

Overview

South Africa has a large energy-intensive coal mining industry. The country has limited proved reserves of oil and natural gas and uses its large coal deposits to meet most of its energy needs, particularly in the electricity sector. South Africa also has a sophisticated synthetic fuels industry, producing gasoline and diesel fuels from the Secunda coal-to-liquids and Mossel Bay gas-to-liquids plants.

South Africa's energy sector is critical to its economy, as the country relies heavily on its large-scale, energy-intensive coal mining industry. South Africa has limited proved reserves of oil and natural gas and uses its large coal deposits to meet most of its energy needs, particularly in the electricity sector. Most of the oil consumed in the country, used mainly in the transportation sector, is imported from Middle Eastern and West African producers in the Organization of the Petroleum Exporting Countries (OPEC) and is locally refined. South Africa also has a sophisticated synthetic fuels industry, producing gasoline and diesel fuels from the Secunda coal-to-liquids (CTL) plant and the Mossel Bay gas-to-liquids (GTL) plant. The synthetic fuels industry accounts for nearly all of the country's domestically produced petroleum because crude oil production is very small.

Figure 1. Map of South Africa



Source: U.S. Department of State

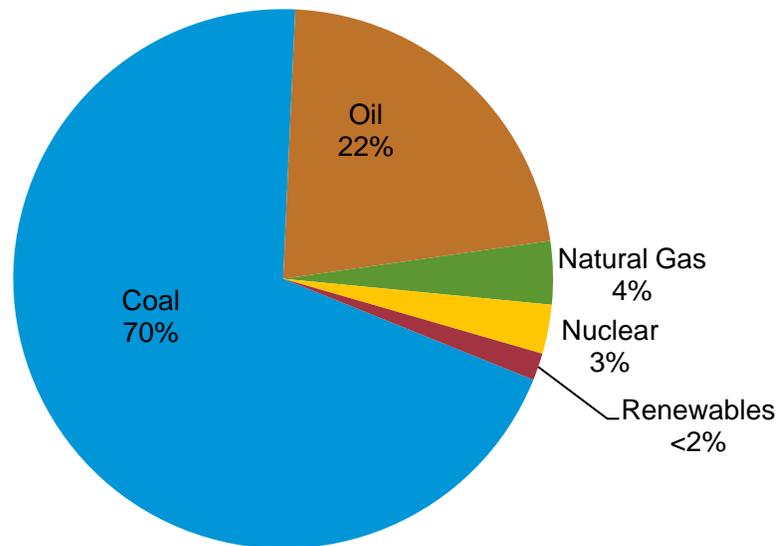
South Africa's economy has grown rapidly since the end of the apartheid era in 1994, and the country is now one of the most developed nations in Africa. South Africa has the second-largest economy in Africa, in terms of gross domestic product (GDP), and it has the highest energy consumption on the continent, accounting for about 28% of total primary energy consumption in Africa, according to *BP Statistical Review of World Energy 2017*.¹ Despite rapid economic growth over the past few decades, economic problems from the apartheid era remain, particularly poverty

and the lack of economic participation among disadvantaged groups. The South African government has committed to ensuring that black-owned companies have access to energy and mining sector activities under its Black Economic Empowerment (BEE) program. In addition, the [2000 Petroleum and Liquid Fuels Charter](#) sets a target to place 25% of the oil industry (across all facets) in the hands of black-controlled energy companies.

According to a 2015 [study by the U.S. Energy Information Administration \(EIA\)](#), South Africa holds the eighth-largest technically recoverable shale gas resources in the world (390 trillion cubic feet) primarily located in the Karoo basin. The South African government hopes that shale gas will provide the country with a reliable alternative fuel to coal. However, regulatory uncertainty and environmental concerns have delayed exploration. Some progress was recently made when the Petroleum Agency South Africa (PASA) announced that it would start processing existing applications for exploration permits in late 2017.²

In 2016, 70% of South Africa's total primary energy consumption came from coal, followed by oil (22%), natural gas (4%), nuclear (3%), and renewables (less than 2%), according to *BP Statistical Review of World Energy 2017* (Figure 2).³ South Africa's dependence on coal has led the country to become the leading carbon dioxide emitter, on a volumetric basis, in Africa (accounting for 35% of emissions in Africa) and the 14th-largest emitter in the world, according to the latest *BP Statistical Review* estimates.⁴

Figure 2. Total primary energy consumption in South Africa, 2016



Note: Traditional solid biomass and waste are not included in the total.
Source: *BP Statistical Review of World Energy 2017*

Energy sector management

PetroSA, a South African state-owned company, operates upstream oil and natural gas producing assets in South Africa, along with the GTL plant in Mossel Bay. Sasol, a privately owned company based in South Africa, operates the Secunda CTL plant, has a majority interest in the Natref oil refinery, partially owns the pipeline transporting natural gas from Mozambique to South Africa, and is involved in coal mining.

Regulatory organizations

South Africa has several government agencies and companies involved in the coal, natural gas, and oil sectors. The Petroleum Agency of South Africa ([PASA](#)) regulates oil and natural gas exploration and production and provides public data on those activities. The National Energy Regulator of South Africa ([NERSA](#)) regulates the electricity sector, natural gas pipeline industries, and petroleum pipeline industries. NERSA regulates electricity prices and promotes private sector participation by encouraging investment by independent power producers (IPPs) and off-grid technologies to meet rural energy needs. [Eskom](#)—the state-owned electricity company—generates about 90% of South Africa's electricity and owns and operates the national electricity grid.⁵

Major Companies

South Africa's upstream oil and natural gas sectors are dominated by the state-owned company Petroleum Oil and Gas Corporation of South Africa ([PetroSA](#)), while the downstream oil sector is more diversified and includes companies from Europe, North America, and Asia. BP, Shell, Chevron, Total, and Engen are the main players in the downstream oil and petrochemical industry. PetroSA operates all upstream oil- and natural gas-producing assets in South Africa, along with the GTL plant at Mossel Bay. The company also participates in oil and natural gas activities internationally.

