



Home > Country Analysis Briefs > **Southern Africa Country Analysis Brief**

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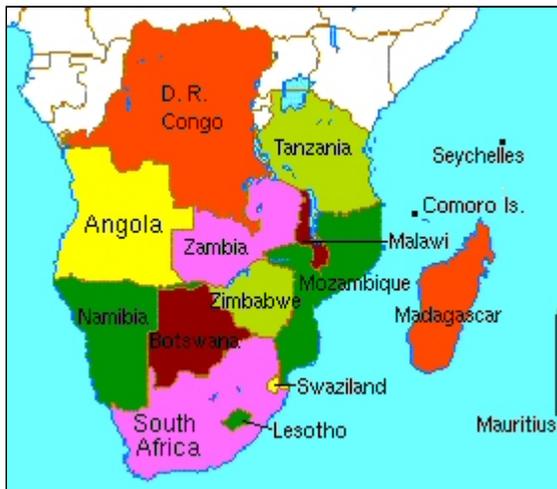
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[Background](#) | [Energy Overview](#) | [Oil](#) | [Natural Gas](#) | [Coal](#) | [Electricity](#) | [Renewable Energy Summary Tables](#) | [Links](#)

## Southern Africa and the Southern African Development Community

*The following provides a brief economic and energy sector overview of Southern Africa, including the fourteen countries that make up the Southern African Development Community (SADC). SADC member-states are [Angola](#), Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, [South Africa](#), Swaziland, Tanzania, Zambia and Zimbabwe. Overviews of non-SADC countries Comoros & Madagascar are also included.*

*Note: The information contained in this report is the best available as of April 2004 and is subject to change.*



### BACKGROUND

The Declaration and Treaty establishing the [Southern African Development Community \(SADC\)](#) was signed at the Summit of Heads of State or Government on July 17, 1992, in Windhoek, Namibia. SADC replaced the Southern African Development Coordination Conference (SADCC), in existence since 1980. South Africa joined SADC in 1994 followed by Mauritius (1995), the Democratic Republic of Congo -- DRC (1997), and Seychelles (1997). Uganda's application for membership in SADC, submitted in the fall of 2000, is currently awaiting SADC approval. Comoros and Madagascar, with SADC-members Angola, DRC, Malawi, Mauritius, Namibia, Seychelles, Swaziland,

Zambia and Zimbabwe, are members of the [Common Market for Eastern and Southern Africa \(COMESA\)](#). The Seychelles recently indicated its intention to leave SADC, while Madagascar has applied for membership.

Tanzania's President, Benjamin William Mkapa, is the current SADC Chairman. President Mkapa is continuing the process of restructuring the SADC mandate to focus on regional economic integration and regional poverty alleviation. Current SADC objectives include harmonization and rationalization of policies and strategies for sustainable development in all areas, as well as the successful implementation of the SADC Trade Protocol (Protocol). The Protocol, which calls for an 85% reduction of internal trade barriers, went into effect on September 1, 2000. The full implementation of the Protocol is on track. In October 2000, COMESA launched its own free trade regime, creating overlapping schedules with SADC for internal tariff reductions. Within the SADC region, the national currencies of Namibia, Lesotho, and Swaziland are linked to the South African rand through the Common Monetary Area (CMA). SADC members are working to eliminate

exchange controls in preparation for an eventual single currency in the region.

In March 2004, the SADC executive secretary announced a strategic plan that sets out measures and time frames for the economic integration of the region. Some of the outlined measures include: the creation of a free trade area by 2008; establishment of a SADC customs union and implementation of a common external tariff by 2010; elimination of exchange controls on intra-SADC transactions by 2006; establishment of a SADC central bank and preparation for a single SADC currency by 2016; the creation of a SADC regional development fund and self-financing mechanism by 2005; and a common market pact by 2012.

The plan also states that policies, regulations and legislation on petroleum, gas and electricity in all SADC countries are to be harmonized between 2004 and 2006.

### **ECONOMIC OVERVIEW**

In 2003, the combined Gross Domestic Product (GDP) for Southern Africa was estimated at \$173.8 billion (see [Table 1.](#)). Individual national economies are structurally diverse and at varying stages of development. South Africa, the region's most developed economy, has a GDP of \$156.9 billion, which is nearly ten times the combined GDP of the other Southern African countries. While the region's economies grew at a combined rate of 2.7% in 2003, the substantial external debt of individual states remains a big problem. Challenges of post-war disarmament and reconstruction (in Angola and DRC), and continuing internal strife (Zimbabwe) also have adversely affected economic performance in several states. According to the April 2004 IMF assessment, the Zimbabwean economy has experienced a sharp deterioration over the past five years. Zimbabwe's real GDP has declined by about 30% during that period, and is still contracting, while inflation doubled in each of the last three years to reach 600% at the end of 2003. The economies of DRC and Angola have begun to experience slight levels of GDP growth as peace agreements in both countries begin to take hold.

On December 30, 2003, President Bush approved the designation of Angola as the 37th sub-Saharan African country eligible for tariff preferences under the [African Growth and Opportunity Act \(AGOA\)](#). As required by the legislation, this annual determination signifies which countries are making continued progress toward a market-based economy, the rule of law, free trade, economic policies that will reduce poverty, and protection of worker's rights. Comoros, DRC and Zimbabwe were the only countries in the region not covered by AGOA.

Foreign direct investment to SADC countries other than South Africa in 2002 and 2003 amounted to an estimated \$7.72 billion. In addition, South Africa's investments into the region consisted of over \$3 billion during those two years. Most of the investment went into mining operations throughout the region, into industrial sectors of Mozambique, and into oil exploration efforts in Angola.

### **ENERGY OVERVIEW**

Overall Southern Africa is a net energy exporter. In 2001, the countries of Southern Africa collectively consumed (see [Table 2.](#)) 5.4 quadrillion British thermal units (Btu) of commercial energy (1.4% of total world consumption) and produced 7.7 quadrillion Btu (2.3% of total world production). Also in 2001, the region generated 119.2 million metric tons of carbon dioxide emissions (1.9% of the world total). The region's dominant economy, South Africa, accounted for 85.1% (4.6 quadrillion Btu) of the region's energy consumption, 72.7% (5.6 quadrillion Btu) of its energy production, and 88.4% (105 million metric tons) of its carbon dioxide emissions.

