Energy and Water

Energy

The National Development Plan (NDP) envisages that by 2030 South Africa will have an energy sector that promotes economic growth and development through adequate investment in energy infrastructure. The plan also envisages that by 2030 South Africa will have an adequate supply of electricity and liquid fuels to ensure that economic activity and welfare are not disrupted, and that at least 95% of the population will have access to grid or off-grid electricity.

The plan proposes that gas and other renewable resources like wind, solar and hydro-electricity will be viable alternatives to coal and will supply at least 20 000 MW of the additional 29 000 MW of electricity needed by 2030.

Other recommendations in the NDP include diversifying power sources and ownership in the electricity sector, supporting cleaner coal technologies, and investing in human and physical capital in the 12 largest electricity distributors.

Energy security is at the core of current and future industrial and technological advancement.

The Department of Energy (DoE) is mandated to ensure the secure and sustainable provision of energy for socio-economic development. This is achieved by developing an integrated energy plan, regulating the energy industries, and promoting investment in accordance with the integrated resource plan.

The department's strategic goals, among others, are to ensure that the energy supply is secure and demand is well managed, and that there is an efficient and diverse energy mix for universal access within a transformed energy sector, and implement policies that adapt to and mitigate the effects of climate change.

The DoE places emphasis on broadening electricity supply technologies to include gas and imports, as well as nuclear, biomass and renewable energy resources (wind, solar and hydro), to meet the country's future electricity needs and reduce its carbon-dioxide emissions.

Goals beyond 2020 include contracting more than 20 000 megawatts (MW) of renewable energy, including an increasing share from regional hydro-electricity.

About 11 000 MW of Eskom's older coal-powered stations will be decommissioned, but close to 6 000 MW of new coal capacity will be contracted – part of it from other southern African countries.

South Africa has committed to attain substantial reductions in carbon dioxide emissions by 2025. The country

supports research, technology development and special measures aimed at environmentally sustainable economic growth.

National Strategic Fuels Stock Policy

The Energy Security Master Plan for Liquid Fuel identified a number of capacity constraints and challenges faced by the petroleum sector in meeting the energy demand.

The National Strategic Fuels Stock Policy sets out the framework for the storage of fuel stock by government and the industry. It aims to ensure uninterrupted supply of petroleum products throughout South Africa by providing adequate strategic stocks and infrastructure such as storage facilities and pipeline capacity.

Strategic stocks are to be used during declared emergencies. The Minister of Energy will have the power to decide when a shortage of fuel and oil is at such a level to warrant an emergency.

National Liquid Petroleum Gas (LPG) Strategy

The LPG Strategy's main objectives are to provide access to safe, cleaner, efficient, portable, environmentally friendly and affordable thermal fuel for all households, and to switch low-income households away from the use of coal, paraffin and biomass to LPG.

The strategy highlights strategic options that could be adopted for the orderly development of the LPG industry in South Africa to make LPG an energy carrier of choice for thermal applications. LPG is considered one of the safest, cleanest and most sustainable energy sources.

National building standards

Energy-efficient regulations for new buildings form part of the deliverables of South Africa's National Energy Strategy to strengthen standards and regulations for energy efficiency.

The energy-efficient regulations apply to residential and commercial buildings, places of learning and worship, certain medical clinics and other categories of building.

The regulations make it compulsory for all new buildings to be designed and constructed to a standard that makes it possible for the user to minimise the energy required to meet the functional requirements. This will save energy significantly, which will relieve pressure on the electricity supply grid.

In addition to temperature regulations, all buildings will also have to be fitted with renewable-energy water-heating systems such as solar systems, which also have to comply with South African national standards.

Role players

Sasol

Sasol is an international integrated energy and chemical company that develops and commercialises technologies, and builds, and operates world-scale facilities to produce a range of product streams, including liquid fuels, high-value chemicals and low-carbon electricity.

Sasol continues to advance its upstream oil and gas activities in West and Southern Africa, the Asia Pacific region and Canada. In South Africa, Sasol refines imported crude oil and retail liquid fuels through its network of some 400 service stations and supply gas to industrial customers. It also supplies fuels to other licensed wholesalers in the region.

