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CLEAN ENERGY



energy

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REPUBLIC OF SOUTH AFRICA

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and use. Given that the energy sector contributes most to GHG emissions, the potential for CDM projects is large. This includes both supply-side and demand-side projects. For CDM projects, there are a number of opportunities which have good potential for emissions reduction, these include:

- Electricity generation from Renewable Energy sources (for example Solar, Wind, Hydro, Biomass);
- Fuel switching for thermal energy supplies, for example from coal and oil to natural gas; from electricity to natural gas;
- Energy efficiency improvements in steam and thermal energy supply systems;
- Energy management (energy efficiency) in the following areas:
 - Variable speed drive; Electrical motors; Lighting; and Compressed air systems
- Manufacturing - industrial EE; structural changes to less energy & emissions-intensive; boiler conversion to gas;
- Residential, public & commercial buildings - fuel switch, solar water heating, energy management, EE building design (thermal-efficiency), EE appliances.

Other potential areas for projects include:

- Waste sector - composting; energy (electricity) generation;
- Mining -Methane reductions from coal mine; and improve Energy Efficiency (EE);
- Agriculture - afforestation & reforestation; fire controls; improved management of woodlands; biofuel production;
- Transport and automotive sectors - Improved public transport, urban planning & traffic management; vehicle fuel switch; vehicle efficiency, road to rail transport.

Current Status of CDM in South Africa

As of 11 November 2011, there are 255 CDM projects submitted to the DNA - 213 Project Idea Notes (PINs) and 43 Project Design Documents (PDDs). Out of 43 PDDs, 21 have been registered by the CDM Executive Board as CDM projects (7 Issued with CER's), and 22 are at different stages of the project cycle - DNA approval, validation stage and/or request for review. For updated portfolio please visit www.energy.gov.za

The projects submitted to the DNA for initial review and approval cover the following types, bio-fuels, energy efficiency, waste management, cogeneration, fuel switching and hydro-power, and cover sectors like manufacturing, mining, agriculture, energy, waste management, housing, transport and residential.

The ultimate aim of the Clean Development Mechanism (CDM) is

- to assist Parties non Annex I in achieving sustainable development
- contributing to the ultimate objective of the Convention, Greenhouse gas emission (GHG) reduction, and
- to assist Annex I Parties in achieving compliance with their quantified emission reduction commitments.

Project Approval Procedure

Project approval by the host country is one of the pre-requisites of international registration of a potential CDM project with the CDM Executive Board. Assessment of projects for host country approval is the primary role of the Designated National Authority. Scope of this assessment is limited to assessing the voluntary participation of South Africa in CDM and the contribution of projects to the sustainable development of the country.

Time Frames for Approval

Project developer submits a Project Identification Note (PIN) application form to the DNA. The DNA will provide the project developer submitting the PIN with the results of the initial screening within 30 days working day
Project developer submits the project details to the DNA in the South Africa Project Design Document (PDD) form and UNFCCC PDD Form. The submission of the PDD and receipt of a decision from the DNA should not exceed 45 working days.

Possible CDM projects in South Africa

South Africa has a great potential for developing CDM projects given its emission level. Compared to other major developing countries, its emissions intensity is relatively high due to its reliance on coal. The energy sector is a key source of emissions; in 2000 it contributed 79% of GHG emissions, followed by industrial processes 14%, Agriculture, forestry and land use 5%, and waste 2% (DEA, 2009). The primary source of Greenhouse Gas (GHG) emissions is the production of CO₂ from energy production

SOUTH AFRICAN RENEWABLE ENERGY RESOURCE POTENTIAL

1. BACKGROUND

Renewable energy is energy that comes from natural sources such as wind, solar, biomass, hydro, etc. which cyclical and non-depletable. In order to meet the long-term goal of a sustainable renewable energy industry, Government set in 2003 the following 10-year target for renewable energy:

10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the estimated electricity demand (41539 MW) by 2013.

