

Carbon Capture and Storage In South Africa

ASSAF – 9, October, 2012

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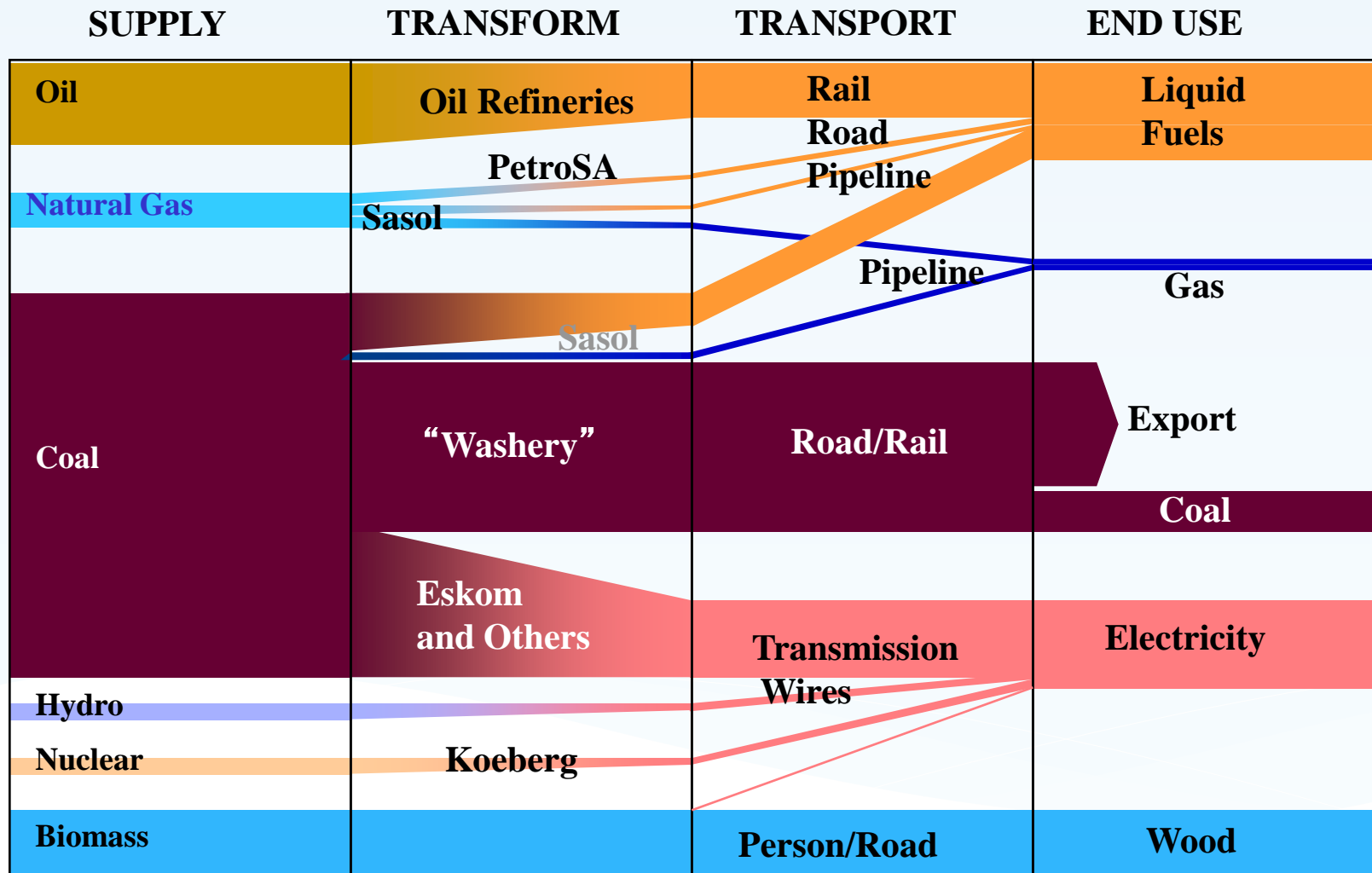
sanedi
South African National Energy
Development Institute