Eskom

Eskom generates, transmits and distributes electricity to about five million customers in the industrial, mining, commercial, agricultural and residential sectors, and to redistributors.

Eskom sells electricity directly to about 3 000 industrial customers, 1 000 mining customers, 49 000 commercial customers, 84 000 agricultural customers and more than four million residential customers (of whom the majority are prepaid customers). Most of the sales are in South Africa, with other southern African countries accounting for a small percentage.

Additional power stations and major power lines are being built to meet South Africa's rising demand for electricity. Recent successes have been the commercialisation of the Sere Wind Farm (100 MW) in the Western Cape in March 2015, and the the inauguration and electricity switch-on of the Kouga Wind Farm in the Eastern Cape in September 2015.

The Kouga Wind Farm was expected to provide about 300 gigawatt-hours (GWh) of clean electricity annually to supply an average of 50 000 households.

Southern African Power Pool (SAPP)

The SAPP was created with the primary aim to provide reliable and economical electricity supply to the consumers of each of the SAPP members, consistent with the

reasonable use of natural resources and the effect on the environment.

The SAPP allows the free trading of electricity between Southern African Development Community member countries, providing South Africa with access to the vast hydropower potential in the countries to the north, notably the significant potential in the Congo River (Inga Falls).

Other role players

- **iGas** is the official state agency for the development of the hydrocarbon gas industry in southern Africa.
- **PetroSA** is a government-owned oil and gas company.
- The **Petroleum Agency of South Africa** promotes the exploration and exploitation of natural oil and gas, both onshore and offshore
- **Petronet** owns, operates, manages and maintains a network of 3 000 km of high-pressure petroleum and gas pipelines, on behalf of the Government.
- The **National Energy Regulator of South Africa** is the regulatory authority for electricity, piped gas and petroleum pipelines.
- The **National Nuclear Regulator** is responsible for safety standards and regulatory practices for the protection of people, property and the environment against nuclear damage.
- The **Nuclear Energy Corporation of South Africa** is responsible for undertaking and promoting research and development in the field of nuclear energy and radiation sciences. It is also responsible for processing source material, including uranium enrichment, and co-operating with other institutions, locally and abroad, on nuclear and related matters.
- The **South African National Energy Development Institute** is mandated to stimulate innovation in energy research and development, transform the gender and race profile of researchers in the sector, and improve South Africa's competitiveness in energy research internationally.
- The **Central Energy Fund** researches, finances, develops and exploits appropriate energy solutions across the spectrum of energy sources to meet South Africa's future energy needs.

Energy resources

South Africa has very limited oil reserves. About 60% of its crude oil requirements are met by imports from the Middle

East and Africa. The country produces about 5% of its fuel needs from gas, about 35% from coal and about 50% from local crude oil refineries. About 10% is imported from refineries elsewhere in the world.

South Africa has a sizeable capital stock and management capacity to produce fuel from gas. In 2015, government announced a gas-to-power programme that will contribute 3 126 MW of electricity between 2019 and 2025.

Electricity

Eskom generates 95% of the electricity used in South Africa and 45% of the electricity used in Africa.

Unit 6, one of six generating units at the Medupi Power Station in Lephalale in Limpopo, was opened in August 2015 to contribute about 800 MW to the national grid.

Once completed in 2020, Medupi Power Station will add 4 764 MW to Eskom's grid and will be the world's largest coal-fired power station. This is also the fourth dry-cooled, baseload station to be built in 20 years by Eskom, after Kendal, Majuba and Matimba power stations.

Unit 5 is due for commercial operation in March 2018; Unit 4 in July 2018; Unit 3 in June 2019; Unit 2 in December 2019, and Unit 1 in May 2020.

At Kusile Power Station in Mpumalanga, Unit 1 is due for commercial operation in July 2018; Unit 2 in July 2019; Unit 3 in August 2020; Unit 4 in March 2021; Unit 5 in November 2021, and Unit 6 in September 2022. Once completed, Kusile will be the fourth-largest coal-fired power station in the world.

