Country Analysis Brief: South Africa

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Overview

Table 1. South Africa's energy overview, 2022

	Crude oil and other petroleum liquids	Natural gas	Coal	Nuclear	Hydro	Other renewables	Total
Primary energy consumption (quads)	1.2	0.2	4.2	0.1		0.1	5.7
Primary energy consumption (percentage)	21%	3%	73%	2%		1%	100%
Primary energy production (quads)	0.0	0.0	5.9	0.1		0.1	6.0
Primary energy production (percentage)	0%	0%	97%	2%		1%	100%
Electricity generation (terawatthours)	0.3	0.0	201.1	10.1	3.1	16.3	229.5
Electricity generation (percentage)	0%	0%	88%	4%	1%	7%	100%

Data source: U.S. Energy Information Administration, International Energy Statistics database
Note: EIA aggregates hydroelectricity and renewables as *renewables and other* for primary energy production and consumption. Quads=quadrillion British thermal units

- South Africa was the largest economy in sub-Saharan Africa in 2023 in terms of gross domestic product (GDP), according to the latest estimates by the World Bank Group. In 2022, South Africa was also the largest petroleum and other liquids consumer in sub-Saharan Africa (601,000 barrels per day [b/d]), just surpassing Nigeria.[1]
- The country has a large coal mining industry and mostly uses coal to meet its energy needs. South Africa also has a sophisticated synthetic fuels industry and produces liquid fuels from its gas-to-liquids (GTL) plant in Mossel Bay and its coal-to-liquids (CTL) plant in Secunda.[2]
- Although South Africa has a high level of access to electricity relative to other sub-Saharan African countries, its electric power sector experiences frequent power outages because of insufficient investment in electricity infrastructure. South Africa is seeking to diversify its power generation mix by attracting investment in renewable energy sources, but coal will likely remain the main fuel source to meet its energy needs for the near future.[3]

Figure 1. Map of South Africa

Data source: U.S. Central Intelligence Agency, *CIA World Factbook*–South Africa

Oil and Natural Gas Exploration

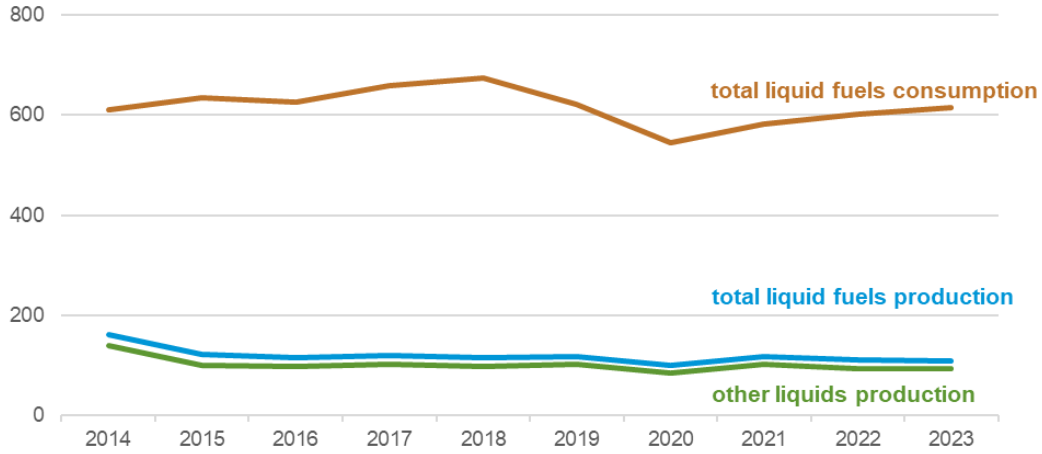
- TotalEnergies and Canadian Natural Resources both announced that they intend to withdraw their respective 45% and 20% working interests in Block 11B/12B (which is a license granted by the government to a company or consortium of companies and permits the company or consortium the right to explore and develop hydrocarbon resources located within a specified geographic area), citing commercial viability concerns and a strategic shift toward other exploration opportunities in neighboring Namibia.[4] Block 11B/12B, located offshore approximately 110 miles south of Mossel Bay, is home to the Luiperd and Brulpadda discoveries, which are two high-profile deepwater natural gas-condensate finds that were touted as some of Africa's largest discoveries in nearly a decade.[5] According to recent field analysis by Rystad Energy, the Brulpadda discovery is expected to reach a peak production level of about 73,000 barrels of oil equivalent per day (BOE/d). The Luiperd discovery, which is currently planned as a two-phase development, is expected to reach peak production of about 44,000 BOE/d in the first phase and 68,000 BOE/d in the second phase.[6] However, should the companies withdraw their working interests from Block 11B/12B, it would significantly delay the block's development and potentially reduce interest in further exploration of South Africa's offshore blocks. Furthermore, the withdrawal might diminish South African prospects for exporting natural gas; providing feedstock for the Mossel Bay GTL plant (which halted operations in 2020 because of a lack of natural gas feedstock); or for power generation, where coal is currently the dominant fuel source.[7]

Petroleum and Other Liquids

- Total liquid fuels production in 2023 was about 108,000 barrels per day (b/d), of which less than 1% was crude oil and lease condensate (Figure 2). Nearly all of South Africa's total liquid fuels production is of synthetic fuels, which are derived from coal and natural gas.[8]

Figure 2. Total annual liquid fuels production and consumption in South Africa, 2014–2023

thousand barrels per day



Data source: U.S. Energy Information Administration, International Energy Statistics database
Note: "Other liquids" production includes South African coal-to-liquids and gas-to-liquids production. 2023 estimates for total liquid fuels consumptions are preliminary estimates.