South African Centre for
**carbon capture
& storage**

South African Energy Chain

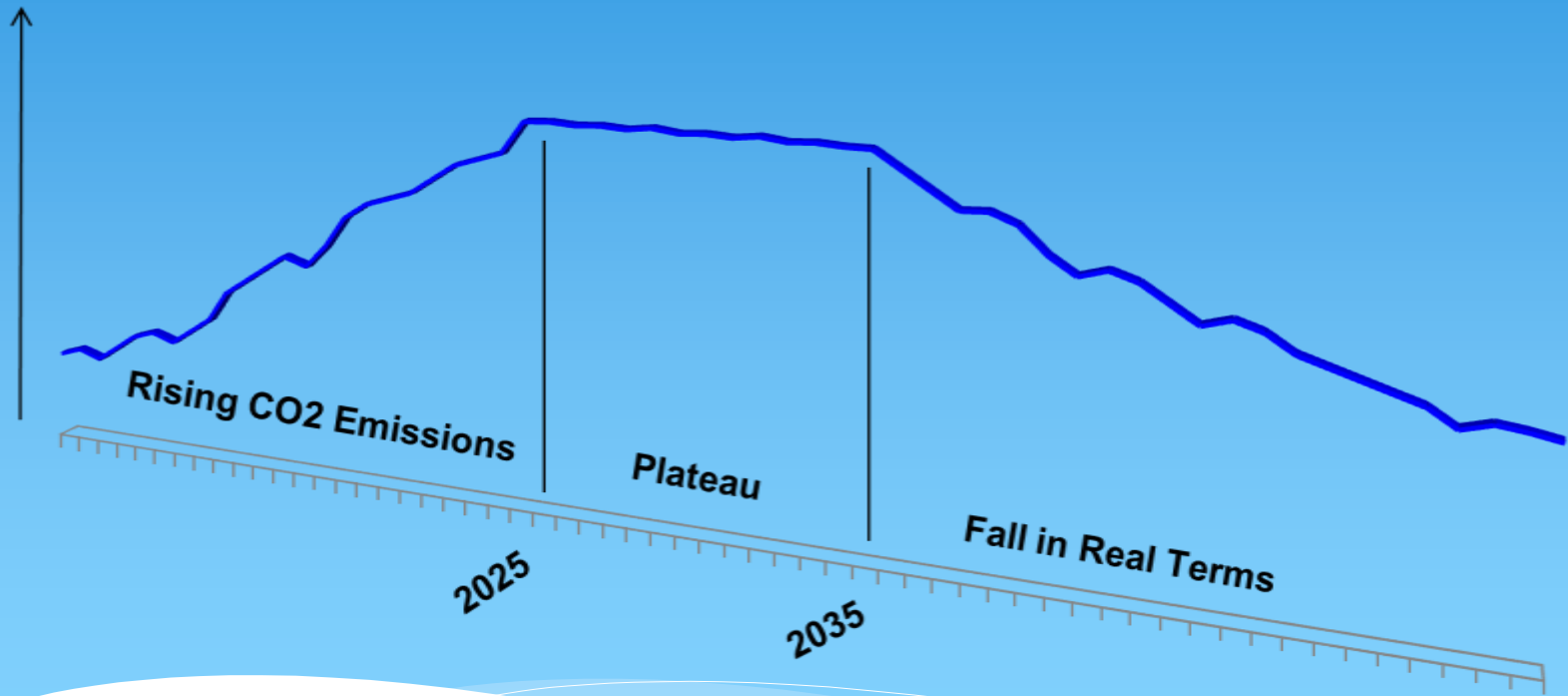
Main End Use – Electricity and Liquid Fuels



