

POCKET GUIDE TO SOUTH AFRICA



ENERGY AND WATER

ENERGY AND WATER

Energy use in South Africa is characterised by a high level of dependence on cheap and abundantly available coal. South Africa imports a large amount of crude oil. A limited quantity of natural gas is also available.

The Department of Energy's Energy Policy is based on the following key objectives:

- ensuring energy security
- achieving universal access and transforming the energy sector
- regulating the energy sector
- effective and efficient service delivery
- optimal use of energy resources
- ensuring sustainable development
- promoting corporate governance.

Integrated Resource Plan (IRP)

The IRP lays the foundation for the country's energy mix up to 2030, and seeks to find an appropriate balance between the expectations of different stakeholders considering a number of key constraints and risks, including:

- reducing carbon emissions
- new technology uncertainties such as costs, operability and lead time to build
- water usage
- localisation and job creation
- southern African regional development and integration
- security of supply.

The IRP provides for a diversified energy mix, in terms of new generation capacity, that will comprise:

- coal at 14% (government's view is that there is a future for coal in the energy mix, and that it should continue research and development to find ways to clean the country's abundant coal resources)
- nuclear at 22,6%
- open-cycle gas turbine at 9,2% and closed-cycle gas turbine at 5,6%
- renewable energy carriers, which include hydro at 6,1%, wind at 19,7%, concentrated solar power at 2,4% and photovoltaic at 19,7%.

The Nuclear Energy Corporation of South Africa continues to produce, through its subsidiary National Toxicology Programme, radioisotopes that are critical to diagnose and treat cancer. They have become the leading commercial supplier of medical radioisotopes that are produced from low-enriched uranium as opposed to production from nuclear weapons-grade uranium.



Power sources

Coal

In addition to the extensive use of coal in the domestic economy, about 28% of South Africa's production is exported, mainly through the Richards Bay Coal Terminal, making South Africa the fourth-largest coal exporting country in the world.

South Africa's coal is obtained from collieries that range from among the largest in the world to small-scale producers.

About 51% of South African coal mining is done underground and about 49% is produced by open-cast methods. The coal-mining industry is highly concentrated, with a few companies accounting for 85% of saleable coal production.

Production is concentrated in large mines, with 11 mines accounting for 70% of the output. South African coal for local electricity production is among the cheapest in the world. The beneficiation of coal, particularly for export, results in more than 65 million tons (Mt) of coal discards being produced every year.

About 21% of the run-of-mine coal produced is exported, and 21% is used locally (excluding power-station coal). The rest is not saleable and is discarded. The remainder of South Africa's coal production feeds the various local industries:

- 62% is used for electricity generation
- 23% for petrochemical industries (Sasol)
- 8% for general industry
- 4% for the metallurgical industry (Mittal)
- 4% is purchased by merchants and sold locally or exported.

Nuclear

Cabinet approved the Nuclear Energy Policy for South Africa in June 2008. The policy aims to increase the role of nuclear energy as part of the process of diversifying South Africa's primary energy sources to ensure energy security. The policy aims to reduce the overreliance on coal.

Eskom, together with Sasol; the Petroleum, Oil and Gas Corporation of South Africa; Anglo American; and the South African National Energy Research Institute, is sponsoring the development of the *South African Carbon Dioxide (CO₂) Storage Atlas*. The atlas will represent an early assessment, aimed at identifying areas and estimating the potential capacity for geological storage of CO₂ in South Africa. 

Eskom is investing up to 20 000 megawatts (MW) on new nuclear capacity by 2025.

Eskom's Koeberg Nuclear Power Station's two reactors outside Cape Town supply 1 800 MW to the national grid when both operate at full power, providing about 6,5% of South Africa's electricity.

The National Nuclear Regulator is the prime safety regulator and is responsible for protecting persons, property and the environment against nuclear damage by establishing safety standards and regulatory practices. It exercises safety-related regulatory control over the siting, design, construction and operation of nuclear installations and other actions.