- South Africa has four refineries, but currently only the Natref refinery in Sasolburg, near Johannesburg, and the Astron Energy refinery in Cape Town are operational (Table 2).[9] In May 2023, the Astron Energy refinery restarted operations after an extended shutdown following an explosion at the facility in July 2020.[10] South Africa also has a GTL plant in Mossel Bay and a CTL plant in Secunda that can process natural gas and coal, respectively, to produce synthetic liquid fuels.
- In December 2023, TotalEnergies announced that it would sell its minority ownership stake in the Natref refinery to the Prax Group. Sasol, a state-owned South African energy company, will continue to hold its majority stake in the refinery, and operations will not be affected during the transaction process.[11]
- In May 2024, bp and Shell, joint venture partners that own the Sapref refinery, announced that they would sell their ownership stakes in the refinery to the state-owned energy company Central Energy Fund. Shell and bp halted operations at the refinery at the end of March 2022 after severe flooding damaged the facility, which led to a shutdown of operations. The flooding also caused an oil leak at the plant, which caused environmental damage. The facility remains idle, and future plans for the refinery are unclear.[12]
- In May 2024, Petroliam Nasional Berhad (Petronas), the majority shareholder of the Engen refinery, sold its ownership stake in the refinery to Vivo Energy, a subsidiary of Vitol, a global commodities trader. The refinery has remained closed since December 2020 when a fire and

explosion occurred at a diesel hydrotreater at the facility. According to Reuters, Engen stated that it intends to convert the refinery to an import and storage terminal by the end of 2023, but progress is unclear.[13]

Table 2. South Africa's existing refineries

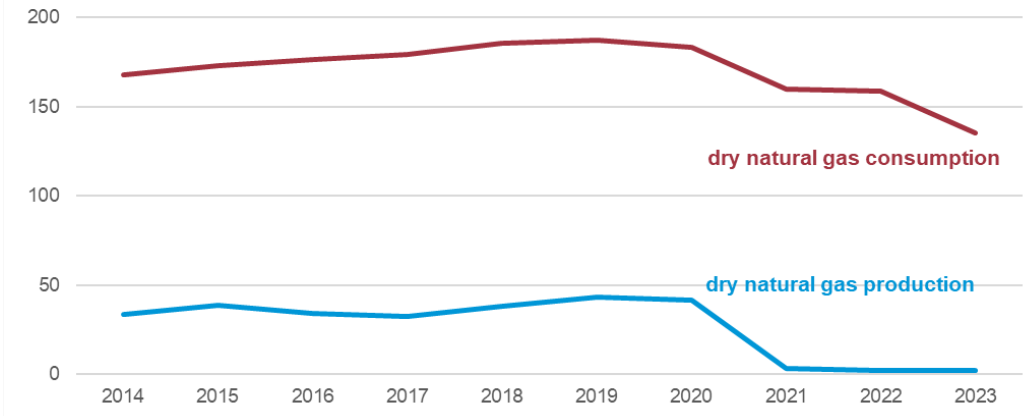
Refinery name	Ownership	Location	Notes	Nameplate capacity (barrels per day)
Astron refinery	Astron Energy	Cape Town	Operational	100,000
Engen refinery	Vivo Energy (74%) Phembani (21%) Phembani-led consortium (5%)	Durban	Shut down in 2020; planned conversion to a storage and import terminal	120,000
Natref refinery	Sasol (64%) TotalEnergies (36%)	Sasolburg	Operational	108,000
PetroSA refinery	Central Energy Fund (100%)	Mossel Bay	Gas-to-liquids plant; shut down in 2020	45,000
Sapref refinery	BP (50%) Shell (50%)	Durban	Shut down in 2020	180,000
Secunda refinery	Sasol (100%)	Secunda, Mpumalanga	Coal-to-liquids plant	150,000
Total				**703,000**

Data source: *Ship & Bunker, Oil & Gas Journal*, South African Petroleum Industry Association website, and company websites

Natural Gas

- Dry natural gas production in South Africa averaged about 27 billion cubic feet (Bcf) per year between 2014 and 2023, while dry natural gas consumption averaged about 171 Bcf over the same period. South Africa has limited natural gas resources that can be commercially exploited, so it imports most of its natural gas from Mozambique to meet demand; the marginal amount of natural gas it produces was used as feedstock at the GTL plant in Mossel Bay before it stopped operating in 2020. Although South Africa reportedly has large shale gas resources in the Karoo Basin, these deposits are often not economical investments due to a lack of infrastructure to transport and process the natural gas and complex geological characteristics that make exploration and appraisal technically challenging and expensive (Figure 3).[14]