[Sasol](#) is another major player in South Africa's energy industry and operates Secunda, one of the world's largest coal-based synthetic fuels plant. The company holds majority interest in the 88,000 barrels per day (b/d) Natref refinery. Sasol is also involved in coal mining and marketing of natural gas and oil products. According to Sasol, the company mines 40 million metric tons (MMt) of marketable coal per year (mostly used at the Secunda CTL plant) and exports about 2.8 MMt per year. Sasol distributes and markets natural gas produced in Mozambique that is exported to South Africa via a pipeline partially owned by Sasol.⁶

Sasol has operations around the world, ranging from supplying petrochemicals to using its proprietary Fischer-Tropsch conversion technology to pursue opportunities to open GTL plants. Sasol has a 49% stake in Qatar's Oryx GTL plant (Qatar Petroleum owns 51%) that came online in 2007. Sasol also has GTL projects in Nigeria and Uzbekistan. Sasol is also considering developing a GTL plant at Lake Charles, Louisiana, in the United States and a GTL plant in Alberta, Canada, although both projects are now on hold as a result of recent low oil prices.⁷

Major companies that participate in South Africa's coal sector include Anglo American, BHP Billiton, and Xstrata Coal. The South African-based, majority black-owned coal company Exxaro also ranks among the top producers. Coal mining in South Africa is mainly undertaken by privately owned companies, and the shareholders of [Richards Bay](#), the country's main coal port, are all private companies as well. The state-owned company [Transnet](#) controls the railways used to transport coal from the mines to the ports.

Coal

South Africa has the world's tenth-largest amount of recoverable coal reserves and holds 75% of Africa's total coal reserves. Coal consumption in South Africa is expected to continue to increase as new coal-fired power stations are scheduled to come online to meet rising demand for electricity.

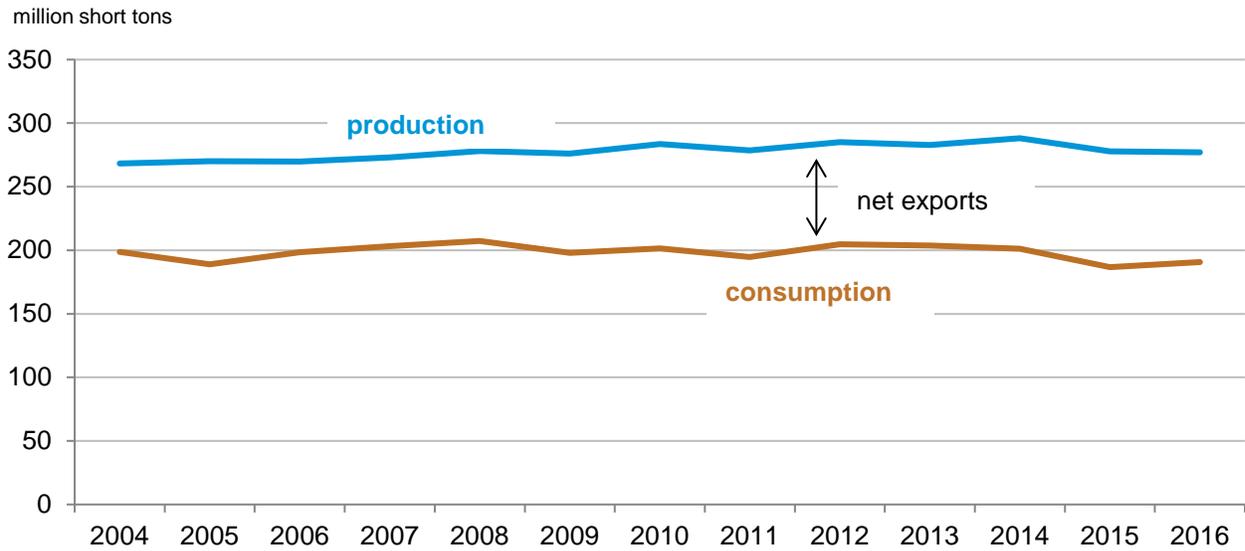
South African proved coal reserves were estimated at 11 billion short tons at the end of 2016, the 10th-largest in the world, according to the *BP Statistical Review of World Energy 2017*. South Africa's coal reserves accounted for 75% of those in Africa and 1% of total world reserves.⁸

South Africa's economy is heavily dependent on coal, as it accounts for about 70% of the country's total primary energy consumption (Figure 2). The electricity sector accounts for more than half of the coal consumed in South Africa, followed by Sasol's petrochemical industries, metallurgical industries, and domestic heating and cooking, according to Eskom.⁹

South Africa's coal production and consumption levels have remained relatively stable over the past decade. In 2016, the country produced an estimated 277 million short tons (MMst) and consumed 191 MMst of coal (Figure 3).¹⁰ Most of the coal produced comes from the Witbank, Highveld, and Ermelo coal fields, which are located in the eastern part of the country near Swaziland. South Africa has the potential to increase coal production, particularly from the resource-rich Waterberg basin in the northeastern area of the country. One of the main bottlenecks to increasing coal exports is the lack of railway infrastructure used to transport coal from the inland mines to the ports. Transnet, South Africa's railway operator, is investing billions of dollars to expand railway infrastructure over the next few years. Several railway projects are slated to be commissioned by 2021, which should facilitate transporting coal to export facilities and demand centers within South Africa.¹¹ However, weaker global coal demand, lower international coal prices over the past few years, and some regulatory uncertainties have delayed investments in these mine projects.¹²

Some of South Africa's mining projects are allocated to domestic electricity generation versus coal exports. South Africa's electricity consumption is increasing, and coal production will be needed to fuel new power plants that are currently under construction. Coal use—especially by Eskom and Sasol—is expected to rise over the next few years.¹³ Eskom is expanding its coal-fired electricity capacity to meet growing demand by bringing online coal-fired power plants—Medupi (4,764 megawatts (MW) and Kusile (4,800 MW)—in stages by 2022. Two units of the Medupi power plant and the first unit of the Kusile plant (collectively 2,388 MW of capacity) were operational by September 2017.¹⁴ However, coal consumption in the power sector is expected to face competition from natural gas and renewable energy in the next few years.

