



South Africa's Coal & Mining Industries

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Webinar Agenda

- Gain an understanding of the opportunities that exist in the South African market for U.S. companies,
- Learn about the importance of coal in the South African economy, and
- Gain insight into which technology requirements exist in South Africa's coal environment and related sectors.
- Questions and answers



Economic Overview

- GDP: USD 283 billion (2007), USD 6,648 per capita
- Economic growth of 5.1% in 2007, 4% in 2008
- 2007 Total Imports: USD 79.9 billion, with U.S. having 8%, Germany 12%, China 11%
- 2007 Total Exports: USD 69.8 billion, with U.S. having 10.72%, Japan 10.25%, Germany 7%
- USD 15.2 Billion in two-way trade (2007)
- JSE – stock exchange among the world's 20 largest



South Africa's Regional Importance

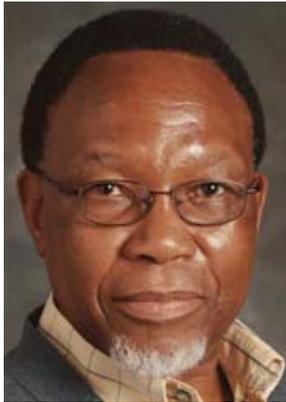
- 6% of the population (48.7 million)
- 24% of continent-wide GDP
- 50% of electrical generation
- 45% of mineral production
- 50% of purchasing power





Political Overview

- Parliamentary democracy
- ANC – split in 2008
- April 2009





South Africa and the U.S.: Partners in Trade

Key sectors:

- Vehicles and parts, wheat, non-crude oil, electrical power generation and distribution systems, telecommunications equipment and franchising.
- US-SA export growth rate:
 - 2008 – 18% (thru Oct 08)
 - 2007 – 19%
 - 2006 – 20%
 - 2005 – 6%
- The U.S. is the second largest foreign direct investor in South Africa.



South Africa and the U.S.: Partners in Trade - Largest US Investors

- Chevron
- Coca Cola
- Dow Chemicals
- IBM
- 3M
- Goodyear
- Ford
- McDonalds
- Eli Lilly
- General Electric
- General Motors
- Minute Maid
- Nike
- Colgate-Palmolive
- Deloitte & Touche
- Levi Strauss
- Microsoft
- Dell
- Sara Lee
- Caterpillar
- HP



Market Challenges & Opportunities

Challenges:

- Competitor nations
- Skilled labor
- BEE

Opportunities:

- A sophisticated and sound banking sector;
- Infrastructure improvements;
- Gateway to other countries in southern Africa;
- U.S. branded goods continue to gain market share;
- Infrastructure Development;
- 2010 FIFA World Cup Soccer



Drivers of Growth - Infrastructure

- Government is planning USD 80 billion upgrade by 2011
 - Electricity generation, USD 40 billion
 - Transportation upgrade, USD 6 billion
 - Communications upgrade 6 billion
- Private sector plans another USD 100 billion capital expenditure:
 - Manufacturing
 - Mining / Metallurgy
 - Tourism



Drivers of Growth - 2010 FIFA World Cup Soccer

- The largest sporting event – larger than the Olympics
- Building or refurbishing nine municipal stadiums
- Upgrading urban transport systems
- Upgrading airports
- Dramatically improving communications backbone
- Investing in security networks
- Upgrades of tourism facilities: hotels, lodges, car rental, catering, retail, franchise, etc



Drivers of Growth - Black Economic Empowerment

- BEE is designed to create economic opportunity for historically disadvantaged groups.
- It is the law – government procurement, licensing, permitting, government ownership of shares
- Has lead to a surge in Black urban middle class
- Has created growth opportunities in all consumer goods and services sectors
- BEE is a bedrock for political stability in South Africa



The South African mining and quarrying industry is...

- Well-developed and a net-exporter of sophisticated goods and services covering extraction, handling, transportation and beneficiation / refining
- Up to mid 2008 experiencing its biggest growth in exploration and take-over of juniors with new concessions
- Was experiencing a big increase in real, fixed investment (25% in 2007)
- The main provider of goods, services and expertise to the mining industries of Sub-Saharan Africa



The role of coal in South Africa...

