation* (Winkler, 2005). In order to appreciate the distinction between these three options, it would be important to understand the first classificatory step that governments take while evolving a renewable energy policy: should the concentration be on *economic instruments* (e.g., taxation, subsidies, tradable permits) or on *regulatory instruments* (e.g., standards, codes, targets) (Baumol & Oates, 1971). While Germany has resorted to the former, the United Kingdom has been content with the latter. The feed-in tariff adopted in Germany operates on a pre-determined cost, does not expose project developers to price competition, and it is assumed that the energy generated has not been delivered at the lowest possible cost (Menanteau, Finon & Lamy, 2003). In the U.K., on the other hand, the development of renewable energy sources was supported by the Non-Fossil Fuel Obligation (NFFO). The NFFO was administered as a series of competitive orders in which renewable energy developers submitted bids specifying the energy price at which they would be prepared to develop a project and deliver energy (Energy Economics Group, 2006, p. 21). In South Africa, there is a target that has been stipulated in the White Paper on Renewable Energy but that does not quite qualify as

an NFFO standard. The NFFO standard corresponds to Winkler's Renewables Obligation.

The reservation that Winkler has in relation to the feed-in tariff is that, as such a mechanism guarantees prices for developers, the government may not be able to pay for such high tariffs and the price would not provide certainty on the amount of renewable electricity delivered (Winkler, 2005). In relation to the NFFO system, though the incentive to reduce costs is much higher due to competition, in South Africa "the institutional capacity to administer the tendering process may be a major constraint" (Winkler, 2005, p. 33). What Winkler thinks is the best option is the Renewable Energy Portfolio Standards (REPS) found in some states of the U.S., where the government sets a standard (i.e., a percentage of sales for each distributor) through REPS and electricity distributors have flexibility to meet this requirement. This system also encourages buying of credits from distributors who achieve more than their target, does not require government expenditure and does not require tendering. NERSA has argued that precedent has shown that in the absence of an established renewable energy industry, the feed-in tariff is the best mechanism.

NERSA has the sole responsibility for formulating a feed-in tariff mechanism. The latter has been on NERSA's books for ages and at the recent WWF Conference held in November 2008, Johannesburg, South Africa, NERSA had categorically stated that the mechanism will be in place by February 2009 (Bukula, 2008). NERSA released a consultation paper along with accompanying guidelines on its REFIT proposals in December 2008 (hereafter referred to as the "Consultation Paper") and had conducted public hearings in relation to the same in February 2009 (hereafter referred to as the "Hearings"). The policy is expected to come into effect in March 2009.

Private investors are unanimous about the desirability of a feed-in tariff to enable investments in renewable energy. The feed-in tariff reportedly has had considerable success in Germany, where it resulted in €7 billion in business and employed approximately 240,000 people (PMG, 2008). Germany is the most appropriate example, as NERSA claims that its model is based on the one in force in Germany. NERSA's proposed regime hinges on the establishment of different tariffs for different technologies (wind, hydro-power, landfill gas and concentrating solar power) covering the cost of generation plus a "reasonable profit" to induce developers to invest. The tariff has been determined for a period of five years, subject to review every three years. Eskom distribution will be the sole Renewable Energy Purchasing Agency with an obligation to buy power from independent power producers in accordance with the terms of Power Purchase Agreements entered into with the IPPs. An IPP may generate power on being granted a generation license. The best part about the scheme is that it leaves scope for improvement: there is a Phase Two REFIT contemplated to address issues such as a broader purchaser base, tariffs based on geographical variation, etc., which according to NERSA are too complex to address at the first level of the REFIT. The obvious question is how the incremental costs incurred by generators for shifting from the cheap coal-powered option to relatively expensive renewable energy sources will be met. This difference would

be uniformly divided between all Eskom customers by way of a "pass-through" mechanism. The "pass-through" mechanism is essentially a method of distributing the incremental costs among all consumers who are connected to the Eskom grid irrespective of the source of generation of the electricity distributed. As envisaged, distribution is only through the Eskom grid; municipalities that generate and distribute their own power to consumers have been excluded from the "pass-through" requirement.

The Consultation Paper was met with a fair bit of criticism, as was evident from the Hearings. The primary objections raised were as follows.

Tariff

There has been some debate as to whether an initial simplified single tariff across all technologies would be preferred in order to attract the first batch of investments. WWF, for instance, mooted the viability of a single tariff for all four qualifying technologies mentioned in the Consultation Paper. However, other stakeholders have argued that a single tariff would be inadequate for technologies that require a higher capital cost, such as photo voltaic power generators or hydro-electricity generating plants as against a landfill gas energy site which is usually less expensive to establish. NERSA has, however, clarified that technologies other than the ones mentioned would be recognized within six months of the Hearings and made part of the REFIT policy. The other primary objection was in relation to the undue incentivization of hydro-electric power in a water-scarce country.

Contractual structure and time period

The South African Institute of International Affairs (SAIIA) was particularly vocal about the lack of clarity of the contractual structure proposed as discussed below. The two primary contracts are the generation license to be obtained prior to generation and the PPA to be entered into between IPPs and Eskom.

In South Africa, obtaining approvals and licenses are cited by developers as being the biggest hurdle and most time-consuming project activity (Fakir & Nicol, 2008, p. 31). These drive up development costs and delays also add to the cost of finance if the cost of capital increases due to inflation. SAIIA had proposed opting for a "Single-Window Clearance" and a fixed timeframe with coordination responsibility assumed by NERSA. The "Single-Window Clearance" is a mechanism that has been successfully adopted in countries such as India, whereby the concerned key regulator assists in identifying, obtaining and consolidating all the regulatory approvals, permits and consents in relation to a project thereby substantially cutting down on transaction costs, risks and time for establishing a project.

In the process of researching for this paper, SAIIA had been informed by several interviewees of Eskom's abuse of its bargaining power during the process of negotiating PPAs with IPPs. In order to avoid this, it is imperative for NERSA to draft a detailed bankable PPA in consultation with stakeholders and ensure that all parties subscribe to certain minimum conditions stipulated therein. This observation was supported by a number of presenters at the Hearings.[17] The model PPA annexed to the consultation paper is grossly inadequate and excludes certain crucial provisions; it is neither negotiated nor comprehensive, does not capture primary risks, and fails to lay down the rights and obligations of both private generators as well as the purchaser-supplier. Some of these absent clauses are those in relation to:

(a) Assignment: ordinarily, a PPA is required contain a "permitted assigns" clause that allows for the assignment of tangible and intangible assets to the lending institutions that provide the debt component of project finance
(b) Slippage windows, which capture any time lapses, construction cost excesses and also any inability to meet milestone targets; the absence of slippage windows during both the construction and operations and maintenance stages prevents a clear detailing and categorization of events of default and the consequences
(c) Clauses capturing inflation and currency-fluctuation risks are also absent—this is particularly difficult in light of the discussion in Section 3.1 where macroeconomic instability in South Africa was identified as a primary problem as far as investments are concerned.