The Nuclear Energy Corporation of South Africa (Necsa) undertakes and promotes research and development in the field of nuclear energy, radiation sciences and technology, medical isotope manufacturing, nuclear liabilities' management, waste management and decommissioning. It is a public entity reporting to the Minister of Energy.

Necsa's reactor-produced radioisotopes are exported to more than 50 countries. The research reactor at Pelindaba, Safari-1, is the most commercialised reactor of its kind in the world with International Organisation for Standardisation 9001-accreditation. It earns South Africa foreign revenue worth millions of rands.

Liquid fuels

A key feature of the South African liquid fuels sector is the fact that most of the transport fuel is produced in the coastal areas, but about 68% thereof is consumed in the inland region of Gauteng. This requires investments in the storage and distribution facilities for the supply of petroleum products at the point of need.

A new R15-billion pipeline to transport petroleum from Durban to Johannesburg is under construction. The 555-km trunk pipeline, with pump stations, terminals and a 160-km

inland pipeline network, will increase capacity from the existing 4,4 billion litres to 8,4 billion litres and is expected to become operational by the end of December 2013.

The petrol price in South Africa is linked to certain international petrol markets in United States dollar. This means that supply and demand for petroleum products in the international markets, combined with the Rand-Dollar exchange rate, influence the domestic price.

Oil and gas

South Africa has limited oil reserves and imports from the Middle East and Africa (Saudi Arabia, Iran, Kuwait, the United Arab Emirates, Yemen, Qatar, Iraq, Nigeria, Egypt and Angola) meet about 95% of South Africa's crude oil requirements.

Refined petroleum products such as petrol, diesel, residual fuel oil, paraffin, jet fuel, aviation gasoline, liquid petroleum gas and refinery gas are produced by:

- refining crude oil (oil refineries)
- converting coal to liquid fuels and gas to liquid fuels (Sasol)
- turning natural gas into liquid fuels (PetroSA).

Another major role player in South Africa's liquid fuels industry is the Central Energy Fund (CEF). Its mandate is to engage in acquiring, exploring, generating, manufacturing, marketing and distributing any energy form, especially oil and gas. It also engages in research relating to the energy sector.

The CEF's diversified portfolio of activities is housed in the following active subsidiaries:

- The Strategic Fuel Fund Association, which was established to procure and store crude oil and manage strategic crude oil stocks for South Africa. It trades and leases spare storage ullage and is involved in oil-pollution control.
- PetroSA, which owns and operates the gas-to-liquids plant at Mossel Bay. PetroSA is also involved in oil and gas exploration and production, and its offshore production platform supplies gas and condensates by gas pipeline to its onshore plant for conversion into a range of environmentally friendly transportation fuels and associated products for the domestic and international markets.
- The Petroleum Agency South Africa, which promotes and markets exploration in South African territory (both offshore and onshore for oil and gas), negotiates and monitors concessions and licences on behalf of government, and is the custodian of geological and geophysical data.

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In 2011, Cabinet approved the implementation of key tasks for the acceleration of the Solar Water Geyser (SWG) Roll-Out Programme.



The key tasks include:

- developing guidelines for the SWG Roll-Out Programme
- engaging with potential funders
- establishing a programme steering committee.

The National Energy Regulator of South Africa granted Eskom R1,15 billion through the second Multi-Year Price Determination (MYPD2) process for the installation of 259 000 systems. By October 2011, 144 141 units had been installed at a cost of over R750 million. MYPD2 enabled Eskom to increase installations to 446 000 units by the end of 2011/12.

- iGas, which is a state-owned entity for the development of gas infrastructure in South Africa. iGas partnered Sasol and ENH of Mozambique in establishing the natural gas pipeline from Mozambique to South Africa.

Government has committed to a 2% blend target for biofuels inclusion in the national fuel supply. In addition, several other developing countries have set blending targets of 10% for biofuels without any need for significant engine adjustment. Were South Africa to increase its blending target to 10%, some 125 000 direct jobs could be created, many of which would be based in rural areas, where the deepest pockets of poverty occur.