Figure 3. Total dry annual natural gas production and consumption in South Africa, 2014–2023



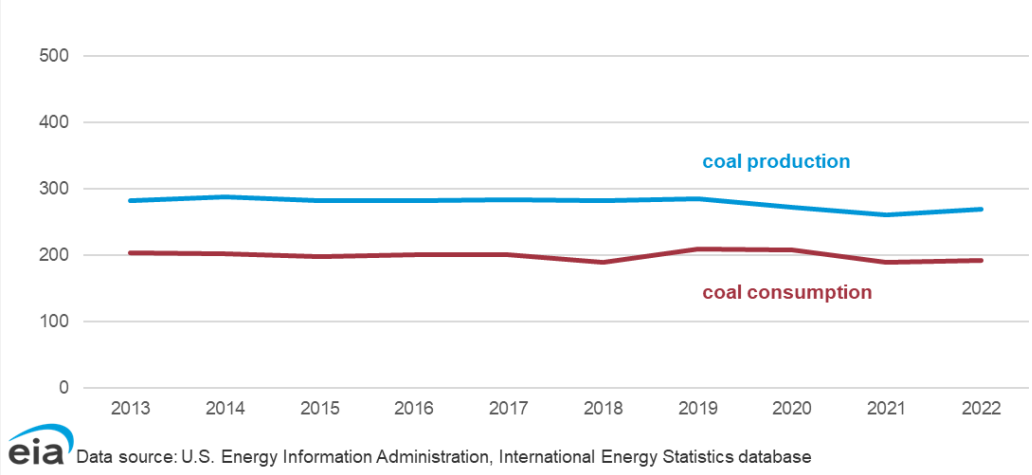
Data source: U.S. Energy Information Administration, International Energy Statistics database
Note: 2023 estimates for dry natural gas consumption and production are preliminary estimates

- The PetroSA GTL plant in Mossel Bay is wholly owned by the South African government through the state-owned energy company Central Energy Fund. PetroSA operates the plant and the offshore natural gas fields that provide the feedstock. The plant converts natural gas to synthetic liquid fuels, such as motor gasoline, kerosene, diesel, propane, and distillates.[15] The Mossel Bay GTL refinery has a nameplate capacity of 45,000 b/d, but the refinery stopped commercial operations in 2020 because of insufficient natural gas supplies. In December 2023, PetroSA announced that it would partner with Gazprombank, a Russian financial institution, to restart the refinery, but a final investment decision has not yet been announced by either entity.[16]

Coal

- According to our latest estimates, South Africa had proved coal reserves of about 11 billion short tons in 2022. Most of the coal produced in South Africa comes from the Witbank, Highveld, Free State, and Ermelo fields in the eastern part of the country.[17]
- South Africa's coal production and consumption have remained relatively flat over the past decade. South Africa produced approximately 269 million short tons of coal (MMst) in 2022, making it the seventh-largest coal producer in the world. South Africa also consumed about 192 MMst in the same year (Figure 4).[18]

Figure 4. Total coal production and consumption in South Africa, 2013–2022

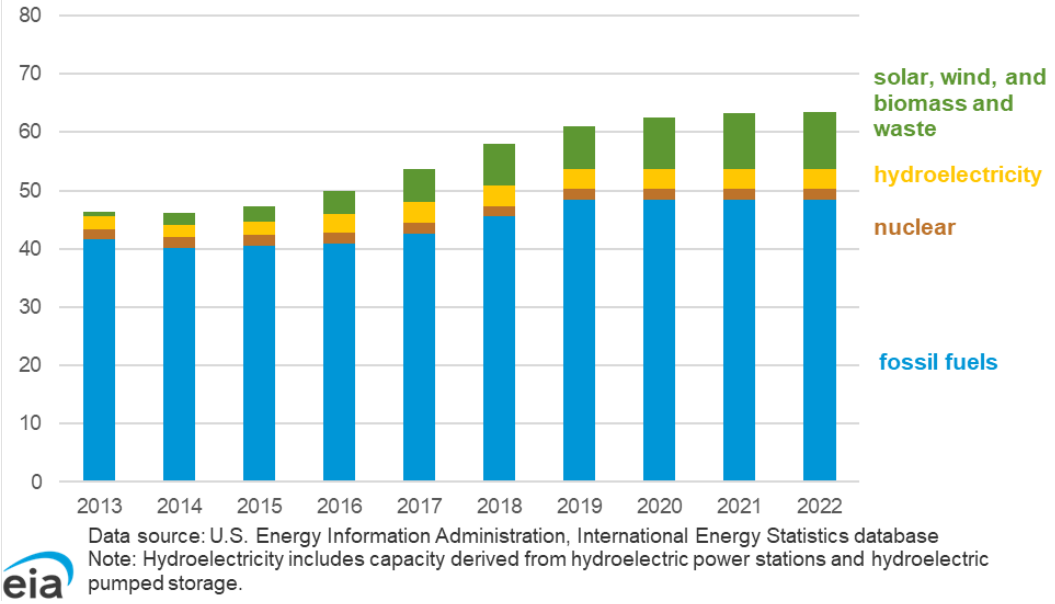


- The Secunda CTL refinery uses coal liquefaction and gasification to produce synthetic liquid fuel and synthetic gas. The Secunda CTL refinery produces synthetic fuels and a range of chemical feedstock for producing solvents, polymers, and chemicals as well as synthetic fuel components and pipeline natural gas. The plant houses two factories and has a total capacity of 150,000 b/d. Secunda CTL is wholly owned and operated by Sasol.[19]