Commercial energy resources in the region are diverse, with significant reserves of coal, petroleum,

and natural gas. Electricity in Southern Africa is generated through thermal or hydroelectric resources (with one nuclear facility in South Africa). Natural gas is becoming more significant to the region's energy sector as fields off Mozambique, Namibia, South Africa and Tanzania are developed.

Due to the region's relatively small urban population (approximately 25.4%), access to commercial energy sources is limited. The majority of Southern Africa's population still relies on the use of biofuel (wood and charcoal) as its primary source of energy. Biofuel accounts for approximately 75% of total final energy demand in the region. The countries with the highest rates of biofuel consumption are Tanzania, Mozambique, Zimbabwe, Zambia and Malawi.

SADC representatives announced plans to elevate its energy technical unit (ETU) to a regional energy commission. The commission is being designed to facilitate regional integration in the energy sector. The ETU started its operations in April 2001 in Luanda, Angola.

## **PETROLEUM**

Angola is Southern Africa's only significant oil producer, production averaged 923,000 barrels per day (bbl/d) in 2003. Angola's estimated proven crude reserves of 5.4 billion barrels constitute 96% of the region's estimated proven crude reserves. Smaller reserves are found offshore DRC and South Africa. The region's refineries are concentrated in South Africa, with additional refining capacity located in Angola, Madagascar, Tanzania and Zambia. In 2003, South Africa produced around 182,000 bbl/d (see [Table 3](#)). South Africa is the region's largest oil consumer (over 71% of the region's total), and is the second largest oil consumer in Africa behind Egypt. South Africa also is the continent's largest net oil importer.

### **Exploration and Production**

Since 2000, nearly a dozen major oil discoveries in Sub-Saharan Africa-- most located in deeper waters offshore Cabinda and Angola proper -- have been announced. In December 2001, the Girassol field, located on Block 17 went into production. Full production of nearly 200,000 bbl/d from Girassol began in the first quarter of 2002. Dalia, the second big field on Block 17, is expected to be as big a producer as Girassol, with daily output close to 200,000 bbl/d and initial production anticipated in early 2006.

Production from other recent regional discoveries are planned to come online in the next few years. BP plans to utilize a floating production, storage and offloading (FPSO) vessel on its Greater Plutonio project on Block 18 in Angola. First oil from the Greater Plutonio project is likely in late 2005, and it will have a production capacity of 250,000 bbl/d. ExxonMobil's \$3 billion Kizomba A, also in Angola, is targeted to have a peak production of 250,000 bbl/d. First oil is scheduled for late 2004. In August 2002, ExxonMobil commenced construction of the Xikomba deepwater development offshore Angola. An estimated 100 million barrels of recoverable resources exist in the field, with first oil production began in late 2003. Chevron's Benguela, Belize, Tomboco and Lobito fields are expected to come onstream some time in 2005, with output in the first phase pegged at 140,000 bbl/d in 2005 and then rising to over 200,000 bbl/d once all the fields are in production. Overall, by early 2004, Angola's production reached nearly 950,000 bbl/d and is expected to double by early 2008, as new deep-water production sites are expected to begin operating in earnest.

South Africa's Oribi oil field began production from an FPSO in May 1997, the country's first conventional oil production. The field currently produces a light oil at the rate of 10,000 bbl/d with 15 million cubic feet per day (Mmcf/d) of associated gas, which is flared. The Oryx field, which lies 3.7 miles from Oribi, began production in May 2000, and currently produces at 12,000 bbl/d.

PetroSA (formerly Soekor) plans to concentrate its exploration efforts on South Africa's western and southern coasts. Several discoveries have been made within the Bredasdorp Basin on Block 9. Oribi and Oryx are located on Block 9. Another significant find, Sable, has been made on the block. PetroSA, and its Sable field partner Pioneer Natural Resources (Pioneer) announced plans for the development of the Sable field in June 2001. The field will be developed with six subsea wells tied back to a FPSO with a capacity to process 60,000 bbl/d of oil, re-inject 80 Mmcf/d of natural gas, and recover natural gas liquids. Production of 40,000 bbl/d began in the third quarter of 2003.

In 1999, the Namibian government announced an open licensing system for both onshore and offshore exploration, under which applications for exploration permits will be accepted at any time. In 2000, the northernmost Namibian area, Block 1711, was awarded to a US firm, Vanco Energy. The company announced in May 2003 its plans to drill an exploration well on the Kunene oil prospect, whose estimated reserves were shown to be 700 million barrels and 6 trillion cubic feet (Tcf) of gas. In March 2001 an open-ended licensing round was launched jointly by the National Petroleum Corporation of Namibia and Angola's state oil company, Sonangol. This covers eight blocks in the Namibe Basin, which straddles the maritime border between the two countries, although only Block 1711 is within Namibian waters. In 2003, a joint venture between a consortium, the First African Oil Corporation, and the National Petroleum Corporation of Namibia was awarded a concession running from the area near Rundu and Ruacana, on the border with Angola, to Tsumeb.

In July 2001, Vanco contracted for a seismic survey of its Majunga Offshore Profond Block offshore Madagascar. In March 2002, Vanco signed a PSC for this block, the first awarded in the Majunga Basin since 1997. The block covers 3.57 million acres. U.S.-based Xpronet announced that it has signed two PSCs with Madagascar's Office of National Mines and Strategic Industries in December 2000. The PSCs grant the company petroleum exploration and production rights for the Mavony and Rivomena blocks, offshore the west coast of Madagascar. Xpronet holds 100% of the operator's interest in the PSCs. In 2003, Vanco was able to locate a field containing heavy oil offshore. The oil was deemed to lie too deep on the seabed and to be too heavy to be commercially viable.