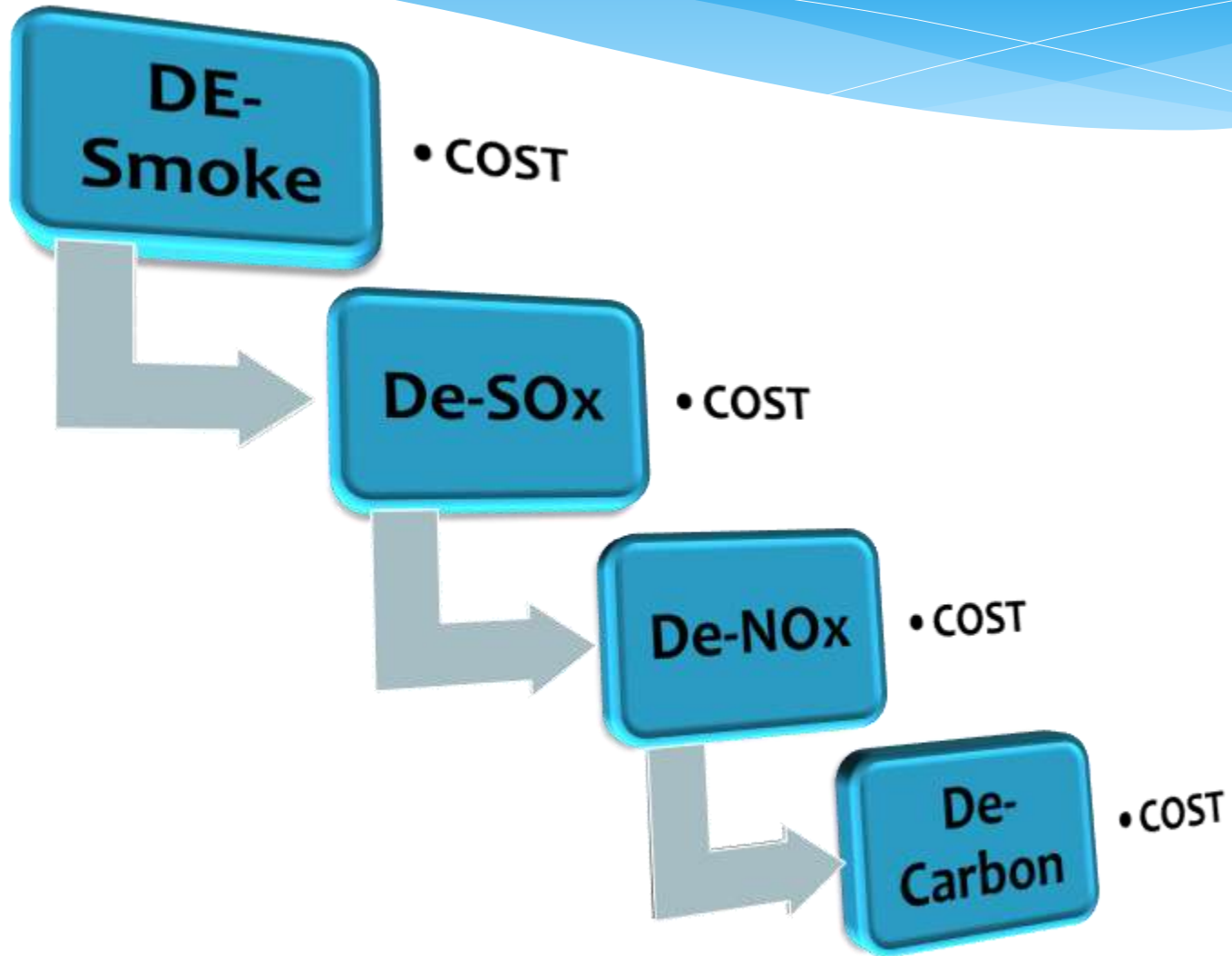
South Africa Carbon Dioxide Emissions Projection

Climate Change Summit Announcement - Mar09

CO2 Emissions



Energy & Environment



ONE OF THE OPTIONS TO DE-CARBON IS CARBON CAPTURE AND STORAGE

Carbon Capture and Storage: Principle

- * **Extract Carbon Dioxide from Fossil Fuel Use**

 - Electricity Generation Stations [$\sim 12\% \text{CO}_2$]

 - Synthetic Fuel Plants [$\sim 95\% \text{CO}_2$]