Electricity

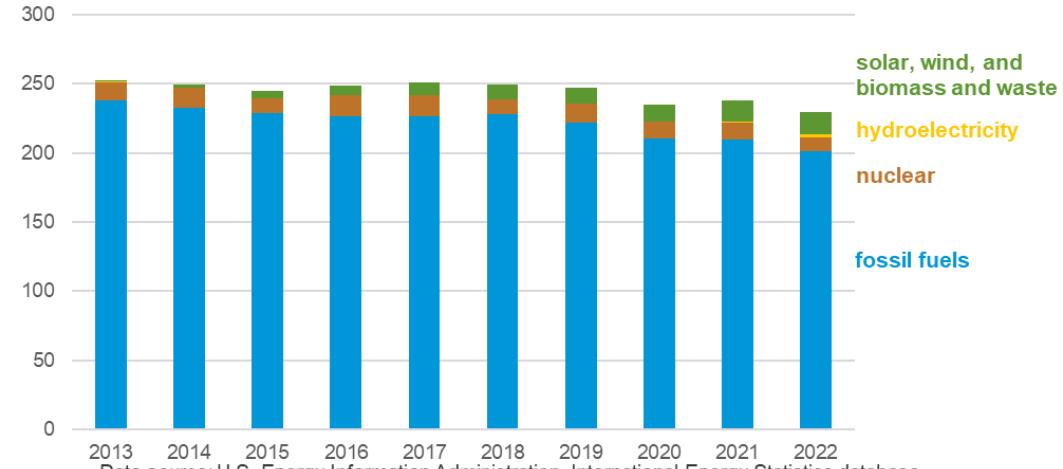
- South Africa had a total installed capacity of 63.4 gigawatts (GW) and generated about 230 gigawatthours (GWh) of electricity in 2022. Fossil fuel-derived generation accounted for approximately 76% of total capacity and approximately 88% of total power generation in that year. As a result of the country's abundant coal reserves and stable domestic coal production, South Africa mainly uses coal-fired power generation to meet its electricity generation needs. However, capacity derived from non-hydroelectric renewable energy sources has been the fastest-growing segment in the electric power sector over the past decade, increasing by about 9 GW during that period (Figure 5 and Figure 6).[20]

Figure 5. South Africa's electricity capacity by fuel type, 2013–2022
gigawatts



Data source: U.S. Energy Information Administration, International Energy Statistics database
Note: Hydroelectricity includes capacity derived from hydroelectric power stations and hydroelectric pumped storage.

Figure 6. South Africa's net electricity generation by fuel type, 2013–2022
gigawatthours



Data source: U.S. Energy Information Administration, International Energy Statistics database
Note: Hydroelectricity includes capacity derived from hydroelectric power stations and hydroelectric pumped storage.

- At the United Nations Climate Change Conference in November 2021 (COP26), the Just Energy Transition Partnership (a partnership involving the governments of South Africa, the United Kingdom, the United States, the European Union, France, and Germany) announced that it will provide an initial commitment of $8.5 billion toward financing South Africa's decarbonization efforts. The initial commitment aims to mobilize private-sector financing through various mechanisms such as grants, concessional loans, and other risk-sharing instruments. The

partnership aims to support South Africa in reducing its use of coal and reducing its emissions by 1.0 gigatonnes to 1.5 gigatonnes over the next 20 years.[21]

- Eskom Holdings SOC Limited (Eskom) is a vertically integrated, state-owned utility company that owns and operates the national electricity grid and most generation assets. Despite Eskom's large presence in the electric power sector, the share of power supplied by independent power producers (IPPs) is growing, in part as a result of the government's renewable energy auction program. Eskom also exports electricity to neighboring countries Botswana, Eswatini, Lesotho, Mozambique, Namibia, Zambia, and Zimbabwe. Eskom states that it supplies about 90% of the power generation in South Africa and the region.[22] South Africa is a member of the Southern African Power Pool (SAPP), which started out in 1995 as the first formal international power pool in Africa. Its mission is to provide reliable and economical electricity supply to consumers in SAPP-member countries through an interconnected electricity grid.[23]
- The electricity network infrastructure in South Africa is aging and poorly maintained; as a result, the country has experienced frequent load shedding events (deliberate shutdowns of parts of the transmission and distribution network to avoid a complete system failure), leading to reliability issues and hindering efforts to expand electricity access in the country. We estimate that South Africa's electricity transmission and distribution losses were about 25 GWh, or around 11% of total power generation, in 2022.[24] To address these issues, the South African government announced in its Integrated Resource Plan 2023 that it is seeking to add about 29.3 GW of additional electricity capacity by 2030, of which about 8.1 GW (28%) is to derive from solar and wind energy sources.[25] In addition, the government is seeking to reform the electric power sector by unbundling Eskom into three separate entities each responsible for the generation, transmission, and distribution segments. Eskom is also seeking to address access and reliability issues by adding about 4,000 miles (or 6,500 kilometers) of transmission lines to connect to the national grid by 2028. Analysts consider progress on these endeavors to be uncertain, given Eskom's financial challenges as well as political sensitivities related to unbundling the utility company.[26]