In 2001, ChevronTexaco's Misato exploration well made a marginal oil discovery on DRC's continental shelf. This was the first wildcat drilled in DRC since October 1998. It was completed and brought into production in March 2001. Onshore in DRC, Perenco successfully drilled a development well in the Kinkasi field during October 2001, with the well coming online the following month. In May 2003, Angola began talks with DRC to demarcate the countries' maritime border areas that are projected to contain several important deep-water offshore blocks. In the former rebel-held areas of Eastern DRC, the Calgary-based Heritage Oil Corp. is planning to start drilling work on the first exploratory oil wells. The company is in talks with the Kinshasa government over terms of a PSC in the area contiguous to Block 3 of Heritage's neighboring Uganda concessions. Heritage began drilling in Block 3 in Uganda in August 2001.

In February 2004, officials from the Nacala Development Corridor (NDC) Project announced that they expect completion by the end of 2004 of long-awaited feasibility studies for a multi-million dollar oil pipeline linking Mozambique's seaport of Nacala to Malawi. Following completion of the studies, the NDC Project (which also includes Zambia), plans to begin construction on a 249-mile pipeline, which is expected to greatly reduce transport costs for the countries involved. The ultimate cost of the pipeline is estimated at nearly \$1 billion dollars.

### **Refining**

Southern Africa's petroleum refining is concentrated in South Africa. South Africa's four refineries

have the capacity to process 519,547 bbl/d of crude. Other Southern African refineries are in Angola (Luanda, 39,000 bbl/d); Madagascar (Toamasina, 15,000 bbl/d); Tanzania (Dar es Salaam, 14,900 bbl/d) and Zambia (Ndola, 23,750 bbl/d).

Angola's Sonangol has announced plans for the construction of Angola's second refinery. The facility, with a potential refining capacity of 200,000 bbl/d, is to be built near the coastal city of Lobito. The \$3.6 billion refinery is expected to begin operations in 2006. Diesel and gasoline produced in the refinery will meet technical and environmental specifications required in targeted markets such as the United States, Western Europe and South Africa. TotalFinaElf, operator of the Luanda refinery, plans to raise capacity to 60,000 bbl/d by 2004. Two processing units will be enlarged and a third scrapped to boost efficiency. The refinery needs to adapt by 2005 to product specifications set by SADC. These include phasing out lead and increasing the octane content in gasoline. The refinery produces almost all of Angola's domestic requirements of gasoline, kerosene and jet fuel.

TotalFinaElf acquired the refining and marketing assets of Agip in Zambia in April 2002 as part of consolidating its position in Africa. Through the transaction, TotalFinaElf has acquired a 50% interest in Zambia's Indeni refinery and will provide technical support for the refinery. The Zambian government will retain control of the remaining half.

In December 2003, it was announced that US-registered Global Energy Overseas has been awarded a license to build and operate a refinery at Walvis Bay in Namibia. The country has no refinery of its own and has been seeking for several years to build one. In addition to Global Energy, Namibian government awarded another license to build a refinery to Polbasa 2000, a South African firm.

### **Consumption**

Petroleum consumption in Southern Africa averaged 664,000 bbl/d in 2003. The vast majority of petroleum consumed in the region is imported; Angola and DRC are the only net exporters of petroleum. The transportation sector consumes approximately 50%. Kerosene is extensively used in rural areas for lighting and, in the urban areas, for cooking and lighting as well. Liquefied petroleum gas (LPG) is also used for cooking, particularly in Angola. Several countries in the region -- particularly Zimbabwe -- have recently experienced periodic, sometimes severe, petroleum shortages.

In late January 2004, Zambia announced that it has finalized a deal with Iran for it to supply nearly 4,320,000 barrels of crude oil -- Zambia's entire annual requirement, in 2004.

All of Botswana's refined oil needs are supplied by South Africa, except for a small supply to the western part of the country by Namibia. Namibia itself, acquires 90% of its petroleum requirements from South Africa.

Malawi imports all of its petroleum. Most of the country's fuel imports are supplied via Tanzanian and South African ports, although additional sources of imports via Mozambique, are also being developed. Current oil imports are delivered to Malawi via tanker trucks. In July 2003, it was announced that a new 248-mile pipeline and additional storage facilities capable of storing up to 60,000 tons of refined oil products, are to be constructed. The pipeline will run from the Mozambiquan port of Nacala to the town of Liwonde in Malawi.

The Comoros, Seychelles and Mauritius islands import most of their fuel energy requirements.

### **Oil Integration**

The 1,069-mile Tanzania-Zambia Tanzama Pipeline transports crude from the oil storage facility at Dar es Salaam, Tanzania to Zambia's Indeni refinery in Ndola. The pipeline, jointly owned by the governments of Zambia (67%) and Tanzania (33%), has a capacity of 22,000 bbl/d. In 2003, the Zambian government continued to study plans for the privatization of the Tanzama Pipeline.

The Mozambique-Zimbabwe Petrozim Petroleum Products Pipeline runs from the Mozambican port city of Beira to Feruka, Zimbabwe and from there to Msasa, which is located near the capital city of Harare. Noczim imports 80% of Zimbabwe's petroleum through the pipeline. Petrozim is a joint-venture between Noczim and the South African-based Lonhro. Zimbabwe's Noczim is planning to construct an additional oil-product pipeline from Beira to Msasa. The 500-mile oil pipeline would help to meet Zimbabwe's growing oil demand.

### **NATURAL GAS**

There are significant reserves of natural gas in Southern Africa. Field discoveries have been confirmed and reserves have been proven in Angola (1.6 Tcf); DRC (35 billion cubic feet--Bcf); Madagascar (70 Bcf); Mozambique (4.5 Tcf); Namibia (2.2 Tcf); South Africa (780 Bcf) and Tanzania (800 Bcf) (see [Table 4](#)). Southern Africa contains approximately 2.5% of Africa's natural gas reserves. Although natural gas is still in early stages of use in the region, several projects for the expansion of its use are under way.