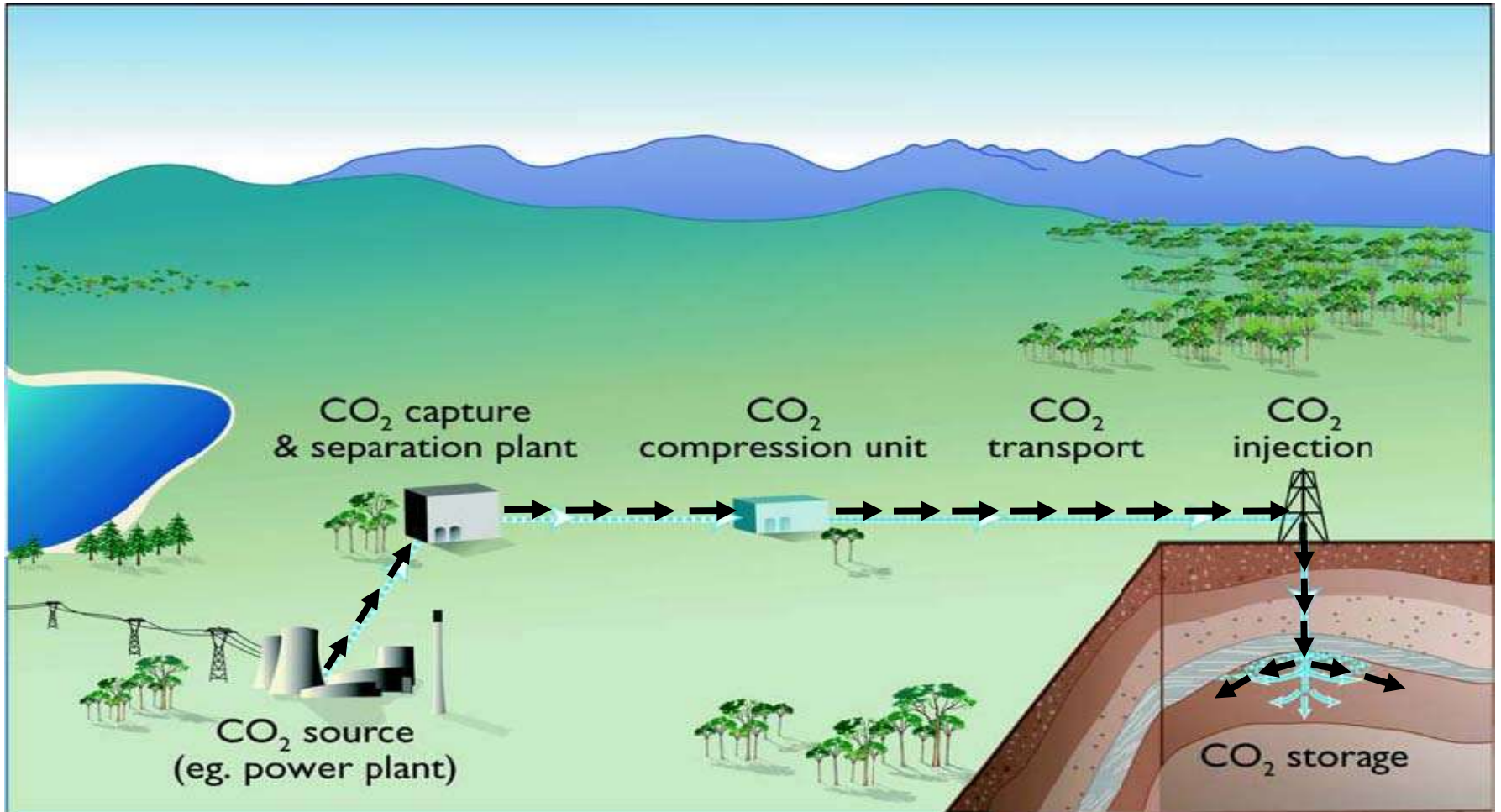
 - etc

- * **Inject Carbon Dioxide back into Geological Formations** [from whence the fossil fuel came]