Figure 3. Total primary coal production and consumption in South Africa



Source: U.S. Energy Information Administration, *BP Statistical Review of World Energy 2017*

Coal-to-liquids (CTL)

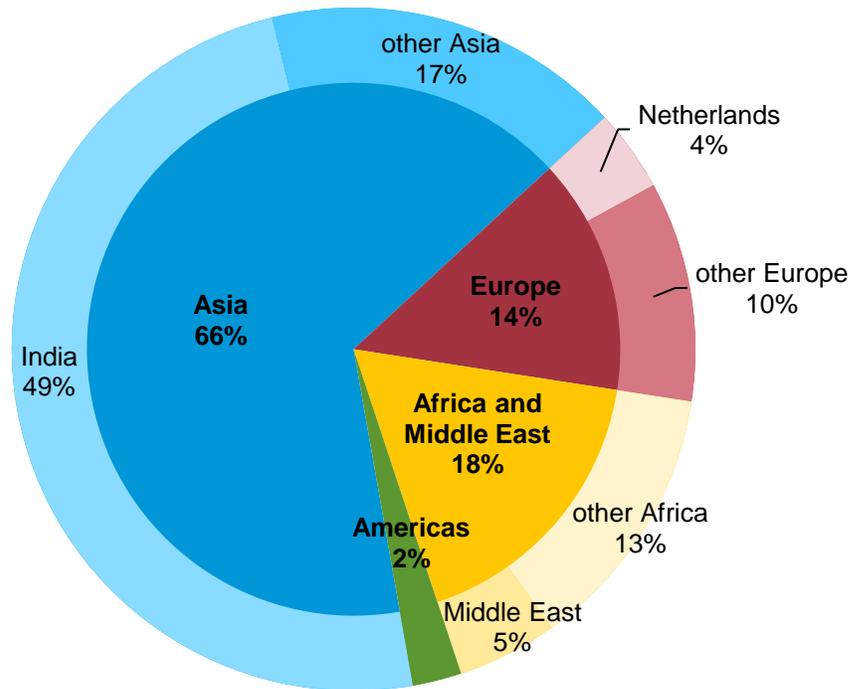
South Africa produces synthetic fuels from low-grade coal and a small amount from natural gas. At the Sasol synfuels plant in Secunda, more than 37 MMst of coal each year are converted into liquid fuels and a range of chemical feedstock. The plant houses two factories with a total capacity of 160,000 b/d of oil equivalent.¹⁵ Sasol proposed an expansion of Secunda's capacity and construction of another CTL facility, although these projects have been postponed until it has a provision for carbon capture at these facilities.¹⁶

Exports

South Africa exports about 30% of its coal production and is the fifth-largest global coal exporter. Most of South Africa's coal exports are sent to Asia, with India being the largest recipient.

South Africa exported about 30% of its coal production (85 MMst in 2016), making it the world's fifth-largest global coal exporter. Asia received nearly two-thirds of South Africa's coal shipments, with the largest destination being India, which accounted for nearly half of South Africa's coal exports (Figure 4).¹⁷ Europe is the second-largest regional importer of South Africa's coal, followed by the rest of Africa, the Middle East, and the Americas. South African exports have shifted to India and South Asia and away from Europe and China over the past several years.

Figure 4. South Africa's coal exports, by destination, 2016



Note: Total coal exports were 85 million short tons.
Source: Global Trade Tracker

About 95% of South Africa's coal is exported via the Richards Bay Coal Terminal (RBCT), and the remainder is exported via the Maputo and Durban terminals.¹⁸ RBCT is located on the eastern coast of South Africa and is one of the world's largest coal export terminals. It began operation with a design capacity of 13 MMst per year in 1976, and it has since gone through several capacity expansions, increasing the export terminal's design capacity to its current level of 100 MMst per year.¹⁹ There are proposals to expand RBCT's capacity to 121 MMst per year. These plans have been delayed because the terminal still operates below its capacity as a result of inadequate rail capacity needed to transport coal produced at inland coal fields to the RBCT.²⁰ However, progress has been made over the past few years to increase the terminal's throughput volumes. In 2015, the RBCT exported more than 83 MMst of coal for the first time before declining to 80 MMst in 2016 (Table 1). Even though exports to Asia and Africa rose in 2016, coal shipments to Europe were weak in 2016, driving down overall exports from RBCT.²¹

Table 1. Richards Bay Coal Terminal Shipping Statistics

million short tons

Year	Coal shipped
2011	72.2
2012	75.3
2013	77.4
2014	78.6
2015	83.1
2016	80.0

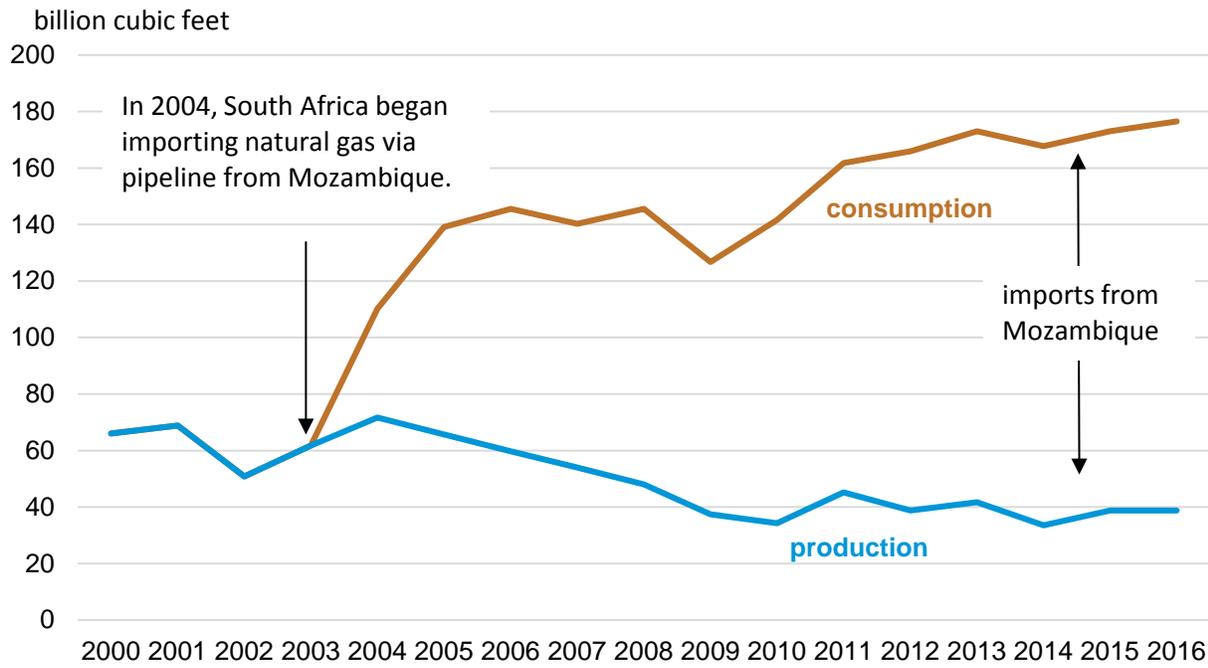
Source: Richards Bay Coal Terminal, Reuters

Natural gas

South Africa imports natural gas from Mozambique via pipeline to supply Sasol's Secunda synfuel plant and to fuel natural gas-fired power plants. South Africa produces a small volume of natural gas offshore, which is mainly used to supply the Mossel Bay GTL plant.