2. DEPLOYMENT OF RENEWABLE ENERGY TECHNOLOGIES

The Government is on course with regard to diversification of South Africa's energy mix away from fossil fuels, and this is largely reflected in the integrated resource plan (IRP2010) that was promulgated on 06 May 2010. Under this plan South Africa's new build options aim to add about 42% renewables-based capacity by 2030.

As a starting point the Minister of Energy has determined that South Africa requires 3,725 MW in order to ensure uninterrupted supply of electricity, and all this will be generated from renewable energy sources. To further advance the enhanced deployment of renewables, the Department of Energy (DoE) is pursuing other equally important initiatives, namely, the national solar water heating programme as well as the integration of biofuels into the country's liquid fuels pool. Over and above this, supportive biofuels regulatory frameworks, in the form of mandatory blending regulations as well as the determination of biofuels transfer price and financial support, are work in progress.

3. RESOURCE POTENTIAL

3.1 Solar Energy

South Africa experiences some of the highest levels of solar radiation in the world. The average daily solar radiation in South Africa varies between 4.5 and 6.5 kWh/m² (16 and 23 MJ/m²) (Stassen, 1996), compared to about 3.6 kWh/m² for parts of the United States and about 2.5 kWh/m² for Europe and the United Kingdom. The figure below shows the annual solar radiation (direct and diffuse) for South Africa, which reveals considerable solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation.

3.1.1 Solar Water Heating

The government has set a target of installing 1 million solar water heaters (SWHs) by 2014 whilst the potential also exists to retrofit an additional 11 million households as well as newly built houses. A system in the middle/upper income sector reduce peak by 0.59 to 0.625kW and between 1600 to 2500 kWh per annum dependent on region, number occupants and system size. A system in low income home that is electrified reduces peak between 0.29 and 0.35kW, and between 1100 and 1400kWh per annum dependent on region, number occupants and system size.

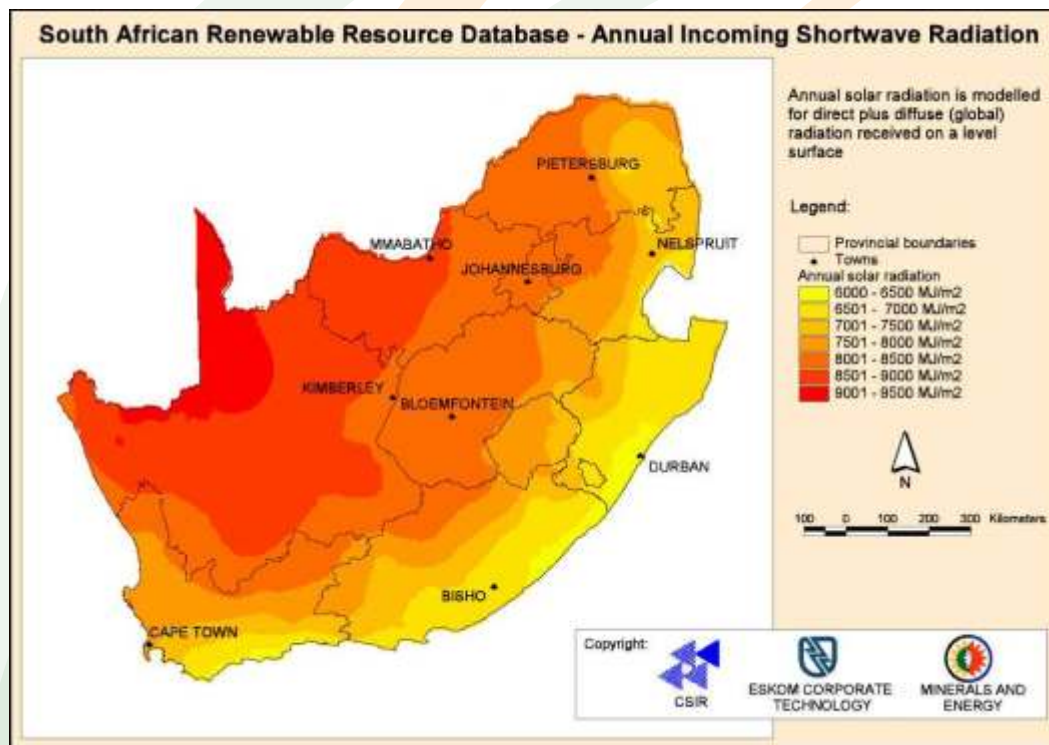


Figure 1: Annual direct and diffuse solar radiation (DME, Eskom, CSIR, 2001)