Biofuel

South Africa had set the beginning of October 2015 as the date from which fuel producers would have to blend diesel and petrol with biofuels. Fuel producers would be required to blend a minimum of 5% biodiesel in diesel and between 2% and 10% of bio-ethanol in petrol.

Biofuels are expected to reduce the country's reliance on imported fuel. The biofuels industry in South Africa, the continent's biggest agricultural producer, has been held back by an inadequate regulatory regime and concerns that biofuels would hurt food security and affect food prices.

Canola, sunflower and soya are feedstock for biodiesel, while sugarcane and sugar beet are feedstock for ethanol.

Maize, South Africa's staple food, will not be used in the production of biofuels to ensure food security and control high prices. The biofuels sector has strong linkages to agri-

culture, manufacturing and distribution, and has the potential to create substantial numbers of labour-intensive jobs in the agriculture sector in particular.

In addition, second-generation biofuel technology will also contribute to South Africa meeting its renewable energy targets sustainably.

Hydropower

Energy from water can be generated from waves, tides, waterfalls and rivers and will never be depleted as long as water is available. South Africa has a mix of small hydro-electricity stations and pumped-water storage schemes.

The Grand Inga Hydro-electrical Project, in partnership with the Democratic Republic of Congo, was expected to generate over 48 000 MW of clean hydro-electricity. South Africa was expected have access to over 15 000 MW.

In March 2016, Unit 3 of the Ingula Pumped Storage Scheme was the first of the four units to be synchronised to the national power grid. All four units of the Ingula Pumped Storage Scheme are expected to produce a total of 1 332 MW. The project involves the release of stored water during peak periods to drive turbines that generate electricity.

Solar power

Most areas in South Africa average more than 2 500 hours of sunshine per year, and average daily solar-radiation levels range between 4,5 kWh/m^2 and 6,5 kWh/m^2 in one day. The southern African region, and in fact the whole of Africa, has sunshine all year round.

The annual 24-hour global solar radiation average is about 220 W/m^2 for South Africa.

In March 2016, government unveiled the Solar Capital De Aar 3 Solar Photovoltaic (PV) plant worth R2,6 billion at De Aar in the Northern Cape. The Solar Capital De Aar 3 PV is a 75 MW facility that will provide power to 49 500 South African homes every year, and with the introduction of lithium batteries, it was expected to transfer power at night when most needed.

De Aar Solar Power is one of the first solar power projects in South Africa, as part of government's REIPPP.

The project has a 20-year Power Purchase Agreement with Eskom as well as an Implementation Agreement with government.

The site spans 100 hectares on which there are 167 580 solar PV panels in operation.

The project generates 85 458 MWh per year, supplying enough clean renewable energy to power more than 19 000 homes.

South Africa was recognised among the top-10 countries with the largest installed utility scale solar PV capacity in the world, having reached 3 300 GWh by December 2015. Concentrated solar power's contribution to the grid was 181 GWh, whilst small hydro technologies made 40 GWh.

Wind power

A study by the Council for Scientific and Industrial Research found that the wind and solar power capacity operational during 2015 showed an R800 million net benefit to the economy achieved during that year, followed by a further marked increase in the first six months of 2015, helping to save more than an additional R4 billion in costs to the economy.

Hybrid systems

Hybrid energy systems are a combination of two or more renewable energy sources such as photovoltaic, wind, micro-hydro, storage batteries and fuel-powered generator sets to provide a reliable off-grid supply.

There are two pilot hybrid systems in the Eastern Cape at the Hluleka nature reserve on the Wild Coast and at the neighbouring Lucingweni community.

Nuclear

Government has committed itself, by means of its Nuclear Energy Policy and Integrated Resource Plan (IRP), to an energy mix consisting of coal, gas, hydro, nuclear, solar and wind.

The nuclear new build programme will enable the country to create jobs, develop skills, create industries, and catapult the country into a knowledge economy. The IRP 2010 – 2030 envisages 9 600 MW additional nuclear capacity by 2030. The IRP is a 20-year projection on electricity supply and demand.

In July 2015, the DoE announced that the first new nuclear power station would start operations in 2023. The government intended to build between six and eight nuclear power plants.

