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COUNTRY ANALYSIS BRIEFS

South Africa

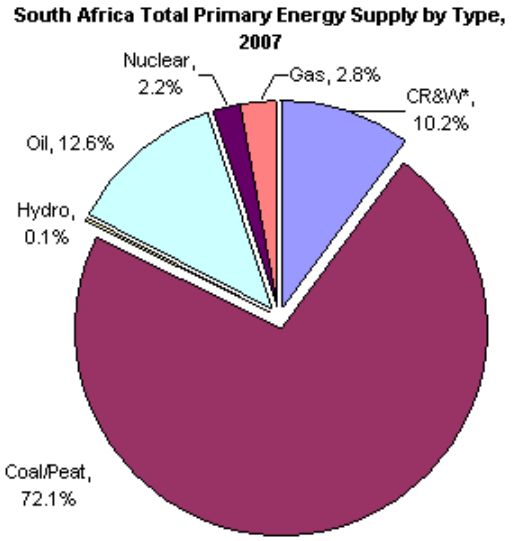
Last Updated: March 2010

Background

South Africa is a significant coal consumer and exporter but imports large amounts of oil and some natural gas.

South Africa's energy sector is critical to the economy as the country relies heavily on its large-scale, energy-intensive mining industry. South Africa has only small deposits of oil and natural gas and uses its large coal deposits for most of its energy needs. As a result, carbon emission and intensity levels are relatively high. The country also has a highly developed synthetic fuels industry, producing gasoline and diesel fuels from coal and natural gas.

In 2007, according to the International Energy Agency (IEA) in 2007, South Africa consumed an equivalent of 5.3 quadrillion Btu. Of this, coal/peat accounted for 72.1 percent of total primary energy supply, followed by oil (12.6 percent), and combustible renewables and waste (10.2 percent).



Source: International Energy Agency (IEA Energy Statistics)
*Combustible renewables and waste

The economy has grown rapidly since the end of the apartheid era in 1994 and is now one of the most developed economies in Sub-Saharan Africa. Despite this rapid growth, approximately 34 percent of the population continues to live on less than US$ 2/day according to the World Bank data. Economic problems remain from the apartheid era, especially poverty and lack of economic empowerment among the disadvantaged groups. The South African government has committed to ensuring that black-owned companies have access to the energy sector under its black economic empowerment (BEE) program whereby targets of 25 percent black ownership of energy companies by 2014 were set. Large, predominantly white-owned corporations have been selling assets to achieve this objective.

Oil Transit

South Africa's Cape of Good Hope (Cape) is a significant point for oil tanker transit around the continent. According to Lloyd's Analysis of Petroleum Exports (APEX) database, approximately 1.25 million barrels a day (bbl/d) of oil from West Africa traveled east around the Cape towards Asian Markets in 2009 while at the same time, 2.25 million bbl/d originating in the Middle East went west around the Cape into the Atlantic Basin.

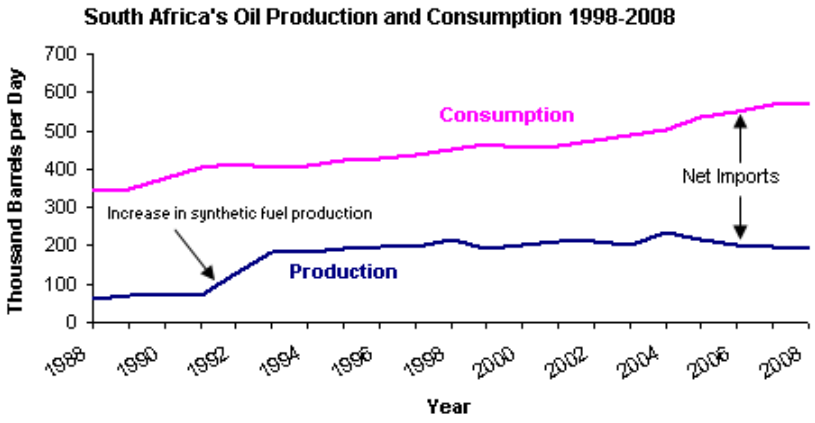
FIFA 2010 World Cup

South Africa will be hosting the FIFA 2010 World Cup starting in June which, according to the Finance Ministry, could add an additional half a percent to the country's 2010 economic growth. The concerns about the country being able to meet the associated demand for oil and electricity are being addressed by both the South African Petroleum Industry Association (SAPIA) and the South African Department of Minerals and Energy. According to SAPIA, the country is expecting approximately 2.7 million spectators for the event involving 64 matches scheduled over a 40 day period around the country starting June 11. To date, announcements have been made with regards to cooperation among the members of the South African Power Pool to provide adequate supplies of electricity and the South African Department of Energy has developed a World Cup Fuel Task Team to ensure that increased demand for gasoline, diesel and jet fuel are met with adequate inventory builds.