Angola is developing projects to utilize associated natural gas, which is currently flared or re-injected (approximately 83%). ChevronTexaco and a consortium of oil companies, including ExxonMobil, BP, TotalFinaElf and Norsk Hydro, are planning to gather associated natural gas from deepwater fields and develop shallow water fields in the Congo Basin as part of the Angola liquefied natural gas (LNG) project. In March 2002, participation agreements between the oil companies and Sonangol were signed. Associated gas gathered from the huge deepwater projects in Blocks 15, 17 and 18 including Girassol, Kizomba and Greater Plutonio will be piped to a central gas compression complex located over the Atum field in Block 2. The gas will then be pumped from the complex to Luanda where the consortium will construct an LNG plant. The Angola LNG project is expected to come onstream in 2007. The LNG plant is expected to consist of a single train with capacity of producing four million tons per year of LNG. The plant design will include the potential to add a second four million-ton train. ChevronTexaco is studying methods of laying a pipeline across the Congo River to utilize gas offshore in Cabinda. Large associated and non-associated gas reserves are found in Cabinda, and if the pipeline is constructed the gas can be utilized by the LNG project. Angola is exploring further uses for the gas, including power generation and a gas-to-liquid fuels project.

Tanzania plans to develop two offshore natural gas fields to provide fuel for power generation. One project aims to exploit natural gas in the country's largest known field, Songo-Songo, located in the Indian Ocean southeast of the capital Dar-es-Salaam. Natural gas from the Songo-Songo field will be transported to Dar es Salaam by a 130-mile pipeline. Upon completion of the project, five liquid fuel turbines at the 112-megawatt (MW) Ubungo power plant will be converted to natural gas, and the power generated by the plant will be fed directly into the national grid. The World Bank has approved \$183 million in financing for the Songo Songo project. Plans call for other industrial users to utilize Songo-Songo gas, and the pipeline could be extended to the Kenyan port city of Mombasa to supply gas for industrial usage and power generation.

A second Tanzanian project would utilize natural gas reserves from the Mnazi Bay field. The gas will be piped to the southern Tanzanian town of Mtwara for use in power generation. The proposed 15-MW generating plant could later be expanded to 50 MW. In 2003 the plan has remained frozen

by the World Bank, awaiting the completion by the government of the energy sector reforms.

South Africa's FA field currently produces at a rate of 194 Mmcf/d of natural gas and 9,500 bbl/d of condensate. An offshore natural gas discovery was made in March 2000 close to South Africa's border with Namibia. Located in Block 2, off South Africa's western coast, the find is reportedly part of the same reservoir, which extends to Namibia's Kudu prospect. Denver-based Forest Oil Corporation (Forest), which operates the field, estimates total reserves for the discovery (renamed Ibhubezi) at 2.5 Tcf.

In late February 2004, South Africa's synthetic fuels and chemicals producer Sasol announced the first delivery from Temane natural gas fields in Mozambique to Sasol's synfuels plant at Secunda, near Johannesburg. The gas was delivered using the 536-mile transport pipeline that runs from the Mozambican fields to Secunda. The \$1.2 billion pipeline and gas development project, a joint venture of Sasol and the governments of Mozambique and South Africa, consists of Pande and Temane gas field developments, a central gas processing facility in Mozambique, the pipeline, the conversion of Sasol's existing gas pipeline network beginning in March 2004, the supply of gas to industries, and the conversion of Sasol Infrachem feedstock in Sasolburg to natural gas from coal by the end of May 2004. Sasol plans to also use the gas as supplementary feedstock for its Secunda synfuels plant.

In September 2003, the South African energy minister outlined a general timetable for the construction of gas pipelines in which the state-owned oil company Petro SA will participate. The minister indicated that once the gas pipeline between Temane in Mozambique and Secunda in South Africa is fully operational, South Africa will build another to supply the Western Cape from either the Kudu fields in Namibia or the Ihubesi fields in South Africa. A third pipeline will subsequently link the West coast to Guateng province via Sishen, followed by a fourth that is to be built to supply Port Elisabeth.

In March 2004, it was announced that the US Trade and Development Agency (USTDA) provided a grant to the local Botswana Development Corporation (BDC) to enable the completion of a project feasibility study regarding the development of a coal bed methane (CBM) project. As a result, BDC subsequently retained the services of Advanced Resources International Inc. (ARI) of the US to complete the study. The project sponsors, the privately-owned Botswana Gas Corporation and the Botswana Department of Water, hold development leases for 1.9 million acres of land which contain an estimated 12.8 Tcf of CBM. The project is intended to capture and process CBM from coalfields in eastern Botswana's Lephepe and Moijabana coal fields. The undertaking is intended to meet growing domestic and regional demand for a low-cost, clean and efficient fuel for power plants as well as feedstock for industrial processes. The study is scheduled to be completed by July 2004.

Additional coalbed methane exploration studies by Botswana's Department of Geological Survey revealed that the coal beds within the Kalahari Karoo basin project area contain significant amount of gas-in-place resources. The project, performed through drilling, coring, and testing, revealed that the coal beds within the project area contain an estimated gas-in-place resource of 60 Tcf, in addition to the 136 Tcf estimated to be contained in the associated carbonaceous shales, bringing the total to 196 Tcf of gas-in-place.

In December 2003, the World Bank's private sector arm, the International Finance Corporation (IFC), announced its participation in a \$1 billion venture headed by South Africa's Sasol to develop natural gas fields in Mozambique. The project aims to produce nearly 2.3 Tcf of gas over the 25-year expected life of the fields in Mozambique's Inhambane province. The IFC is contributing \$18.5

million of the \$220 million estimated cost for development of the fields. The World Bank helped finance a 615-mile pipeline system that began transporting the gas to South Africa in late February 2004. Mozambique state oil company ENH is also participating in the venture.