3.2 Wind Energy

Estimates of wind power potential for South Africa were done by Diab (1995) who concluded that:

- Wind power potential is generally good along the entire coast with localised areas, such as the coastal promontories, where potential is very good, i.e., mean annual speeds are above 6 m/s and power exceeds 200 W/m²;
- Moderate wind power potential areas include the Eastern Highveld Plateau, Bushmanland, the Drakensberg foothills in the Eastern Cape and KwaZulu-Natal; and
- Areas with low wind power potential include the folded mountain belt (vast region of very complex and diverse terrain), the Western and Southern Highveld Plateau, the Bushveld basin, the Lowveld, the Northern Plateau, the Limpopo basin, Kalahari basin, the Cape Middleveld and the KwaZulu-Natal interior.

DIRECTORATE: DESIGNATED NATIONAL AUTHORITY

The South Africa's Designated National Authority (DNA) was established in December 2004 as an important step for the implementation of the provisions of the Kyoto Protocol and of the United Nations Framework Convention on Climate Change. It has been established in terms of a regulation under section 25 of National Environmental Management Act (NEMA). Cabinet approved the establishment of DNA at Department of Minerals and Energy (DME). As a result of the split of DME into two Departments (Mineral Resources and Energy) in 2009, the DNA now resides within the Department of Energy. The DNA is mainly responsible for the following functions:

Regulation function:

- Project evaluation and approval

Promotion function:

- To promote and facilitate the development of CDM projects in South Africa
- Secure an adequate share of CDM investment in South Africa

Designated National Authority has a steering committee, established to oversee DNA's activities. It comprises of National government departments, these include the Department of: Energy (DOE) as a chair; International Relations and Co-operation (DIRCO); Environmental Affairs (DEA); Water Affairs (DWA); Trade and Industry (DTI); Science and Technology (DST); Transport (DOT); National Treasury (NT); Agriculture, Forestry and Fisheries (DAFF); Human Settlement (DOHS) and Health (DOH).

Background of CDM

Clean development Mechanism is a project based mechanism, established in article 12 of the Kyoto protocol of the United Nation Framework Convention on Climate Change (UNFCCC) that provide a practical framework for project participants to reduce or stabilize greenhouse gases that are known to be the cause for global warming and climate change.

7. Environmental Management Plan (EMP)

With the promulgation of the National Environmental Management Act 107 of 1998 (NEMA), national and provincial departments which are listed in Schedules 1 and 2 of NEMA are required to prepare Environmental Implementation Plans (EIP's) and/or Environmental Management Plans (EMP's) within one year of the promulgation of NEMA. The Department falls within the ambit of the Schedule 2 departments.

The purpose of the EMP as contemplated in section 12 of NEMA is to:

- Give effect to the principles of co-operative governance as contemplated in Chapter 3 of the Constitution;
- Co-ordinate and harmonize environmental policies, plans and programmes and decisions of the various national departments that exercise functions that may affect the environment, or are entrusted with powers and duties aimed at the achievement, promotion and protection of a sustainable environment in order to minimize the duplication of procedures and functions and to promote consistency in exercising of functions that may affect the environment;
- Secure the protection of the environment; and
- Enable the Minister of Environmental Affairs and Tourism to, as the lead agent for the environment; monitor the achievement, promote and protect the sustainability of the environment.

NEMA requires that National Government departments and Provinces to report annually on the implementation of its gazetted EMP, therefore the purpose of the Annual Report is to:

- Report on the implementation of the commitments set in the EMP;
- Report on changes which effects the EMP; and
- Provide additional information not included in the Second Edition EMP.