Oil

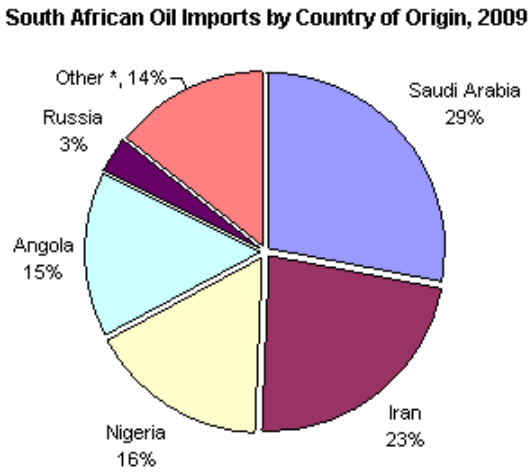
South Africa has the second largest oil refinery system in Africa and imports the majority of its crude oil from members of the Organization of Petroleum Exporting Countries (OPEC), namely Saudi Arabia, Iran, Nigeria and Angola.

According to *Oil and Gas Journal (O&GJ)*, South Africa had proven oil reserves of 15 million barrels in January of 2010. All of the proven reserves are located offshore southern South Africa in the Bredasdorp basin and off the west coast of the country near the border with Namibia. In 2008, South Africa produced 195,000 barrels per day (bbl/d) of oil, of which about 160,000 bbl/d was synthetic liquids processed from coal and natural gas (see Synthetic Fuels Section below).



Source: EIA

South African oil consumption is estimated to be 575,000 bbl/d, of which, approximately 380,000 bbl/d is imported (67 percent of consumption). According to the Global Trade Atlas, the majority of South African oil imports are from Saudi Arabia and Iran followed by Nigeria and Angola. The country is promoting further exploration and development in the petroleum sector but will continue to rely on oil imports in the near-term.



Source: Global Trade Atlas; EIA
*Other Includes: Yemen, U.A.E., Iraq, Venezuela

Sector Organization

The National Energy Regulator of South Africa (NERSA), created in 2005, regulates policy over the entire South African energy industry and is responsible for implementing South Africa's energy plan. South Africa also has a national oil and natural gas company, the Petroleum Oil and Gas Corporation of South Africa (PetroSA), which is responsible for managing and promoting the licensing of oil and natural gas exploration in the country and has exploration and production activities around the world.

Refining and Downstream

South Africa has the second largest refining capacity in Africa at 692,000 bbl/d according to a 2008 SAPIA report, surpassed only by Egypt (726,250 – *O&GJ*). Major refineries include Sapref (180,000 bbl/d) and Enref (125,000 bbl/d) in Durban, Calref (100,000 bbl/d) in Cape Town, and Natref (108,000 bbl/d) at Sasolburg. PetroSA is also developing a new 400,000 bbl/d refinery in the Eastern Cape to meet rapidly growing product demand.

South African Refinery Capacity, 2008	
Refinery	**Capacity (bbl/d)**
Sapref	180,000
Enref	125,000
Chevref	100,000
Natref	92,000
Sasol	150,000
PetroSA	45,000
Total	**692,000**

Source: South African Petroleum Industry Association

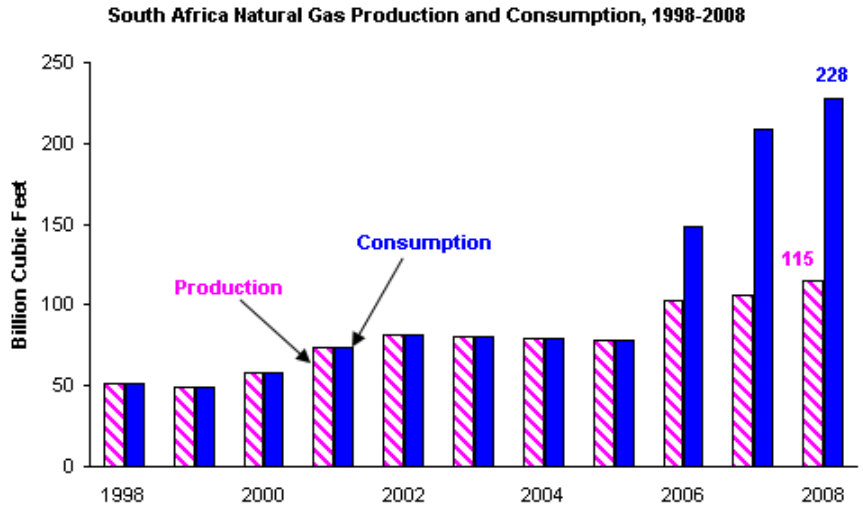
Refining of Synthetic Fuels from Natural Gas and Coal