Electricity

Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors. The majority of sales are in South Africa and other countries of southern Africa account for a small percentage of sales.

South Africa is faced with a situation in which the demand for electricity continues to grow within a supply-constrained environment.

Eskom's New-Build Programme was launched in 2005 with the aim of adding more than 17 000 MW to the national electricity grid by 2018. By mid-2011, more than 5 000 MW of new generation capacity and more than 3 000 km of new transmission lines had been added to the country's electricity grid.

As part of the programme, Eskom has spent R20,5 billion on recommissioning three power stations that have been out

of service for over 20 years: Camden, Komati and Grootvlei, all in Mpumalanga. Together, the stations can produce an estimated 3 800 MW, which equals that of a new power station. The cost of recommissioning the retired stations is estimated at almost R100 billion less than a new station, and the electricity will be available sooner. Camden was reopened in 2010, with work progressing on Komati and Grootvlei. Eskom aims to have all three operational by 2013.

Construction of two massive new coal-fired stations – Medupi and Kusile – is in progress.

Integrated Electrification Programme

The electrification programme is a modern energy option and also has a positive socio-economic impact on the lives of South Africans. There have been improvements in the education, health and social circumstances of communities that have been electrified through the grid and off-grid technologies. By 2011, South Africa's energy penetration stood at over 75%, and with R3,2 billion allocated to the electrification programme, the department aimed to connect an additional 150 000 households, build 10 substations and contribute about 5 000 jobs. In 2010/11, the department created 5 811 jobs and connected 195 000 homes to the electricity grid, exceeding its target by 45 000 households.

Solar energy

Solar power is being used increasingly for water-pumping through the rural water-provision and sanitation programme of the Department of Water Affairs.

Eskom's Solar Water Heating Programme has gained momentum, with 60 183 claims received for the solar water heating rebate, of which 41 690 were paid by the end of 2010.

Wind energy

The Darling Wind Farm in the Western Cape has four wind turbines. All the electricity produced will be sold to the City of Cape Town as part of a long-term power agreement with the city. The facility consists of four German-designed wind turbines. The structures are 50 m high with the blades spanning 31 m. Each turbine will produce 1,3 MW, bringing the total output of the wind farm to 5,2 MW.

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The project is referred to as the National Demonstration Project and will be used as an example for future public-private partnerships in the establishment of alternative electricity generation. The R75-million project was the first “green-energy” initiative in the country to produce electricity from wind power commercially.

The first commercial wind farm at the Coega Industrial Development Zone, Port Elizabeth, in the Eastern Cape, will have a total power capacity of 57,5 MW, which is about 10% of the Nelson Mandela Bay electricity consumption, and can power about 80 000 homes with green energy.

Energy efficiency

Government set a target of 15% energy efficiency for the industry and 12% nationally to be achieved by 2015. The energy industry leads by example by committing to energy efficiency.

While the focus has been on energy-intensive industries, room has been created for other industries and the commercial sector to join the *Energy-Efficiency Campaign*, through the introduction of, among other things:

- efficient lighting and heating, ventilation and air conditioning and employee education
- efficient production processes and cogeneration in the industrial sector.

Government remains committed to the efficient use of available resources. It is also committed to broadening the energy mix, thereby moving away from being fossil-dominated to a more balanced combination, which places a high premium on the use of more efficient technologies and renewable-energy resources.

Sasol

Sasol is an integrated energy and chemical company. It beneficiates coal, oil and gas into liquid fuels, fuel components and chemicals with the help of its proprietary Fischer-Tropsch

The roughly 43,5 million compact fluorescent lamps (CFLs) introduced between 2004 and 2010 as part of Eskom’s efficient lighting programme holds the world record for the highest number of CFLs rolled out in one country through a single campaign.



processes. It mines coal in South Africa and produces gas in Mozambique and oil in Gabon. Its chemical manufacturing and marketing operations span the globe.

In South Africa, Sasol refines imported crude oil and retail liquid fuels through its network of retail convenience centres. Sasol also supplies fuels to other distributors in the region and gas to industrial customers in South Africa.

