Annual Report 2007

Presentation to

Portfolio Committee on

Public Enterprises

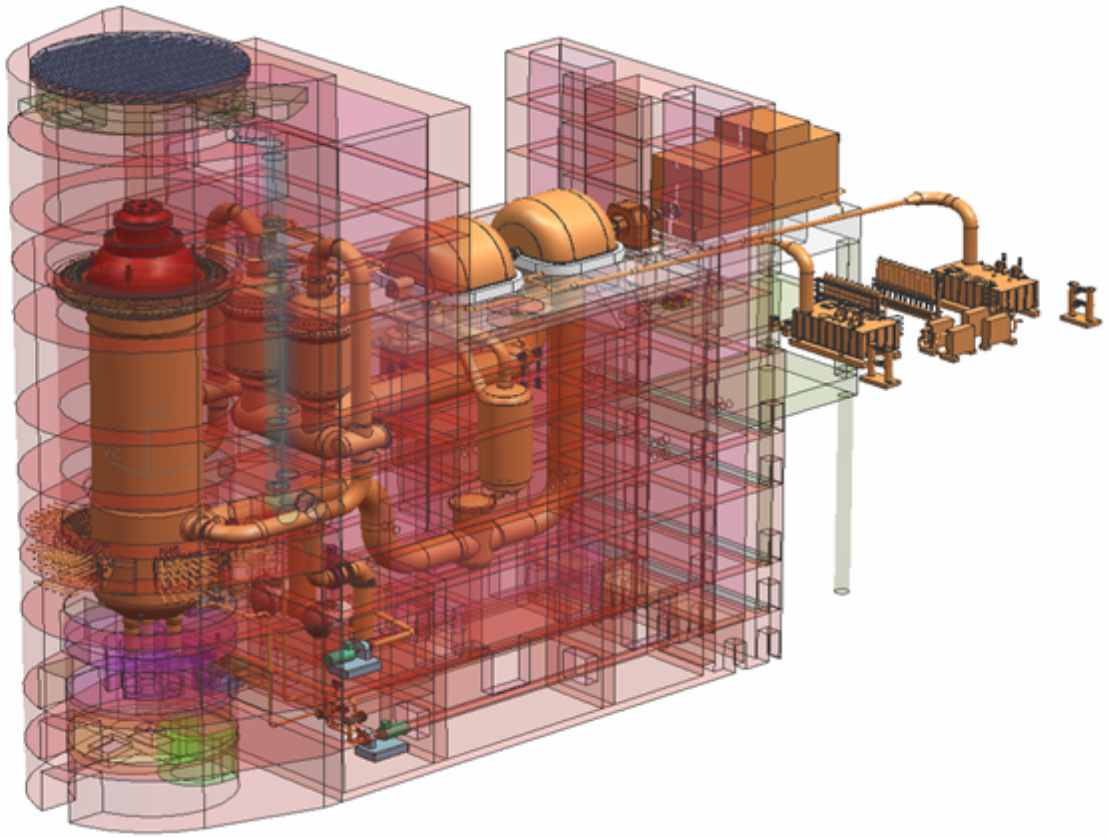
14 November 2007

Vision, Mission & Key Objectives

Vision

- **Vision**

To be the preferred global provider of standardised, safe nuclear energy systems, fuel and life-cycle support.



Mission and key objectives

- **Mission**
  - To successfully commercialize pebble bed technology for the world's energy market
- **Objectives**
  - To build a Demonstration Power Plant near Cape Town
  - To build the first PBMR Fuel Plant at Pelindaba

The project is on schedule to be the first commercial High Temperature Reactor in the power generation field

PBMR's Position

National Strategic Project

- Industrial development & localization
- Skills development & job creation
- Export potential of high value capital goods - Balance of Payments

Extracting value from SA's historically developed nuclear capability and technology. New Skills and opportunities.

Electricity demand

Eskom new nuclear Build (20 000 MW)

SA Power Project

Leverage spend

PBMR Uniqueness

Current world demand is 4,000GW (~100 x Eskom)
World average growth of 3% per annum since 1980 equates to 600 PBMRs per year
MIT forecasts global demand to triple by 2050
Current world spending is about $100bn per year on new power stations
Political support is growing for the nuclear globally

PBMR benefits

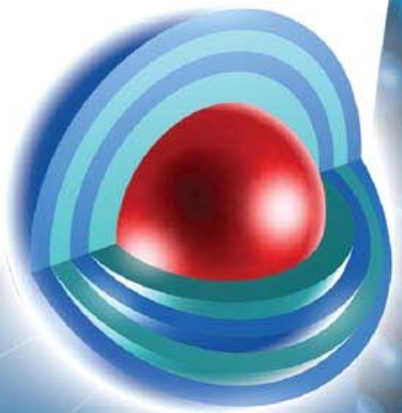
Locally controlled technology limits foreign exchange exposure.

Potential exploitation of own uranium.

Contribution to clean and safe energy.

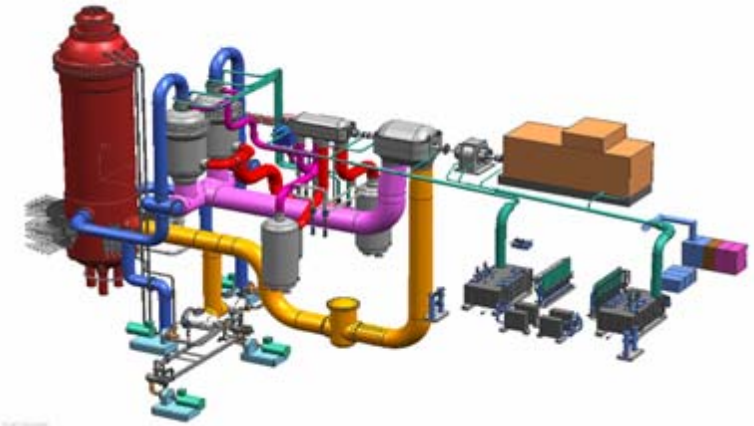
P B M R

Suppliers Conference *2005*



PBMR's Competitive Advantage

- Inherent Safety
- High efficiency
- Load following
- On-load refuelling
- Low proliferation risk
- Low impact on environment
- Short construction times
- Smaller capital cost increments
- Modularity
- Process heat applications
- Small emergency planning zone



Key Achievements

Key Achievements (Annual Report)