The upper limit of wind energy available to be captured in South Africa is estimated at 3 GW (Diab, 1988). Taking a conservative estimate of 30% conversion efficiency and 25% capacity factor, it is estimated that wind power could supply at least 1% of South Africa's projected electricity requirements (198000 GWh) in 2002. This excludes the offshore wind energy potential which should also be assessed. South Africa is collecting wind data from 10 measurement masts across the country. Further details on this project are available on the project website: www.wasa.csir.co.za. Monthly data files are made available for download for everyone entering their registration information.

3.3 Biomass Energy

The main sources of biomass are fuelwood in the rural domestic sector, bagasse in the sugar industry, and pulp and paper waste in the commercial forestry industry for in-house heat and electricity generation. According to the then Department of Water Affairs and Forestry (DWAf, 2003) the key biomass resources that play a role in terms of renewable energy are invasive aliens (e.g. exotic acacia species like black wattle and Port Jackson), commercial plantations and the wood industry, woodlots, trees in the urban environment, woodlands and indigenous forests and trees cultivated as fuel crops. Table 1 below shows a summary of the

Industry	Biomass	NCV (MJ/t)	Mass (1000 t)	Energy Content (TWh/yr)	Power Potential (GWh/yr)
Sugar	Field Residue	6894	5336	10.21	2553
	Bagasse	7117	6136	12.12	3031
Forestry	Softwood	13016	1588	5.74	1650
	Hardwood	11820	1555	5.11	1073
Saw Mill	Chips	10316	1433	4.11	1162
	Dust	10611	730	2.15	608
	Bark	10135	443	1.25	353
Pulp & Paper	Black liquor	6243	5206	9.03	2257
	Sludge	5777	234	0.38	94
	Bark	7975	345	0.76	191
Total		7958	23006	50.86	12972

Table 1: Summary of energy potential from biomass in South Africa (CaBEERE, 2004)

In the forestry sector, the volume of waste remaining in the forests is substantial. This waste is about three times the total waste used or discarded in all the mills and, as such is potentially a large renewable energy resource that might have use for charcoal, gasification or direct generation of power. In addition, there is considerable potential (without impacting on food production) for the production of biofuels from energy crops such as sugar cane, sugar beet, sunflowers, canola, etc.