In 2016, South Africa produced about 40 billion cubic feet (Bcf) of dry natural gas and consumed nearly 180 Bcf; the difference of 140 Bcf was imported from Mozambique via pipeline (Figure 5). South Africa has very limited proved natural gas reserves but potentially large shale gas resources. Most of South Africa's natural gas is produced from the maturing offshore F-A field and South Coast Complex fields and sent to the GTL facility in Mossel Bay via an offshore pipeline.

Figure 5. South Africa's natural gas production and consumption



Source: Energy Information Administration, International Energy Agency

PetroSA intended to develop the F-O field, also known as Project Ikhwezi, to sustain natural gas supplies to the GTL facility, although field reserves and production potential have been severely overestimated by the state company.²² The company plans to tap into nearby prospective areas, such as the E-BK Project, to continue natural gas flows to the GTL plant.²³ One of the most viable opportunities for offshore field development is the Ibhubesi natural gas field, owned by a joint venture of the South African firms Sunbird (the field operator) and PetroSA. The Ibhubesi field holds at least 540 Bcf of recoverable reserves. The field developers aim to finalize a natural gas supply agreement with South Africa's state-owned electricity firm, Eskom, in 2017 and to begin production by 2020 to replace some of the country's diesel-fired power.²⁴ Sunbird received the environmental authorization for the Ibhubesi natural gas project in August 2017.²⁵

The government aims for new natural gas production from offshore conventional fields, onshore shale gas developments, regional imports from Mozambique, and potential liquefied natural gas (LNG) imports to reduce the country's reliance on coal in the electricity and industrial sector in the long term. Currently, infrastructure constraints limit the role of natural gas in the country's electricity sector.

South Africa created a new natural gas plan that includes constructing several natural gas-fired power plants and at least two LNG regasification terminals by 2025. South Africa's Department of Energy has proposed building nearly 290 Bcf/y of capacity from two floating LNG import terminals on the eastern side at Richards Bay and the southeastern coast at Port Coega. South Africa reported that it plans to move forward with the bidding process for the facilities in late 2017 and to begin importing LNG by 2020. PetroSA has also considered building a floating regasification facility to supply the Mossel Bay GTL plant in the future.²⁶

Shale gas resources

EIA estimates that South Africa holds 390 trillion cubic feet of technically recoverable shale gas resources. Environmental concerns led the government to place a moratorium on shale gas exploration from April 2011 to September 2012. Recently, South Africa's government has started to process pending applications for shale exploration permits.

According to a [June 2013 report released by EIA](#), South Africa has 390 trillion cubic feet (Tcf) of technically recoverable shale gas resources, making the country the eighth-largest holder of technically recoverable shale gas resources in the world. Technically recoverable resources represent the volumes of oil and natural gas that could be produced with current technology, regardless of oil and natural gas prices and production costs.²⁷

South Africa's shale gas resources are located in the Karoo basin in the Whitehill (211 Tcf), Prince Albert (96 Tcf), and Collingham (82 Tcf) formations. EIA lowered its estimate from 485 Tcf to 390 Tcf in the most recent report because the prospective area for the three shale formations in the Karoo basin was reduced by 15%. The Whitehill Shale's recovery rate and resource estimates were also reduced because of the geologic complexity, according to the report.

Environmental concerns regarding water usage and hydraulic fracturing, one of the processes used to facilitate the extraction of shale gas, led the government to enact a moratorium in April 2011 on issuing exploration licenses for shale gas exploration. The moratorium was lifted in September 2012 after a government-funded study recommended that it was safe to continue shale gas exploration. In June 2015, South Africa's Minister of Mineral Resources enacted technical regulations to govern petroleum exploration, particularly standards for shale gas exploration and hydraulic fracturing. These regulations balance the economic opportunity of shale gas development to improve the country's energy security against environmental concerns.²⁸ South Africa approved shale gas development in the Karoo basin in early 2017. However, the government's regulations were contested and declared invalid by the Eastern Cape's High Court.²⁹ Petroleum Agency South Africa (PASA) had announced it would start processing existing applications for exploration permits in late 2017, although drilling for shale gas could face delays.³⁰

Gas-to-liquids (GTL)

The GTL plant at Mossel Bay was commissioned in 1992 and is one of the largest in the world. PetroSA operates the plant, in addition to the offshore gas fields that provide the fuel. The plant has the capacity to process 45,000 b/d of liquid fuels through a Fischer-Tropsch Process, where natural gas is converted to synthetic liquid fuels. The plant produces several synthetic liquid fuels, of which more than half is unleaded petrol (motor gasoline) and the remainder includes: paraffin (kerosene), diesel, propane, liquid oxygen and nitrogen, distillates, eco-fuels, process oils, and alcohols.³¹

The Mossel Bay GTL refinery has operated well below its nameplate capacity for several years and produced less than 22,000 b/d in 2016 because of insufficient natural gas supplies.³² As a medium-term solution to keeping the GTL plant operating, PetroSA installed a condensate splitter in 2016 and can process about 18,000 b/d of heavy liquid condensates in addition to natural gas.³³

Natural gas pipelines

Natural gas from Mozambique is imported through a 535-mile pipeline and transported to Sasol's Secunda synfuels plant. Sasol, the South African government, and the government of Mozambique own the pipeline through a joint

venture, ROMPCO (the Republic of Mozambique Pipeline Investments Company).³⁴ The pipeline has a peak capacity of 550 million cubic feet per day of natural gas and was part of a \$1.2 billion natural gas project started in 2004.³⁵ The pipeline has expanded its capacity in recent years to accommodate growing natural gas markets in both Mozambique and South Africa.

Two proposals are pending for a natural gas pipeline that would run from Mozambique's Rovuma basin in its northeastern province Cabo Delgado to demand centers in South Africa. SacOil Holdings, a South Africa-based oil and natural gas company; the Mozambican national oil company; a consortium of Mozambican private sector companies; and China National Petroleum Corporation's (CNPC's) subsidiary, China Petroleum Pipeline Bureau (CPP), signed a cooperation agreement in March 2016 and are studying the possibility of constructing the \$6 billion, 1,615-mile African Renaissance Pipeline. CPP would provide 70% of the funding from Chinese financial firms. The second project is the Gasnosu Pipeline, proposed by the Mozambican state oil company and South African firm, Gigajoule, and supported by South African utility Eskom.³⁶ Several significant gas discoveries have been made in Mozambique's northeastern Rovuma Basin over the past few years. South Africa is a viable market for Mozambique's future production given South Africa's limited proved gas reserves and its need to sustain production at its GTL plant. However, both proposed pipelines involve long distances and high capital costs, current LNG regasification proposals are likely to be more economically competitive in the near term.

