




CCOP-Norway Program for Enhancing Public Petroleum Management of the CCOP Member Countries (EPPM)

P2W4 : Workshop on Regulatory Framework for Carbon Capture & Storage (CCS) : with focus on storage into geological formations, HSE, CDM and flaring

Phuket, Thailand

CCOP Member Country/NOC Updates

July 2010

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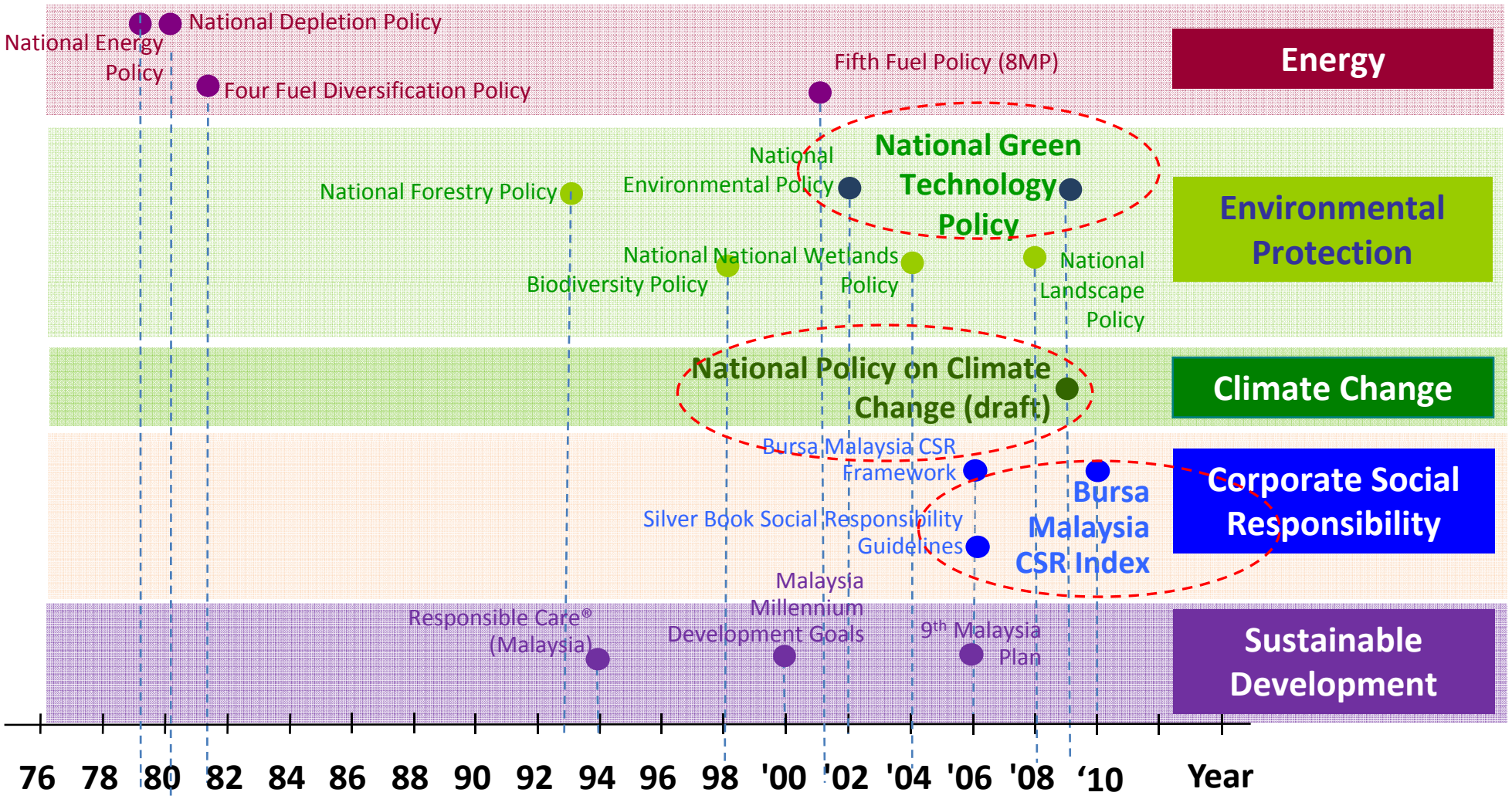
Regulations

PETRONAS Carbon Management Efforts

Challenges

In Malaysia, new regulations on environment, climate change and green technology may potentially change the rules of how industry operates