Eskom operates the Koeberg Nuclear Power Station near Cape Town, the only nuclear power station in South Africa and the entire African continent, which supplies power to the national grid.

On 17 September 2015, the South Africa Fundamental Atomic Research Installation (SAFARI-1), celebrated its

50th annivesary. The 20 MW tank-in-pool type nuclear research reactor, owned and operated by the South African Nuclear Energy Corporation, is located at Pelindaba, near Pretoria.

Programmes and projects

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)

Earlier in 2015, the DoE expanded opportunities for the private sector to contribute to the production of power by approving 13 new renewable Independent Power Producers (IPPs) that will add 5 243 MW to the national grid.

At the end of 2015, the DoE had procured 6 376 MW of power from 102 IPPs in four bid rounds of the REIPPPP and connected 44 projects with a capacity of 2 021 MW to the national grid.

The 6 376 MW of power procured represents an extraordinary 92,1% of the target 6 925 MW renewable energy to be operational by 2020.

The energy contribution of IPPs was expected to grow to approximately 7 000 MW with the first 47 renewable energy IPPs fully operational by mid-2016. The programme also seeks to procure energy from small scale IPPs, with projects that generate between one MW and five MW of energy from solar, wind, biomass and landfill gas projects.

Through the REIPPPP, the DoE is targeting the procurement of 13 225 MW from IPPs by 2025.

Working for Energy Programme

The Working for Energy Programme is a social programme mainly intended to provide energy services derived from renewable resources to rural and urban low income houses in a manner that facilitates job creation, skills development, community-based enterprise development and the emancipation of youth, women and people with disabilities thereby creating sustainable livelihoods. It is an integral part of the Expanded Public Works Programme.

Water and sanitation

Water is a critical element to sustainable socio-economic development and the eradication of poverty, and has a critical function in the South African economy where it contributes 60% towards agriculture and irrigation.

The Department of Water and Sanitation's (DWS) legislative mandate seeks to ensure that the country's water

resources are protected, managed, used, developed, conserved and controlled by regulating and supporting the delivery of effective water supply and sanitation.

By mid-2015, the War on Leaks Programme, which was launched in August 2015 to eradicate water leaks whilst creating jobs for the youth, had about 3 000 trainees that were in the system as plumbers, water agents and artisans.

The DWS aimed to train an additional 7 000 unemployed youth in 2016/17.

According to the results of the General Household Survey released by Statistics South Africa in June 2016, some 89,4% of South African households had access to piped water in 2015. During the same year, an estimated 45,8% of households had access to piped water in their dwellings.

Nationally, 62% of households rated the quality of water-related services they received as 'good'. A further 27% accessed water onsite while 13,9% relied on communal taps and 2,7% relied on neighbours' taps.

Although households' access to water is improving, 4,4% of households still had to fetch water from rivers, streams, stagnant water pools and dams, wells and springs in 2015.

This is a decrease of more than five percentage points from 9,5% of households that had to access water from these sources in 2002.

Nationally, the percentage of households with access to 'RDP-standard' sanitation increased from 62,3% in 2002 to 80% in 2015. The majority of households in the Western Cape (93,3%) and Gauteng (91%) had access to adequate sanitation, while about half those in Limpopo (54%) and just below two-thirds of those in Mpumalanga (65,8%) had adequate access.

The percentage of households that continued to live without proper sanitation facilities declined between 2002 and 2015, decreasing from 12,3% to 4,7% during this period.

Sanitation and Hygiene Week

The DWS marked Sanitation and Hygiene Week from 11 to 15 May 2015 under the theme "It's not all about flushing".

The week, which was first introduced at the Global WASH Forum held in Dakar, Senegal in 2004, aims to raise awareness on the importance of sanitation and promotes sanitation best practices.

National Water Resource Strategy (NWRS)

The NWRS2 sets out the vision and strategic actions for effective water management These included the security of

water supply, environmental degradation, and pollution of resources.

The NWRS2 outlines the key challenges, constraints and opportunities in water resource management and proposes new approaches that ensure a collective and adequate response for the benefit of all people in South Africa.