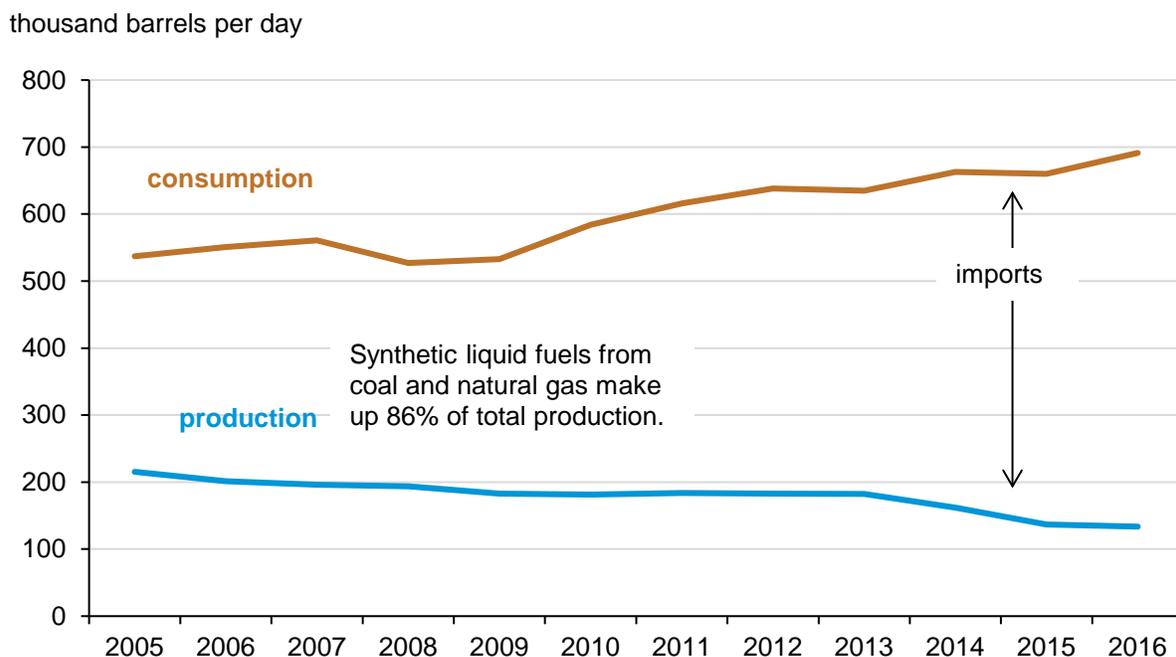
Petroleum and Other Liquids

South Africa has small amounts of proved crude oil reserves, and the country's crude oil production is very small. Synthetic fuels, derived from coal and natural gas, account for about 86% of the country's domestic petroleum liquids production.

According to the *Oil & Gas Journal*, South Africa has proved crude oil reserves of 15 million barrels.³⁷ All of the proved reserves are located offshore in southern South Africa in the Bredasdorp Basin and off the west coast of the country near the maritime border with Namibia. South Africa's petroleum and other liquids (total oil) production was about 134,000 barrels per day (b/d) in 2016 (Figure 6). Synthetic fuels, derived from coal and natural gas, accounted for about 86% of the country's domestic petroleum supply. Less than 5,000 b/d of crude oil and lease condensate is produced at the Oribi and Oryz fields operated by PetroSA. The country's crude oil and lease condensate production continues to decline as oil fields mature and as no commercially viable discoveries have been made. Refining gains accounted for about 10% of domestic petroleum liquids supplies.

South Africa's deepwater offshore Orange Basin near Namibia is believed to hold substantial oil and natural gas resources, although limited exploration activity has occurred in the area. In 2009, Shell acquired exploration rights over a large block in the basin. Shell obtained an environmental authorization for exploration drilling in 2015. However, the company is years away from potentially producing any commercial reserves.³⁸

Figure 6. Petroleum and other liquids production and consumption in South Africa



Source: U.S. Energy Information Administration, *Short-term Energy Outlook*, September 2017

Downstream

South Africa consumes the second-largest amount of petroleum in Africa, behind Egypt. The petroleum consumed in South Africa comes mostly from its domestic refineries that import crude oil and its CTL and GTL plants. South Africa imports crude oil mostly from OPEC countries in the Middle East and West Africa.

EIA estimates that South Africa's petroleum consumption was 691,000 b/d in 2016. The petroleum products consumed in South Africa come mostly from its domestic refineries that import crude oil and its CTL and GTL plants. The country also imports an increasing amount of petroleum products because overall oil consumption continues to rise. In 2016, South Africa imported an estimated 155,000 b/d of petroleum products, mostly from Asia and the Middle East, according to Global Trade Tracker (GTT).³⁹

The South African government is considering a policy to encourage greater use of liquefied petroleum gas (LPG) in the residential, commercial, and industrial sectors to diversify fuel sources and provide low-income households with more affordable and cleaner-burning fuels.⁴⁰ A few LPG processing and storage facilities are set to come online in Saldanha Bay and Richards Bay during the next few years to meet the country's rising demand for this product.⁴¹

Refining

South Africa has the second-largest crude oil distillation capacity in Africa at 493,000 b/d, surpassed only by Egypt, according to the OGJ January 2017 estimates (Table 2).⁴² The government has proposed plans to implement new, tighter fuel standards that would require upgrades at all refineries. However, because of low returns on investment, refinery operators have yet to upgrade their facilities. The new fuel standards will raise refiners' operational costs. The government's initial deadline to upgrade the refineries was July 2017, but this target has been delayed indefinitely.