The Consultation Paper advocates a 15-year PPA with a re-negotiation option thereafter and a three-year Engineering Procurement Construction Contract. During the Hearings, the former was criticized as being too short to attract long-term project finance, while the latter was considered to be an unnecessarily long period.

Carbon revenue

Under the proposed structure, if earnings by way of CERs are contemplated under a project, then such earnings shall reduce the tariff for the power that is generated from such project. Various business houses and consultants criticized this proposal, pointing out the global price-fluctuation of CERs, which would render the tariff uncertain. The other issue in relation to CERs is the appropriation of proceeds from their sale. There are precedents of Eskom appropriating such proceeds, which is contrary to international best practice, as the earnings from CERs are generally either retained by the concerned independent power generator or divided between the generator and the supplier. There is intimation now that carbon revenue from the CDM would be excluded from

[17] Clarence Oelofse of Fieldstone Africa, Anton Rohner of Macquarie Renewables for Asia and Africa, Tristen Taylor of Earthlife Africa, among others, had stressed the need for a bankable PPA.

the REFIT (NERSA, 2009), but the position on appropriation of proceeds from CERs is still uncertain.

Capacity

The guidelines accompanying the Consultation Paper point out that, in order to prevent oversubscription, NERSA shall be permitted to specify capacity limits on specific technologies. Further clarity on this point would be required—with immensely ambitious targets, what could constitute over-subscription in relation to renewable energy?

Other than the above, there have been several other concerns raised, such as the difficulties of automatic degression and exclusion of co-generation from the REFIT. The provision in relation to degression as it stands now is that the tariff is automatically reduced in intervals based on the assumption of improved plant efficiencies and economies of scale over time. However, this is not a viable option as, once a project has been banked at fixed equipment and Engineering Procurement and Construction costs, it is difficult to assume that there would a marginal or technology cost evolution over time, and the proportion in which the same would be achieved. Eskom has a Pilot National Co-generation Programme in relation to bagasse and the Consultation Paper therefore excludes biomass from the ambit of the REFIT to avoid an overlap. This does not take into account primary generation from biomass technologies.

The above concerns would hopefully be incorporated in the final policy document. NERSA released a short Media Statement on March 31, 2009 whereby they intimated that they are opting for reduced tariffs for the different sources of electricity, as provided in Table 6.

Table 6: Proposed REFIT Tariffs

Technology	Unit	REFIT
Wind	R/kWh	1.25
Small Hydro	R/kWh	0.94
Landfill Gas	R/kWh	0.90
Concentrated solar	R/kWh	2.10

Source: NERSA (2009)

NERSA (2009) has also clarified that there would be an annual review of the tariffs and other qualifying technologies would be considered for inclusion in six months time. They specify that the term of the PPA would be increased to 20 years but the content of the PPA is still unclear. There is intimation that a standard Eskom PPA would be used but, as discussed in the section on *Contractual*

structure and time period above, certain problems still remain, as Eskom would be difficult to negotiate with and some provisions tilt in favour of Eskom. Further, as discussed above, carbon revenue from the CDM has been excluded. NERSA has intimated that the revised policy document and statement of reasons would be released "in due course."

The Inkatha Freedom Party (IFP) is also lobbying for the introduction of a feed-in tariff bill before the parliament, called the "Renewable Energy Feed-in Tariffs and Incentives Bill," which, as its primary lobbyist Dr. Ruth Rabinowitz (2008) explains, is complementary to the NERSA guidelines with some differences but would have the coercive elements of legislation. The primary distinction between this Bill and the NERSA regime discussed above is that the Private Members Bill does not support a single buyer model; there is provision for mini grid and distribution systems and hence municipalities would be able to distribute electricity (PMG, 2008).

Just on the announcement of a proposed feed-in tariff system with a favourable tariff for private generators, the DME reported that it received more than a hundred renewable-energy project proposals, involving as much as 5,000 MW of potential generation capacity, in response to its call for expressions of interest that closed on October 12, 2008 (Creamer, 2008). Notable among them is the joint venture between Irish wind-energy developer Mainstream Renewable Power, which will hold 85 per cent of the new venture, and Genesis Eco-Energy, of South Africa for the development of a 500 MW wind farm in Western, Eastern and Northern Cape provinces Creamer, 2009), with the plants slated for functioning between 2011 and 2014.

Thus, once the feed-in tariff is introduced, there would very clearly be a flurry of investment in clean energy projects.

4.2 Tradable Renewable Energy Certificates

Also known as Green Tags, Tradable Renewable Energy Certificates (TRECs) represent the environmental attributes of electricity generated from renewable resources such as biomass, wind, solar, or others and then delivered to the power grid (Price, 2008). Price (2008) offers the following example to understand TRECs: when a municipality generates electricity from landfill gas and sells it to its utility, it earns one TREC for every 1,000 kWh of power generated. The TRECs can be sold on the open market to anyone wishing to offset their use of electricity produced from fossil fuels. The purchaser of a TREC can legally claim to have purchased renewable energy. Each TREC is assigned a number by a certifying agency to assure that it cannot be sold more than once (Price, 2008). Obtaining a TREC is normally not easy and follows a detailed cycle, as explained in Table 7.

Table 7: TREC certificate cycle

1.	Registration/accreditation of renewable energy plant	The renewable energy plants apply for accreditation. The power plant becomes an accredited TREC generator once it has been verified according to the TREC system rules. All TRECs are registered in the TREC system register and an account is created in the Central Registration Database
2.	Issuing and verification of TRECs	The renewable energy produced by the power plant that has been accredited is monitored and verified by the issuing body. After the verification, the plant receives certificates for a specific quantity of renewable energy generation
3.	Trading and transferring of TRECs	The TREC administrative system enables and tracks trading of electronic certificates between accounts in the register whenever a trade occurred. Trading can take place up until the TREC is consumed (redeemed) or exported from the system, or until the TREC certificate expiry date
4.	Redeeming certificates	When a TREC is consumed (e.g., to verify that a product is "green," to fulfill a renewable energy obligation, to claim tax exemption or other financial production-based support) it is redeemed. The TREC is either erased from the register or earmarked so that it cannot be traded anymore by transfer to a redemption account

Source: Fakir and Nicol (2008, p. 27)

Whereas Certified Emission Reductions form part of the CDM process, TRECs and CERs are different but complementary. TRECs provide a mechanism to supply green electricity within a voluntary market and CERs provide a framework for funding and transacting global emission reductions in terms of the Kyoto Protocol. CERs can be generated from any project that reduces emissions (provided that the project is registered as part of the CDM), whereas TRECs access the wide-ranging benefits associated with green electricity (Steadfast Greening, 2008). Such benefits include not only emissions reductions but also increased price certainty, generation diversification, better job creation opportunities and the establishment of a viable renewable energy generation industry (Niemack, 2008).

