Energy and other supply constraints:  
A planning perspective
Introduction

- South Africa underinvested in infrastructure from the mid-1980s to about 2003
- We have to undergo a major modernisation of our infrastructure
- This provides both opportunities and risks
- It will require an economic adjustment that will bear long-term benefits
- There are complex, multiple objectives involved and significant risk of things going wrong
- Economic infrastructure is both an enabler of economic growth and a structural determinant of the pattern of growth
  - E.g. If we have abundant, cheap electricity, we bias electricity-intensive industries
  - E.g. If our ports are set up to export coal as opposed to fruit, it biases the economy in favour of coal exports
- The economics of economic infrastructure is complex
  - Markets often fail due to network externalities, size of project, natural monopoly, long lead times etc
  - Government often fail because of unclear mandates, political interference, uncosted social objectives, poorly aligned incentive structures, complex regulatory regimes
Gross fixed capital formation (% of GDP)
GFCF by major sector
Major policy challenges

- Multiple objectives of investment
  - Security and adequacy of supply
  - Lowest cost (competitiveness)
  - Help to change pattern of economic growth
  - Help to change spatial patterns of development
  - Climate change objectives
  - Sustainable funding models
  - Raise national savings

- Balance between low prices and cash to renew investments
  - ... in the context of a savings constrained economy

- Markets are now always good at providing price signals

- What institutional reforms will help deliver on these objectives?

- Large backlog of maintenance is pushing up costs of operations

- Poor quality operations in many (but not all) areas
Funding/pricing dilemmas

- Who should pay – user or taxpayer?
  - Given our distance from large markets, is there a case for a fiscal subsidy for competitiveness reasons?
  - User pays principle

- How quickly do we push up prices
  - Quickly – because we have a supply shortage and prices are the best mechanism to constrain demand and we need to raise the cash to invest in new capacity
  - Slowly – because higher prices means we are less competitive, higher inflation and higher interest rates (and there are inefficiencies within the utility)
Security of supply – IRP2 as an example

- What demand growth projection do we use?
  - Energy intensive users would like 5% growth
  - Environmentalists would like close to zero

- What price is socially, politically, economically and financially feasible?
  - Too high a price and we would constrain demand
  - Too low and price and we may run out of electricity

- Other variables: carbon price, local jobs, BoP, risks, water requirements

- We chose to optimise model on price first and then imposed constraints such as carbon price, water usage and need for some localisation
IRP2 – finding the balance

**Base Scenario**
- Total capacity (2030): Base load - Coal 72%, Renewables 3%

**Balanced Scenario**
- Total capacity (2030): Base load - Coal 48%, Renewables 16%
- Diversified ~20% Re 33% less Coal

- Carbon intensity
  - Base Scenario
  - Low Carbon
  - Balanced

- Indicative price path
  - Low Carbon
  - Balanced
  - Base Scenario

- Water usage
  - 230 MCM (2010)
  - 270 MCM (2010)
Electricity sector: options for institutional reform

- What institutional framework would balance security of supply with efficient operations
- Everyone agrees that there should be some sort of independent buyer, either external or a ring-fenced entity within Eskom (at first)
- Everyone agrees that we need independent power producers and we have made significant progress in making this happen
- Some argue that Eskom should be vertically unbundled
  - I am not yet convinced, given experience with British utility unbundling
South Africa is already starting to import some refined product

Most refineries are at the coast, most demand is inland
  ◦ New pipeline to be completed by 2014

What options do we have:
  ◦ Build a new oil refinery (Muthombo)
  ◦ Build a new coal to liquid refinery (Mafutha)
  ◦ Expand capacity at existing refineries
  ◦ Import refined product

Difficult decision
  ◦ Decision must be made on the basis of sound economic analysis taking into account cost to the consumer, BoP, effects on the cost of capital, the environment, security of supply etc
Water is a scarce resource and the Minister acts as a Public Trustee for the country’s water resources. The role players are:

- The Department of Water Affairs manages the water resources (i.e. raw water);
- Local government assisted by water boards manages potable water and sanitation services.