South Africa imports oil products to make up for the country's widening supply shortfall. South Africa's Department of Energy and the South African Petroleum Industry Association (SAPIA) have been discussing a cost-recovery program for the refineries since 2015.⁴³

PetroSA and Chinese national oil company, Sinopec, considered building a new refinery in 2012, but they canceled the project based on high capital cost. In March 2017, Sinopec announced that it planned to purchase a 75% share in Chevron's refinery in Cape Town. The Chinese national oil company was in discussions with the South African government, whose main concern is to continue operations and upgrade the refinery to meet the new fuel standards.⁴⁴ However, the minority stakeholder of Chevron's downstream assets in South Africa prevented the acquisition deal from moving forward. Swiss-based oil trading company, Glencore, then decided to acquire these assets in October 2017, although the bid is under review.⁴⁵

Table 2. South African Crude Oil Refinery Capacity

Refinery	Company	Location	Capacity (b/d)
Sapref	Shell and BP PLC Petroleum	Durban	170,000
Enref	Engen Petroleum	Durban	135,000
Chevref	Caltex Oil SA (Chevron)	Cape Town	100,000
Natref	National Petroleum Refiners of South Africa	Sasolburg	88,000
Total			493,000

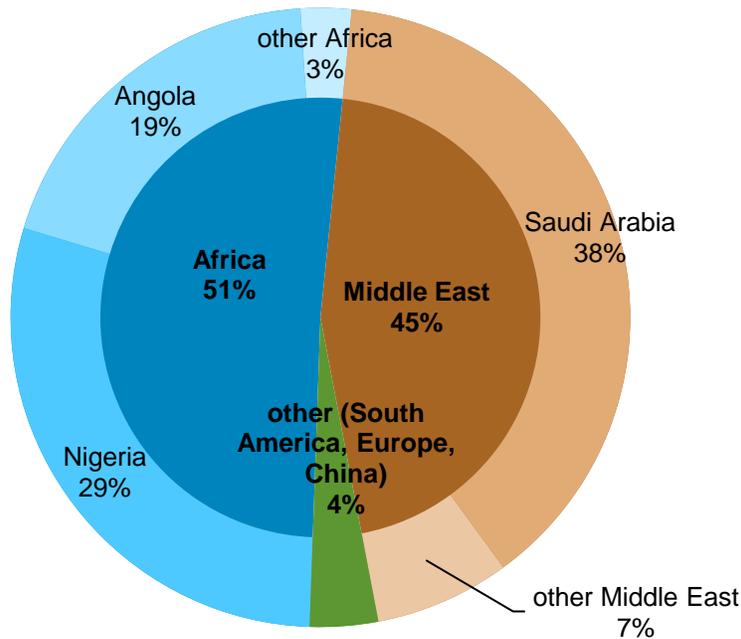
Source: *Oil & Gas Journal*, January 2017

Crude oil imports

In 2016, South Africa imported 416,000 b/d of crude oil, according to GTT data. South Africa imports crude oil mostly from OPEC countries, namely Saudi Arabia (38%), Nigeria (29%), and Angola (19%) (Figure 7).

South Africa's top oil supplier has shifted from Iran to Saudi Arabia in recent years. In 2011, Iran was South Africa's largest crude oil supplier, accounting for about 27% of South Africa's total crude oil imports.⁴⁶ But in 2012, South Africa's crude oil imports from Iran dropped because of U.S. and European Union (EU) sanctions against Iran. U.S. sanctions, directed toward foreign financial institutions that facilitate oil-related transactions with the Central Bank of Iran, entered into full force in July 2012. To avoid the sanctions, Iranian crude oil importers had to show or pledge significant reductions in their Iranian crude oil purchases to receive a 180-day renewable exemption. South Africa halted Iranian crude oil imports before the July 2012 deadline and was granted exemptions. South Africa has not resumed imports from Iran despite the sanctions on Iran being lifted in 2016. The country continues to substitute Iranian imports with supplies from Saudi Arabia, Nigeria, Angola, and other countries.

Figure 7. South Africa's crude oil and condensate imports, by country of origin, 2016



Note: Total crude oil and condensate imports were 416,000 barrels per day.
Source: Global Trade Tracker

Electricity

After experiencing chronic power shortages for several years, in 2016, South Africa had a power capacity surplus as a result of new capacity commissioned by both public and private sectors and of weaker electricity demand. South Africa intends to diversify its electricity generation portfolio to include cleaner-burning fuels such as natural gas and renewable energy.

South Africa's electricity generation has declined overall from 2007 to 2016 by more than 4% as a result of economic weakness, downward pressures on commodity markets, inadequate fuel supply and capacity to meet demand, and rising electricity costs. Gross electricity generation was around 250 Terawatthours (TWh) in 2015 and 2016.⁴⁷

Eskom supplies approximately 90% of South Africa's electricity, and the remainder comes from independent power producers (IPPs) and imports.⁴⁸ South Africa is a member of the [Southern African Power Pool \(SAPP\)](#), which began in 1996 as the first formal international power pool in Africa, with a mission to provide reliable and economical electricity supply to consumers in SAPP-member countries. Eskom exports electricity to Lesotho, Namibia, Botswana, Zimbabwe, Mozambique, Swaziland, and Zambia, and it imports electricity from Lesotho, Mozambique, Zambia, and Zimbabwe.⁴⁹

South Africa's installed electricity capacity was about 53 gigawatts (GW) in September 2017, although total net maximum capacity (installed capacity minus the amount the power station uses to operate) is lower. Of this capacity, 76% of South Africa's installed electricity capacity is coal-fired, 7% petroleum liquids- or natural gas-fired at open-cycle plants, 7% hydroelectric, 4% nuclear, and 6% from nonhydro renewable energy (Table 3).⁵⁰ South Africa plans to diversify its electricity generation mix to ensure greater energy security and reduce its environmental emissions.

South Africa has struggled with a constrained electricity system over the past decade because the margin between peak demand and available electricity supply was extremely narrow. Reserve margins were low because of aging coal-fired power plants, insufficient investment in power infrastructure, and mismanagement of the sector. Load shedding (scheduled power cuts) during peak demand periods occurred frequently between 2013 and 2015, and the lack of electricity security has negatively affected the country's industries and economic growth. However, at close to 90%, South Africa still had one of the highest electrification rates in Africa as of 2016.⁵¹ South Africa intends to provide electricity access to all households by 2030.⁵²

In response to chronic power shortages and the need to ensure a more diverse fuel supply, South Africa began a procurement program in 2011 to purchase power from renewable sources and lower-emitting energy plants funded by IPPs. This program has added 5 GW of generation capacity to the grid, mostly from facilities fueled by wind, solar, and natural gas. South Africa's capacity target from IPP procurement is 29 GW by 2025.⁵³

In 2015, South Africa's Department of Energy released a natural gas plan to develop the country's natural gas infrastructure and to meet increasing demand with future LNG imports and indigenous production. Underlying the plan is the construction of 3.7 GW of new natural gas-fired capacity through the IPP program by 2025. Most of the capacity is expected to be sourced from LNG. The government expects to issue a request for proposal for companies to bid on development of LNG and associated natural gas-fired power plants by 2018.⁵⁴