Energy and the environment

South Africa is among the top 20 emitters of greenhouse gases (GHGs) in the world and is the largest emitter in Africa, largely because of the economy's dependence on fossil fuels. The National Climate-Change Strategy, developed by the former Department of Environmental Affairs and Tourism, requires that government departments collaborate in a coordinated manner to ensure that response measures to climate change are properly directed and carried out with a national focus. The Department of Energy is expected to respond to and mitigate climate change.

South Africa is a developing country or a Non-Annex 1 country. This means that within the international political and negotiation context, South Africa is not required to reduce its GHG emissions.

However, the South African economy depends greatly on fossil fuels for energy generation and consumption and is a significant emitter due to relatively high values being derived from emissions' intensity and emissions per capita.

South Africa must therefore proactively move the economy towards becoming less carbon-intensive, with the Department of Energy playing a prominent role.

The department has introduced systems to access investment through the Clean Development Mechanism of the Kyoto Protocol. It has developed the *White Paper on Renewable Energy and Clean Energy Development*, together with an energy-efficiency programme, to support diversification in pursuit of a less carbon-intensive energy economy.

Water

The Department of Water Affairs continues to focus on meeting water targets; managing South Africa's scarce water resources for long-term sustainability; improving the regulatory and institutional environment; spearheading transformation in the water

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sector; and supporting the development of water-resources infrastructure. Ongoing key challenges include the department's role as a sector leader for water services.

The department adopted the Integrated Water Resources Management (IWRM) approach, which provides a more holistic approach to water management.

The IWRM requires intensive planning to ensure efficient, equitable and sustainable management of water resources and for coping with conflicting demands. The department developed two key strategic frameworks to guide it, namely the National Water Resource Strategy in South Africa of 2004, and the Water for Growth and Development Framework of 2008. The strategy seeks to achieve the reconciliation between the available water resources with growing requirements.

The Water for Growth and Development Framework guides actions and decisions that will ensure water security in terms of quantity and quality to support South Africa's requirements for economic growth and social development.

Water and sanitation

Between April and December 2011, 449 082 people were supplied with basic water supply. This means that South Africa has surpassed the Millennium Development Goal of halving the proportion of people without sustainable water and is likely to achieve the 2014 goal of universal access to potable water, despite the challenge of an ever-increasing number of households.

Major dams of South Africa

Dam	Full supply capacity (10 ⁶ m ³)	River
Gariep	5 341	Orange
Vanderkloof	3 171	Orange
Sterkfontein	2 616	Nuwejaarspruit
Nuwejaarspruit Vaal	2 603	Vaal
Pongolapoort	2 445	Pongolo
Bloemhof	1 264	Vaal

South Africa is supporting the security of its water supply by ensuring the completion of several major new water projects around the country by 2014.



The projects include the Mokolo Augmentation Project to supply water to the planned Medupi Power Station in Lephalale in Limpopo, and the Mooi-Mgeni Transfer Scheme Project, which will include the construction of the Spring Grove Dam around eThekweni/Durban and Umgungundlovu in KwaZulu-Natal.

Water-quality management

The Blue Drop and Green Drop certification programmes are flagship innovations of the Department of Water Affairs. Introduced in 2008, this incentive-based regulation system aims to improve municipal drinking-water quality and wastewater management.

South Africa's drinking-water quality matches best international practice and follows the guidelines set out by the World Health Organisation. As it involves a benchmark score of 95%, the Blue Drop certification is the recognition of exceptional performance, and should not be equated to a pass mark. It simply credits exceptional drinking-water quality.

In 2011, the Blue Drop Certification Programme verified the status of drinking-water quality and the management of the supply systems of 162 municipalities. Teams from the department assessed 914 water systems, compared to the 787 systems assessed in 2009.

In 2010/11, 66 water supply systems were awarded Blue Drop certificates, which was an increase of 74% from the 38 systems in 2009/10.

Working for Water (WfW)

Invasive alien species cause billions of rands of damage to South Africa's economy every year, and are one of the biggest threats to the country's biological biodiversity.