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Regulations

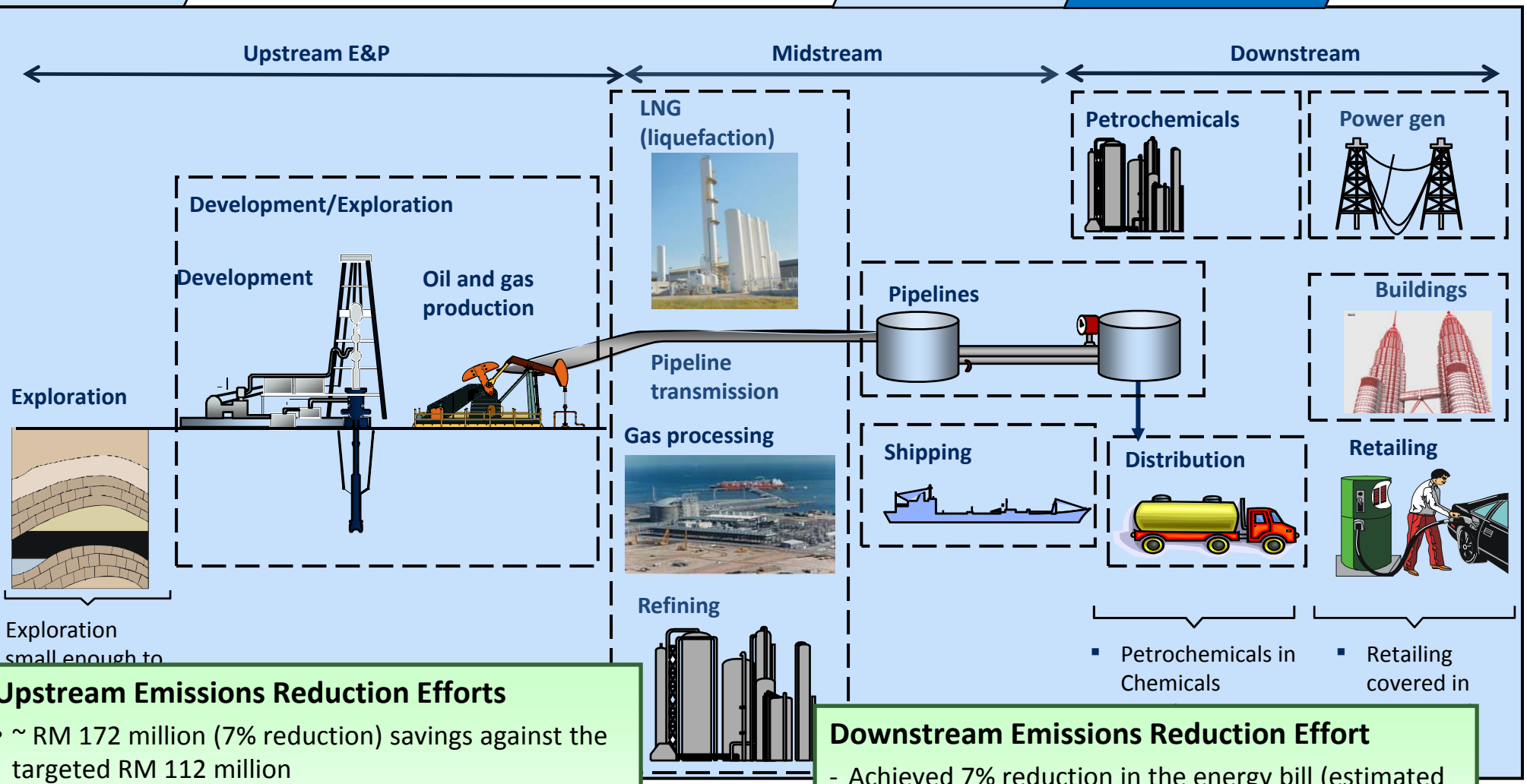
PETRONAS Carbon Management Efforts

Challenges

PETRONAS efforts in the area of carbon management is focused on the key activities in the oil and gas value chain

Exploration | Development | Oil and gas production | Gas processing / Refinery | Pipelines / Shipping | Petrochemicals / Distribution | Marketing