As Steadfast Greening (2008) points out, "In South Africa, the SATIB (SA TREC Issuing Body) is in the process of formation and will ultimately be the governance authority for the industry. It will be based on the European AIB (Association of Issuing Bodies). In the meantime the registration of Production Devices is undertaken by suitably qualified energy consultancies [GreenX Energy Pty Ltd and Amatola Green Power Pty Ltd] and GreenX Energy maintains the central certificate register" (p. 5). As of February 10, 2009, the market size of TRECs is about 1 per cent of the total

South African electricity market (Morris, 2009b). However, the DME has shown a clear interest in the working of TRECs and has published a detailed report on it. The characteristic feature of the TREC is that it clearly indicates the "source of origin" of the electricity that a consumer purchases and hence allows a consumer to choose the source. In States such as the Netherlands, there are further state-incentives such as tax rebates (on production of TRECs) provided to promote the use of TRECs. The 2003 White Paper provides, "A Green market survey indicated that there is an, albeit small, growing demand by consumers (household and commerce) willing to pay a premium for the receiving of 'green' electricity. This 'green' premium will further accelerate the commercialisation of renewable energy technologies, thus reducing the Government financial assistance required" (DME, 2009, p. 29). Notwithstanding, the use of TRECS, though found in significant quarters,[18] is not substantial. In South Africa, the TREC is exclusively private and is lacking in state incentives. Glynn Morris (2009), the Managing Director of Green X Energy has been vocal about the lack of coordination between NERSA's REFIT proposal and the DME's interest in TRECs. The primary problem in this regard lies in the non-recognition of differentiated sources of electricity by the regulator under the REFIT and the administrative costs that could be avoided by maintaining a common register for both TRECS and the REFIT. Further, he believes that the TREC would not be a niche difficult market a few years down the line as the price of coal-fired power increases and private generators voluntarily opt for investing in renewable energy technologies irrespective of the retail price incentive that the REFIT affords. This has led Morris (2009b) to conclude that the REFIT is a "stop-gap arrangement." This assertion may not be far-fetched as electricity from coal fired plants is set to grow at 5.1 per cent per annum (Fakir & Nicol, 2008, p. 10). For the time being, however, TRECs are well suited to off-grid electricity.

4.3 The Technology Transfer Guarantee Fund

Another incentive connected to the TRECs mentioned above is the Technology Transfer Guarantee Fund (TTGF), which had been initiated in 2007 and is monitored by the DME. The TTGF will guarantee 90 per cent of the technology transfer transaction expenses to a maximum of R1,000,000. The maximum guarantee will be for a period of five years. However, an application for a guarantee must be accompanied by a technical evaluation certificate issued by the Council for Scientific and Industrial Research (CSIR) approving of the technology, which is sought to be transferred.

[18] It has been incorporated in the Power Purchase Agreements entered into in relation to the Darling Wind Farm Project (Glynn Morris, personal communication, February 10, 2009).

4.4 Subsidies

4.4.1 REFSO: One-time capital grant

The DME has established a Renewable Energy Finance and Subsidy Office (REFSO), which provides a one-time capital grant to companies who wish to set up new projects. The REFSO has formulated a standard contract and terms of reference. As per the standard contract, the rights and obligations of the developer may not be transferred to any other party during the life of the project without the prior approval of the DME.[19] This might prove to be cumbersome because, even under plain vanilla financing, there are always substitution agreements/terms of accession in favour of creditors (Vinter, 2003, p. 31). The aim of the subsidy is to serve as a top-up given that the purchase price of RE-generated power is likely to be more than the generation cost. It may be noted that the total amount of the subsidy cannot exceed 20 per cent of the total project cost and any project with a capacity of more than 1 MW may apply, provided the project cost does not exceed R100 million. It is unclear whether the DME would take operations and maintenance costs into account. The terms of reference annexed to the application form provides that a subsidy of R500/kW capacity for electricity would be provided. The subsidy offer was subsequently revised to R1000/kW. However, the REFSO has met with some success—to date, six projects with a total installed capacity of 24 MW have been subsidized to the value of R15 million. Over R300 million has been leveraged from private sector to implement these projects and over 180 jobs has been created (DME, 2009). Under the 2009–2010 budget, the National Treasury has declared the REFSO budget to be R10 million.

Apart from the above, the only other subsidy that is being provided is a tax rebate that applies only to biofuels; biofuels qualify for a fuel levy exemption of up to 40 per cent and a tax depreciation of 50:30:20 per cent over three years (DME, 2007).

4.5 Other incentives

4.5.1 Taxes

During the 2008 Budget Speech, the South African Minister of Finance moved to impose a new tax of 2c/kWh on non-renewable power generation (or about 0.2 US cents). This is certainly an interesting development, especially in the wake of Eskom's reduced capacity. This disincentive may influence Eskom towards renewable sources. However, there has been criticism that this tax is too mild by international standards and the utilization of the revenue collected by way of this tax is not clear; it would be preferable if the funds recovered by way of this tax were to be used to fund

[19] Article 14 of the Standard Contract

research or investment in renewable energy (Sebitosi & Pillay, 2008). This proposal has not been implemented yet; there are also proposals for introducing a carbon tax in addition to the levy on non-renewable power generation. There have been criticisms in relation to the suitability of a carbon tax; with consultants arguing that a cap-and-trade system would be preferable to a carbon tax as it targets "the actual polluters, promotes South African competitiveness, is more efficient, enjoys greater support from industry and stimulates behavioural changes" (Business Day, 2009). The other argument against a carbon tax is from the point of view of its feasibility. Although the 2008 proposal is a lower rate than what was suggested in the LTMS framework discussed in Section 2.4.2, it was estimated that at a rate of R100 for every tonne of carbon dioxide emissions, Eskom would have to pay R23 billion for the 236 million tonnes of carbon dioxide it emits every year—which is more than half of its total turnover (Donelly, 2008). Such a tax would have dire consequences in terms of job cuts and electricity supply. However, a recent Oxfam/Earthlife Report has suggested that a gradual tax implemented over a number of years is a feasible option (Oxfam International, 2009, p. 41).