 - Depleted Oil and Gas Fields

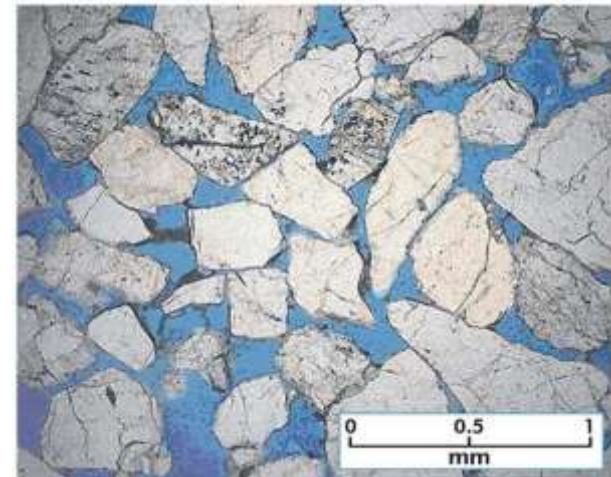
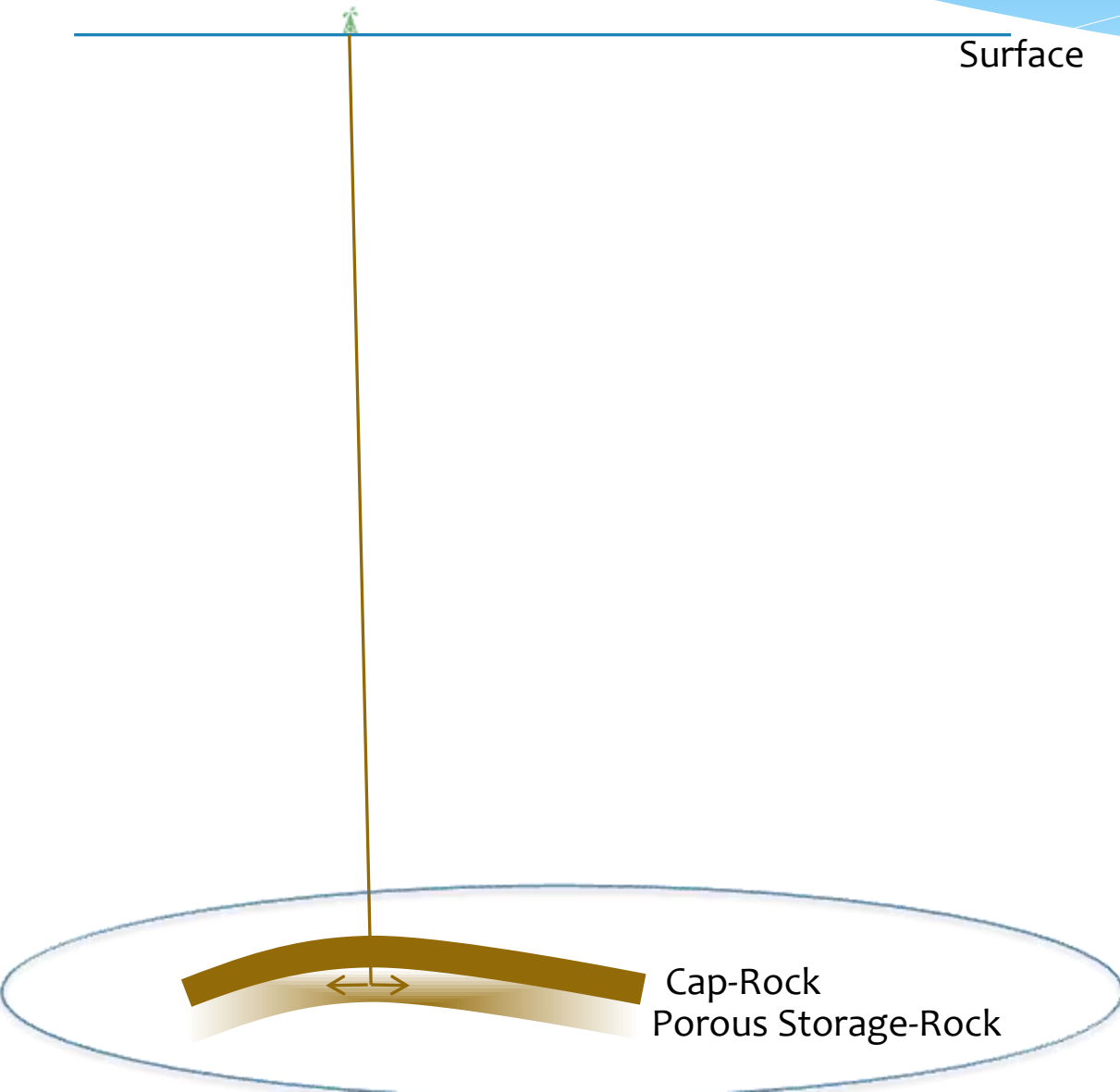
 - Deep Saline Aquifers