Upstream E&P | Midstream | Downstream



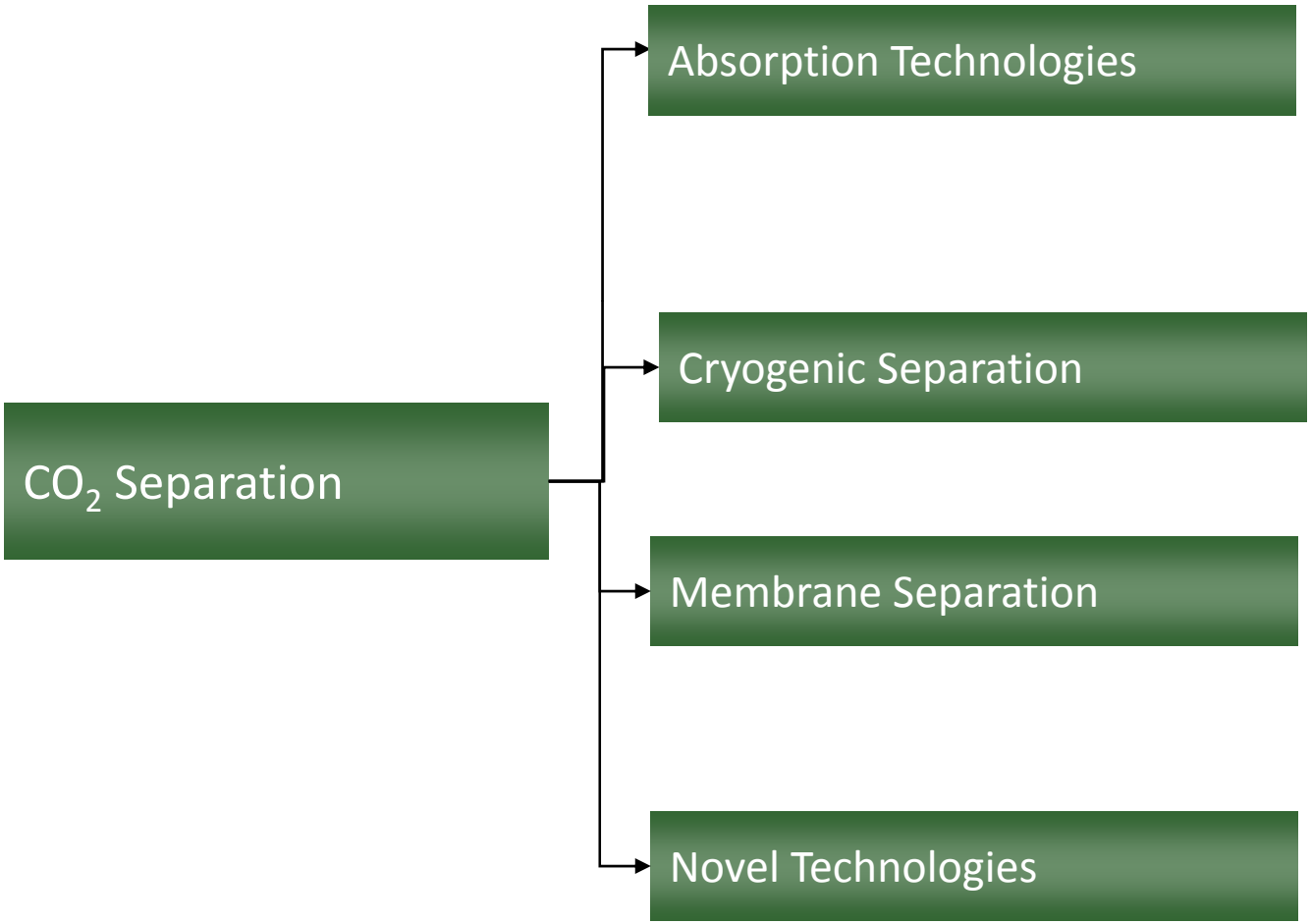
Upstream Emissions Reduction Efforts

- ~ RM 172 million (7% reduction) savings against the targeted RM 112 million
- Met the goal to reduce 5% of the 2005 energy bill by end of 2008

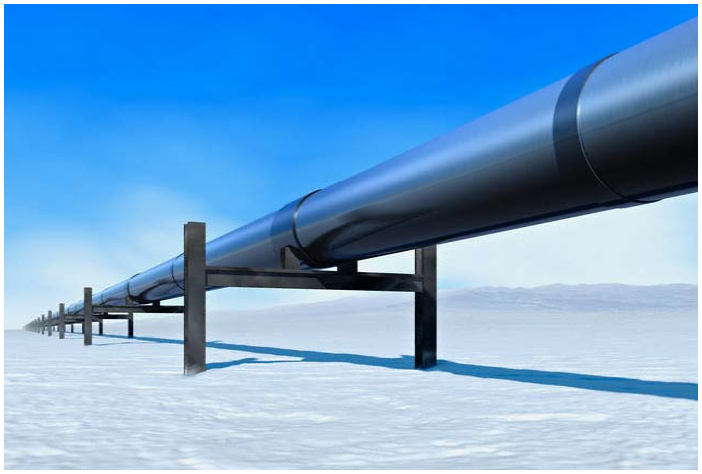
Downstream Emissions Reduction Effort

- Achieved 7% reduction in the energy bill (estimated savings of about RM 172 million) for PETRONAS Downstream plants