In the 2009 Budget Speech delivered on February 11, 2009, there were no clear indications of either a carbon tax or the proposed 2c/kWh levy. The following proposals put forward in the 2009 budget speech may be worth noting:

i. Mention has been made of the introduction of a "favourable tax treatment" of income generated from the sale of CERs under the Kyoto Protocol
ii. A supplementary depreciation allowance shall be afforded to companies that invest in energy efficient technologies.
iii. There is a proposed tax on the use of incandescent light bulbs in order to encourage the use of compact fluorescent bulbs.
iv. Allocation of R1 billion for electricity demand management and tax incentives for investment in energy efficient technologies

4.5.2 *Solar Water Heating Programme*

Eskom is promoting the use of solar water heaters with its rebated Solar Water Heating (SWH) Programme. The SWH Programme is part of Eskom and the South African government's commitment to help South Africans lead energy-efficient lifestyles. When using a South African Bureau of Standards (SABS) and Eskom-approved supplier for the purchase and installation of solar water heating, the end user get up to 25 per cent discount on the system. However, commentators have been critical of the SWH Programme; the aim of replacing 900,000 solar water heaters in five years seems unrealistic given that only 800 heaters have been installed so far (Oxfam International, 2009).

5. Financing Renewable Energy

The United Nations Framework Convention on Climate Change (UNFCCC) *Report on Investment in Renewable Energy and Energy Efficiency* states that "Private Investment is - and is likely to remain - the main source of financing for renewable energy and energy efficiency. Consequently, Renewable Energy has flourished in countries with developed financial markets and active private investors" (Hohler, Greenwood & Hunt, 2008). This observation was based on the New Energy Finance finding that globally, private investment in renewable energy is 96.4 per cent while multilateral/bilateral investment is 3.6 per cent (Hohler, Greenwood & Hunt, 2008). This is in stark contrast to investments in energy in South Africa, where private capital has not been nearly as active as other forms of financing. This is evident from the Foster-Pedley and Hertzog study (2006) on financing strategies in the South African renewable energy industry (see Figure 6).

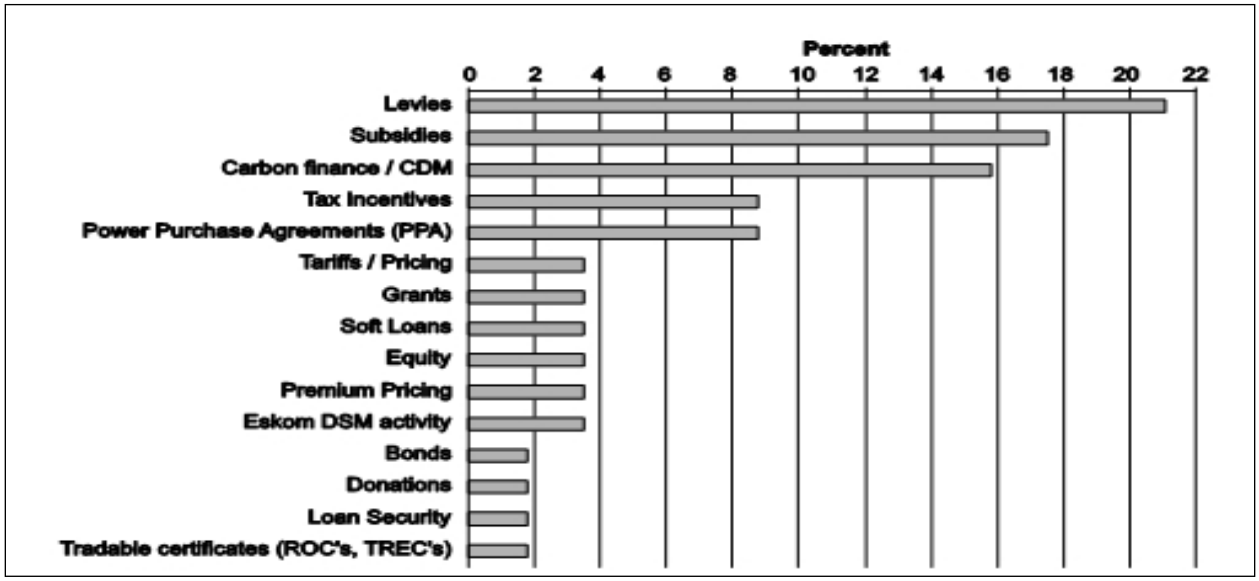


Figure 6: Financial mechanisms/instruments
Source: Foster-Pedley & Hertzog (2006)

In order to discern preferences of stakeholders in the South African RE market, Foster-Pedley and Hertzog (2006) interviewed around 40 stakeholders including manufacturers, financiers, academics and government officials (p. 58). The percentages provided against each financing mechanism related to the proportion of the total interviewee base. The preference is not a reflection of actual projects but the expected financing mechanisms that would be opted for. It is clear that levies and subsidies rather than market-based instruments are the preferred choices amongst interviewees. The study further observes that "many interviewees expected government to provide the financial

support needed to make renewable energy a viable business. International funds were also a popular source but the details of exactly which international source was rarely specified, if known. Carbon-based finance from prototype carbon funds was also popular" (p. 60). It appears that the study does not really concentrate on examining the various mechanisms in which private capital may operate in the renewable energy sector. However, the fact remains that renewable energy projects in South Africa are in their infancy and are certainly not voluminous. In our discussions with Daniel Modise (2008), the Chairperson of the Subsidy Governance Committee, Department of Minerals and Energy, the total number of renewable energy projects that have substantial private participation would be a handful. While conversing with John Paley of the eThekwini municipality, it became clear that greenfield investments in renewable energy initiated by private players are probably completely absent and the eThekwini municipality, for example, does not rely on private funding at all; he added that one of their projects depends on World Bank funding but otherwise the municipality is self-sufficient.

Thus, South Africa does not conform to the global trend of relying primarily on private funding. However, as per Marquard's study (Marquard, Merven & Tyler, 2008), if South Africa is going to meet a 15 per cent renewable energy target by 2020 (meaning 56,000 GWh of electricity produced from renewable sources), huge amounts of government and private investment in Renewable Energy would be required. This projection cannot be met given the current trend of heavily government-sponsored renewable energy projects and would require a substantial amount of private investment in renewable energy projects.