South Africa has a highly developed synthetic fuels (synfuel) industry, creating liquid fuels from coal and natural gas. State company PetroSA and petrochemicals giant Sasol are the major players. PetroSA manages the world's largest commercial natural gas-to-liquids plant at Mossel Bay in the Western Cape, with a capacity of 45,000 bbl/d. Sasol, an oil, gas and chemical company, operates the world's only commercial coal-to-liquids synthetic fuels facility (see Natural Gas and Coal sections for more information.) According to the Department of Minerals and Energy, approximately 36 percent of liquid fuel demand in South Africa is met by synthetic fuels.

Natural Gas

South Africa produces small amounts of natural gas, which it uses in synthetic fuel production.

South Africa had 0.32 billion cubic feet (Bcf) of proven natural gas reserves in 2009 according to Cedigaz. In 2008, South Africa produced 115 Bcf, and consumed 228 Bcf, the remaining 113 Bcf imported from neighboring Mozambique and Namibia. The South African government would like to locate additional natural gas reserves and has provided investment money for exploration in fields in Mossel Bay. Any recoverable natural gas reserves would be developed with the intent of extending the lifespan of the Mossel Bay gas-to-liquids (GTL) plant (see below).



Source: *EIA*

In terms of new production, PetroSA has stated that production from the Jabulani field has been delayed until 2012 and Ibubhesi production is not expected until 2013. As of 2008, South Africa did not import LNG but discussions were underway to import LNG for the Mossel Bay GTL refinery in order to meet the plant's natural gas requirements until the new fields come online.

Natural gas currently plays a limited role in the South African electricity sector but the government plans to increase imports, and expand domestic production, which could diversify the energy mix and offset some of the country's overreliance on coal. Exploration rights have also been awarded to study the potential for shale gas developments.

Sector Organization

South Africa has numerous government agencies and companies involved in the natural gas industry, but as with oil and coal, the National Energy Regulator of South Africa (NERSA) is the industry regulator.

Gas to Liquids Refinery

The Gas to Liquids (GTL) refinery at Mossel Bay began operations in 2004 and is one of the largest in the world. The refinery has the capacity to process 45,000 bbl/d of oil equivalent

through a Fischer Tropsch Process in which natural gas is converted to synthetic liquid fuels. An overview of the refining process by PetroSA can be found here.

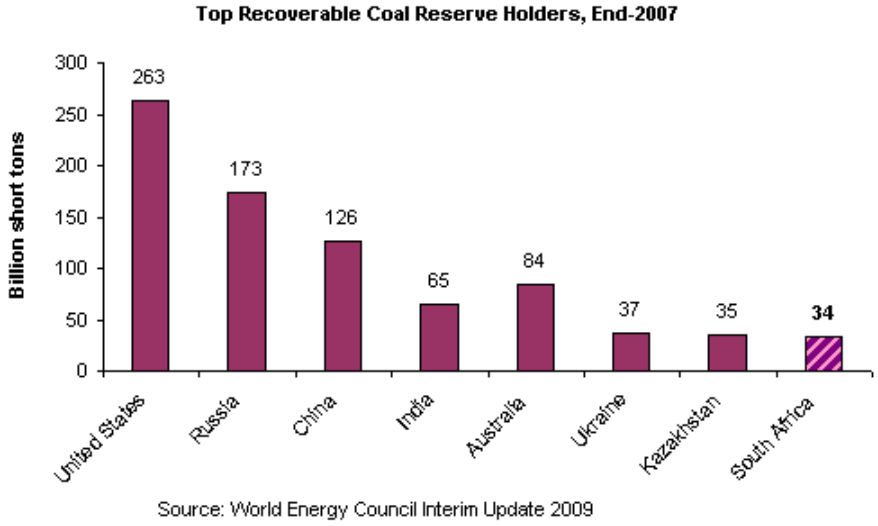
Natural Gas Pipelines

Natural gas from Mozambique is imported through a 535-mile transport pipeline, which Sasol, the South African government, and the government of Mozambique own through a joint venture. The pipeline has peak capacity of 524 MMcf/d of natural gas and was part of a U.S. $1.2-billion natural gas project started in 2004. It is designed to eventually be able to transport double its current capacity.