In January 2004, the Namibian government, through the state-owned Namcor, announced the acquisition of a 10% interest in the offshore Kudu gasfield license. The move follows a December 2003 announcement that ChevronTexaco was relinquishing its interest in Kudu, ostensibly because it did not align with the firm's West African strategy. This left South Africa-based (but Malaysian-owned) Energy Africa as the sole permit holder and operator. ChevronTexaco itself, became the major partner in the Kudu field (discovered in 1974), after Shell withdrew from the project in 2002 having concluded that reserves were insufficient for large-scale exports but had made no move to carry out further drilling. Estimated proven reserves are considered to be 1.3 Tcf. The cost of the first phase of Kudu's development which involves piping gas ashore to an 800-MW power station at Oranjemund is estimated to already be at \$400 million.

## COAL

Coal resources are abundant in Southern Africa, especially in South Africa, where recoverable reserves are estimated at 54.6 billion short tons, representing 6% percent of world recoverable coal reserves. The total recoverable coal reserves in the region amount to 60.7 billion short tons. In 2001, regional coal production reached nearly 257.0 million short tons (Mmst), of which South Africa produced 250.3 Mmst (see [Table 5](#)). The primary use of coal in the region is in the generation of electricity. Coal generates a significant portion of the electricity in Botswana, South Africa and Zimbabwe. South Africa also uses coal to produce synthetic fuels and chemicals, while Zambia uses coal in the mining transformation process. South Africa consumed the vast majority (96%) of the region's coal in 2001. Total coal consumption for 2001 in Southern Africa came to at total of 183.6 mmst.

In April 2004, the chairman of the Brazillian mining giant, the Companhia do Vale do Rio Doce (CVRD), announced the company's intention to revive Mozambique's Moatize mines, following the "highly promising" geological viability studies conducted over the course of previous several years. The Moatize mine in northwestern Mozambique was initially operated by the South African-steel producer, Iscor, in the 1970's. High production costs and lack of infrastructure led to Iscor's withdrawal in 1977. The re-development project would include the development and improvement of mine facilities and the establishment of a rail line to supply coal to the Mozambican port of Beira, as well as for use in neighboring Zimbabwe, Malawi, Zambia and DRC. Port facilities at Beira would also be upgraded. The Moatize mine would have the capacity to produce 3.3 Mmst of coking coal annually, as well as quantities of steam coal. Additional studies on the extent of the coal reserves and the feasibility of the revival of the mines are expected to take a further 6 months.

Despite increases in production, Malawi's Mchenga coal mine continues to produce below peak output owing to financial constraints. The coal mine's reserves are estimated to be at 2.3 Mmst. The mine, which by 2003 began producing 0.06 Mmst annually, hopes to raise output to at least 0.20 Mmst by the end of 2004. Malawi is currently estimated to consume approximately 0.07 Mmst of coal annually. In order to meet the growing demand, and to try to reduce the growing reliance on imported coal, Malawi plans to develop the Lengwe Mwabvi fields in the lower Shire River valley in the country's Southern areas.

Zimbabwe's petroleum shortages also have affected the country's coal industry. The National Railways of Zimbabwe (NRZ), which transports the majority of the coal produced at Zimbabwe's Wankie Colliery, has been forced to ground some of its trains because of diesel fuel shortages. Industrial facilities, including Zimbabwe's Hwange Power Station, have been forced to scale back

production.

## **ELECTRICITY**

Southern Africa's total installed electric generating capacity was 55,756 MW at the beginning of 2001, the majority of which was thermal (see [Table 6](#)). Total electricity generation for the region in 2001 was 230.8 billion kilowatthours (bkwh). Net hydroelectric generation was 30.4 bkwh, with Zambia (7.7 bkwh), Mozambique (7.0bkwh) and the DRC (5.2 bkwh) being the largest generators. In 2001, total regional electricity consumption was 211.9 bkwh, led by South Africa's 181.2 bkwh (85.5%). Zimbabwe (9.8 bkwh, 4.6%), Zambia (5.5bkwh, 2.6%) and the DRC (3.8 bkwh, 1.8%) were the next largest electricity consumers.

Created in 1995, the [South African Power Pool \(SAPP\)](#) aims to link SADC member states into a single electricity grid. The national utilities currently participating in the SAPP are Angola's Empresa Nacional de Electricidade (ENE), the Botswana Power Corporation (BPC), the DRC's SNEL, the Lesotho Electricity Corporation (LEC), Malawi's Electricity Supply Commission (MESC), Mozambique's Electricidade de Mocambique (EDM), Namibia's NamPower, South Africa's Eskom, the Swaziland Electricity Board (SEB), Tanzania Electric Supply Company (Tanesco), Zambia's ZESCO, and Zimbabwe's ZESA. SAPP's coordination center is located in Harare, Zimbabwe.

Eskom, South Africa's state-owned electricity supplier, is a significant provider of energy to the African continent. It supplies more than 95% of the country's electricity. Around 74% of South Africa's electricity supply comes from coal-fired power stations (proven coal reserves are expected to last more than 150 years). The African continent's one nuclear power plant is situated in Koeberg, near Cape Town, supplying electricity to the economically important Western Cape province. It has a further active lifespan of about 30-40 years; at present there are no plans to expand nuclear energy.

The DRC has extensive energy resources, including hydroelectric potential estimated at 100,000 MW. The [Inga](#) dam alone, on the Congo River, has a potential capacity of 40,000-45,000 MW, sufficient to supply all of Southern Africa's growing electricity needs. Due to continuing political uncertainties and the resulting lack of investor interest, only a fraction of this amount has been developed at Inga. Total installed generating capacity was estimated at 2,473 MW in 2001. However, actual production is estimated at no more than 650-750 MW, largely because two-thirds of the turbines at Inga are not functioning. South Africa's Eskom, is currently involved in the rehabilitation of the Inga dam. The DRC exports hydroelectricity to its neighbour, Republic of Congo along a 220 kilovolt (KV) connection. The interconnection supplies nearly one-third of the electricity consumed in Congo-Brazzaville. Power from Inga is also transmitted to the Zambian grid along a 500-KV DC line from Inga to Kolwezi in southern DRC, and a 220-KV line from Kolwezi to Kitwe in northern Zambia. South Africa also imports DRC's energy output through the SAPP grid. In 2003, talks were also initiated to supply power to electricity-starved Zimbabwe.