Thermal energy

- Eskom has been expanding its coal-fired power capacity to meet growing demand. Eskom completed construction of the 4.8 GW Medupi power plant in 2021, but an explosion in August 2021 caused extensive damage to one of the six power generation units, resulting in the plant operating below its full capacity. Repairs to the damaged unit are ongoing, and it will reportedly be ready to restart operations in 2025.[27] The 4.8 GW Kusile power plant began full commercial operations in March 2021, after construction of its third unit was completed and synchronized with the national grid. Once both are fully online, the Medupi and Kusile coal-fired power plants will be two of the largest power plants in the world. These plants highlight the importance of coal in the country's power generation mix, despite small but growing competition from natural gas and renewable energy sources.[28]

Nuclear

- South Africa has two nuclear reactors in operation, both located at the Koeberg plant near Cape Town. The Koeberg plant was commissioned in 1984 and is owned and operated by Eskom. The two reactors collectively provide about 1.9 GW of capacity. The government is seeking to

expand its nuclear power capacity and aims to develop two nuclear power plants that could collectively provide an additional 2.5 GW of capacity. In December 2023, the South African government announced that it would launch a bidding process for investor proposals in 2024.[29]

Renewables

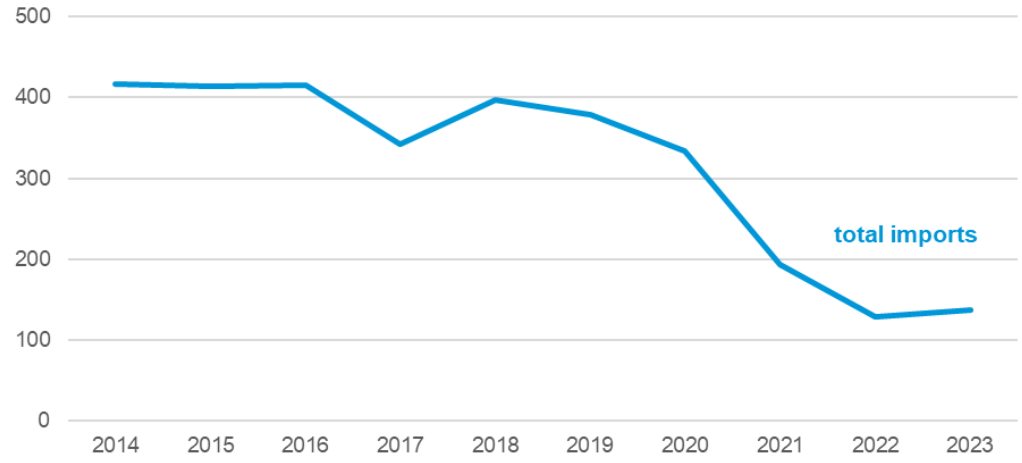
- Hydropower accounts for a small share of South Africa's total electric capacity and generation. South Africa is a relatively dry country, but its rivers in the eastern part of the country are used for hydroelectric power generation. Most of South Africa's hydroelectric power generation comes from four hydroelectric pumped storage plants that generate power by sending water to a dam that, when released, is then used to produce electricity.[30]
- According to the International Trade Administration, power generation derived from non-hydropower renewable sources has a lot of potential for growth in South Africa because of its renewable energy auction program, the Renewable Energy Independent Power Producer Procurement Program (REIPPPP), which has been successful in attracting private sector investment in renewable energy projects. As of January 2024, the REIPPPP has procured approximately 6.4 GW of renewable energy from 112 IPPs over seven bidding auction windows. The REIPPPP is also attractive as an alternative source of power generation because it can enable South Africa to diversify away from power generation sources derived from fossil fuel and help increase access to electricity. The South African government extended the latest bidding auction window to August 2024 and is seeking investors to develop an additional 5 GW of new capacity from solar and wind sources.[31]

Energy Trade

- South Africa does not export any crude oil or condensate; the country uses imports to meet domestic consumption needs. South Africa imported an average of 316,000 b/d of crude oil and condensate between 2014 and 2023, according to estimates by Vortexa and EIA (Figure 7).[32]