There several technologies that currently available and pursued in the areas of CO2 capture



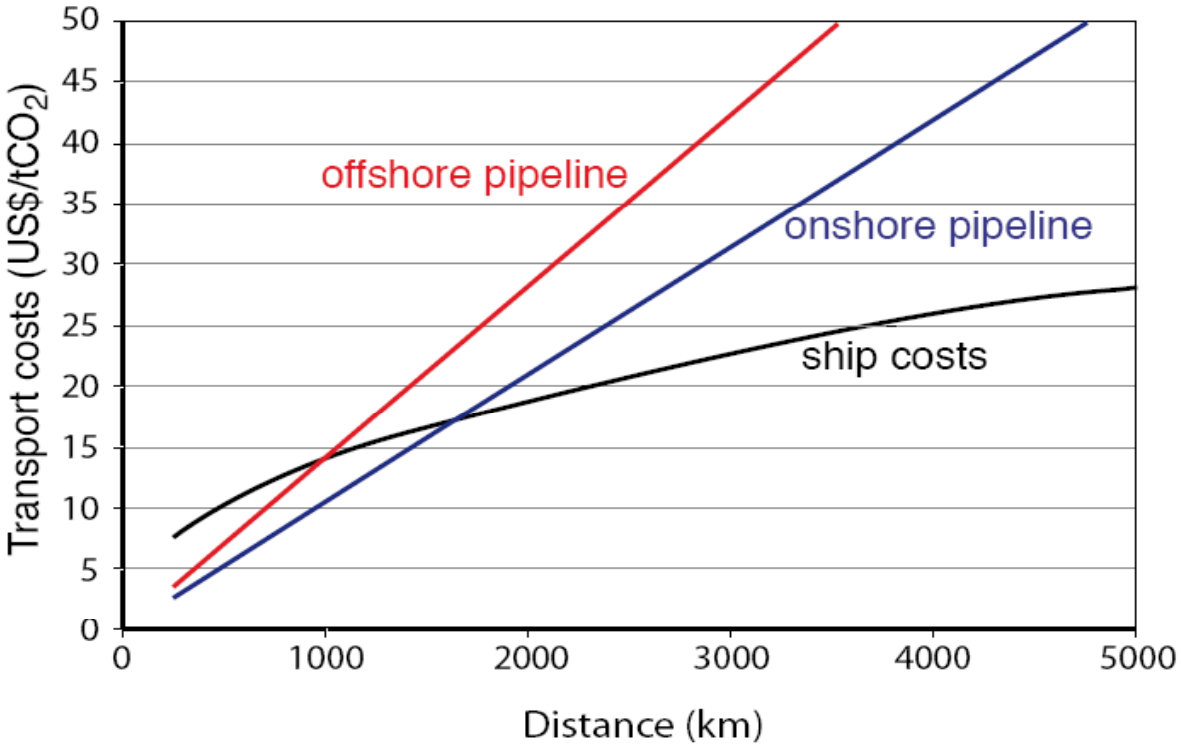
Pipelines are preferred for transporting large amounts of CO2 for distances up to around 1,000km



Pipeline Transport

CO_2 Tanker

Cost for transporting CO2 for three methods; onshore and offshore pipelines and ship



Source: IPCC

Note: Pipeline costs are given for a mass flow rate of 6 MtCO2/yr. Ship cost include intermediate storage facilities, harbor fees, fuel costs and loading and unloading activities

Major challenges in transporting CO2 resolves around materials needed for pipelines to support highly corrosion environment