This strategy moves towards the achievement and attainment of an inclusive sustainable and equitable economy.

The NWRS2 ensures that the management of national water resources contributes towards achieving South Africa's growth, development and socio-economic priorities in an equitable and sustainable manner over the next five to 10 years.

The strategy also responds to the priorities set by government in the NDP and National Water Act of 1998 imperatives that support sustainable development.

Dams and water schemes

The country has more than 500 government-owned dams spread across all nine provinces. They range in storage capacity from a volume of 5 500 million m^3 of water down to 0,2 million m^3 of water.

South Africa uses about 10 200 million m^3 of water a year from its major dams. The majority of water consumption can be attributed to drinking, irrigation, electricity, mining processes and industrial processes.

Bucket Eradication Programme

In keeping with the aspirations of the NDP, steady progress is being made towards eradicating the bucket toilet system in both formal and informal areas across South Africa.

By March 2016, the DWS's Bucket Eradication Programme had prioritised North West, Eastern Cape, Northern Cape and Free State.

By March 2016, some 2 261 structures were completed in the Eastern Cape, 124 in North West, 6 377 in Northern Cape and 6 974 in the Free State. Since September 2013, the DWS has eradicated the use of 14 386 buckets countrywide. Government remains committed to completely eradicate the backlog of the bucket system in communities.

Role players

Water boards

The primary activity of water boards is to provide water services (bulk potable and bulk waste water) to other water services institutions within their respective service areas.

They may perform other activities under conditions set out in the Water Services Act of 1997. There are 15 water boards in South Africa, with the three largest being Rand Water in Gauteng, Umgeni Water in KwaZulu-Natal and Overberg Water in the Western Cape.

Catchment management agencies (CMAs)

The main responsibilities of CMAs are to manage water resources at catchment level in collaboration with local stakeholders, with specific focus on involving local communities in the decision-making processes, in terms of meeting basic human needs, promoting equitable access to water, and facilitating social and economic development.

Water-user associations (WUAs)

WUAs are cooperative associations of individual water users who wish to undertake water-related activities at local level for their mutual benefit.

Water Research Commission

The WRC has a vital role in water research by establishing needs and priorities, stimulating and funding research, promoting the transfer of information and technology, and enhancing knowledge and capacity building in the water sector.

It also focuses on water resources management, water-linked ecosystems, water use and waste management, and water use in agriculture.

Water Trading Entity (WTE)

The DWS is responsible for the regulation of water use in South Africa by ensuring that water is allocated equitably and used beneficially in the public interest, and is also required to create a register of all water users in the country.

The National Water Act of 1998 provides for cost recovery on services rendered by the department to water users. It is against this background that the department created the WTE within its administration.

The main function of the WTE is development, operation and maintenance of specific water resources infrastructure

and managing water resources in specific water management areas.

Trans-Caledon Tunnel Authority (TCTA)

The TCTA is a State-owned entity (SOE) specialising in project financing, implementation and liability management. It is responsible for the development of bulk raw-water infrastructure. It also provides an integrated treasury management and financial advisory service to the DWS, water boards, municipalities and other entities that are linked to bulk raw-water infrastructure.

Komati River Basin Water Authority

The Komati Basin Water Authority was established in terms of a treaty between South Africa and Swaziland. The aim of the authority is to manage the water resources of the Komati River basin sustainably. The authority is responsible for financing, developing, operating and maintaining the water resources infrastructure in the basin, comprising the Driekoppies Dam in South Africa and the Maguga Dam in Swaziland.

Water Tribunal

The aim of the Water Tribunal is to hear appeals against directives and decisions made by responsible authorities, CMAs or water management agencies about matters such as the issuing of licences to use water. It is an independent body and can hold hearings anywhere in the country.

Strategic Water Partners Network (SWPN)

The SWPN is a dynamic and cutting-edge partnership between the DWS, the private sector and civil society working collectively to close a 17% gap between water supply and demand that is anticipated to manifest by the year 2030 in South Africa.

The partnership strives to contribute to efficient, equitable and sustainable water supply and access to water for all South Africans through the identification and application of innovative and cost effective solutions and programmes.