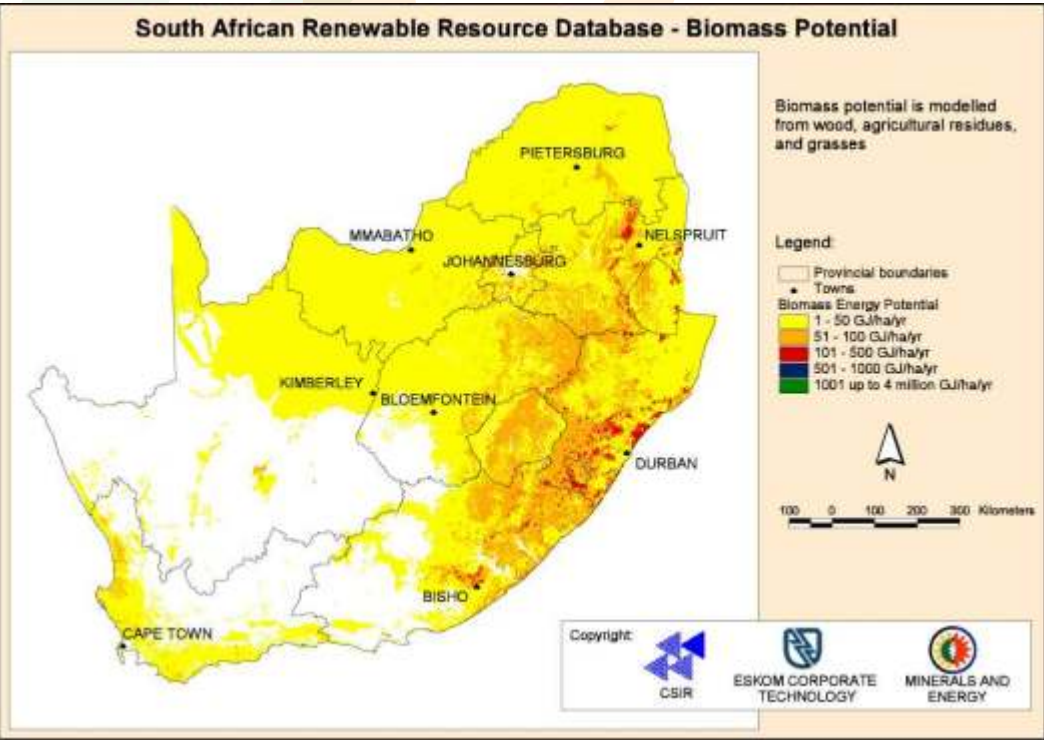


Figure 2: Total Biomass energy potential in South Africa (DME, Eskom, CSIR, 2001)

3.4 Hydro Power

A popular perception that the potential for hydropower in South Africa is very low is often overstated. It has been shown in an assessment conducted by the DME (2002), the "Baseline Study on Hydropower in South Africa" (CaBEERE, 2002) that there exists a significant potential for development of all categories of hydropower in the short- and medium-term in specific areas of the country.

5. Industrial Energy Efficiency

The project aims at contributing to a sustainable transformation of industrial energy usage practices in South Africa and possibly in the Southern African Region, by putting the system of Energy Management Standards (EMS) in place and ensuring that industries in agro-processing, chemical and liquid fuels, mechanical engineering, automotive and mining industry use it.

In order to achieve this goal, it is planned to stimulate the demand of Energy Efficient services through formulation and implementation of an enabling policy framework including a supportive financial mechanism for EE, creation of institutional capacity to implement the EMS, awareness raising, energy audits, and demonstration projects.

It is also planned to support the supply of Energy Efficient services by building the institutional capacities to accredit, certify EMS compliance, and by training local trainers and consultants in EMS implementation and energy system optimization, as well as in energy management in the targeted sub-sectors. Sharing experience gained and providing initial support to the neighboring countries in the region have also been envisaged. To date an Energy management Standard has been developed and being piloted through workshops and training programmes taking place country wide.

Training programmes focusing on Steam, fan, pump and system optimization are currently being offered with the intention to create capacity within the industrial sector.

6. Energy Efficiency Campaign

The department in consultation with key stakeholders through the NEDLAC process has developed an Energy Efficiency campaign strategy which seeks to provide a collective approach in information dissemination. The campaign aimed to design, distribute energy efficiency publications and to establish and manage an energy efficiency information system (IT Library & Website).

4. Energy Efficiency Regulations, Standards and Labelling

The world communities are shifting from energy use business as usual practice to a more energy efficient culture. This is being emphasized worldwide through the implementation of energy efficiency standards and codes of practice.

The DoE, the DTI and its agencies SABS and SANAS in consultation with industry players, have over the past few years introduced a number of energy efficiency standards. Some of the standards include the standard for energy efficient industrial motors, Energy Management standards, standards for efficient domestic appliances. The Department of Energy together with the dti, with the assistance of GEF and UNDP will now start with the implementation of Appliance Standard and labelling programme aimed at transforming the appliance market to energy efficiency.

This project will focus on strengthening the regulatory and institutional framework and also develop labelling specifications and MEPS thresholds for the products selected for Standard and Labelling regulation. The project will also strengthen institutional and testing capacities as well as increase energy efficiency awareness amongst consumers, retailers, manufacturers and public stakeholders. This will be done through public outreach campaigns and training on energy efficiency to appliance professionals.

The project will also implement an evaluation process for energy programs and disseminate the finding of the Standard and Labelling projects to the main stakeholders for replication on other appliances and equipment.

Stephenson (CaBEERE, 2002) identified the Eastern Cape Province (particularly the area of the former Transkei) as potentially the most productive areas for macro hydro-electric development in South Africa. Clackson (2002) investigated potential in the Lower Orange river for hydropower plants in series or tandem. It is envisaged that some 12 hydro-electric plants can be installed in series, each site having a potential output of between 6 MW and 25 MW.