5.1 Development of a PPP model

It is the authors' opinion that there should be more systematic development of project finance mechanisms and public-private partnership (PPP) models in relation to clean energy in order to ensure some form of certainty for investors and other benefits discussed below. There is a PPP Manual and Standardised PPP Provisions are issued as Treasury PPP practice notes in terms of the Public Finance Management Act that governs the financial management of the national and provincial spheres of the South African government.[20] In relation to municipalities, Municipal financial management is governed by the Municipal Finance Management Act, which became law in 2003. According to the national PPP website, municipal PPP regulations were being finalized early 2005, and the PPP Unit is working on special Guidelines for Municipal PPPs, but the municipal law is substantially similar to the national legislation. However, having a PPP model for renewables would certainly go a long way in incentivizing more investors; there have been a number of international success stories in relation to the same. Among these, mention may be made of the renewable energy projects in the states of Rajasthan, Gujarat in India under framework legislations

[20] PPP Unit of the National Treasury, http://www.ppp.gov.za/

(Sethi, 2007; Rastogi, 2007), the EGAT project in Thailand (Susangarn, 2007) and the Incentive Program for Residential Photovoltaic (PV) Solar Energy Project in Japan (Goldman Sachs, 2007).

As none of the renewable energy projects in South Africa so far has been a strictly private venture, it may be argued that there has always been some form of public-private partnership. However, it is suggested that standardized regulatory frameworks would serve as substantial incentives. A PPP regulation/model may come in different forms but the most effective ones are Standard Concession Agreements (which would be designed according to the allocation of responsibility and risk between the government and private parties), Operating Leases, Management and Service Contracts (Feig & Finlayson, 2008). While it may be argued that appropriate models are best selected on a case-by-case basis, what private investors look for is certainty as far as allocation of risk is concerned (Dobriansky, 2006). Further, it allows for greater competitiveness among interested private organizations if they were to bid for a concession on similar terms (Cuttaree, 2008). Government assistance in relation to issues such as resettlement, community disruptions and distrust, land conflict is much needed and such assistance may not be provided to smaller investors (Adenikinju, 2008). As the venture capital market in RE is in its infancy, the attraction of debt becomes critical and bankers would certainly prefer assumed risks by a government body. This becomes especially critical when private parties are interested in providing decentralized off-grid solutions (Adenikinju, 2008). A UNEP study also shows that more micro-frameworks may be developed in relation to PPPs such as insurance facilities, guarantee fund mechanisms and technology-specific derivatives (UNEP, 2008).

5.2 Accepted sources of finance in relation to renewable energy: CDMs

As an emerging power, South Africa is in a unique position in that it is classified as a non-Annex I country under the Kyoto Protocol (Department of Environmental Affairs and Tourism, 2008), whereby it isn't burdened with any emission reduction obligations and yet it has one of the highest greenhouse gas emissions per capita (WWB, 2008). As of February 10, 2009 there were 97 CDM projects submitted to the South African DNA—72 Project Idea Notes and 25 Project Design Documents. Out of 25 Project Design Documents, 14 have been registered by the CDM Executive Board as CDM projects (Mukwevho, 2009).[21] It may be noted, however, that only three of the CDM Projects that have been registered have applied for CER credits.

However, there are some shortcomings with implementing CDM Projects in South Africa. A consultant observes that "the biggest issue with the CDM is that it takes a long time; people put a lot of their own money on the line and there are a lot of obstacles to overcome" (J. Venderberg, as cited in Erion, 2007). As to what these obstacles are, he points out that there are high transaction costs—

[21] Lufuno Leonard Mukwevho, of the Designated National Authority DME. The information available on the relevant web page, South Africa's CDM Portfolio, is not updated. http://www.dme.gov.za/dna/dna_project_portfolio.stm

it costs approximately R40,000 (US$4,000 approx) to get a project approved and a minimum of six months (J. Venderberg, as cited in Erion, 2007). The CDM project cycle in South Africa is complex, as it requires the following: extensive project-design and formulation (through a project-design document, a PDD); host country approval (through the DNA); validation (by a certified Operational Entity), and registration with the CDM executive board, project financing (through investors); monitoring (through the project participants); verification and certification (by another independent operational entity); and the issuance of certificates from the CDM Executive Board of the UNFCCC (Stowell, 2005, p. 180). Further, Geoff Stiles (2008) of the South African Climate Action Plan notes that the contribution of CERs to the total financing of a project in South Africa has been between 10 and 20 per cent, depending on the nature of technology used. The other problem that should be noted is that the market structure of the CDM and the current low price of carbon make it difficult for smaller sustainable development projects to attract funding (eAfrica, 2005). Thus, for investors interested in purchasing CERs, it is a good deal but those interested in investing in projects (especially on a small scale[22]) that produce CERs would have to source substantial additional funding for such projects. This is also because of the additional criterion where a project is required to be able to sustain itself despite any finances that may be attracted through CDMs. In addition, while carbon markets have had promising price ranges for CERs because of a shortage of supply, the price secured depends largely on who the purchasing party is, at what stage of the project the carbon financing takes place and what can be negotiated between the CDM project owner and the carbon credit purchaser (Fakir & Nicol, 2008, p. 13). Thus, CER financing is uncertain.

However, it may be mentioned that South Africa has been high on CDM standards. The "Gold Standard" for CDM Projects is one such project benchmark and CDM projects in South Africa tend to aspire towards attaining this standard. The Kuyasa low-cost housing project based in the township of Khayelitsha outside Cape Town is the first CDM Project in the world to attain the Gold Standard and the Landfill Gas Project in Belville has applied for the Gold Standard. Projects that achieve Gold Standard verification will have their CERs traded on the largest compliance market, the European Union Emissions Trading Scheme (Ashdown, 2008). Thus, the trend towards the Gold Standard is a welcome change.

[22] Scale in this context refers not directly to size of a project but the percentage of CER financing taken into account while formulating the business plan of such project. For example a 10 MW methane reduction project could generate more CERs than a 45 MW wind energy project. The different kinds of technology cannot be compared to determine scale, as a project that has a relatively low generation may in fact prove to be extremely cost effective in the long run. Considering the multiple variables that need to be taken into account in determining what constitutes small scale in this context, we faced an inadequacy of data.

5.3 Accepted sources of finance: Voluntary Green Power Market and venture capital

A pilot Voluntary Green Power Market project was implemented between June 2006 and December 2007. Under this pilot phase there was only one trader, Amatola Green Power, two green power producers (TSB and Tongaat Hullet) and three customers (City of Tshwane, Daimler Chrysler and Buffalo City Municipality). For the duration of the pilot, Eskom operated as the Independent Market Operator (REFSO, 2009). Commentators have observed that the size of the market was too small to make a major impact and therefore was not taken seriously (Padayachee, 2009). However, the form that green power trading has now adopted is the TREC system described in Section 4.2.