South Africa's renewable energy industry is small, but the country has expanded its renewable electricity capacity through the IPP Procurement Program. IPPs added 3.3 GW of renewable capacity to the grid between 2011 and early 2017. Eskom also completed its new Ingula hydroelectric facility with 1.3 GW of capacity in 2017.⁵⁵ As part of its Integrated Energy Plan, South Africa aims to commission 17.8 GW of renewable energy capacity by 2030, in line with its overall goal to lower carbon emissions and to diversify the fuels portfolio for power generation.⁵⁶

Eskom is also increasing its own production capacity by building more efficient coal-fired units and converting some diesel-fired power stations to more efficient natural gas-fired combined-cycle units. Eskom is developing the country's first massive supercritical coal-fired power plants—Medupi and Kusile—with a combined installed capacity of nearly 10 GW from 12 units. The plants are coming online in stages. The Medupi plant has brought two units online, and the Kusile facility has brought one unit online (combined 2.4 GW of installed capacity) since 2015. The other units of these two plants are slated to be online by 2022. Although the government has discussed decommissioning several of its old coal-fired units as new plants come online, Eskom plans to study each facility to determine the best course of action.⁵⁷

Recent plant additions have resulted in a surplus power capacity in South Africa. Overall plant availability was back up to 77% from lows of about 70% in 2015. The government aims to improve plant maintenance and raise the electricity availability factor to 80% by 2020.⁵⁸

Table 3. South Africa's power stations and installed capacity¹ (unit: megawatts)

Coal-fired plants		Hydroelectricity	
Arnot	2,352	Conventional hydro stations	
Camden	1,561	Gariep	360
Duvha	3,600	Vanderkloof	240
Grootvlei	1,180	Pumped storage schemes	
Hendrina	1,893	Drakensberg	1,000
Kendal	4,116	Palmiet	400
Komati	990	Ingula	1,332
Kriel	3,000	Other hydropower stations	
Lethabo	3,708	Colley Wobbles	42
Majuba	4,110	Second Falls	11
Matimba	3,990	First Falls	6
Matla	3,600	Ncora	2
Tutuka	3,654	Other renewable energy stations	
Medupi (operational)	1,588	Sere Wind Facility	100
Kusile (operational)	800		
Gas/liquid turbine stations		Nuclear	
Acacia	171	Koeberg	1,940
Port Rex	171		
Ankerlig	1,338		
Gourikwa	746		
Independent Power Producers (IPPs)²		5,027	
total installed capacity (existing)		53,028	
Eskom planned capacity additions (Medupi and Kusile)		7,176	

¹ The table provides installed capacity, which is higher than the country's actual total net maximum capacity.

² Capacity among IPP-owned power stations represents total installed capacity owned by independent companies. All other power plants in the table are owned by Eskom, South Africa's state-owned utility company.

Source: Eskom Integrated Report, March 2017; Eskom media reports.

Notes

- Data presented in the text are the most recent available as of October 27, 2017.
- Data are EIA estimates unless otherwise noted.

Endnotes

- ¹ [BP Statistical Review of World Energy 2017](#).
- ² Newsbase, AfrOil, "South Africa finally approves Karoo shale gas drilling", April 4, 2017, pages 8-9; "High hopes for South African shale", June 13, 2017, page 10; "South Africa fracking license move is close", July 11, 2017, page 21.
- ³ [BP Statistical Review of World Energy 2017](#).
- ⁴ [BP Statistical Review of World Energy 2017](#).
- ⁵ Eskom, [Integrated Report 2017](#), page 4.
- ⁶ Sasol official website, [Operating Business Units, Products](#) (accessed August 2017).
- ⁷ Sasol North America, [Gas-to-Liquids Facility](#) (accessed August 2017); Sasol Integrated Report 2017, page 66.
- ⁸ [BP Statistical Review of World Energy 2017](#).
- ⁹ Eskom, Generation Communication, [Fact Sheet: Coal in South Africa](#), (February 2016).
- ¹⁰ Energy Information Administration, International Energy Statistics; BP Statistical Review of World Energy 2017.
- ¹¹ Railway Technology webzine, "[South Africa: investing in a new era of rail](#)", May 11, 2015; Independent Online, "[Transnet gets going on coal line expansion](#)", July 15, 2016.
- ¹² International Energy Agency, Medium-Term Coal Market Report 2015, page 127.
- ¹³ Medium-Term Coal Market Report 2016, pages 112-113.
- ¹⁴ Eskom, "[Eskom's Medupi Unit 5 achieves Commercial Operation ahead of schedule](#)", April 3, 2017; The Citizen, "[Eskom connects Medupi Power Station Unit 4 into national grid](#)", June 1, 2017; Eskom, "[Unit 1 of Kusile power station brought into full commercial operation, bringing further stability to the power grid](#)", August 30, 2017.
- ¹⁵ Sasol official website, [Sasol Facts](#), 2012-2013, page 31; World Coal Institute, [Coal: Liquid Fuels](#), October 2006, page 6; National Energy Technology Laboratory, [Commercial Use of Fischer-Tropsch Synthesis, Sasol](#) (accessed September 2017).
- ¹⁶ Creamer Media's Engineering News, "[Sasol decelerates Project Mafutha pending carbon capture, refinery clarity](#)", September 13, 2010.
- ¹⁷ Global Trade Tracker (accessed September 2017).
- ¹⁸ International Energy Agency, Medium-Term Coal Market Report 2016, page 113; Medium-Term Coal Market Report 2015, page 128.
- ¹⁹ [Richards Bay Coal Terminal website](#) (accessed September 2017).
- ²⁰ International Energy Agency, Medium-Term Coal Report 2016, page 113; Creamer Media's Mining Weekly, "[Richards Bay Coal Terminal sets new 75.4Mt export record](#)", January 19, 2016.
- ²¹ Richards Bay Coal Terminal, [Media Engagement Session 2017](#), slides 14 and 16; Reuters, "[South Africa's Richards Bay misses 2016 coal export target](#)", January 31, 2017; Richards Bay Coal Terminal, [Media Engagement Session 2017](#), slides 14 and 16.
- ²² Newsbase, AfrOil, "PetroSA's financial missteps come under parliamentary microscope", March 21, 2017, page 4.
- ²³ Newsbase, AfrOil, "South Africa strikes Russian deal", September 12, 2017, pages 5-6; IHS Energy, Plays and Basins, Energy Technical Report, "PetroSA looking to farm out an equity stake in three fields within Block 9 in addition to looking for exploration partners for the northern and southern portion of the block", September 8, 2017.
- ²⁴ Creamer Media's, Mining Weekly, "[New African owners of Ibhubesi gas prospect aim to settle Ankerlig supply deal in 2017](#)", December 15, 2016; Offshore Technology, "[Ibhubesi Gas Field, Orange Basin, South Africa](#)" (accessed September 2017).
- ²⁵ IHS Energy, Plays and Basins, Energy Technical Report, Sunbird Energy Holdings Pty Ltd receives environmental authorization for the development of the Ibhubesi gas field", August 25, 2017.
- ²⁶ IHS Energy, LNG Import Outlook: South Africa, December 7, 2016.
- ²⁷ Energy Information Administration, [Technically Recoverable Shale Oil and Shale Gas Resources](#), June 2013, page 15 and section XIX.
- ²⁸ South Africa, Department of Mineral Resources, Government Gazette, [Regulations for Petroleum Production and Exploration](#), June 3, 2015.
- ²⁹ Newsbase, AfrOil, "South African ruling knocks back fracking", October 24, 2017, page 10.
- ³⁰ Newsbase, AfrOil, "South Africa finally approves Karoo shale gas drilling", April 4, 2017, pages 8-9; "High hopes for South African shale", June 13, 2017, page 10; "South Africa fracking license move is close", July 11, 2017, page 21.
- ³¹ PetroSA, [Operations and Refinery](#) (accessed September 2017).
- ³² PetroSA, Integrated Annual Report 2016, page 51.
- ³³ International Energy Agency, Oil Market Report 2017, page 93; Creamer Media's Engineering News, "[In bid to revive GTL refinery, PetroSA plans gas-to-condensate swing](#)", November 18, 2016.
- ³⁴ Sasol, Media Center, "[Mozambique Gas Pipeline in US\\$210 Million Expansion](#)", November 30, 2015.
- ³⁵ Republic of Mozambique Pipeline Investments Company (Pty) Ltd, "[Network Code](#)", December 21, 2016; United Nations, Africa Renewal Online, "[Pipeline benefits Mozambique, South Africa](#)," (October 2007).
- ³⁶ Newsbase, AfrOil, "Chinese mission notes Mozambique push", November 29, 2016, page 8; "An alternative to LNG in Mozambique", March 8, 2016, pages 4-5; Business Live, "[Mozambique: Conflict in the pipeline](#)", March 17, 2016;