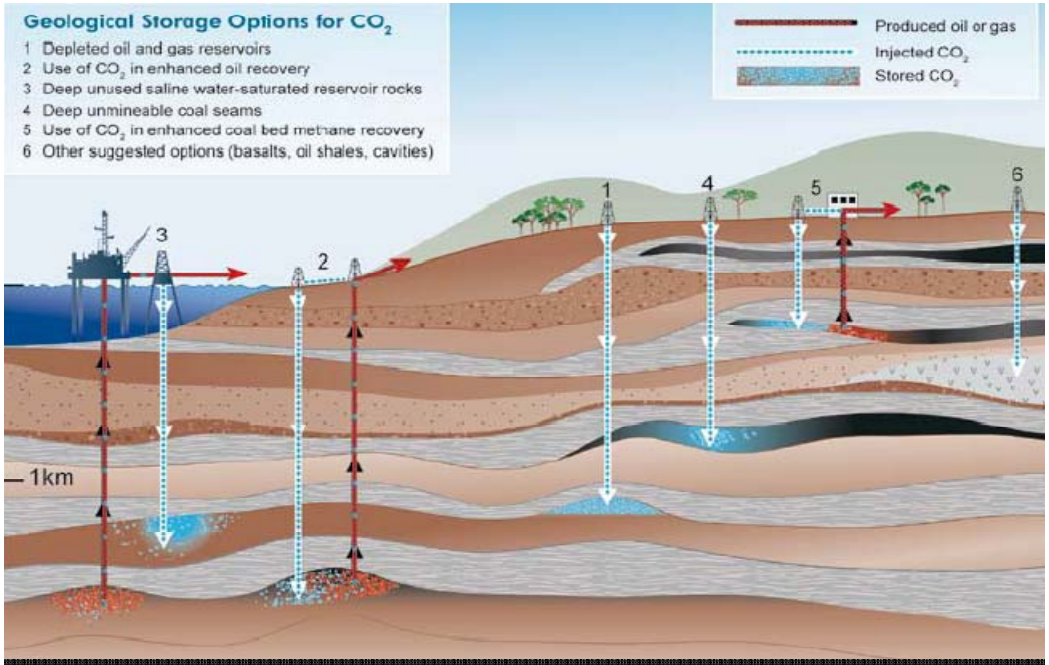
Issues and Challenges in CO_2 Transport

- Availability of new and cost effective alternative material
- Limited access to proprietary chemicals
- Reliability of corrosion monitoring tools

Research & Technology Focus

- Software for corrosion prediction
- Development of corrosion inhibitors in HPHT environment
- Lined and clad pipe materials

Exploratory Activities has been undertaken for CCS..



Geological Storage Options for CO_2

1. Depleted oil and gas reservoirs
2. Use of CO_2 in enhanced oil recovery
3. Deep saline water-saturated reservoir rocks
4. Deep coal seams
5. Use of CO_2 in enhanced coal bed methane recovery
6. Other suggested options (basalts, oil shales, cavities)

CO2 Storage & Utilization Initiatives

Enhanced Oil Recovery

- Investigation into the potential use of CO2 for EOR-related projects to increase recovery factors for Malaysian reservoirs

Storage Options

- Identification of potential sites (depleted oil and gas reservoir, saline aquifer and etc) for CO2 storage activities