Venture capital investments have been rather slow in South Africa, with more investments from the government rather than the private sector (Planting, 2008). This prompted the National Treasury to introduce a 30 per cent tax deduction in venture capital investments. In relation to clean energy, venture capital has been sparse due to the absence of a suitable price incentive for new generators, which may change once the feed-in tariff is introduced, as Christopher Clark of the Evolution One Fund has observed (2009). The Evolution One Fund launched in October 2008 is South Africa's first clean technology investment fund that aims to devote approximately R1 billion in clean energy technology projects in Southern Africa.

The fund is scheduled to last for 10 years and spans many industries, including:

- air quality and control of emissions
- water management and purification
- waste management
- cleaner energy generation; and
- energy efficiency
- agribusiness and forestry

The fund aims to directly benefit small emerging enterprises and BEE, among others. Greenfield and brownfield projects in thin-film solar manufacturing and co-generation would be initially targeted.

Other than private venture capital funds, it may be noted that South Africa's development finance institutions such as the Development Bank of South Africa, the Industrial Development Corporation (IDC) and the Central Energy Fund act as venture capital funds.

6. International Assistance for Clean Energy Investment

The UNFCCC Report on Investment in Renewable Energy indicates that donor and multilateral funding constitutes 3.6 per cent of the total investment in RE worldwide. Though there is no accepted statistic evolved yet in relation to the percentage of donor and multilateral funding in relation to renewable energy investments in South Africa, the situation in South Africa might well be different—there may be greater participation of donors and multilateral agencies than participation of private funds.

There is increasing participation of the Global Environment Fund (GEF) directly in individual projects that are primarily off-grid, and more recently, in the Renewable Energy Market Transformation Project (REMT) where the GEF has provided $6 million to "remove the barriers and reduce implementation costs of renewable energy technologies to help mitigate greenhouse gas emissions and to promote on-grid electricity from renewable sources" (DME, 2008) over a four-year period (i.e., between 2009 and 2013).

The REMT is a DME initiative and the implementing agency is the DBSA. Without going into the detailed plan of the REMT, it may be pointed out that aim of the 4-year plan is to "establish policy and regulatory frameworks and build institutional capacity for renewable energy development in South Africa" (World Bank, 2007, p. 2) Other than the development of an institutional framework, there are two other factors that private parties may look out for:

(1) The development of a help desk that would facilitate activities for renewable energy investments, prepare pre-feasibility studies for renewable energy investments and facilitate activities for promotion of off-grid renewable energy.
(2) Providing of "Performance Grants" and "Matching Grants" to eligible beneficiaries to establish a program for small and medium-sized private enterprises to design and implement commercial SWH subprojects.

Other than through the GEF, UNDP has also been directly involved in sector-specific projects, most notably the South African Wind Energy Programme. The latter originated from the declaration by the Minister of Minerals and Energy in June 2000 with respect to the Darling National Demonstration Wind Farm as a National Demonstration Project (Davidson, 2004). Its objective is therefore to install and operate up to 5.2 MW on the Darling Wind Farm and prepare the development of 45 MW combined wind farms (by the private sector) (Davidson, 2004). The project has an estimated $2 million funding over 2 years, with the Darling Wind Farm investment ($7 million) having been accepted as South Africa's co-funding (commissioning of Darling Wind Farm was a prerequisite for GEF SAWEP Full Size project grant) (La Roux, 2003).

There has been a recent grant of R60 million by the Royal Danish Government to be injected into renewable energy projects. While the nature and number of the projects have not been finalized, it has been specified that the amount is to be used by metropolitan local governments (Van der Merwe, 2009).

Other than the GEF, the Renewable Energy Efficiency Partnership (REEEP), USAID and NORAD have been active in providing funds. The general practice for such organizations has been to partner with the Central Energy Fund (CEF), a state-owned entity and channel the funding/donation through the CEF, particularly the Energy Development Corporation (EDC), a division of CEF. This practice is interestingly different for other nations in Africa where donors and multilateral agencies have directly invested in energy projects (Gratwick & Eberhard, 2008). The projects in which international donors/agencies are participating along with the EDC are:

- The Bethlehem Hydro Power Project, where the EDC has signed a shareholders agreement with NuPlanet, a Dutch project development and management company active in the sustainable energy sector. The parties have joined up to establish one of the first IPPs to generate electricity from a mini-hydro scheme. NuPlanet is also designated as the business manager.[23]
- The Solar Water Heating 500 Project, which aims to "install and subsidise 500 solar water heaters in low-, medium- and high-income urban households. It also aims to standardise the solar water heating quality and testing regime, consolidate and expand distribution and maintenance infrastructure, offer low-interest financing options; and ensure continued awareness and involvement on both the supply and demand side" (CEF Group, n.d.). UNDP and GEF are seeking to ensure proper implementation of the project.

Other than these two projects, the EDC is supported by Danish International Development Assistance (DANIDA), the NORAD and the German Technical Assistance (GTZ).

[23] For more information on the Bethlehem Hydro Power Project, visit: http://www.cefgroup.co.za/index.php?option=com_content&view=article&id=78&Itemid=14&b6e5cde5d2b5d180ea8ad8e99ed82263=1f05a8aface11642423f84408c3dcd86

7. Conclusions

It is clear that renewable energy development will require financial incentives. While the government intends to provide the necessary incentives, South Africa's fiscal resources are limited, and there are competing high-priority social and economic programs, particularly in providing services to historically disadvantaged communities. Hence, the financial resources for these incentives will have to come from a combination of South African and international sources. South Africa has already ratified the United Nations Framework Convention on Climate Change (1997) and the Kyoto Protocol (2002), which creates the framework for tapping international funds via the GEF and CDM to reduce greenhouse gas emissions.

Macroeconomic stability is a compelling factor that investors take into account when making investment decisions in a particular country. For new ventures such as renewable energy projects, the deployment of capital without "adequate investor protection" would not be robust. Further, the labour force skills are also uppermost in investors' decisions, especially at operations and maintenance stages of projects. The key obstacles to increased clean energy investment in South Africa are embedded in the institutional and regulatory framework, centred in particular on the role played by the current dominant supplier. There are also challenges in financing and the bias towards conventional sources of energy generation.

Market conditions for renewable energy generation can be optimized by reducing the barriers to the increased production of electricity from this source through the development and implementation of an appropriate financial and legislative framework. There is a need for government support for renewable energy to help establish initial market share and demonstrate the viability of renewable sources, after which economies of scale and technological development take over.

In this regard, the South African government is advocating a renewable energy feed-in tariff as an incentive to attract investment into renewable energy. The proposed regime hinges on the establishment of different tariffs for different technologies (wind, hydro-power, landfill gas and concentrating solar power) covering the cost of generation plus a "reasonable profit" to induce developers to invest. Though there are initial concerns regarding the proposed REFIT, domestic private investors are unanimously positive about the desirability of a feed-in tariff to enable investments in renewable energy.