Coal

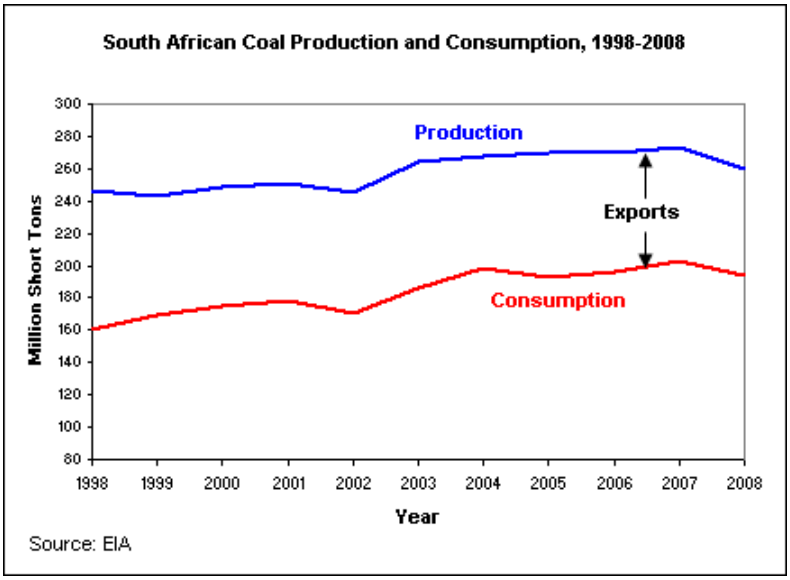
South Africa has the world's eighth largest recoverable coal reserves.

South Africa's economy is heavily dependent on coal. According to the World Energy Council (WEC) South African coal resources were estimated to be approximately 34 billion short tons at the end of 2007, accounting for 95 percent of African coal reserves and 4 percent of world reserves. Coal provided an estimated 72 percent share of the country's total primary energy supply in 2007 and accounts for approximately 85 percent of electricity generation capacity. Coal is also a major feedstock for the country's synthetic fuel industry.



Source: World Energy Council Interim Update 2009

Production and consumption of coal has remained relatively stable over the past decade. In 2008, the country produced an estimated 260 million short-tons and consumed 194 short tons. The remaining 66 million were exported, mainly to Europe and East Asia. While there have been some decreases in reserves, production, and consumption in recent years, environmental groups continue to target the industry for air, land, and water pollution through all of the industry's stages from extraction to end use.



Source: EIA

Nonetheless, coal use – especially by Eskom (the state electricity company) and Sasol – is

expected to continue or even accelerate over the next few years. Eskom is in the process of returning to service three coal-fired power stations (Camden, Grootvlei and Komati) with a combined capacity of 3,800 megawatts (MW). It has also begun construction of the new 4,800 MW Medupi power station, whose first unit is due to begin generation in 2012, while a second plant called Project Bravo (5,400 MW) is scheduled to start generating power in 2013.

Coal-to-Liquids

In addition to power generation, the country produces synthetic fuels from low-grade coal and a small amount from natural gas. At the Sasol synfuels plant in Secunda, around 45 million short tons a year are converted into liquid fuels, gas, and other products. The plant itself produces an estimated 150,000 bbl/d of oil equivalent and is the world's only commercial coal-to-liquids plant in operation.

Electricity

Rapidly increasing electricity demand in South Africa has led the government to set out ambitious plans to expand the sector.

Despite having reached a 75 percent electrification rate nationwide, the highest in Sub-Saharan Africa, only 55 percent of the rural population has access to electricity (compared to 88 percent in urban areas). According to 2008 IEA data, these figures indicate that approximately 12 million people had no access to electricity and likely rely heavily on wood fuel to meet their heating and cooking needs.

The Integrated National Electrification Program (INEP) provides a socio-economic support net that ensures that previously unconnected households have access to electricity. The program creates new infrastructure while ensuring that existing infrastructure is rehabilitated and maintained. The government aims to achieve universal access to electricity by 2012. In the interim, the Department of Minerals and Energy is promoting the use of liquefied petroleum gas (LPG) in rural areas to meet the basic needs of rural populations while mitigating the health and environmental impacts associated with burning wood fuels and coal.

Electricity demand continues to rise in South Africa and in recent years, has outstripped the available supply infrastructure to the point where the country suffered rolling blackouts. In January 2008, the Department of Minerals and Energy and Eskom released a policy document, "National response to South Africa's electricity shortage". The plan includes work on the country's electricity distribution structure and the fast-tracking of electricity projects by independent power producers. The government is also investing heavily in new power projects with plans to generate an additional 22,000 MW by 2017.