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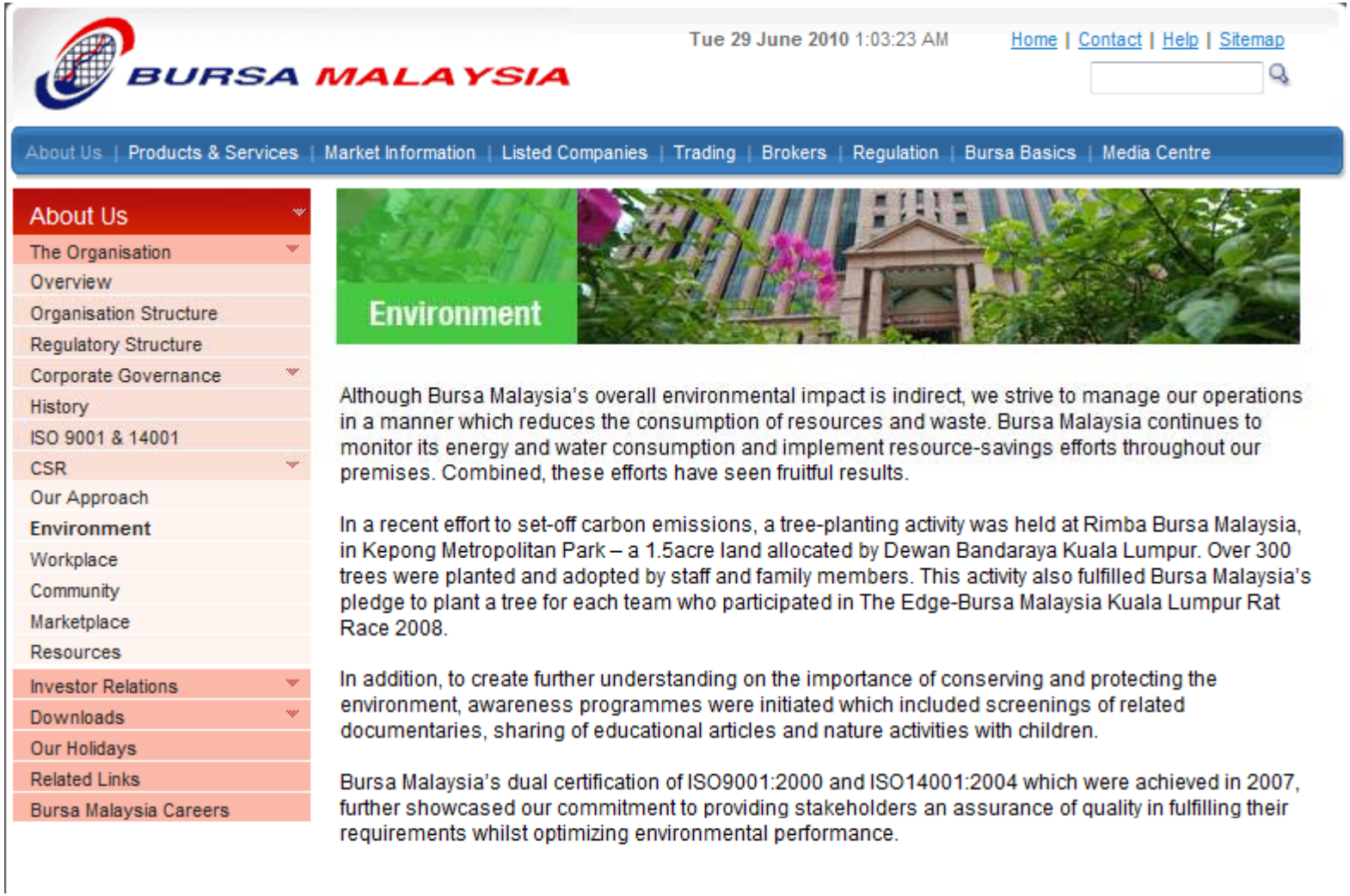
CCS Challenges for PETRONAS:

Capture	• No cost efficient technology available to separate High CO_2 • To maintain high pressure for CO_2 injection and transportation • To have an efficient separation between liquid HC and CO_2 • Minimum pretreatment, footprint , energy consumption and HC loss • Efficient and reliable CO_2 simulation tools
Transport	• Availability of new and cost effective alternative material • Limited access to proprietary chemicals • Reliability of corrosion monitoring tools
Storage	• High CO_2 sequestration cost • Economic viability to convert CO_2 • Uncertainties on CO_2 sequestration technology • Managing huge CO_2 volume

THANK YOU

Bursa Malaysia CSR Index



National Policy on Climate Changes

- Taking another step to combat greenhouse emissions, Malaysia will launch its National Policy on Climate Change this year, Natural Resources and Environment Minister Datuk Seri Douglas Uggah Embas said today.
- He said a blueprint comprising five principles, 10 strategic thrusts and 43 key actions was focused on mitigation, adaptation measures and capacity building.
- "As the issue of climate change is cross-sectoral in nature, a number of ministries, including the natural resources and environment ministry, will be directly invoved in implementing strategies and programmes aimed at tackling the issue.
- "The implementation of the climate change policy will drive efforts to reduce emissions and contribute to the larger agenda of resolving the issue of climate change," he said at the opening of a climate change seminar here.
- Douglas noted that Malaysia had already begun its roadmap to reduce emissions as pledged by Prime Minister Datuk Seri Najib Tun Razak to cut emissions by 50 percent from 2005 levels, at the Climate Change Conference in Copenhagen.
- He said the government would also draw up a comprehensive and detailed road map to address the climate change issue in the long term, he added.
- As part of its ongoing commitment, Douglas said the Pusat Tenaga Malaysia was re-designated recently as Malaysian Green Technology Corporation as further testimony of efforts to combat climate change.
- He added that Malaysia was also progressing in the implementation of environmentally-sound projects under the Clean Development Mechanism (CDM) and so far, registered 81 projects with the CDM Secretariat in Bonn, Germany.
- "I am proud to say, we currently rank fifth among countries in the world which had registered their CDM projects with the CDM Secretariat," he said