Mitigation action requires a long-term shift from a dependency on dirty coal to a diverse energy mix. However, it is crucial that mitigation is not the only option that is implemented. Mitigation strategies should be accompanied by adaptation towards increased energy efficiency and the increased investment in renewable sources of energy.

The DME, in its recent study, *Implementation Progress for the First Five Years of the Renewable Energy White Paper,* arrived at several steps, which are required to be taken to tackle RE challenges (see Table 8).

Table 8: Steps required to tackle RE challenges

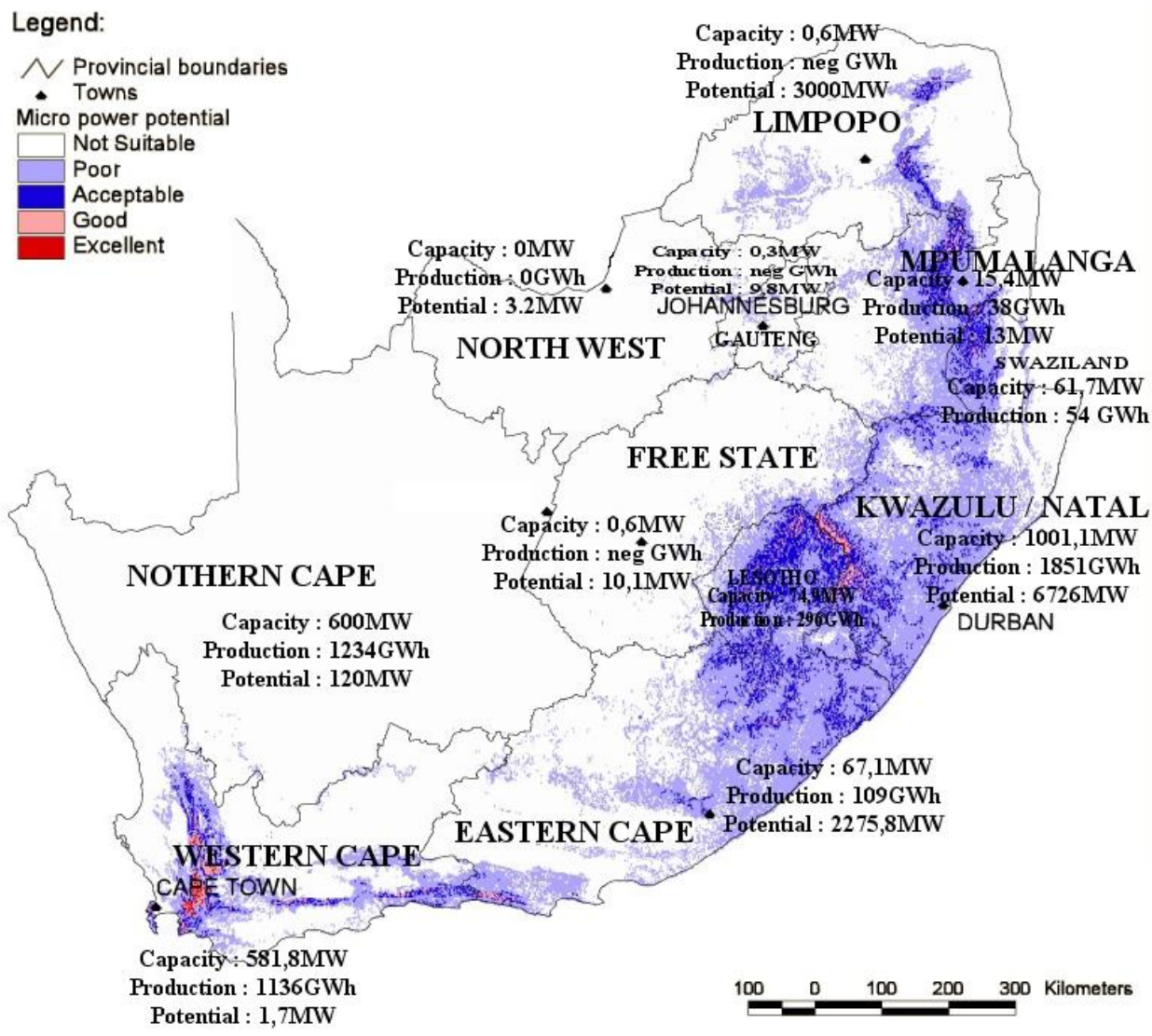
Focus Area	Possible solutions to challenges
Financial instruments	A decision on the long-term finance mechanism for RE projects; implementation of the electricity levy for RE and DSM purposes; and strengthening and forging new partnerships with the private sector
Legal instruments	Develop regulations to access grid and wheeling of green electricity; set up mandatory targets that must be achieved from each technology over time, develop a standard PPA that is favourable both to off-takers and IPPs; develop regulations for biofuels;
Technology, Research and Development	Implement the national SWH roll-out program; produce an updated Wind Atlas for South Africa; establish local manufacturing capacity; monitor and coordinate research activities and explore funding sources for research activities
Awareness raising, capacity building and education	Establish a "help desk" for renewable energy information

Source: DME (2009)

It has been observed in the course of this study that a more cooperative approach between the DME, the DEAT and NERSA needs to be adopted to ensure that appropriate legal instruments are in place to boost long-term financing and that these reinforce rather than contradict one another. This is especially crucial in the wake of the recession where equipment supply as well as the flow of fresh capital in clean energy projects may be a problem.