-
- Egypt Oil and Gas Newspaper, "[South African Investors Compete over Mozambican Gas Pipelines](#)", March 6, 2016; Bloomberg Business, "[South Africa, Mozambique, Study \\$6 Billion Gas Pipeline](#)," (December 8, 2014).
- ³⁷ *Oil & Gas Journal*, *Worldwide look at reserves and production*, (December 5, 2016).
- ³⁸ Creamer Media's Engineering News, "[Shell gets nod to drill wells in SA's Orange basin](#)", October 19, 2015.
- ³⁹ Global Trade Tracker (accessed September 2017).
- ⁴⁰ The Competition Commission of South Africa, [Market Inquiry into the LPG Sector Final Report](#), March 2017, page 19.
- ⁴¹ Creamer Media's Engineering News, "[Sunrise discharges first LPG shipment through Saldanha Bay terminal](#)," June 2, 2017; World LPG Association: Media Room, "[Argus Analysis: Petredec Plans South Africa Terminal](#)", June 30, 2017; Newsbase AfrOil, "Bidvest to develop new South African LPG import facility for Petredec", June 13, 2017, page 17.
- ⁴² *Oil & Gas Journal*, *2017 Worldwide refining survey*, (December 5, 2016).
- ⁴³ South Africa Petroleum Industry Association (SAPIA), [Key Issues, Cleaner Fuel II](#) (accessed September 2017); Hydrocarbon Processing, "[Refining: Uncertainty grips South Africa's Clean Fuels Program](#)", April 2017; Focus on Transport and Logistics, "[Clean fuels 2: South Africa's problem child](#)", February 23, 2017.
- ⁴⁴ Reuters, "[South Africa wants Sinopec to retain refinery capacity](#)", May 25, 2017; Reuters, "[China's Sinopec buys first major refinery in Africa from Chevron](#)", March 22, 2017; Business Report, "[Refinery outlook takes shine off Chevron deal](#)", March 27, 2017.
- ⁴⁵ IHS Energy, "Glencore outbids Sinopec in the race for Chevron's assets in South Africa and Botswana", October 18, 2017.
- ⁴⁶ Global Trade Tracker (accessed August 2017).
- ⁴⁷ [BP Statistical Review of World Energy 2017](#).
- ⁴⁸ Eskom, [Integrated Report 2017](#), page 4.
- ⁴⁹ Eskom, [Integrated Report 2017](#), page 5.
- ⁵⁰ Eskom, [Integrated Report 2017](#), pages 50 and 112; Eskom, "[Eskom's Medupi Unit 5 achieves Commercial Operation ahead of schedule](#)", April 3, 2017; The Citizen, "[Eskom connects Medupi Power Station Unit 4 into national grid](#)", June 1, 2017; Eskom, "[Unit 1 of Kusile power station brought into full commercial operation, bringing further stability to the power grid](#)", August 30, 2017.
- ⁵¹ Eskom, [Group audited condensed financial results](#) (for March 31, 2017); Eskom, Media Room, "[Recent statistics show that nearly 90% of households in SA now have access to electricity](#)", June 4, 2016.
- ⁵² Government Gazette, [Integrated Energy Plan](#), November 2016, page 40.
- ⁵³ South African Department of Energy and Department of National Treasury, IPP Projects, Publications, Quarterly Reports, [Overview of the Independent Power Producer Procurement Programme \(IPPPP\), March 31, 2017](#), page 1.
- ⁵⁴ Independent Power Producer Procurement Programme, [Gas Utilisation Master Plan](#) (accessed October 2017); [IPP Gas LNG](#) (accessed October 2017); [Overview of the Independent Power Producer Procurement Programme \(IPPPP\), March 31, 2017](#), page 5; IHS Energy, LNG Import Outlook: South Africa, December 2016, page 2.
- ⁵⁵ Hydro Review, HydroWorld.com, "[All units in commercial operation at 1,332-MW Ingula pumped storage project in South Africa](#)" January 31, 2017.
- ⁵⁶ South African Department of Energy and Department of National Treasury, IPP Projects, Publications, Quarterly Reports, [Overview of the Independent Power Producer Procurement Programme \(IPPPP\), March 31, 2017](#), page 5.
- ⁵⁷ Eskom, [Integrated Report 2017](#), page 14.
- ⁵⁸ Eskom, [Group audited condensed financial results](#) (for March 31, 2017); Eskom, Media Room, "[Eskom is now delivering excess electricity capacity to power SA's economic growth](#)", January 24, 2017.