IAEA SCART Team

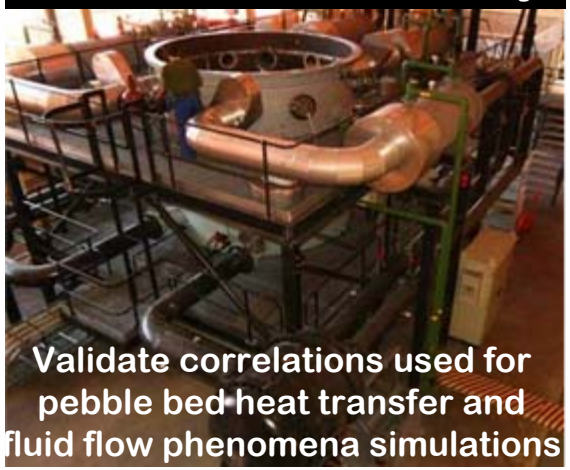
Reactor Pressure Vessel

- International Atomic Energy Agency (IAEA) review of nuclear safety culture
- Heat Transfer Facility complete
- Heat Pressure Transfer Unit and Heat Transfer Test Unit complete
- 5 kg Advance Coater facility complete
- Environmental Impact Assessment (EIA) accepted for fuel manufacturing at Pelindaba
- Training of candidate engineers and mentorship programme
- Launched WiNPBMR – branch of WiNSA
- Localization and capacity building
- Government committed R6 billion in current MTEF
- Board accepted long term business case
- Awarded Phase 1 - NGNP in a Westinghouse-led consortium (USA)

Key achievements (update)

- Safety culture awareness initiatives
- World class graphite machining facility
- Orders placed for long lead items
- Delivery organization strengthened
- EPCM contractors appointed to DPP and PFP
- Integrated Risk Management System implemented

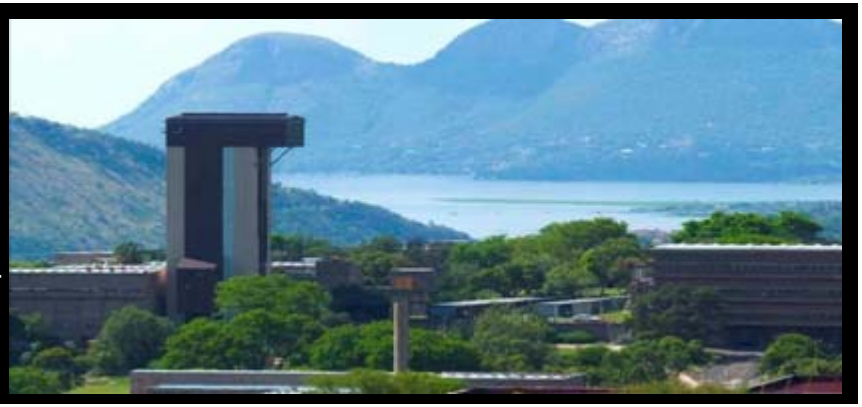
Heat transfer test facility



Validate correlations used for pebble bed heat transfer and fluid flow phenomena simulations

HTTF – construction of the test sections

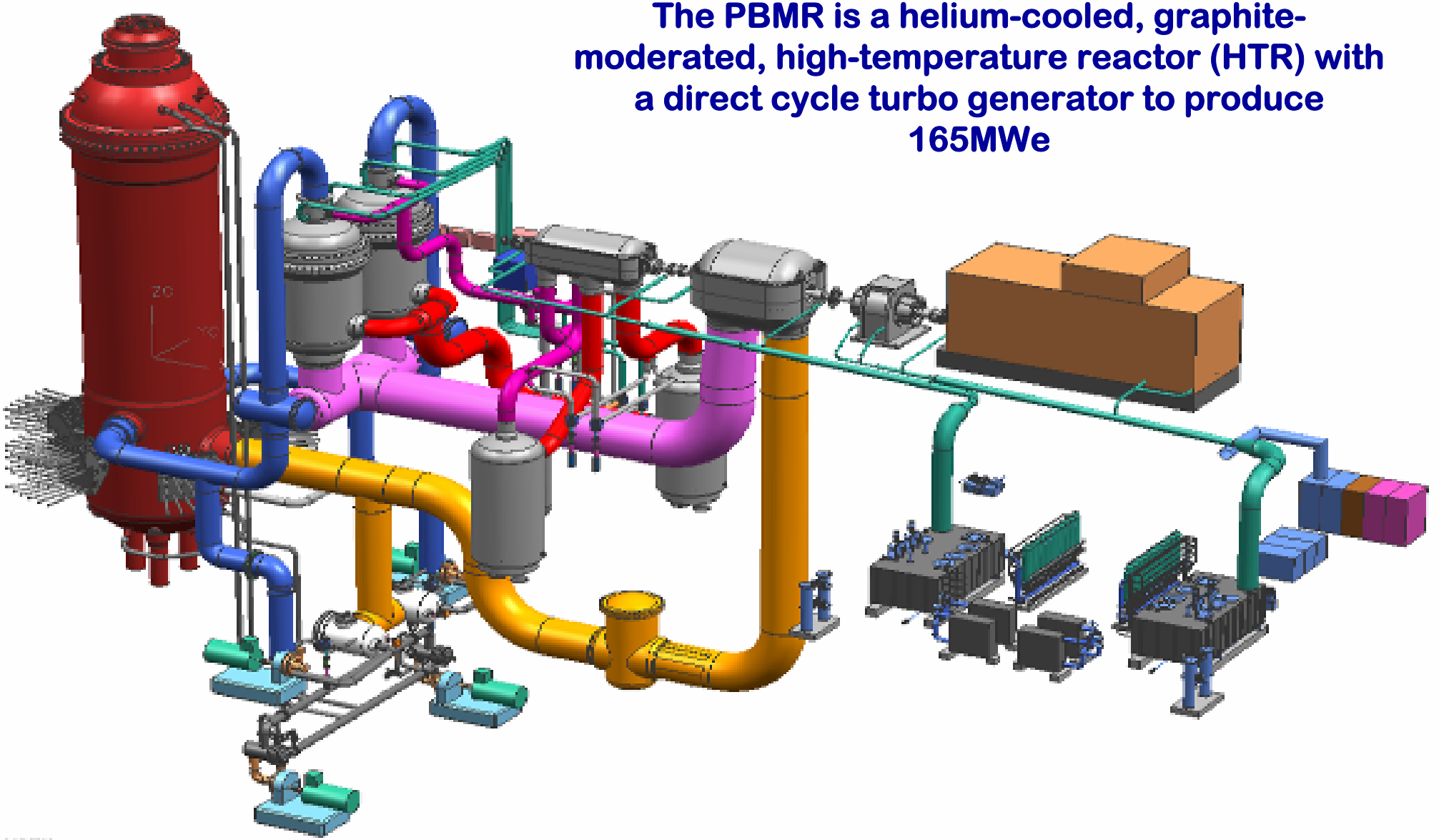
The 43 meter Helium Test Facility at Pelindaba will test the helium blower, valves, heaters, coolers, recuperator and other components to be tested at pressures up to 95 bar & 1200 °C