In November 2003, BPC, Eskom, ENE, NamPower and SNEL formed the Westcor Power Project. The project's proclaimed aims are to provide low-cost, affordable and environmentally friendly electricity to ensure that economic development in the region is not constrained by capacity shortages. The first phase of the project will cost an estimated US \$4 billion, according to a report by Eskom, and includes the building of a 3,500 MW Inga III hydropower station in DRC, with interconnections for about 1,864 miles of power transmission lines to supply the five Westcor countries. Inga III is the third of four hydropower plants due to be developed along the Congo River. A further phase - beyond Inga III - is Grand Inga, with a potential output of some 39,000 MW. The plan will eventually extend to building hydropower stations in Angola and Namibia.

Depending on the outcome of the feasibility studies, the project is due to begin in 2010.

Mozambique's Cahora Bassa hydroelectric facility is located on the Zambezi river in the western Mozambican province of Tete. The power station's nominal capacity is estimated at 2,075 MW, and it currently supplies electricity domestically, as well as to Zimbabwe and South Africa. Cahora Bassa is operated by Hidroelectrica de Cahora Bassa (HCB), a joint-venture between Portugal and EDM. Currently, Mozambique is seeking funds to modernize the Cahore Bassa at an expected cost of US \$40 million. The Mozambican government is also seeking investors for a second hydroelectric facility on the Zambezi River. The \$1.3- billion Mepanda N'cua dam is to be built south of the existing Cahora Bassa dam. The new facility will have a capacity of 2,400 MW. The government expects construction to begin in 2005, and generation to begin in 2010. The Mepanda dam will also help to reduce the impact of floods in the Zambezi valley.

In June 2003, it was announced that HCB won the tender to supply Malawi with electricity for a 20 year period starting in 2004. According to the tender documents, the Electricity Supply Corporation of Malawi will be responsible for the transmission line from the dam town of Songo to the Malawian commercial capital of Blantyre, and will have to obtain the necessary funding. The cost is estimated at US \$80 million. Work on the line began in late 2003 and is due to be completed in 2004. HCB will eventually supply Malawi with up to 300 MW of power, though it will initially begin supplying 100 MW. The two countries began work on the interconnection of their respective electricity grids, in 1998.

In 2003, Malawi has continued to experience frequent electricity shortages due to damage to the country's powerstations caused by severe flooding, and as a result of the overall lower than expected water levels on the Shire River. Additional problems result from the continuing breakdowns in the country's power transmission network. The Shire river supports four Malawian hydroelectric plants, which account for the majority of the country's electrical output. The previously stated deal on the construction of the 131-mile power-supply link from Mozambique's Cahora Bassa dam, is designed to decrease the country's reliance on the Shire River hydroelectric plants. Currently, the lack of available resources prevents the project from moving forward. Additional work continues on the Kapichira hydroelectric power scheme that is designed to add 128 MW to the country's current capacity.

The Muela hydroelectric power station, build during phase 1A of the Lesotho Highlands Water Project (LHWP), opened in September 1998. The resulting electricity production ended Lesotho's previous dependence on imported electricity from South Africa and resulted in Lesotho's self-sufficiency in electric power. Fully operational since January 1999, the plant has a capacity of 80 MW, but this is due to increase to 110 MW when phase 2 of the LHWP goes ahead. Currently there are plans to privatize the operation of the plant, although no specific time schedule has been established.

In August 2003, it was announced that the Swaziland Electricity Board (SEB) and the European Investment Bank (EIB) had signed a \$9.3 million loan agreement covering the construction of a hydroelectric power station at the Maguga dam on the Komati River. The total cost of the project is estimated to amount to \$23.6 million, to be spent on purchasing two 2.5-MW turbines, two 11.3-MW generators and the construction of a 66-KV transmission line. The Maguga project forms part of the Swazi government's plan to reduce the importation of electricity from almost 100% of consumption at present to 80%. Most of the country's electricity is currently supplied by South Africa.

Botswana plans to provide electricity to 70% of the population by March 2009 and to the rest of its

citizens by 2016. Currently, only 22% of Botswana's population has access to electricity. Botswana is continuing talks with Eskom and Nampower concerning the importation of additional electricity into the country. At present, nearly 60% of national demand is fulfilled by power imports, but Gaborone is keen to reduce this dependence, in part by developing its large reserves of (low-grade) coal. Through government funding, BPC is engaged in a major programme to extend the electricity grid into rural areas, the largest phase of which was completed in early 2004. BPC plans to spend a total of \$700 million to extend the company's transmission and distribution systems.

In March 2003, it was announced that a proposal to build a hydropower plant at Botswana's Popa Falls had been rejected on environmental grounds. Concerns centered on possible damage to the Okavango Delta, the country's premier tourist attraction. The Popa Falls project, which had the potential for 20-30 MW of power generating capacity, was strongly backed by Namibia's NamPower. Construction of the dam was due to start in mid-2004.

In January 2004, the South African government announced its intentions to encourage the private sector to move into power generation in the country.

In an effort to better deal with the issues of frequent blackouts and inefficiencies in the operations of the national water and power utility, Jirama, the Malagasy energy minister announced a new round of bidding open to private firms interested in operating the Madagascar company. The round is set for mid-April 2004.

About 50% of Namibia's electricity comes from its own generating sources. The remaining 50% is imported from South Africa. The main domestic electricity source is the Ruacana hydropower plant. The production level is cyclical, so imports from South Africa are needed to make up the difference between local demand and the periodic gaps in production from Ruacana. Over the last few years, total demand has outstripped the local generating capacity so that even when Ruacana is producing at full capacity, imports are needed to meet Namibia's domestic demand for electricity. The current import agreements between Namibia and South Africa are scheduled to expire in 2005, so Namibia is actively seeking alternative sources, including possible gas-to-electricity (GTE) supplies from the soon to be producing Kudu gas fields, as well as potential hydroelectric supplies from the Kunene River on the border with neighboring Angola.