Figure 7. South Africa's total annual crude oil and lease condensate imports, 2014–2023

thousand barrels per day

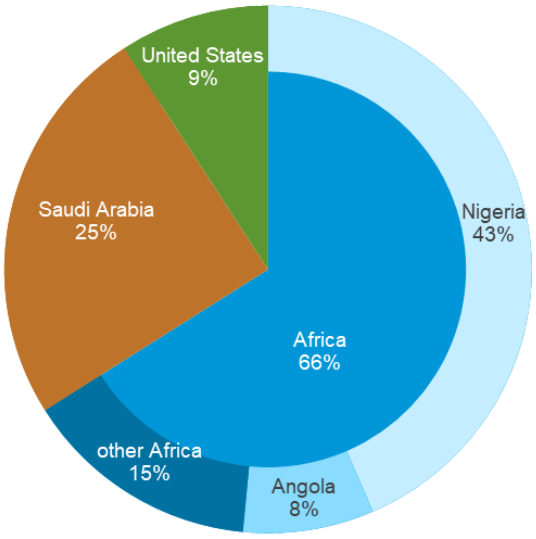


Data source: U.S. Energy Information Administration, International Energy Statistics database and Vortexa

Note: EIA estimates are for 2013–2018; subsequent years are Vortexa estimates.

- In 2023, South Africa imported about 138,000 b/d of crude oil and condensate, with a significant proportion (66%) coming from African countries. Nigeria was the main source of imports for South Africa, accounting for nearly half, or about 60,000 b/d, of the total. Saudi Arabia, the sole supplier from the Middle East, provided about 34,000 b/d, with an additional 13,000 b/d of crude oil and condensate coming from the United States in 2023 (Figure 8).[33]

Figure 8. South Africa's crude oil and lease condensate imports by origin, 2023

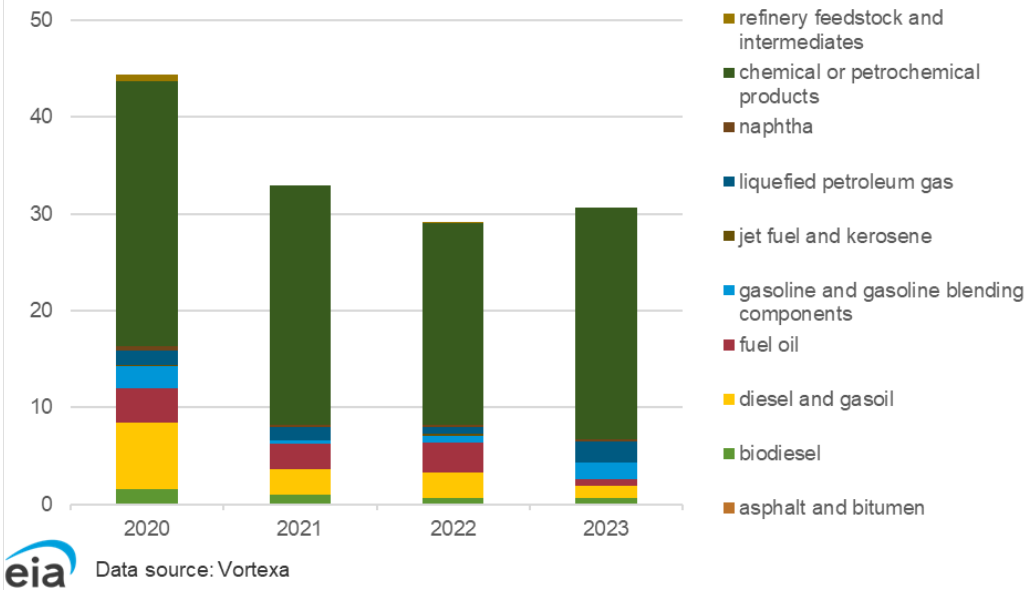


Data source: Vortexa

- South Africa is both an importer and exporter of petroleum products and conducts a substantial of trade through its maritime ports. South Africa imports a wide range of petroleum products for domestic consumption and, according to seaborne trade flow estimates by Vortexa, imported an average of 316,000 b/d of petroleum products between 2020 and 2023; about 75% of this volume was diesel, gasoil, gasoline, and gasoline blending components. South Africa also exports petroleum products through its seaports, albeit in much smaller volumes; South Africa exported an average of approximately 34,000 b/d of petroleum products from 2020 to 2023. Most of South Africa's petroleum product exports (71%) were chemical or petrochemical products; South Africa also exported smaller amounts of diesel, gasoil, and fuel oil (Figure 9 and Figure 10).[34]

Figure 9. South Africa's total annual petroleum product seaborne exports, 2020–2023