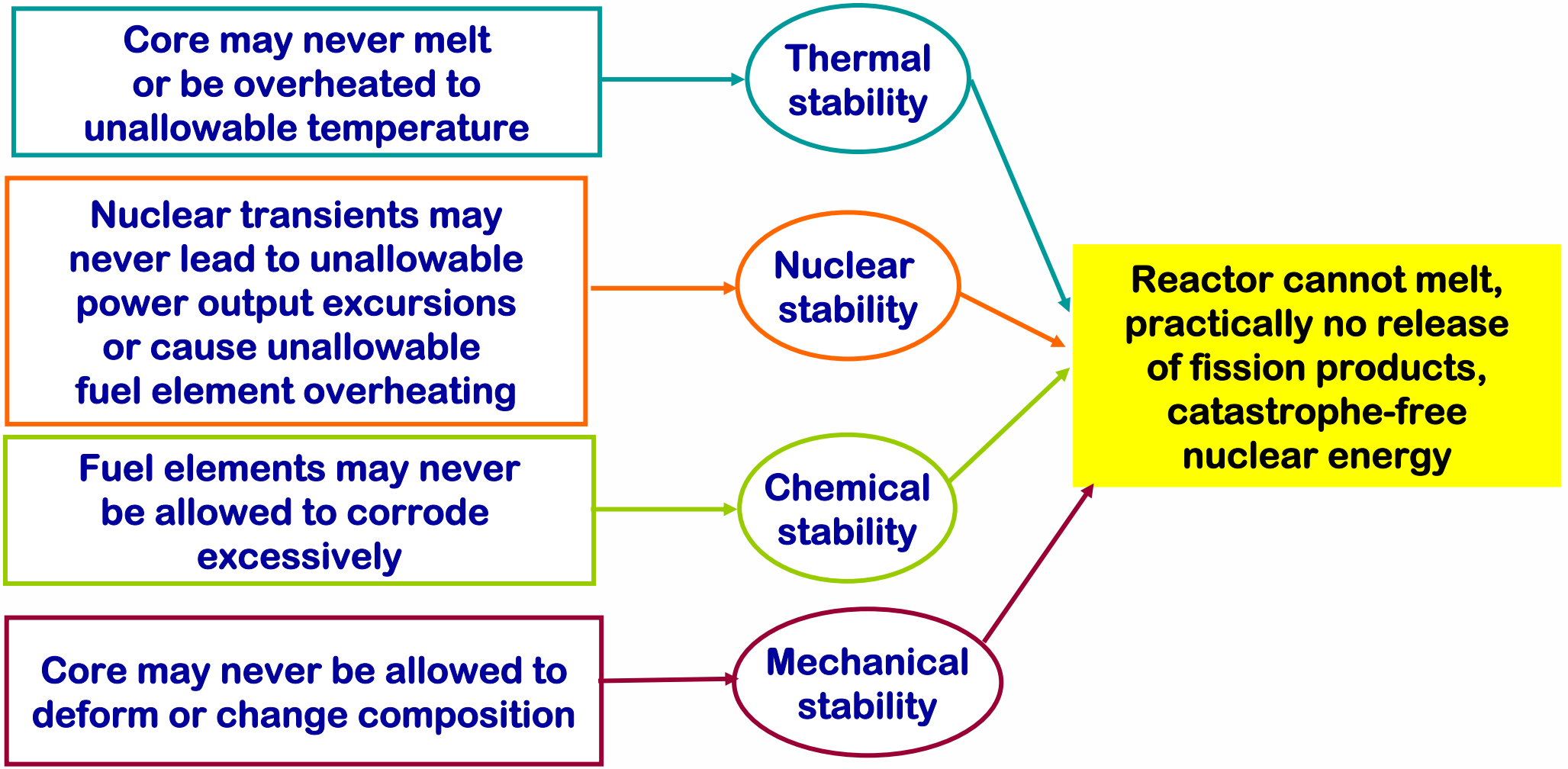
Technology

PBMR High Temperature Reactor

The PBMR is a helium-cooled, graphite-moderated, high-temperature reactor (HTR) with a direct cycle turbo generator to produce 165MWe



4 Principles of Stability for Reactors, Enhanced Safety Characteristics incorporated in PBMR Design



Clean power

1 pebble

(9 g of 9.6% enriched Uranium)