South Africa has an extensive water infrastructure network comprising of:

- 267 government owned water resources projects with a total storage capacity of 34 174 million m$^3$ – annually delivering 8 618 million m$^3$ of bulk raw water;
- 820 water treatment works delivering more than 9 000 megalitres of treated water per day;
- More than 850 waste water treatment works treating approximately 7 589 megalitres waste water per day;
- Assets with a capital replacement cost in excess of R 200 billion.

The condition of sector infrastructure varies as there is:

- A backlog of R 10 billion on rehabilitation / maintenance of water resources infrastructure;
- An estimated need of R 113 billion to upgrade and refurbish bulk water and sanitation infrastructure owned by municipalities;
- The expansion of services and maintenance of existing infrastructure are hampered by under-recovery of the real cost of providing water. The full cost recovery (i.e. for the developing, operating and managing of the water resource) is only achievable for commercially viable projects.

5 of the 19 water management areas experience water shortages (scenario 2000); 4 have water surpluses and remainder are in balance. In 2025 shortages will become more prevalent if proper attention is not given to providing more water and better use of existing water resources and water-related infrastructure (scenario 2025).
**Major water resource projects**

**MOKOLO AND CROCODILE RIVER (WEST) AUGMENTATION PROJECT**
- 15 million m\(^3\) of water per annum for ESKOM (Medupi PS);
- 8 million m\(^3\) of water per annum for mining; and
- 7 million m\(^3\) of water per annum for domestic use

**VAAL RIVER EASTERN SUB SYSTEM AUGMENTATION PROJECT**
- 96 million m\(^3\) of water per annum for ESKOM; and
- 64 million m\(^3\) of water per annum for SASOL

**CLANWILLIAM DAM**
- 70 million m\(^3\) of water per annum for existing and new irrigation farmers

**OLIFANTS RIVER WATER RESOURCES DEVELOPMENT PROJECT**
- 40 million m\(^3\) of water per annum for domestic use; and
- 40 million m\(^3\) of water per annum for mining

**KOMATI WATER SYSTEM AUGMENTATION PROJECT**
- 54 million m\(^3\) of water per annum for ESKOM

**MOOI MNGENI TRANSFER SCHEME (PHASE 2)**
- 60 million m\(^3\) of water per annum for domestic use

**HAZELMERE DAM**
- 10 million m\(^3\) of water per annum for domestic use

National Planning Commission
Policy challenges in the water sector

- Complex institutional arrangements
- Some municipalities are simply failing to maintain the infrastructure
- Prices have to rise, but here prices have a direct impact on the poor and on food prices
- There are long term challenges in relation to climate change, the cost of transporting water and the need to support food export sectors
- Acid mine drainage
Road, rail and ports

- South Africa has an extensive transport infrastructure network – the backbone of the economy
  - 752 700 km road network
  - 2228 km of passenger rail network in major cities
  - 12 801 km of core rail network and 7 278 km of secondary network (branch lines).
  - 8 commercial ports

- The condition of sector infrastructure varies between the sub-sectors.
  - Most national roads are in fair to very good condition, The core rail network is in good condition and profitable to Transnet.
  - However, the secondary rail network is in poor to very poor condition, with some lines closed. This has an impact on the reliability and efficiency of operations.
  - Port efficiency is improving but is still poor and prices are relatively high.
  - Of concern is that the extent of the crises at municipal level cannot be determined, due to a lack of information and decision support systems. It is estimated that R75 billion is needed over the next five years to arrest this decline.
  - Difficulties in implementing projects, even when funding is available due to poor capacity and a diminishing pool of technical expertise.
Logistics performance

Quality of South Africa's Infrastructure

Global rank

South Africa's ranking in the Logistics Performance Indicators

Source: World Bank Logistics Performance Index, Macquarie Research, November 2010
Road, rail and ports

- South Africa’s transport sector consists mainly of public monopolies in rail, ports and road sub-sectors, and considerable gaps in regulatory oversight.