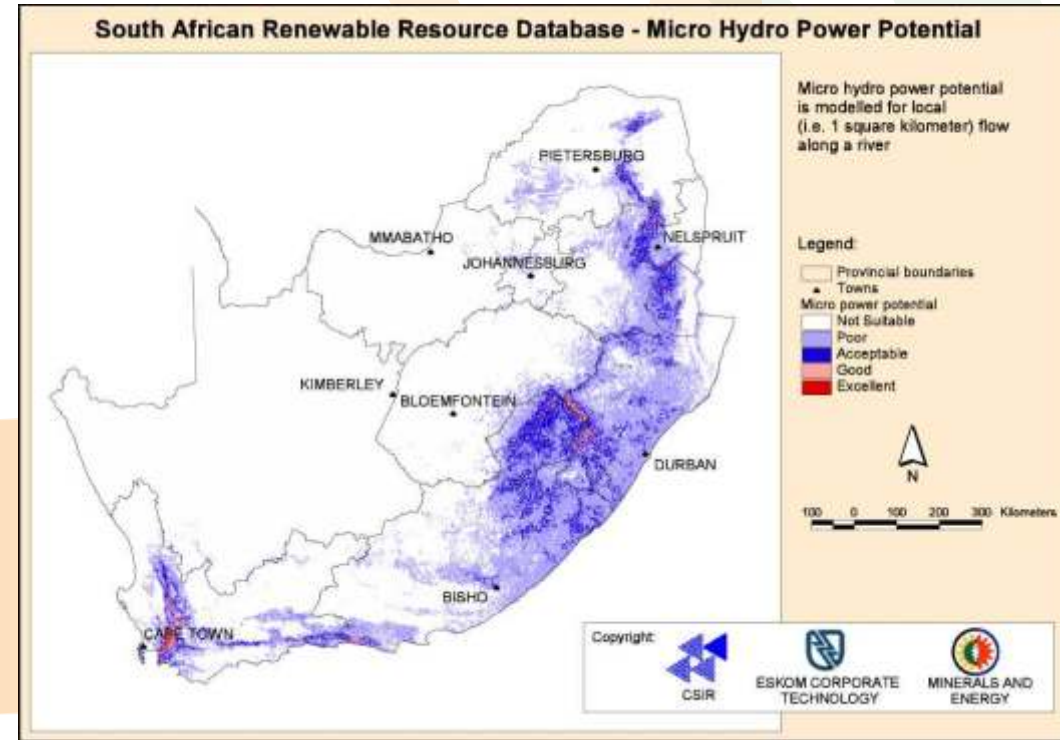


Figure 3: Areas with micro hydro potential in South Africa (DME, Eskom, CSIR, 2001)

3.5 Wave Energy

Wave potential along the Cape coastline is estimated as significant, but no exploitation is taking place to date. A mean annual power level of about 40 kW/m wave crest is typical offshore at the Cape Peninsula. An estimated total average power of 56 800 MW is available along the entire coast. However, it is doubtful whether any of this potential energy could be realised on a large scale in the medium-term due to cost considerations (DME, DANCED, 2001). Wave technology is still at an early stage of development. Many-small-scale experimental devices are being tested and several prototype devices are now producing electricity for consumption (Cavanagh et al, 1993).

DIRECTORATE: ENERGY EFFICIENCY & ENVIRONMENT

Objective

The directorate is responsible to develop measures to promote energy savings, reduce the negative impact of energy use on the environment, reduce energy costs to the economy, contribute towards sustainable development, and to achieve a national energy policy objective.