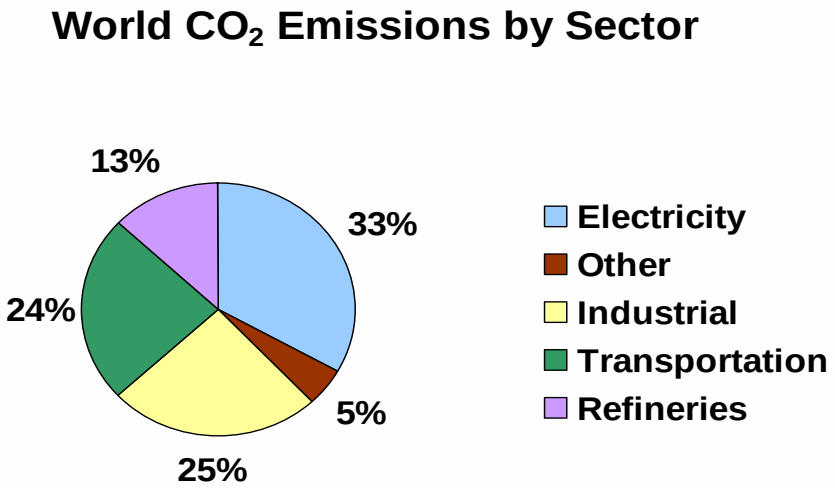
5.76 tons of coal

1.5 to 2.5 tons of ash

21 tons of CO_2

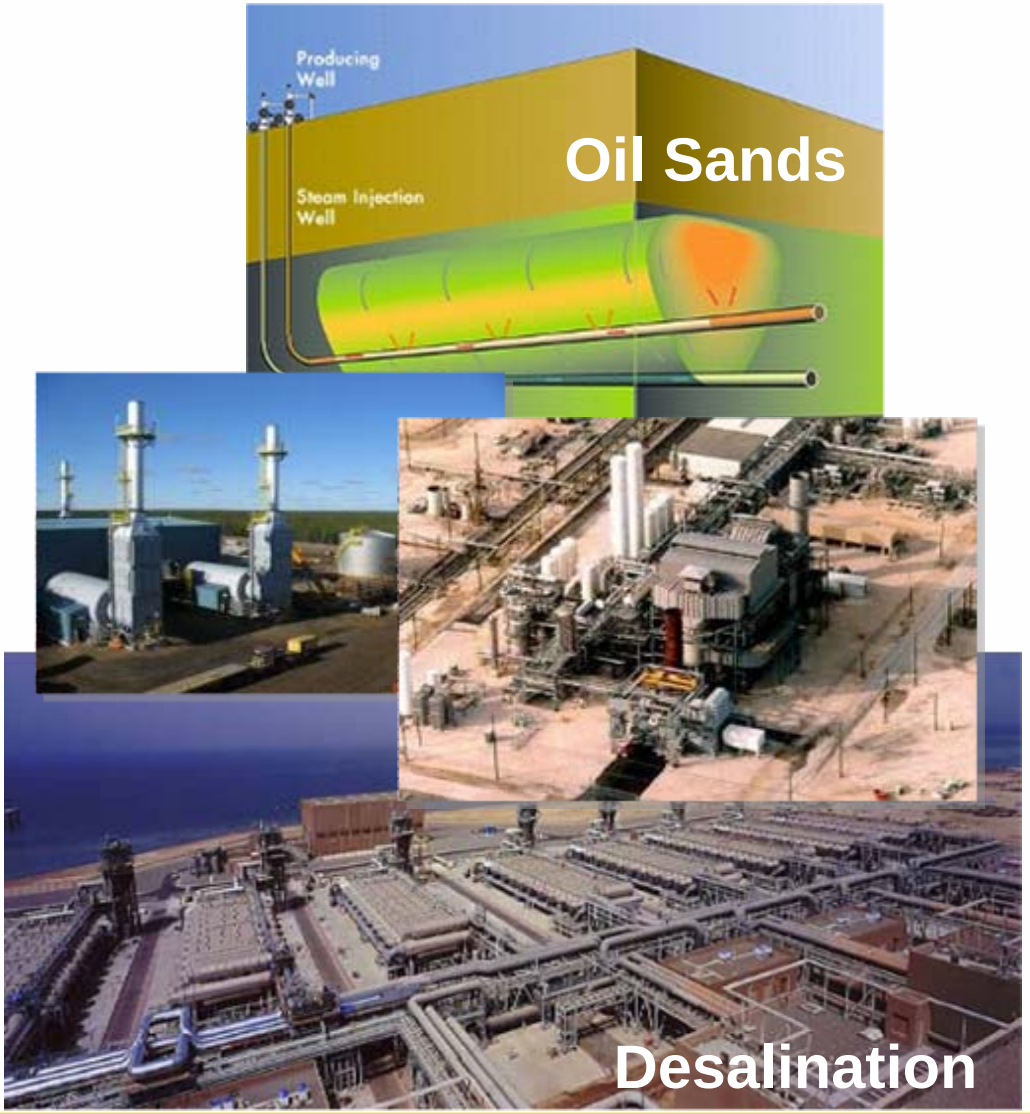
Beyond Electricity

- Nuclear power plants today supply ~9.3% of global electricity
- Process heat can expand nuclear applications to other energy sectors
  - Industrial, Transport, Refineries
- Process Heat Opportunity
  - Stable process energy costs
  - Displace natural gas and other premium fuels
  - Reduce CO_2 emissions