In February 2004, Eskom of South Africa and HCB of Mozambique announced their refusal to renew contracts with the Zimbabwe Electricity Supply Authority (ZASA). The failures to conclude numerous supply agreements with its African neighbors, due to non-payments of previous delivery charges, has put Zimbabwe in a difficult situation of facing potential power blackouts. Zimbabwe currently imports about 35% of its electricity requirements.

Throughout 2003 and the early months of 2004, Tanzania's electricity supply has remained erratic due to the national grid's heavy reliance on hydroelectric power, which in turn was impacted by poor rainfall. Tanzania Electricity Supply Company (Tanesco) is considering the utilization of the gas to be supplied by the Songo Songo fields and the possibility of linking with the Zambian electricity grid as means of boosting power supply to the country.

Zambia has abundant hydroelectric sources and meets most of its energy needs from its own hydroelectric stations, which are operated by the state-owned and soon to be privatized Zambia Electricity Supply Company (Zesco). Zambia provides considerable electricity exports to its regional neighbors, especially Tanzania and Kenya, and in 2003, was actively seeking foreign investors from China and other countries to refurbish and upgrade its hydroelectric plants.

## RENEWABLE ENERGY/ENVIRONMENT

The Compagnie Thermique de Belle Vue (CTBV), a joint-venture composed of Harel Freres (51%) of Mauritius, France's Cidec (27%), the Sugar Investment Trust of Mauritius (14%) and the State Investment Fund (8%), in early 2001 built a 70-MW IPP facility north of the Mauritian capital of Port Louis. The CTBV plant utilizes bagasse (biomass refuse from the processing of sugar cane) as its primary fuel. Swaziland also expressed interest in feasibility studies of utilizing its own sugar cane bi-products for electricity production.

In November 2001, a 20-MW steam-turbine/generator for a sugar mill near Chirezdi, Zimbabwe was commissioned, but due to the difficult economic and political situation in the country, is currently on hold. The facility, owned by Hippo Valley Estates, is expected to use steam generated from burning bagasse to generate the mill's electrical power. The exhaust steam will be used in the sugar refining process.

Solar energy is being viewed by several countries in the region as a prime tool to speed up rural electrification programs, which have been slowed by the high costs of grid extension services. Zambia, Namibia and South Africa are developing programs to utilize solar energy for off-grid (rural) electrification. Zambia's government has taken steps to encourage investment in solar energy by eliminating all import duties on solar panels and waiving the otherwise obligatory annual license fees for solar energy projects. In April 2002, Namibia's President Nujoma officially opened a solar module factory in northern Namibia. Mauritius is also examining several projects designed to utilize solar energy to provide electricity for street lamps in its capital city.

Southern Africa faces various **environmental problems**, including pollution of water supplies, deforestation, desertification, pollution associated with oil and gas development, and dramatic decline in biodiversity throughout the region.

*Sources for this report include: Africa Analysis; African Energy; Africa Energy Intelligence; AllAfrica.com; BBC News; CIA World Factbook; Economist Intelligence Unit; Energy Information Administration; Factiva Inc.; Global Insight; International Monetary Fund; Mbendi; Oil and Gas Journal; Petroleum Economist; Reuters; U.S. Energy Information Administration; World Bank; World Markets Analysis.*

## SUMMARY TABLES

<b>Country</b>	<b>Gross Domestic Product (GDP), 2003E (Billions of U.S. \$)</b>	<b>Real GDP Growth Rate, 2003 Estimate</b>	<b>Real GDP Growth Rate, 2004 Projection</b>	<b>Per Capita GDP, 2002E</b>	<b>Population 2003E (Millions)</b>
Angola	\$10.0	4.4%	11.4%	\$650	13.9
Botswana	\$5.1	3.7%	3.6%	\$2,980	1.6
Comoros	\$0.2	2.5%	3.0%	\$380	0.6
Democratic Republic of	\$7.0	5.0%	6.0%	\$90	53.6

Congo					
Lesotho	\$0.8	4.2%	4.4%	\$480	2.2
Madagascar	\$4.6	6.0%	6.0%	\$240	16.0
Malawi	\$1.5	6.5%	5.2%	\$160	10.5
Mauritius	\$4.5	3.3%	5.5%	\$3,900	1.2
Mozambique	\$2.4	7.0%	8.0%	\$210	19.4
Namibia	\$2.9	3.7%	4.7%	\$1,840	1.8
Seychelles	\$0.6	-5.1%	-2.0%	\$6,530	0.1
South Africa	\$156.9	2.2%	3.0%	\$2,520	45.7
Swaziland	\$1.2	1.5%	1.6%	\$1,220	1.1
Tanzania	\$8.9	5.5%	6.3%	\$280	36.2
Zambia	\$3.1	4.5%	4.5%	\$330	9.8
Zimbabwe	\$9.4	-11.0%	5.1%	\$570	11.4
<b>Regional Total/Average</b>	<b>\$173.8</b>	<b>2.7%</b>	<b>4.8%</b>	<b>\$1,399</b>	<b>219.5</b>

Sources: Central Intelligence Agency World Factbook; International Monetary Fund; World Bank

<b>Country</b>	<b>Total Commercial Energy Consumption, (Quadrillion Btu)</b>	<b>Total Commercial Energy Production, (Quadrillion Btu)</b>	<b>Net Energy Exports, (Quadrillion Btu)</b>	<b>Carbon Dioxide Emissions (Million metric tons of carbon)</b>
Angola	0.093	1.608	1.515	3.59
Botswana	0.069	0.025	-0.044	1.23
Comoros	0.001	0.000	-0.001	0.03
Democratic Republic of Congo	0.078	0.107	0.029	0.73
Lesotho	0.004	0.000	-0.004	0.06
Madagascar	0.033	0.006	-0.027	0.52
Malawi	0.019	0.008	-0.011	0.22
Mauritius	0.047	0.001	-0.046	0.88
Mozambique	0.037	0.075	0.038	0.39
Namibia	0.033	0.000	-0.033	0.50
Seychelles	0.008	0.000	-0.008	0.17
South Africa	4.600	5.593	0.993	105.18
Swaziland	0.023	0.009	-0.014	0.32
Tanzania	0.061	0.025	-0.036	0.72
Zambia	0.089	0.085	-0.004	0.56
Zimbabwe	0.242	0.158	-0.084	3.92
<b>Regional</b>				