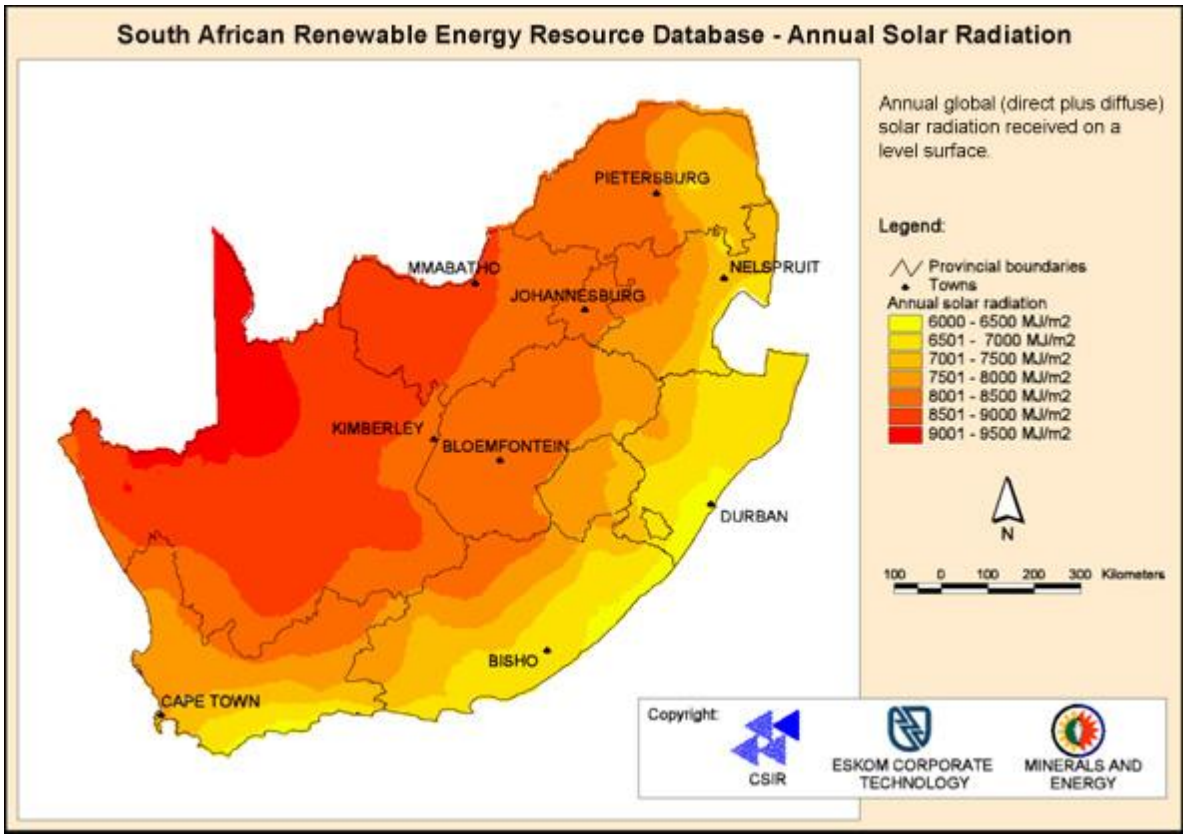
Appendix 1: Figures for Renewable Energy Resources

Appendix 1A: Distribution of hydro-power resources



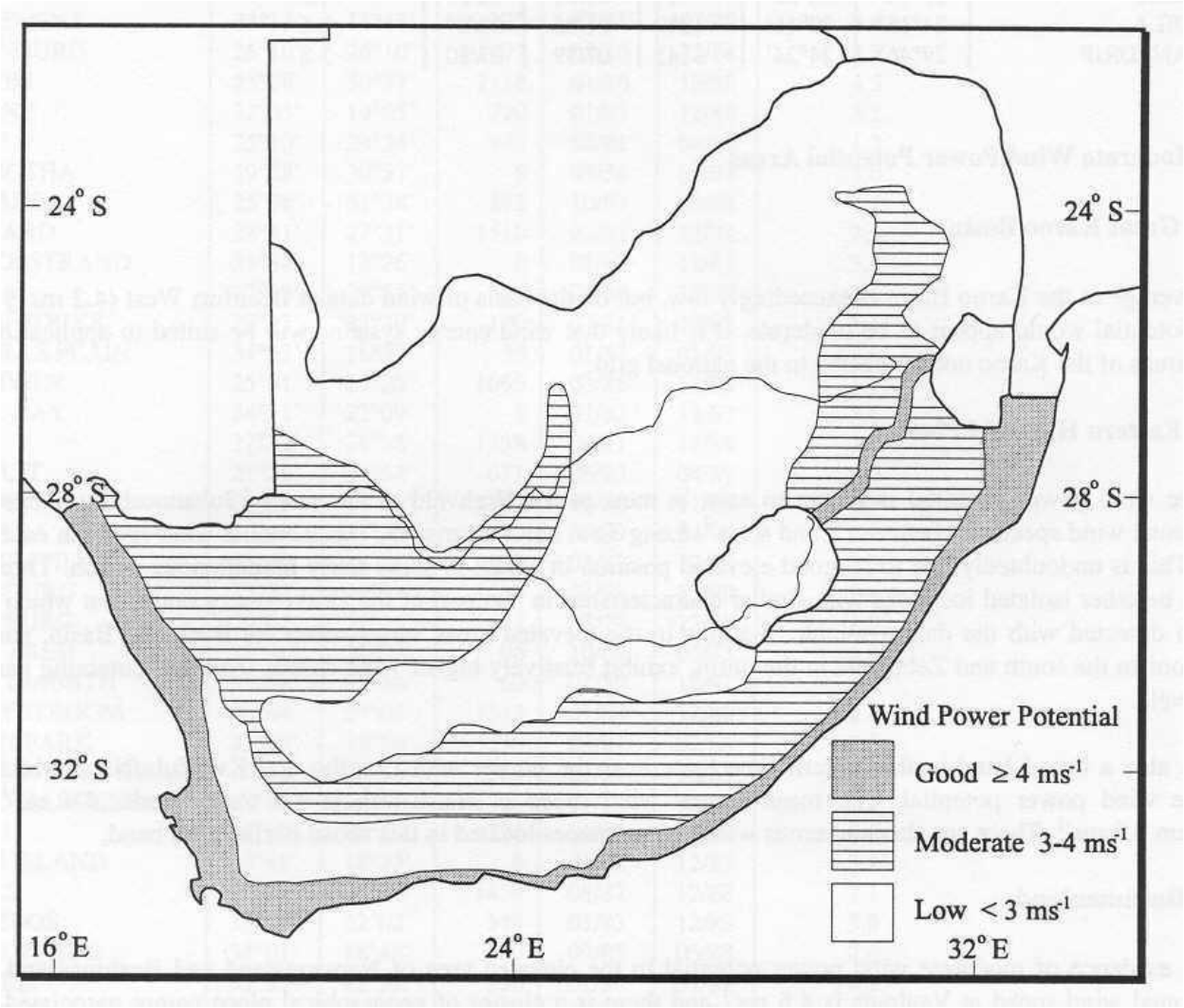
Provincial representation of hydropower capacity, production and potential. This represents all categories of hydropower including pumping storage but excluding imported hydropower.
Source: DME (2003) http://www.afriwea.org/download/IPPbrochure.pdf

Appendix 1B: Annual solar radiation



Source: CSIR, 2002. South African Renewable Energy Resource Database – Annual Solar Radiation. www.csir.co.za/plsql/ptl0002.

Appendix 1C: Wind-power potential



Source: DME (2003) http://www.afriwea.org/download/IPPbrochure.pdf

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