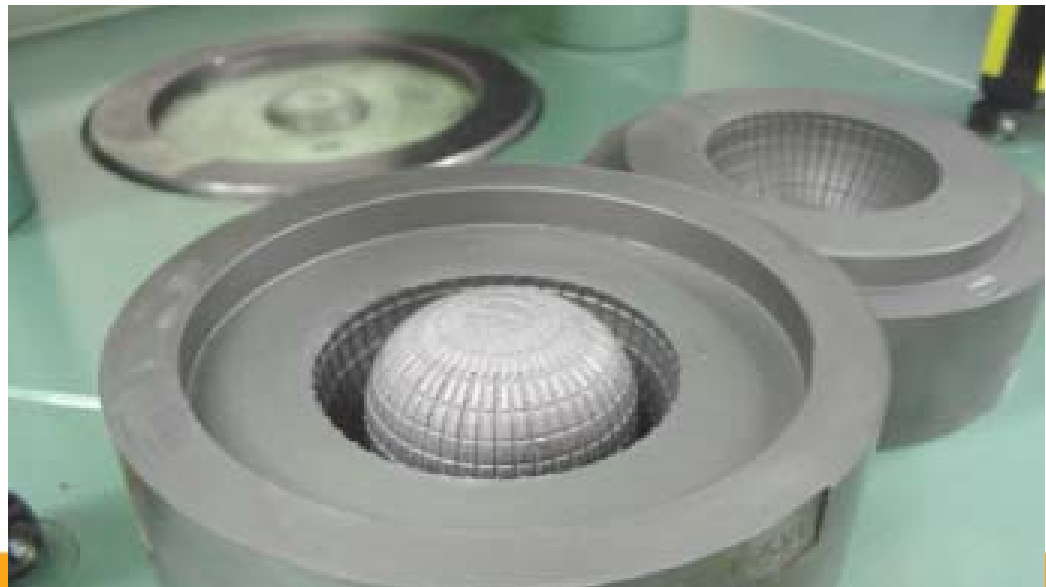


Process Heat Applications

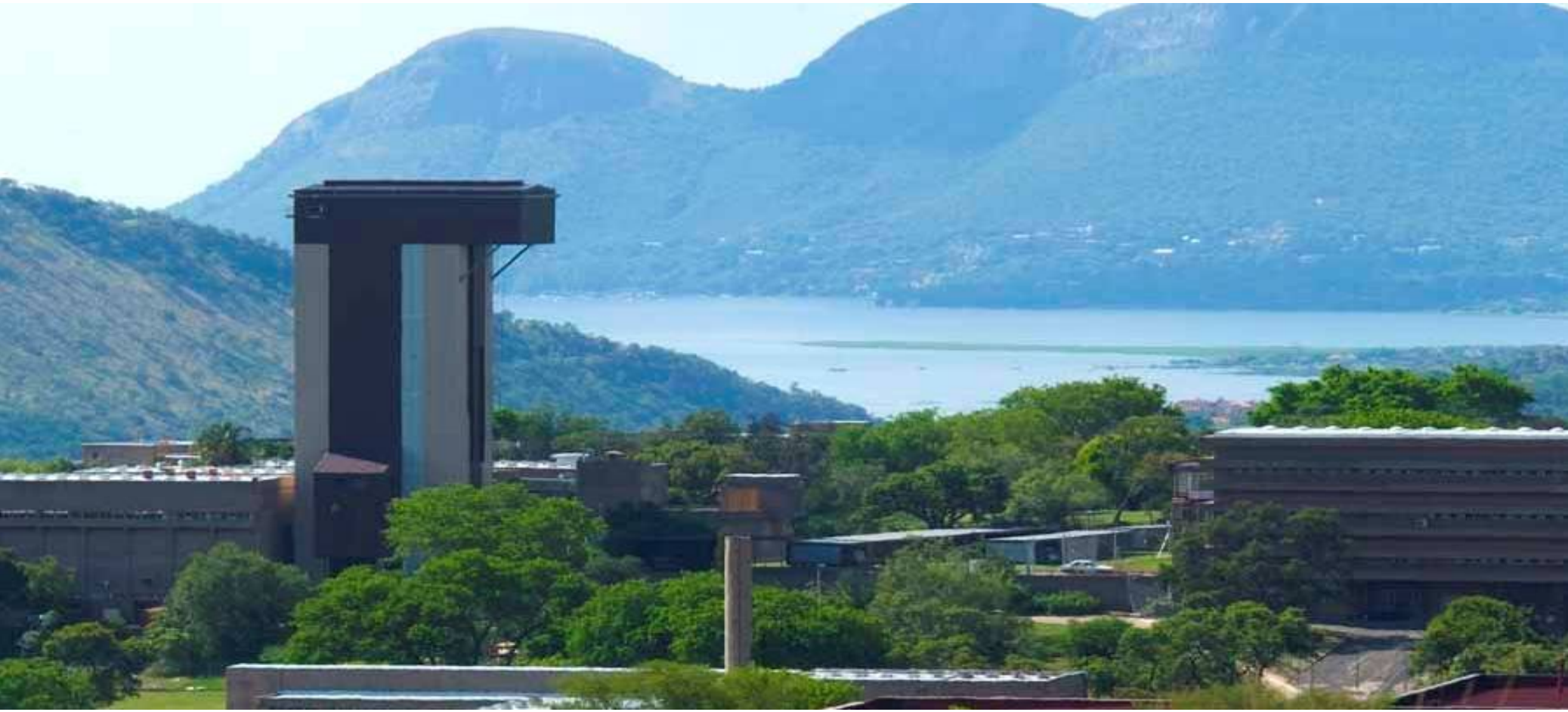
- Steam Generation
  - Heavy Oil Recovery
  - Oil Sands
  - Cogeneration
- Steam Methane Reforming
  - Hydrogen
  - Ammonia
  - Methanol
- Water-Splitting (H_2 & O_2)
  - Bulk Hydrogen
  - Coal-to-liquids
  - Coal-to-methane
- Desalination



Fuel Fabrication at Pelindaba



Helium Test Facility



43 m high HTF at Pelindaba - test the helium blower, valves, heaters, coolers, recuperator and other components at pressures up to 95 bar and 1200°C

Helium Test Facility

High Pressure Test Unit

High Temperature Test Facility

Challenges & Responses

Challenges & Responses

Challenge: Licensing of First of a Kind Technology

Response

- Enhanced processes, procedures, safety culture, risk management and governance frameworks

Challenge: Strategic manufacturing capacity (slots booked for 2011 -2015)

Responses:

- SA Power Project (DPE)
- Slot reserving strategy for RSA
- Economies of scale in SA nuclear build programme
- Centre for manufacturing excellence (Necsa)

Challenge: Skills shortage

Responses:

- Sophisticated attraction and retention tactics
- Extensive training, development and mentorship programmes
- University programmes

Challenge: Localisation and expansion of supply chain

Responses:

- Advanced contract negotiation and management
- Robust contingency management plan linked to price indices
- Localisation reduces balance of payment risk

Challenge: Shaping the nuclear environment

Responses:

- NIASA, SA Power Project (DPE), long term strategic alliances with Eskom, Necsa
- Regulatory challenges

SA Nuclear Sector Developments

Sector developments since March 2007

- Nuclear Energy Policy and Strategy
- Nuclear Industry Association of South Africa
- SA Power Project (DPE)
- PBMR / NECSA – fuel, R&D
- Generation IV International Forum accession
- Strategic Investor interest
- Opportunities – DWAF (desalination)

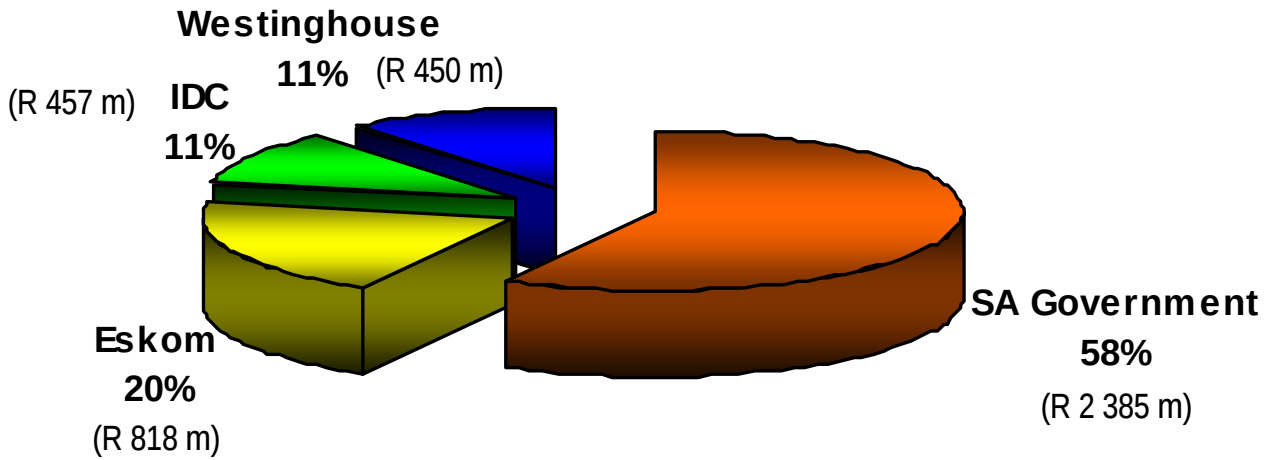
Governance & Financials

Governance Compliance

- First Annual Report
- Corporate Plan
- Quarterly Reports to DPE
- Unqualified annual financial statements
- No significant audit finding by external auditors
- Full compliance - PFMA
- Strengthened governance structures and systems
- IAEA - Safety Culture Assessment Review Team
- Minister of Public Enterprise's Chairs, CEO, CFO, Risk Management and Governance Forums