Four Stages



Stored Deep >800m

Surface



Permanency

* Permanency Stages of Trapped CO₂:

Structural Trapping

- * Overlaying cap rock

Residual Trapping

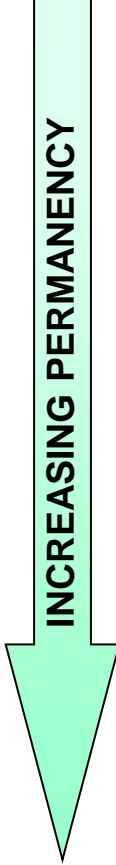
- * Tiny pores in rock – capillary pressure of water

Solubility Trapping

- * Dissolve in saline water

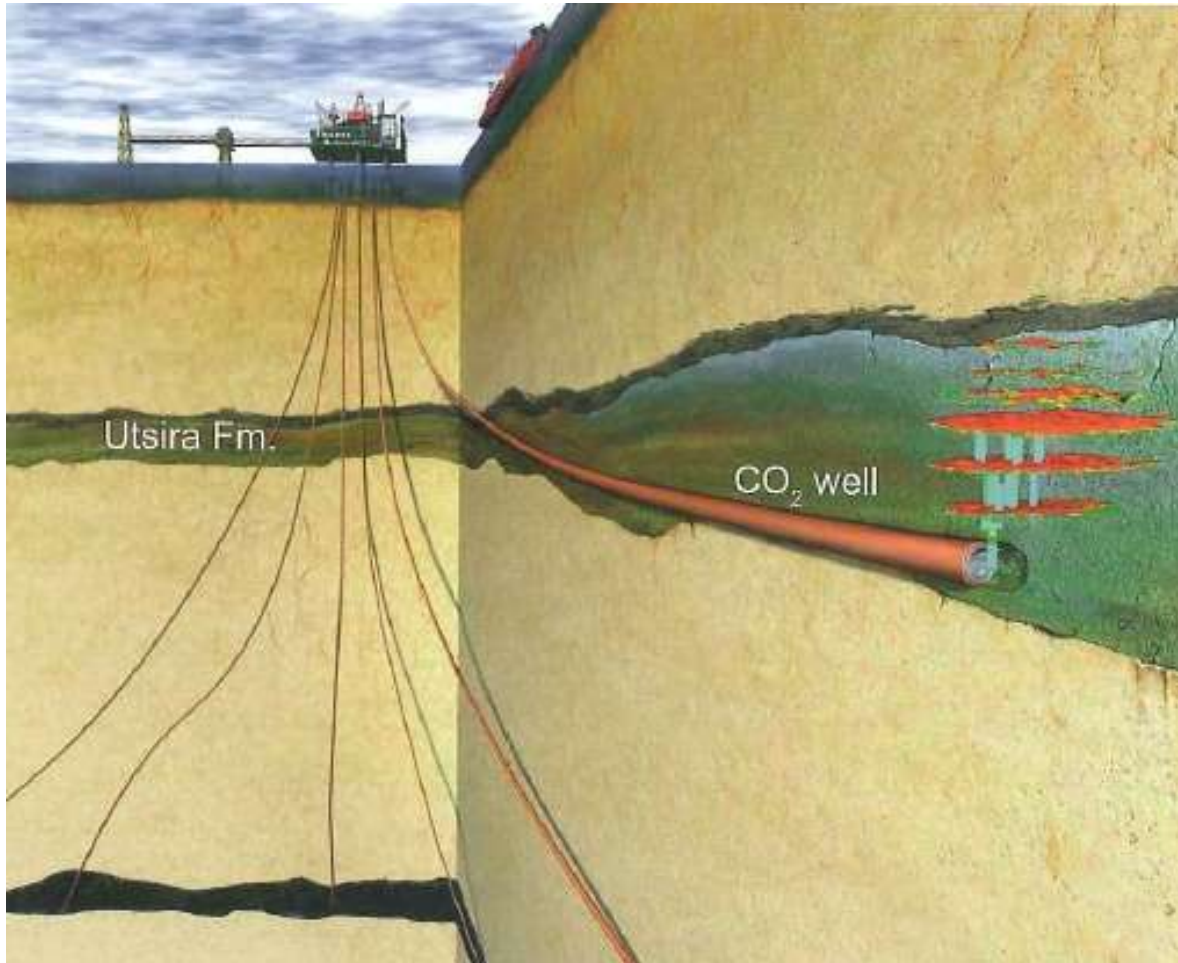
Mineral Trapping

- * React chemically with surrounding rocks – become part of rock

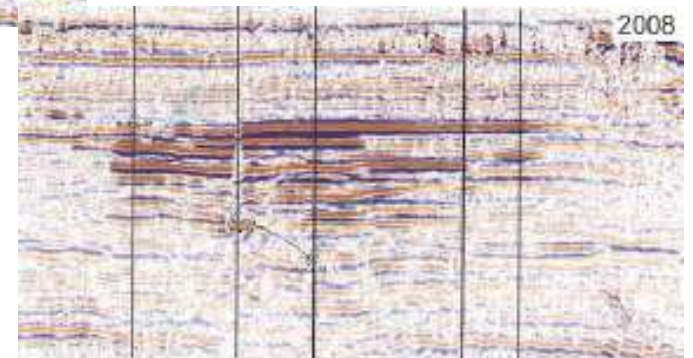
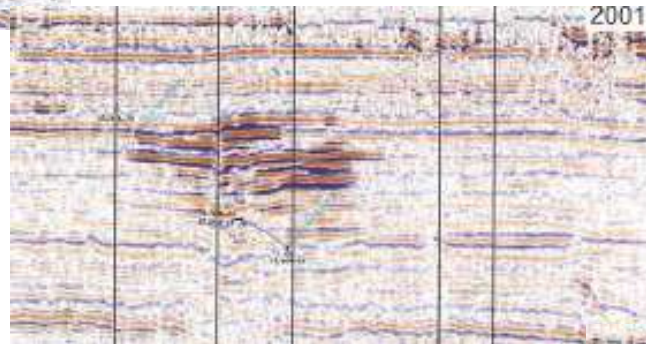
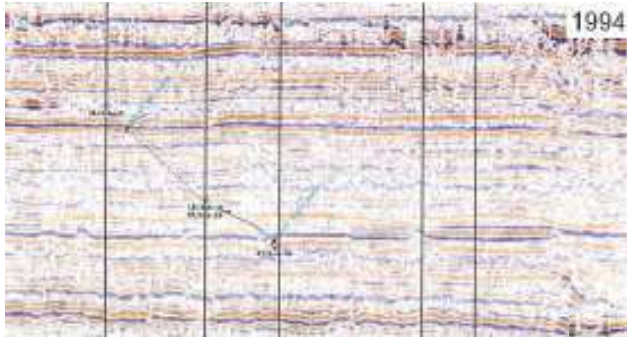