Of the estimated 9 000 plants introduced to this country, 198 are classified as invasive. It is estimated that these plants cover about 10% of the country and the problem is growing at an exponential rate.

The fight against invasive alien plants (IAPs) is spearheaded by the WfW Programme. Since its implementation in 1995, more than one million ha of IAPs have been cleared.

South Africa's first *Atlas of Freshwater Ecosystem Priority Areas* was launched in Pretoria in November 2011. The atlas provides the first comprehensive assessment of the freshwater ecosystem priority areas – those areas of the country that are most important for sustaining the health and continued functioning of freshwater ecosystems.



Maps were developed for each of the water management areas in South Africa. The maps facilitate informed choices and trade-offs that can be made based on a clear understanding of where valuable freshwater ecosystems are located.

WfW's aim is to reduce the impact of "water-guzzling" invasive species and protect indigenous biodiversity.

The project has been very effective and has seen the steady recovery of indigenous biodiversity in cleared areas and wetlands. It has seen the rebirth of flowing streams where riverbeds had been perennially dry.

WfW runs over 300 projects across South Africa.

Dams and water schemes

Bulk infrastructure is a critical element of water-services infrastructure and an integrated part of water-services management.

Initiatives to identify and establish new water resources are occurring for both surface and groundwater.

Government has implemented key projects to augment South Africa's water resources:

- The Trans-Caledon Tunnel Authority has procured funding to implement the Mokolo and Crocodile River West Water Augmentation Project's first two phases with a total cost of about R2 billion, to deliver water to Eskom's new Medupi power station and other industries in the area, as well as domestic water to the Lephalale Local Municipality. The first water delivery is expected in 2014.
- In KwaZulu-Natal on the Mooi River, near Rosetta, a R2,2-billion contract was awarded for the construction of the 42 m-high Spring Grove Dam, with a storage capacity of 142 million m³. The first water delivery is expected late in 2012.
- R91,2 million was spent in 2011/12 to raise the Hazelmere Dam, to augment the water supply provided by Umgeni Water to KwaZulu-Natal's north coast.

- Construction of the De Hoop Dam to deliver water for domestic and agricultural use in the Greater Sekhukhune, Waterberg and Capricorn district municipalities. The estimated cost of its construction is approximately R3,1 billion. This will deliver water to three million Limpopo residents.
- During 2011/12, the construction of a water conveyance system from the Vaal Dam to Secunda to augment the water supply to Eskom power stations and Sasol was commissioned, comprising abstraction works, a storage reservoir, a high-lift pump station and a 121-km pipeline.

Dam Safety Rehabilitation Programme (DSRP)

The department owns 314 dams. In 2004/05, a large number of these were identified as being in need of rehabilitation to bring their condition up to international standards. The DSRP started in 2005/06. Some R1,35 billion was spent by the end of 2010/11, completing the rehabilitation of 22 dams; R300,8 million was spent in 2010/11 alone.

A number of dams are in various phases of planning and design. The rehabilitation of 13 dams was in progress by the end of 2010/11:

- Molepo, Nsami, Mashashane, Chuniespoort and Rust de Winter in Limpopo
- Klein Maricopoort in the North West
- Elandsdrift, Grassridge, Glen Brock, Mankazana, Laing and Magwa in the Eastern Cape
- Boegoeberg in the Northern Cape.

In his 2012 State of the Nation address, President Jacob Zuma indicated government's commitment to build a dam in the former Transkei part of the Eastern Cape, using

South Africa's strategic bilateral engagements remain critical to advancing peace and security and enhancing water security in the region. In this regard, South Africa has developed strategic relations with neighbouring countries by signing cooperative water agreements. In 2011, South Africa signed the Statement of Intent on the Lesotho Highlands Water Project on the operation of cross-border water supply with Swaziland. The Phase II Agreement will augment the original treaty and the sale of hydro-electric power to South Africa generated by the proposed Katse-Kobong Pump Storage Scheme.



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the Umzimvubu River as a source, to expand agricultural production.