Historical Contributions

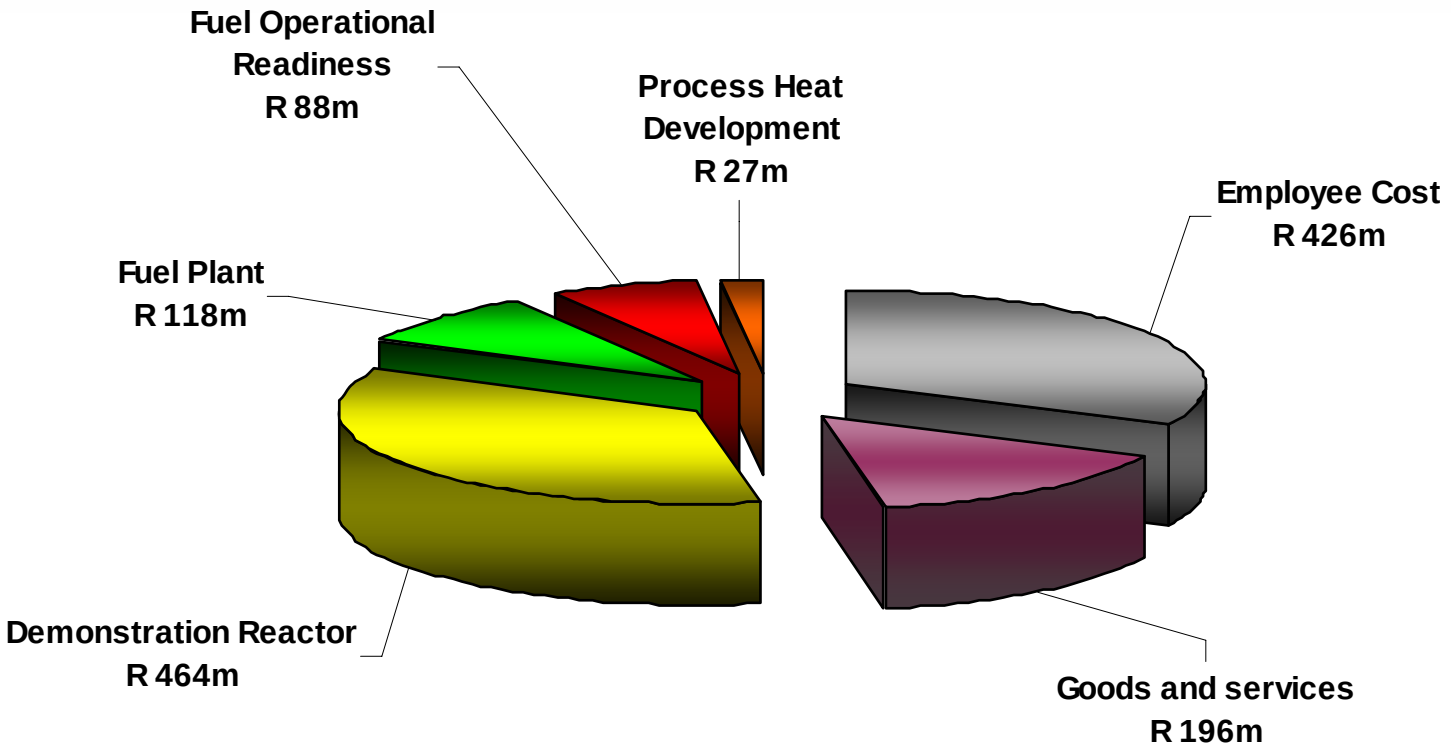
Contributions of investors from 1999 to 31 March 2007
(R4 210 million, incl VAT)



Allocation of Cost: 2007 Financial Year

Financial Period to March 2007:

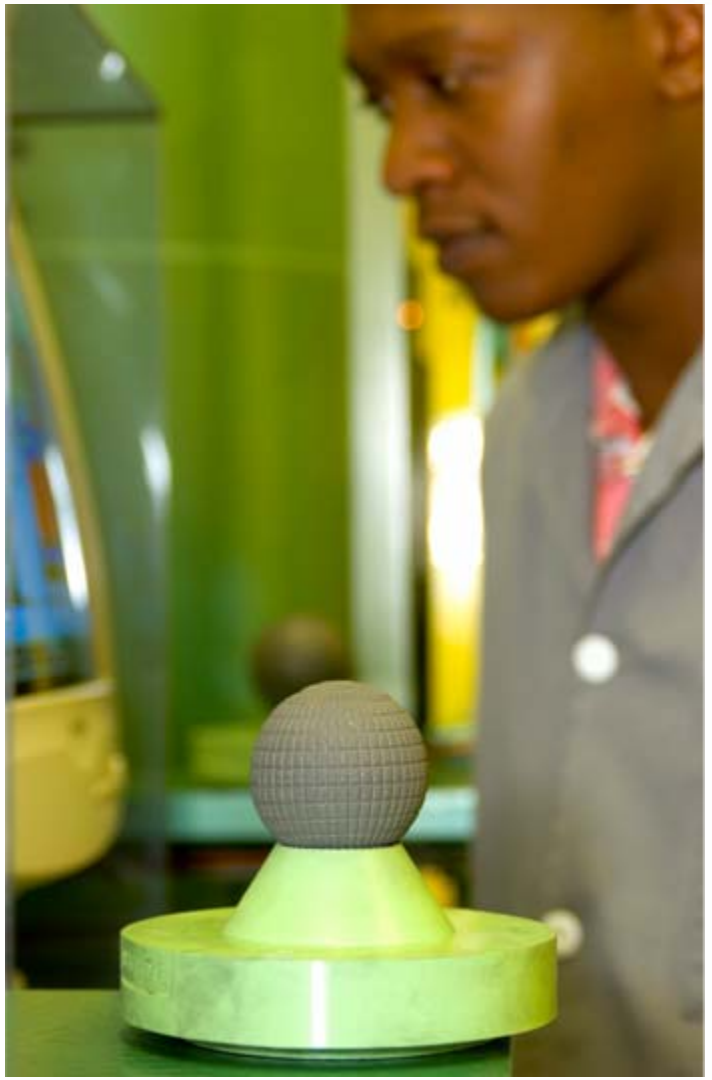
R1,3 billion



Capacity Building

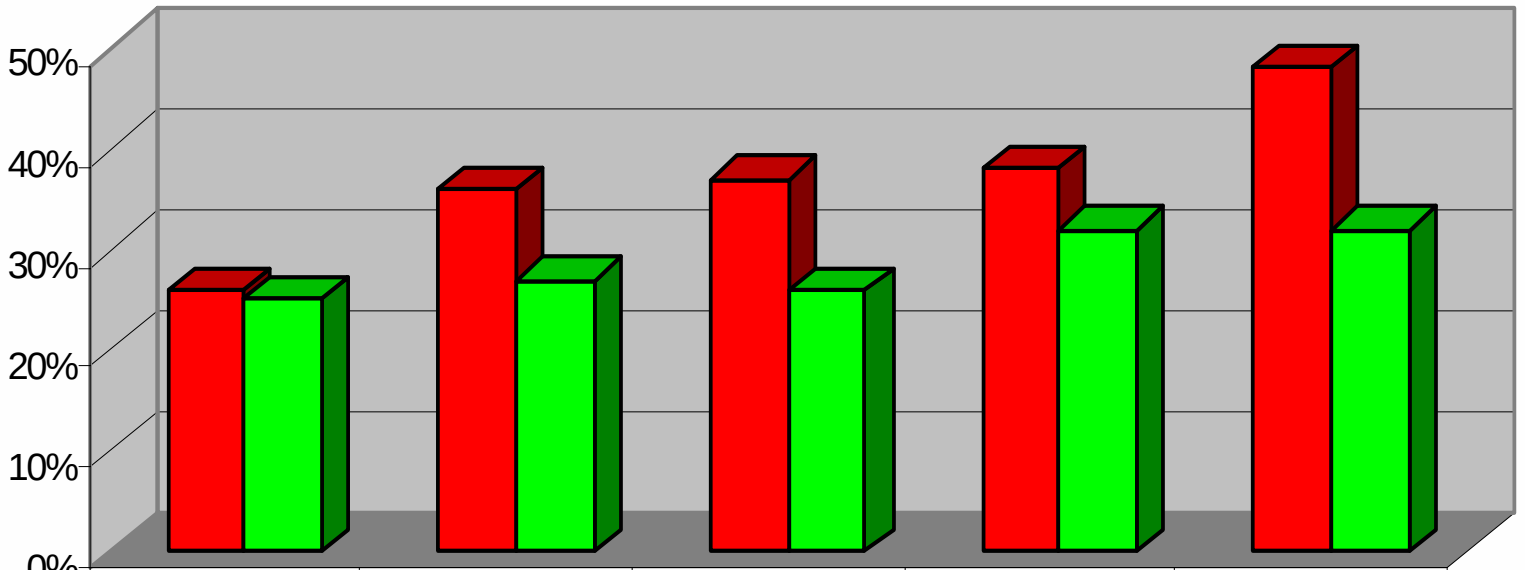
Employees as at 1 October 2007

- **Number of employees**
  - Full-Term employees – 712
  - Non-permanent employees 62
- **Employment equity**
  - Black employees (African, Coloured, Indian) – 277
  - Female employees (all races) – 227 (of which 104 are black)
- **Forecasted growth**
  - After employee ramp-up, total approved headcount is 972 by 2009



Employment equity

Employee Equity Actuals



	Aug-05	Mar-06	Mar-07	End Oct 2007	Target
Black	26%	36%	37%	38%	48%
Female	25%	27%	26%	32%	32%

Employment Equity initiatives in support of Employment Equity

- Diversity management training
- Preferential recruitment
- Preferential development (HDI)

  - ✓Mentorship
  - ✓Succession management and
  - ✓Accelerated development

- Retention - HDI's
- Bursaries - HDI's
- Schools Outreach Programmes
- Women advancement – support WinPBMR
- Support for physical challenged
- EE targets contracted
- EE progress monitoring

Capacity Building

Further studies

Employees

75

17 employees registered part time at Universities for technical programmes

4 employees in UK - work experience

Bursary scheme

33 Bursars

8 Masters students Univ. of NW

5 PhD's – full-time at Universities

Technology Programs

Technology Programme
Network of expertise

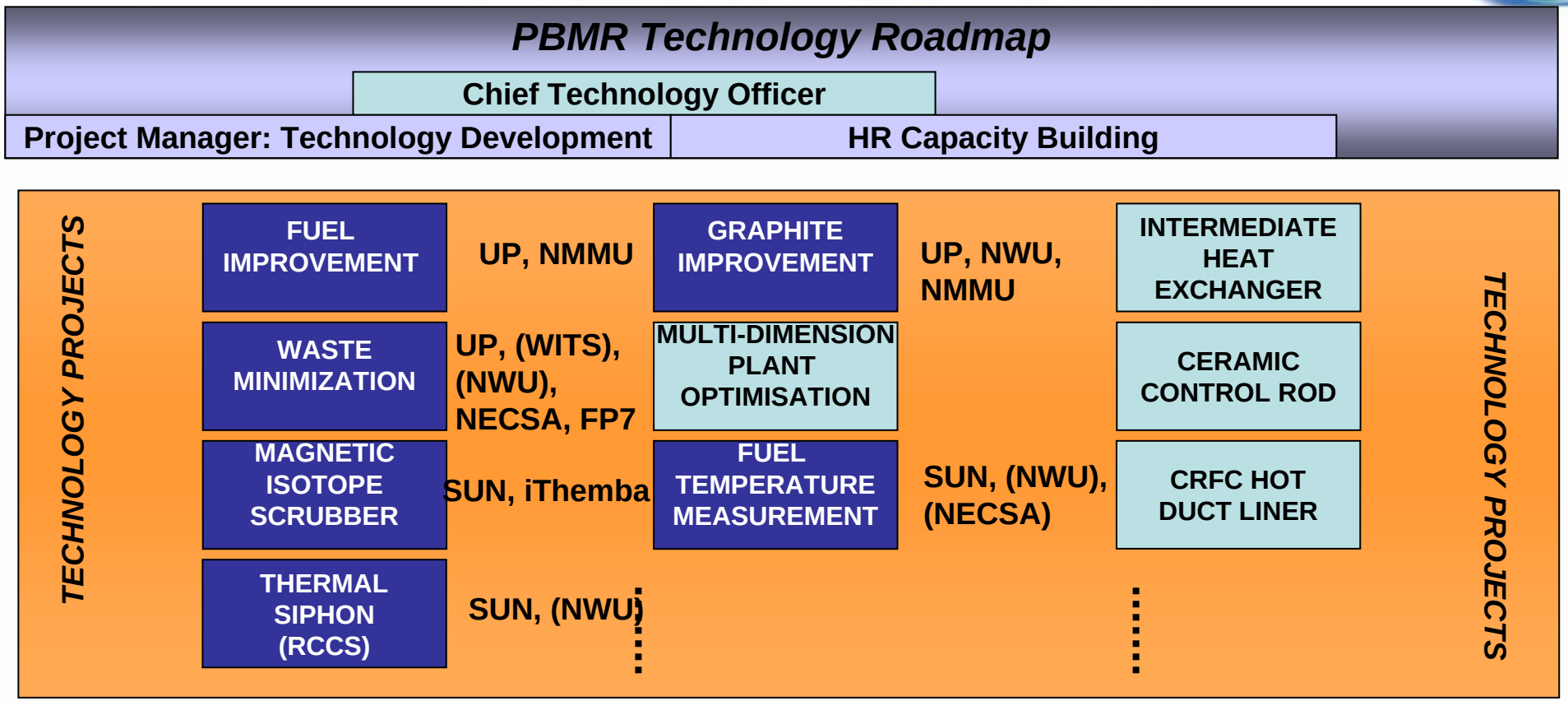
- South Africa
  - ✓ University of Pretoria - R15m
  - 🕘 Northwest University - R5.2m
  - 🕘 Stellenbosch University - R11m
  - 🕘 Nelson Mandela Metropolitan University - R8m
  - 🕘 iThemba LABS - R1m
  - ✓ NECSA - TBN
  - 🕘 University of the Witwatersrand – TBN
  - 🕘 University of Cape Town – TBN
- Europe
  - 🕘 Dalton Institute (UK) – TBN
  - ✗ ALD (Germany) – TBN
  - 🕘 ✓ EURATOM (FP7) (EU-wide)
- North America
  - ✗ Idaho State University – TBN
  - ✗ LUNA Inc – TBN