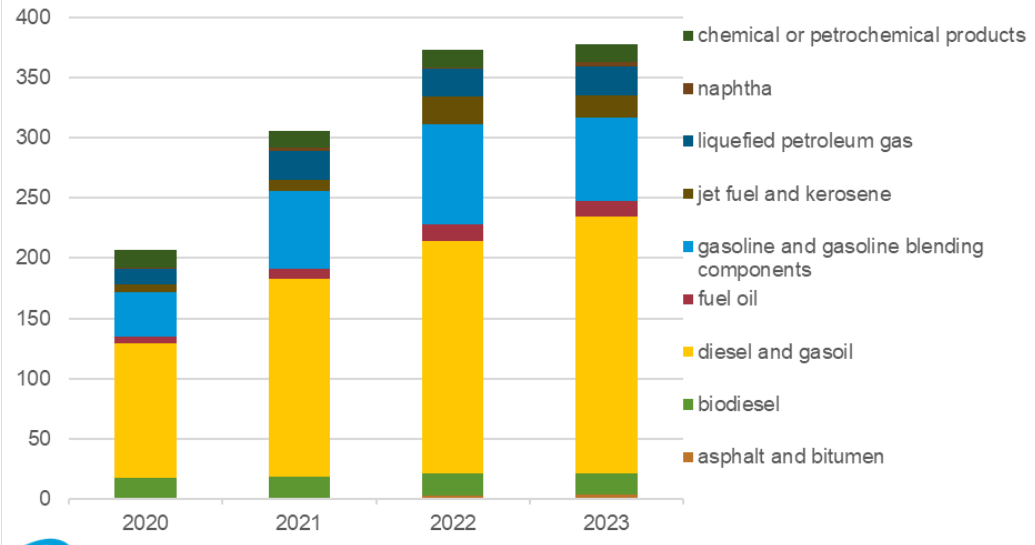
thousand barrels per day



Data source: Vortexa

Figure 10. South Africa's total annual petroleum product seaborne imports, 2020–2023

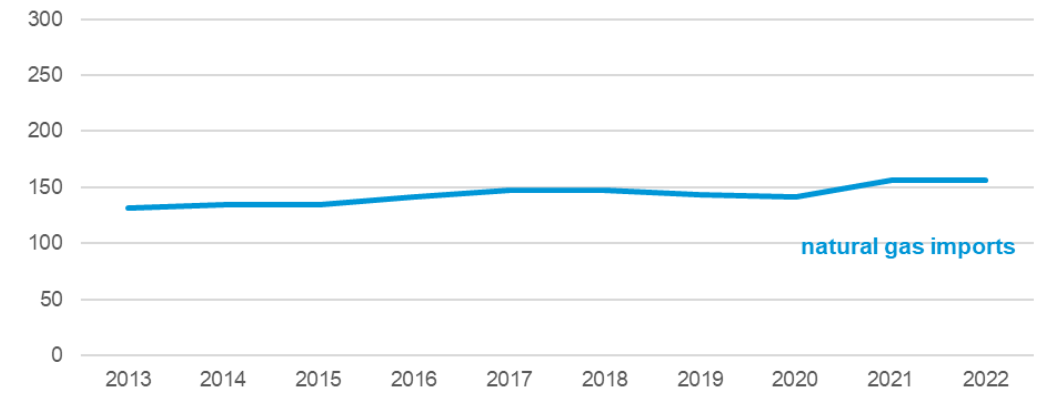
thousand barrels per day



Data source: Vortexa

- South Africa does not export any natural gas and imports natural gas by pipeline to meet domestic consumption. South Africa imported an average of about 143 Bcf per year between 2013 and 2022 (Figure 11).[35]

Figure 11. South Africa's total annual natural gas imports, 2013–2022
billion cubic feet

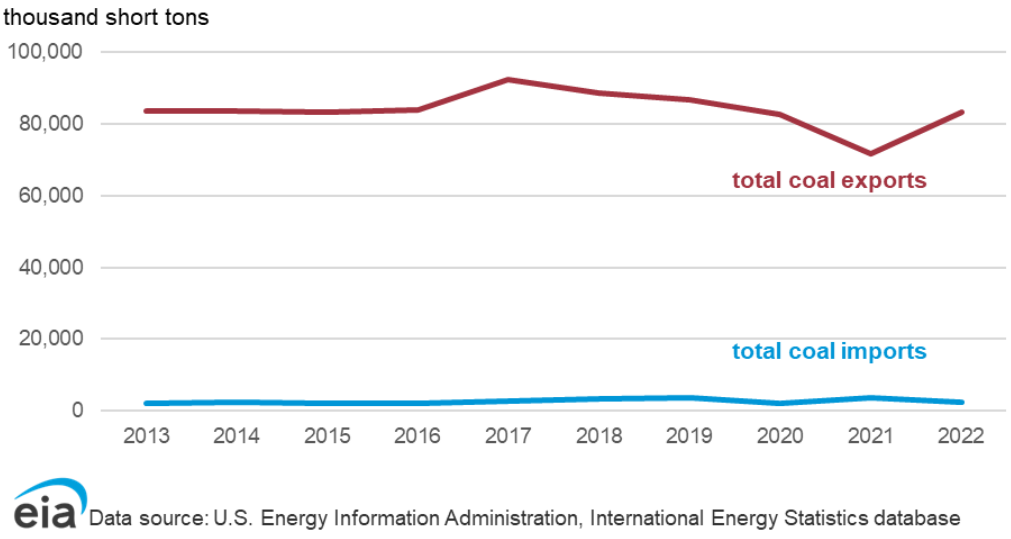


Data source: U.S. Energy Information Administration, International Energy Statistics database