- South Africa's economy is overwhelmingly dependent on fossil fuels.
- Coal provides nearly three quarters of total primary energy, supports almost 90 per cent of electricity generation,
- And provides feedstock for close to a third of the country's liquid fuels via Sasol's coal-to-liquids (CTL) process.
- In addition, roughly a third of the nation's annual coal output is exported, generating an important source of foreign exchange earnings.



with future demand by ESKOM...

- Growth in coal use – especially by Eskom and Sasol – is expected to accelerate over the next few years.
- Eskom is in the process of returning to service three coal-fired power stations (Camden, Grootvlei and Komati) with a combined capacity of 3800 megawatts (MW). It has also begun construction of the new 4800 MW Medupi power station, whose first unit is due to begin generation in 2012, while a second plant called Project Bravo (5400 MW, scheduled to start generating power in 2013) was recently given the go-ahead.
- The combined consumption of these five power plants could raise Eskom's coal use by over 50 mt per year



then add SASOL = 40 % increase...

- For its part, Sasol has announced that it is conducting feasibility studies for an expansion of its existing synfuels plant at Secunda by 20 per cent (or 30,000 barrels per day) and for the construction of a new plant (called Mafutha) with a capacity of 80,000 barrels per day. If both of these projects come on stream, they could raise the demand for coal by approximately 25 million tons a year.
- In short, domestic demand for coal could rise by 75 million tons or over 40% over the next decade. Only from about 2025 when the decommissioning of older coal-fired power plants begins could one expect consumption of coal to start falling (provided no further coal-fired plants are built).



Clean Coal Technology

- Suppliers and users will be required to develop the coal resource in a considerably cleaner and more efficient manner than has been the case to date.
- Clean Coal Technology (CCT) in South Africa requires that all aspects be considered with respect to improvements in the extraction, production, beneficiation, utilization and environmental management of coal and its carbon-based derivatives
- There are two immediate options to explore both thermal / calorific efficiency, as well as clean combustion:



Carbon Capture and Storage (CSS)

- CSS has received a lot of attention, but the development of economical technology could take many years .
- Whether or not CCS will someday become technically viable in South Africa, it looks highly likely that carbon sequestration at existing plants would substantially increase the costs of coal-based electricity and/or liquid fuels.



Underground Coal Gasification (UCG)

- UCG may provide a partial solution to many coal-related challenges in South Africa by substantially extending the amount of economically recoverable coal reserves while also limiting the environmental damage.
- Eskom and Sasol are currently working jointly to develop an alternative technology for extracting the energy from coal by means of UCG. Eskom estimates that an additional 45 billion tons of coal could be exploited through UCG with reduced mining health and safety risks, and with much less environmental impact (in terms of groundwater contamination, land degradation and subsidence, and greenhouse gas emissions) than conventional mining.
- Eskom's small pilot UCG plant in operation at the Majuba power station in Mpumalanga is generating 100 kilowatts of electricity.



Other technology requirements (1)

- De-stoning of raw coal to improve efficiency.
- Sulfur reduction for coal utilization.
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- The partitioning of trace elements in coal seams.
- Fluidized bed beneficiation for coal in South Africa.
- Electrostatic separation in the upgrading of fine coal prior to utilization.



Other technology requirements (2)

- X-Ray transmission to sort coal from torbanite that is widespread in South Africa.
- Advanced carbon products and graphite.
- Coke prediction technologies.
- Anthracites as a substitute for coke in metallurgical processes.
- Chemical looping combustion for pure CO₂ capture during power generation.
- Eradication of methane from mines.
- Geological sequestration of CO₂.
- Coal handling technologies, especially is adverse wet conditions.
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Coal Technology Services

There is also the need to optimize combustion, calorie output and emissions through improved services. These include:

- The determination of the coal quality reserves in South and southern Africa.
- The economics of coal resources in small scale mines
- Review and evaluation of combustion prediction formulae
- Combustion optimization by accurate air flow, fuel flow and unburned carbon measurement



Coal Technology Services (2)

- **Characterization of South African coals & chars in fluidized bed gasification**
- **Characterization of lump coal from a pipe reactor**
- **Prediction of lump coal physical-property behavior**
- **Determining particle density on the gasification of high-ash, inertinite-rich coals**
- **Increasing electric efficiency of waste-fired power plants by managing kaolinite on alkali deposits.**



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