In the short-term, three coal fire power stations have been re-commissioned (see below) and plans are underway for another 4,700 MW coal-fired plant (Medupi) as well as a 3,500 MW nuclear power station. To meet generation targets, and as a demand-side measure, electricity rates have been gradually increasing for all sectors, causing concern among the more energy-intense industries as well as households.

Eskom Power Stations 2008

Baseload	Capacity (MW)	Other	Capacity (MW)
Coal-fired		***Hydro***	
Arnot	2,100	Gariep	360
Duvha	3,600	Vanderkloof	240
Hendrina	2,000	***Hydro distribution***	
Kendal	4,116	First Falls	6.4
Kriel	3,000	Second Falls	11.0
Lethabo	3,708	Colley Wobbles	42.0
Majuba	4,110	Ncora	24.0
Matimba	3,990	***Pumped Storage***	
Matla	3,600	Drakensberg	1,000
Tutuka	3,654	Palmiet	400
New Build (coal)		Ingula (new build)	1,332
Medupi	4,788	***Open cycle gas turbine***	
Return-to-service (coal)		Acacia	171
Camden	1,600	Port Rex	171
Grootvlei	1,200	Ankerlig	592
Komati	1,000	Gourikwa	444
Nuclear		Gas I (new build)	1,036
Koeberg	1,930	***Wind***	
		Klipheuwel	3.2
Total Baseload	**44,396**	**Total Other**	**5,833**
Coal share of total cap	**42,466**	**Total Overall Capacity**	**50,229**

Source: Eskom

Eskom generates about 95 percent South Africa's electricity, mainly from coal fired plants. According to the company website, in 2008 Eskom had a total generation capacity of 50.2 Gigawatts (GW), 85 percent of which is from coal fired plants (42.5 GW including return-to-service and new build plants). South Africa also exports electricity to neighboring countries through the Southern African Power Pool (SAPP), some of which have also been affected by South Africa's recent power generation problems.

Sector Organization

The electricity sector falls under the regulation of the National Energy Regulator of South Africa (NERSA) which replaced that National Electricity Regulator. Eksom is responsible for transmission and generates almost all of South Africa's electricity. NERSA is promoting private sector participation by encouraging investment on the part of independent power producers (IPPs) as well as promoting of-grid technologies to meet rural energy needs.

Quick Facts

Energy Overview

Proven Oil Reserves (January 1, 2010)	15 million barrels
Oil Production (2008)	195,000 barrels per day (bbl/d), of which about 160,000 bbl/d was synthetic liquids
Oil Consumption (2008)	575,000 bbl/d
Crude Oil Refining Capacity (2008)	692,000 bbl/d (SAPIA)
Proven Natural Gas Reserves (Cedigaz 2009)	0.318 billion cubic feet
Natural Gas Production (2008)	115 billion cubic feet
Natural Gas Consumption (2008)	228 billion cubic feet
Recoverable Coal Reserves (2007)	34 billion short tons (World Energy Council)
Coal Production (2008)	260 million short tons
Coal Consumption (2008)	194 million short tons
Electricity Installed Capacity (2008)	43 gigawatts (EIA)
Electricity Production (2008)	240 billion kilowatt hours
Electricity Consumption (2008)	215 billion kilowatt hours
Total Per Capita Energy Consumption (2007)	111 million Btus
Energy Intensity (2007)	17,022 Btu per $2005-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2008)	451 million metric tons
Per-Capita, Energy-Related Carbon Dioxide Emissions (2008)	9.25 metric tons
Carbon Dioxide Intensity (2008)	1.63 Metric tons per thousand $2005-PPP**

Oil and Gas Industry

Major Refineries (capacity, bbl/d)(2006E) (Source: SAPIA Annual Report 2006)	Sapref (1 8 0, 000), Enref (1 25 , 00 0), Calref (1 0 0,000), Natref (10 8, 0 00)-Synthetic Fuel Refineries, Sasol (1 5 0,000), PetroSA (45,000)

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power.
**GDP figures from Global Insight estimates based on purchasing power parity (PPP) exchange rates.

Links

EIA Links

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U.S. Government

CIA World Factbook - South Africa
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Associations and Institutions

Chamber of Mines of South Africa
South African Petroleum Industry Association (SAPIA)

South African Government Agencies
Department of Environmental Affairs and Tourism (DEAT)
Department of Minerals and Energy (DME)
National Energy Regulator of South Africa

South African Energy Links
Engen
Eskom
Petroleum, Oil and Gas Corporation of South Africa (PetroSA)
Sasol
Southern African Power Pool

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