INCREASING PERMANENCY

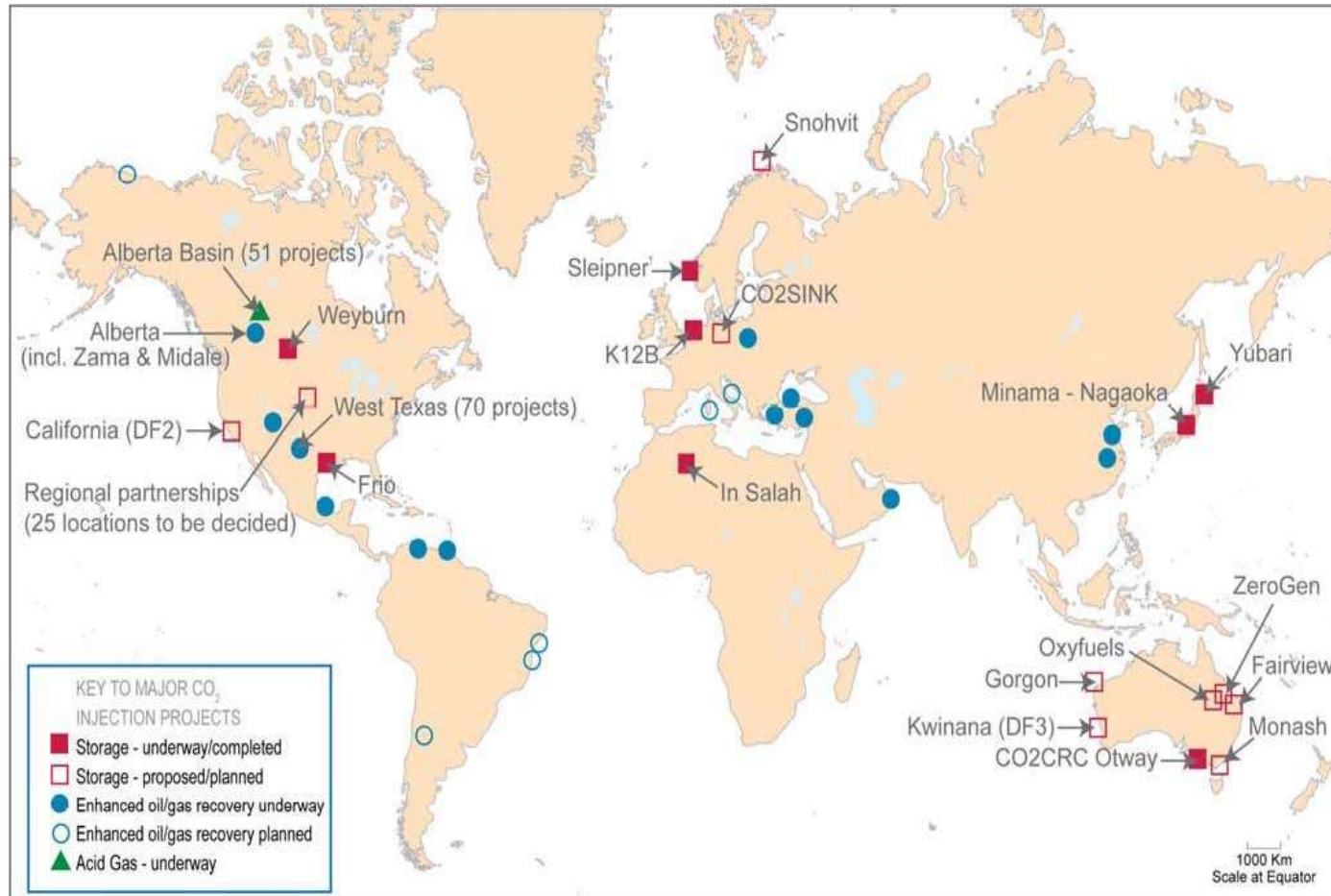
Geological Storage



Permanency - Sleipner



World Projects



Technology Development

It is not a question as to whether the technology works

We know it works

Been operating at many sites for decades

It is a scale-up issue

Integrity of Storage Site

South African Centre for Carbon Capture & Storage

Established 30Mar09



Core Parties



Participants



Charter Signing 27Mar09 Minister Sonjica Presiding



Time/Scale for Carbon Capture and Storage in South Africa

2004: CCS Potential - Done

2010: Carbon Atlas -

Launched by Minister Oct2010

2016: Test Injection -

Planned [10s thousands tonnes]

2020: Integrated Demonstration Plant -

Planned [100s thousands tonnes]

2025: Commercial Operation -

Planned 2025 [millions tonnes]

Mandate for Carbon Capture and Storage

- 1. CCS is a Flagship Programme of the National Climate Change Response White Paper – Released by the Department of Environmental Affairs Nov2011**
- 2. Carbon Capture and Storage Road Map endorsed by Cabinet May2012.**