"Traditional innovation models, which rely exclusively on in-house inventions and an own-and-protect approach to intellectual property, are obsolete...
To crank out innovative products that expand the top line, manufacturers are adopting a new market model called 'Innovation Networks.' "
Navi Radjou
Forrester Research, Inc.

PBMR/ACADEMIA NETWORK OF EXPERTISE

🕘 Close to signatures
✓ Signed & in place
✗ In process
🕘 ✓ Only awaiting EC award, consortium in place
TBN Negotiations on project cost & content in process

Technology Programme



Technology Programme Notes

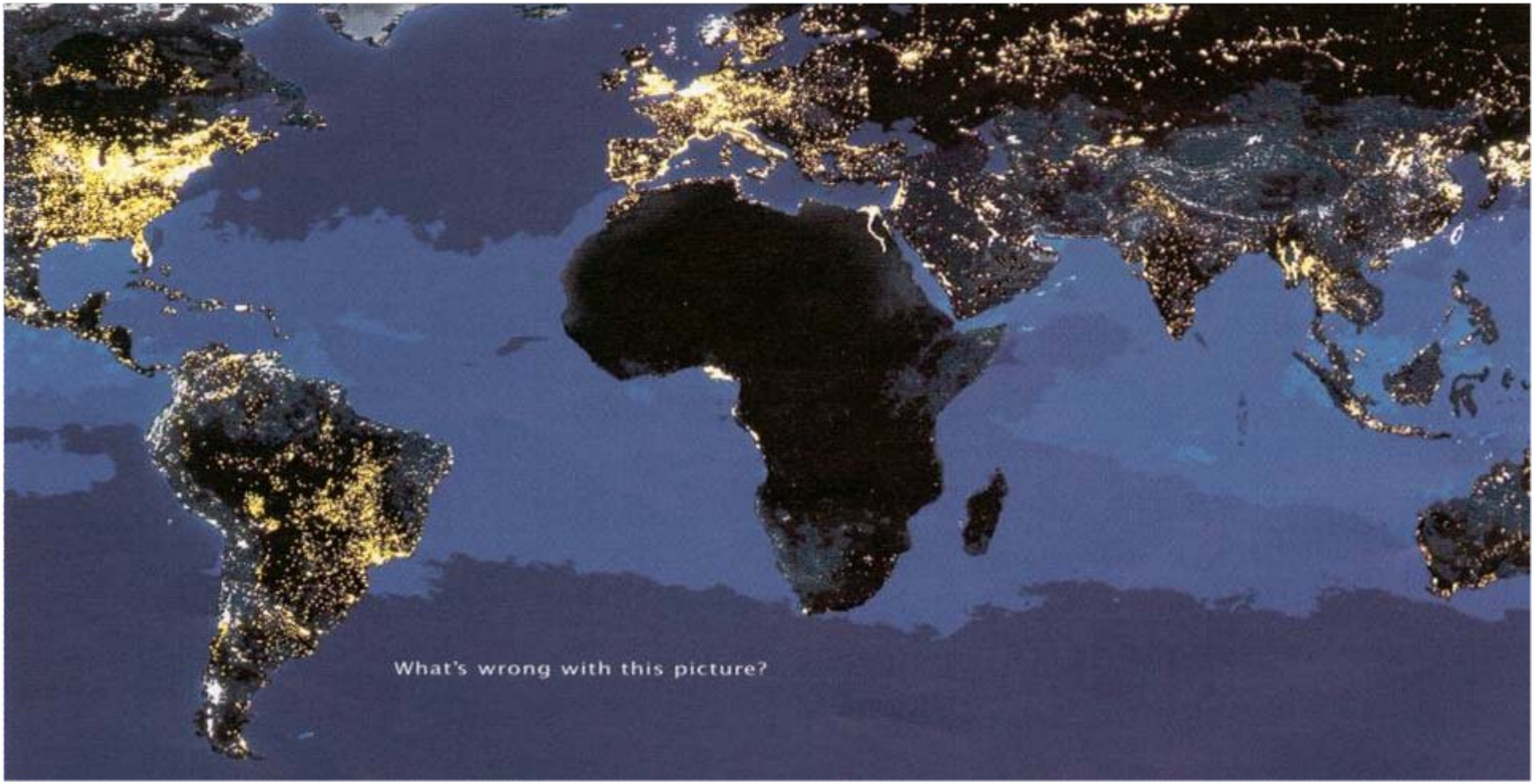
- **Principle of Contracting**
  - **Overarching enabling agreement (framework)**
  - **Agreements - 6 year periods**
  - **Feeder pipeline between HT & Tech programs**
  - **Preference to local Universities and knowledge**
  - **Technical transfer from foreign to local Universities**

Global Nuclear Industry

International Relations

- **Developments**
  - Feasibility study - Canadian Oil Sands
  - Phase 2 – NGNP (USA Department of Energy)
  - African countries, international nuclear consortia and research programmes
- **Initiatives for further progress**
  - Bi-lateral agreement - Canada
  - US bilateral - facilitate exchange of technology
  - Generation IV International Forum accession - international credibility of PBMR
  - IAEA: Coordinated Research Programmes on High Temperature Gas Reactors

Africa Needs Energy



Market Dynamics

OPPORTUNITIES

- Energy markets driven by:
  - Diversification of energy supply
  - Shortage of and increasing cost of natural gas
  - Increasing cost of petroleum
  - Incentives to reduce CO_2 and other emissions

- PBMR - CO_2 free economic option for providing large amounts of process heat in the 900 °C temperature range

PBMR DPP - Building in Koeberg

Thank you

Technology Programme Legend

- **Legend:**
  - **UP = University of Pretoria**
  - **UCT = University of Cape Town**
  - **NMMU = Nelson Mandela Metropolitan University**
  - **NWU = Northwest University**
  - **WITS = University of the Witwatersrand**
  - **SUN = Stellenbosch University**
  - **UFS = University of the Free State**
  - **Dalton Institute = part of Manchester University, UK**