- Infrastructure provision, according to Transnet, has been hampered by mainly by balance sheet affordability.
  - The South African Government has guaranteed R11.1bn of the Group’s borrowings. No new Government guarantees have been issued since 31 March 2004.
  - Transnet’s five year expenditure of R93.4 billion is part of the long-term integrated Port and Rail Development Plan, aligned to a corridor focused growth strategy.
  - R39bn (37%) will be spent on the expansion of services.
  - R41.5bn (63%) will be spent on maintaining infrastructure.
## Freight logistics forecast

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<tr>
<th>Commodity</th>
<th>Market outlook</th>
<th>Transnet Projection</th>
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<tbody>
<tr>
<td><strong>Manganese (mt)</strong></td>
<td>Growth over next 3 years ±5.6%pa (future 14mt). Plans in place to address capacity constraints</td>
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<td>2010/11 2011/12 2012/13 2013/14 2014/15</td>
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<td><strong>Export Coal (mt)</strong></td>
<td>Emerging markets demand is recovering, led by China and India</td>
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<td>2010/11 2011/12 2012/13 2013/14 2014/15</td>
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<td><strong>Export iron ore (mt)</strong></td>
<td>Increase in steel production in China.</td>
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<td><strong>Containers on Rail (’000 TEUs)</strong></td>
<td>Opportunity for TFR to gain market share</td>
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<td><strong>Pipeline Petroleum (Billion litres)</strong></td>
<td>Steady growth in petroleum volumes are aligned to approximately GDP minus 1%</td>
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Source: Transnet, November 2010
**Freight Rail Network Capacity**

By 2030 installed capacity on strategic corridors of the freight rail network will be constrained

- Worsening condition of the rail network and increased demand on rail operations.
- The current 5 year freight investment plan aims to address investment backlogs and operational improvements rather than large scale capacity expansions.
- The Transnet 30 year plan will accommodate large scale capacity expansions in line with economic and industrial policy development.
Ports 5 year expenditure plans

Transnet’s five year expenditure of R93.4 billion is part of the long-term integrated Port and Rail Development Plan, aligned to a corridor focused growth strategy.

- Ngqura container terminal (R7.9bn)
- Reengineering of Durban container terminal (R1.9bn)
- Durban Harbour entrance channel widening and deepening
- Deepening of container berth 101 to 103 (Pier 1)
- Reconstruction of sheet-pile quay walls at Maydon Wharf (R1.6bn)
- Dry Bulk Terminal refurbishment and replacement of equipment (R1.7bn)
- Ore line (R3.1bn)
- Expansion and reconfiguration of Cape Town Container Terminal (R4.4bn)

Source: Transnet Freight Demand Model
Coega: Example of poor policy sequencing

- Building the port cost about R14 billion
- R4 billion of public infrastructure in the IDZ
- R2 billion cost to Eskom to put in 750 kVa lines to accommodate a smelter
- Port is spec’d for a smelter, containers and some fresh produce exports
  - It is not spec’d for cars, nor for fuel imports or exports
- Decisions about how to spec such a port are key industrial policy decisions
  - … which in this case, we got wrong
Road infrastructure

- Major road projects focused on urban areas and freight corridors
- Tolling is an absolute necessity to ensure sustainability

Source: National Roads Agency, Macquarie Research, November 2010
Information and Communications Technology

- South African telecoms market continues to reflect a market with a number of vertically integrated operators. This includes two very strong incumbent mobile operators and a weak third entrant, a dominant fixed operator and a new fixed-line entrant.
- Mobile operators are also currently in the process of building broadband infrastructure and are keenly following aggressive corporate/business services strategies.
- With the arrival of a competitor to the SAT 3 undersea cable operated by Telkom with the landing of Seacom in the middle of 2009, service providers initially tended to increase bandwidth availability to their customers.
ICT Household Penetration by Province

Although mobile services continue to grow, challenges remain around universal access.

Social and economic divides still prevail. ICT penetration in both household and public sectors varies between and within provinces, creating a digital divide between those with high and those with low access levels.

In terms of broadband access, South Africa continues to compare poorly against other lower middle income countries and, within Africa, against those in North Africa.

The lag in the telecom sector is also evident when looking at countries with similar GDPs per capita including Argentina, Poland, Mexico, Turkey and Brazil. South Africa had just over 1 million Broadband connections which translate into a penetration rate of 2% of individuals.
Conclusion

- The modernisation of our infrastructure has huge economic benefits, but poses significant risks due to the size of investments.
- Multiple and overlapping mandates remain a problem.
- Poor maintenance, poor regulation and uncompetitive industry structures pose significant institutional challenges.
- To solve such complex economic coordination problems, a combination of good public policy, sound regulation, appropriate involvement of the private sector and clear operational efficiency benchmarks are needed.