- Imported natural gas comes from Mozambique's Pande and Temane fields and is transported to Sasol's Secunda CTL plant via a 535-mile pipeline called the Mozambique-Secunda Pipeline (MSP). The gas imported from Mozambique is either transported to other provinces in South Africa or used for industrial processes at the Secunda CTL plant. Sasol, the South African government, and the government of Mozambique own the pipeline through a joint venture called the Republic of Mozambique Pipeline Investments Company (ROMPCO). The Pande and Temane fields in Mozambique are aging and, according to a report by Norton Rose Fulbright, natural gas production from these fields will begin declining in the mid-2020s, which will limit Secunda CTL plant operations unless the plant can acquire alternative sources for feedstock.[36]
- South Africa is seeking to expand its natural gas pipeline network through the Africa Renaissance Pipeline (ARP), an $8 billion, 1,615-mile pipeline with a capacity of 635 Bcf per year. In March 2016, a joint venture comprised of Mozambique's national hydrocarbon company and a private sector consortium (which includes South African oil and natural gas company SacOil, the China Petroleum Pipeline Bureau, and Profin Consulting Sociedada Anónima) proposed to build the pipeline, which would transport natural gas from Mozambique's Rovuma Basin to South Africa's Gauteng province. However, the midstream project has not reached a final investment decision and is unlikely to meet its target completion date of 2026.[37]
- South Africa currently does not have any liquefied natural gas (LNG) terminals, but the government is looking to develop LNG infrastructure to diversify natural gas import supply and increase natural gas consumption. In January 2024, the government selected a consortium composed of Royal Vopak, a Dutch company, and state-owned Transnet Pipelines as the preferred bidder to develop and operate an LNG import terminal at the Port of Richards Bay. The proposed LNG import terminal, known as the Zululand Energy Terminal, is planned to be developed in two phases and provide a total capacity of 5 million metric tons per year (or about 240 Bcf per year) when fully completed. It will include a floating storage unit, LNG storage, and an onshore regasification system. The Royal Vopak consortium aims to bring the first phase online by 2027.[38]

- As a result of plentiful domestic coal reserves, South Africa imports relatively small amounts of coal, but it is a significant exporter of the commodity; South Africa imported an average of 2.7 MMst per year of coal between 2013 and 2022 but exported an average of 83.9 MMst per year during the same period. Most of South Africa's coal is exported via the Richards Bay Coal Terminal (RBCT), and the remainder is shipped via the Maputo and Durban terminals. RBCT is located on the eastern coast of South Africa and is one of the world's largest coal export terminals; it has a capacity of 91 MMst per year. The state-owned company Transnet controls the railways that transport coal from the mines to coal terminals (Figure 12).[39]

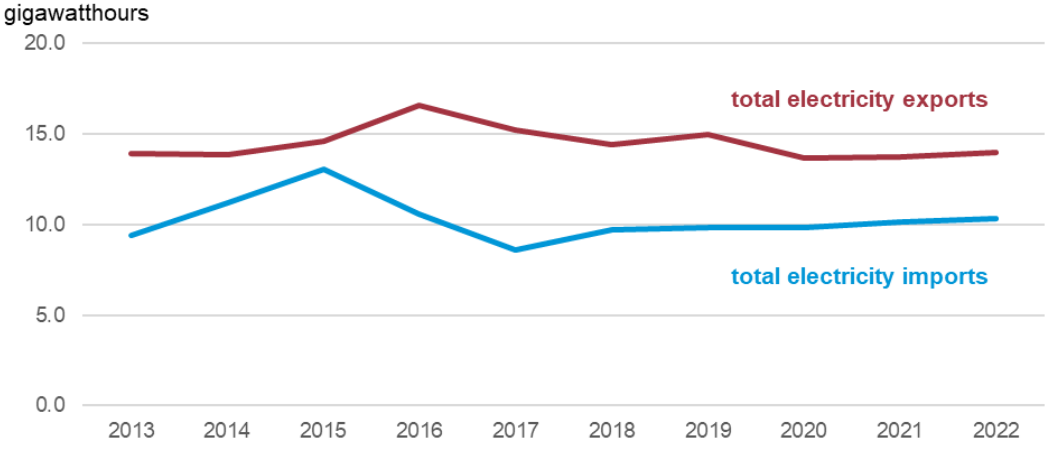
Figure 12. South Africa's total annual coal imports and exports, 2013–2022



eia Data source: U.S. Energy Information Administration, International Energy Statistics database

- As a SAPP-member country, South Africa trades electricity with other member countries through an interconnected electricity grid. Between 2013 and 2022, South Africa exported an average of 14.5 GWh and imported an average of about 10.3 GWh during the same period (Figure 13).[40]

Figure 13. South Africa's total annual electricity imports and exports, 2013–2022



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