The following are the objectives of the Energy Efficiency and Environment directorate:

- Promote and develop energy efficiency practices, norms and standards in different energy sectors, including industries, commercial buildings, households, transport and agriculture;
- Develop energy efficiency policies, strategy and guidelines;
Facilitate information awareness, and capacity building campaigns on energy efficiency and environmental issues;
- Promote energy for sustainable development;
- Mitigate negative impact of energy utilization on environment;
- Promote energy efficiency technologies, clean energy technologies including environmentally sound energy technologies;
- Promote and facilitate international collaboration and cooperation;
- Ensure compliance through the implementation of Environmental Management Plan and
- Ensure the Department of Energy's participation at national and international forums on Energy Efficiency and the Environment, including the Intergovernmental Committee on Climate Change (IGCCC), National Committee on Climate Change (NCCC), United Nations Commission on Sustainable Development (UNCSD), the Kyoto protocol and the United Nations Framework Convention on Climate Change (UNFCCC).

ACTIVITIES CURRENTLY UNDERWAY:

1. Implementation of Energy Efficiency Demand Side Management (EEDSM)

EEDSM is an initiative of government to provide subsidies to selected municipalities to reduce the electricity demand as a measure to minimise supply interruptions through the installation of solar water heaters, and energy efficient lighting technology in buildings, street lights and traffic lights. The EEDSM project started in 2009/10 financial year, and will run for a period of three years until 2011/12. The allocations are formalized through gazetting process as Schedule 6 and 7 of the Division of Revenue Act (DoRA). The receiving municipalities, once confirmed, provide a business plan and sign a contract that re-confirm the allocation conditions stipulated in the Act and the framework.

The directorate manages, coordinates, administers, monitors, and evaluates the (EEDSM) Programme. The programme is implemented by transferring funds to electricity distributors [Schedule 6 (21 selected local municipalities) and Schedule 7, (Eskom, 5 municipalities)] that have the capacity to undertake the execution of the EEDSM programme.

The department has set a target of an installation of 1 million Solar Water Heaters (SWHs) by 2014. In addition, the Solar Water Heating programme is also aimed to address social upliftment issues by providing low-income households with access to hot water at little or no cost. This also ensures better access to energy for all South Africans. Installing SWHs in low-income, mid/high income households increases energy security for those households and contributes to the upliftment of these communities.

2. Review of the National Energy Efficiency Strategy

The project is aimed at contributing to sustainable transformation of industrial energy usage practices in SA, and possibly in Southern African Region, by facilitating the implantation of the energy management system, Energy Management Standard, and energy system optimization. The project has four components: (i) Improvement of the policy framework for implementing and monitoring energy efficiency, (ii) Implementation of Energy Management Standard

The National Energy Strategy was developed in 2005. The document allowed for two reviews during its ten year lifetime. The first review workshop was held in October 2008 and a revised Strategy was afterwards gazetted for comments. However, the received comments were critical, indicating that circumstances have changed so much that a more comprehensive review process is required to formulate a new revised Strategy that has to address all the major problems of the day and developments, such as: the power crisis in 2008 and beginning of 2009, the world financial crisis and its impacts on SA, new agreements on Climate Change at the global level and commitments and targets made by the Government of SA, etc.

Since the beginning of 2010, UNIDO together with the DoE, DTI and other counterparts are implementing a project on Industrial Energy Efficiency Improvement in SA. The department is undertaking the review process and revising the current Strategy.

3. Energy Efficiency Monitoring and Implementation

The aim of the project is to contribute to facilitate energy efficient buildings through structured implementation at the municipal level and systematic monitoring and policy oversight at the national level. The project seeks to close gaps between the intentions of the National Energy Efficiency Strategy, which was published in 2005 and reviewed in 2008, and the implementation thereof. The intention is:

- To introduce and institutionalise an "Energy Efficiency Target Monitoring System" (within the Department of Energy) for measuring and reporting on progress in the implementation of the National Energy Efficiency Strategy for South Africa.
- Establish adequate legal and financial framework in place to facilitate monitoring of the energy efficiency strategy and implementation of Energy Efficiency particularly in the building sector at National and Local Municipality Level.
- To plan, assess and develop institutional capacity at national and local level
- To develop communication strategy with approved budget in DoE as well as SALGA to facilitate fact-based information and awareness about EE in the building sector.
- To develop an IT library including realistic maintenance beyond the lifetime of the project.