Department of Energy is the Lead Department for Carbon Capture and Storage

DoE undertakes Policy/Regulatory development

SACCCS/SANEDI undertakes technical development



Council for Geoscience

ATLAS

on
geological storage of carbon dioxide in South Africa



SASOL
reaching new frontiers



saneri
South African National Energy Research Institute
1992-2010



Potential for Carbon Dioxide Storage in South Africa

✿ Atlas indicated a Storage Potential:

- 150 Giga tonnes
- At an “effective level”
- 98% off-shore

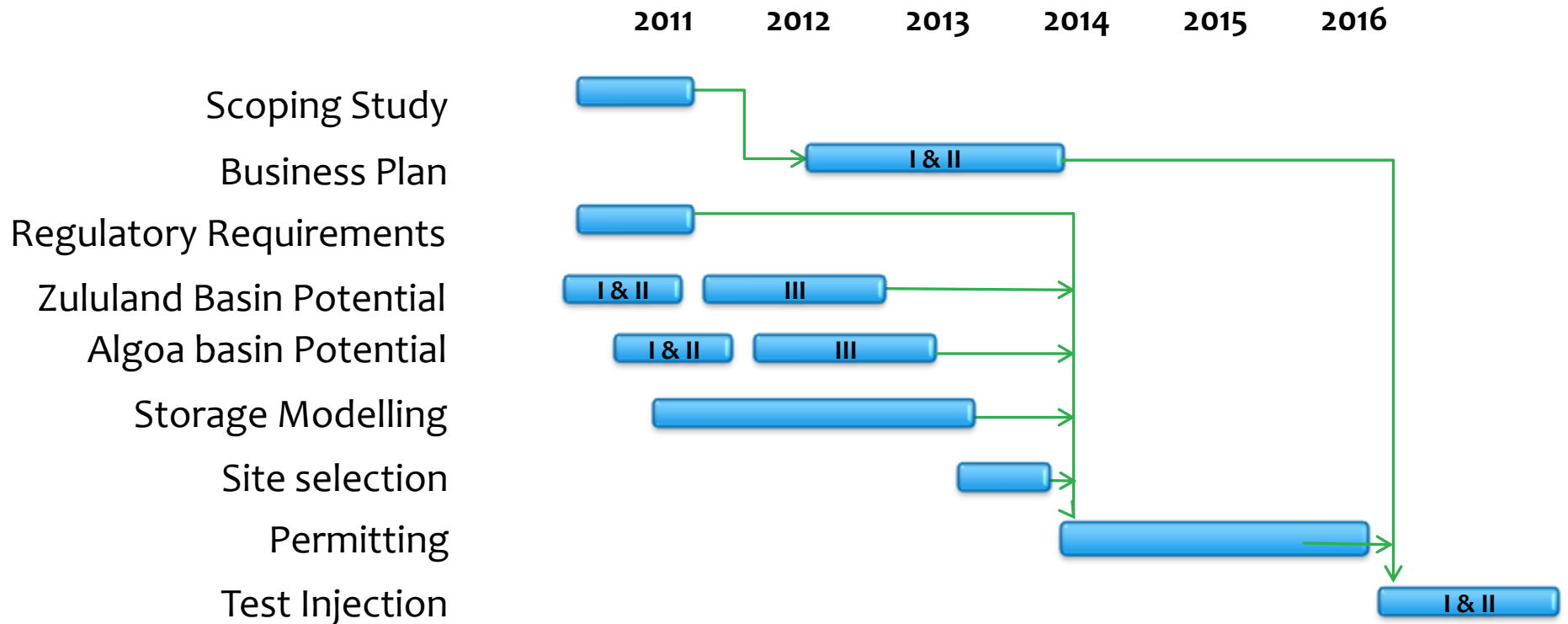
✿ Need:

- 4 Giga tonnes
- To store 40 million tonnes
- For 100 years

Projects Currently Underway

- Scoping Study for Test Injection
- Regulatory Requirements for Test Injection [Europe Aid/SACCCS Funded]
- Zululand Basin Storage Potential [UK Funded]
- Algoa Basin Storage Potential [Europe Aid/SACCCS Funded]
- Geological Modelling of Storage Sites [Europe Aid/SACCCS funded]
- Financial Opportunities for CCS in South Africa [Europe Aid/SACCCS funded]
- Public Outreach Determination [World Bank Funded]
- Definition of “Capture Readiness” Determination
- Capacity Building:
 - Five post-graduate bursaries
 - Post-primary Schools Science Expo
- Techno-Economic Study [SACCCS/World Bank]
- Collateral Benefits – Job Creation/preservation, industry development [CSLF]
- The Department of Energy: Developing a Carbon Capture and Storage Regulatory Framework [World bank Funding]

Critical Paths for Test Injection



Paradigm Change



To Date:

Low Cost

Low Liability



Forward:

High Cost

High Liability

Thank You

Full details available at
www.sacccs.org.za