<b>Total</b>	<b>5.437</b>	<b>7.7</b>	<b>2.263</b>	<b>119.02</b>
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Sources: Energy Information Administration

<b>Country</b>	<b>Petroleum Production, 2003 (Thousand Barrels Per Day)</b>	<b>Petroleum Consumption, 2003 (Thousand Barrels Per Day)</b>	<b>Petroleum Net Exports, 2003 (Thousand Barrels Per Day)</b>	<b>Crude Oil Reserves, 1/1/2004 (Million Barrels)</b>	<b>Crude Oil Refining Capacity, 1/1/2004 (Thousand Barrels Per Day)</b>
Angola	922.7	33.0	889.7	5,412.0	39.0
Botswana	0.0	21.0	-21.0	0.0	0.0
Comoros	0.0	1.0	-1.0	0.0	0.0
Democratic Republic of Congo	22.0	12.0	10.0	187.0	15.0
Lesotho	0.0	2.0	-2.0	0.0	0.0
Madagascar	0.0	15.0	-15.0	0.0	0.0
Malawi	0.0	6.0	-6.0	0.0	0.0
Mauritius	0.0	23.0	-23.0	0.0	0.0
Mozambique	0.0	9.0	-9.0	0.0	0.0
Namibia	0.0	15.0	-15.0	0.0	0.0
Seychelles	0.0	4.0	-4.0	0.0	0.0
South Africa	182.0	470.0	-288.0	15.7	519.5
Swaziland	0.0	3.0	-3.0	0.0	0.0
Tanzania	0.0	18.0	-18.0	0.0	14.9
Zambia	0.0	11.0	-11.0	0.0	23.8
Zimbabwe	0.0	21.0	-21.0	0.0	0.0
<b>Regional Total/Average</b>	<b>1,126.7</b>	<b>664.0</b>	<b>462.7</b>	<b>5,614.7</b>	<b>612.2</b>

Sources: Energy Information Administration, Oil & Gas Journal

<b>Country</b>	<b>Production, 2002</b>	<b>Consumption, 2002</b>	<b>Reserves, 1/1/2004</b>
Angola	21.90	21.90	1,620
Botswana	0.00	0.00	0
Comoros	0.00	0.00	0
Democratic Republic of Congo	0.00	0.00	35
Lesotho	0.00	0.00	0
Madagascar	0.00	0.00	0

Malawi	0.00	0.00	0
Mauritius	0.00	0.00	0
Mozambique	2.12	2.12	4,500
Namibia	0.00	0.00	2,200
Seychelles	0.00	0.00	0
South Africa	81.22	81.22	1
Swaziland	0.00	0.00	0
Tanzania	0.00	0.00	800
Zambia	0.00	0.00	0
Zimbabwe	0.00	0.00	0
<b>Regional Total</b>	<b>105.24</b>	<b>105.24</b>	<b>9,156</b>

Sources: Energy Information Administration; Oil and Gas Journal

<b>Table 5. Coal Overview (Million Short Tons)</b>			
<b>Country</b>	<b>Production, 2001</b>	<b>Consumption, 2001</b>	<b>Reserves</b>
Angola	0.00	0.00	0.00
Botswana	1.06	1.09	4,739.94
Comoros	0.00	0.00	0.00
Democratic Republic of Congo	0.11	0.26	97.00
Lesotho	0.00	0.00	0.00
Madagascar	0.00	0.01	0.00
Malawi	0.00	0.02	2.20
Mauritius	0.00	0.07	0.00
Mozambique	0.02	0.04	233.69
Namibia	0.00	0.00	0.00
Seychelles	0.00	0.00	0.00
South Africa	250.28	176.64	54,586.46
Swaziland	0.32	0.32	229.28
Tanzania	0.01	0.01	220.46
Zambia	0.21	0.21	11.02
Zimbabwe	4.96	4.97	553.36
<b>Regional Total</b>	<b>256.97</b>	<b>183.64</b>	<b>60,673.41</b>

Sources: Energy Information Administration

<b>Table 6. Electricity Overview, Billion Kilowatthours except where noted</b>					
<b>Country</b>	<b>Consumption, 2001</b>	<b>Generation, 2001</b>	<b>Installed Capacity, 1/1/2001 (gigawatts)</b>	<b>Exports, 2001</b>	<b>Imports, 2001</b>
Angola	1.35	1.45	0.586	0.00	0.00

Botswana	1.56	0.41	0.217	0.00	1.18
Comoros	0.02	0.02	0.005	0.00	0.00
Democratic Republic of Congo	3.84	5.24	2.473	1.10	0.06
Lesotho	0.04	0.00	0.00	0.00	0.04
Madagascar	0.77	0.83	0.285	0.00	0.00
Malawi	0.72	0.77	0.308	0.00	0.00
Mauritius	1.22	1.31	0.365	0.00	0.00
Mozambique	1.39	7.19	2.388	5.80	0.50
Namibia	0.60	0.03	0.00	0.00	0.58
Seychelles	0.15	0.16	0.028	0.00	0.00
South Africa	181.24	195.64	44.683	6.91	6.20
Swaziland	0.96	0.35	0.131	0.00	0.64
Tanzania	2.75	2.91	0.620	0.00	0.05
Zambia	5.46	7.75	1.786	1.75	0.00
Zimbabwe	9.81	6.73	1.881	0.00	3.55
<b>Regional Total</b>	<b>211.88</b>	<b>230.79</b>	<b>55.756</b>	<b>15.56</b>	<b>12.80</b>

Sources: Energy Information Administration

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