CO_2 Capture Project

CO2 Capture Project's Policies & Incentives Study

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CCP Phase 1 Results: Brussels Roll-out
2 June 2004

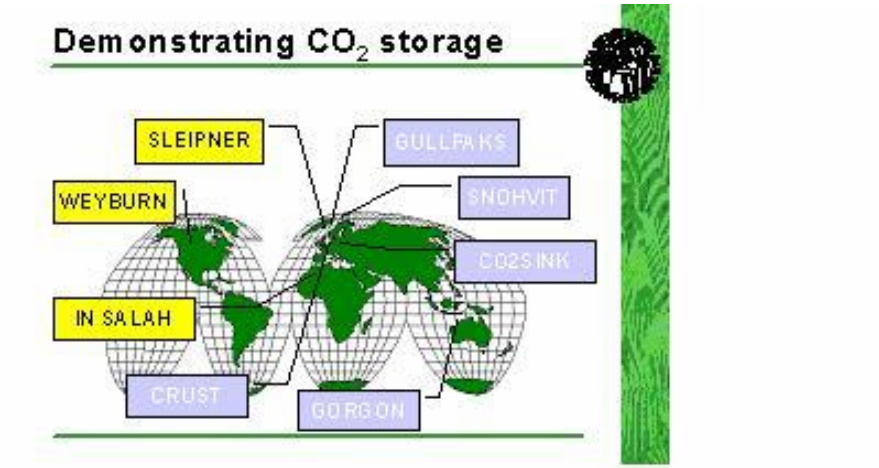
Why this study?

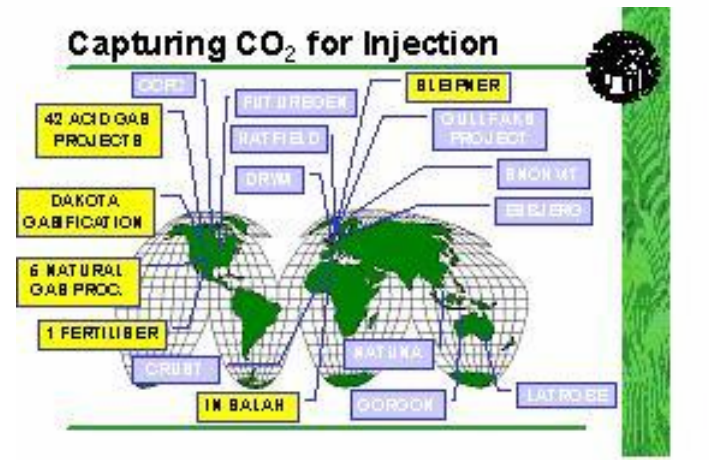
- **CO2 Capture Project Executive Board recognized that technology, policy, and public acceptance are intertwined**
- **Give overview of developments that may impact or benefit the CCP technology program**
- **Task performed by a team with members from CCP companies. Report prepared by ERM (Environmental Resources Management – London)**

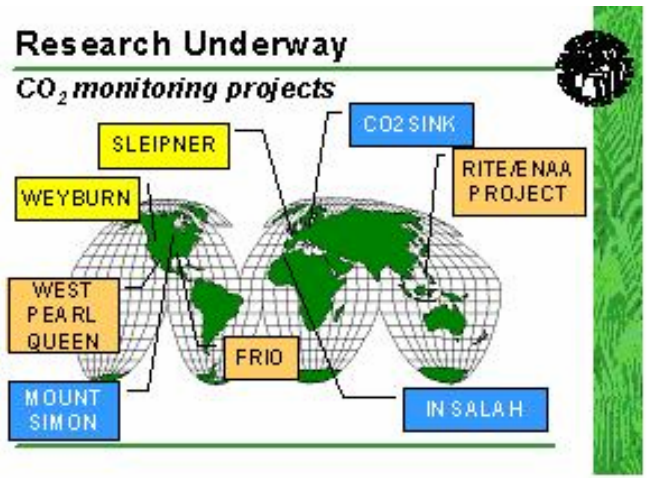
Activities covered by the Team

- **Identified**
  - policies and regulations influencing CCS
  - incentives developed supporting CCS
  - road blocks for successful CCS – applications
- **Countries covered by the study**
  - Australia
  - Canada
  - Denmark
  - Germany
  - Italy
  - The Netherlands
  - Norway
  - UK
  - USA
  - China – less detailed

CO2-storage – current activities worldwide







Source: Paul Freund – IEA Greenhouse Gas Programme

Policies for CCS - overview

Country	Supportive Policies or Regulations *specific* to CO_2 capture and storage	Restrictive Policies or Regulations *specific* to CO_2 capture and storage	Supportive Policies or Regulations *extended* to CO_2 capture and storage	Restricting Policies or Regulations *extended* to CO_2 capture and storage	Will lack of regulatory framework restrict CCP projects development? (Yes/ No)	Limited awareness, Negative (-ve) or Positive (+ve) NGO actions?	Limited awareness, Negative (-ve) or Positive (+ve) public opinion?
EU	×	×	✓	✓	Yes	+ve	Limited
Denmark	×	×	✓	✓	No	-ve	Limited (potentially –ve)
Germany	×	×	×	×	Yes	-ve	-ve
Italy	×	×	×	✓	No	+ve	+ve
Netherlands	✓	×	✓	✓	No	-ve	Limited
Norway	×	×	✓	✓	No	-ve[1]	Limited
The UK	✓	×	×	✓	Yes	-ve and +ve	-ve
USA	×	×	✓	✓	Yes	Limited	Limited
Canada	✓	×	✓	✓	Yes	Limited	Limited
Australia	×	×	✓	✓	Limited	-ve	-ve
China	×	×	×	×	-	Limited	Limited

× : no existing Policies or Regulations; √: Policies or Regulations exist;

Policies for CCS – important findings

- **Little progress in the development of policy and regulatory frameworks for CO2 capture and storage in the countries of interest to this study.**
- **Some non-government organizations (NGOs) and the public in the European Union are becoming slightly less skeptical of the technology.**
- **It may still be too early to assess the level of public skepticism, which will become clearer when specific projects are reviewed for permitting or licensing.**

Policies for CCS – important findings

- **Australia, Canada, Netherlands, Norway, UK and US are developing or implementing policy measures aimed at promoting the use of CO2 capture and storage.**
  - US is revising 1605b guidelines to include detailed monitoring and verification provisions –expected to include CCS in 3-5 years
  - UK has not yet developed policies specifically aimed at CO2 capture and storage, but has developed recommendations that encourage a move in that direction.
  - No direct policies but CCS expected to become an important part of Canada's climate change mitigation options
  - Norway proposed a strategy to develop gas-fired power generation with CO2 capture and storage.
  - Netherlands Electricity Act of 2003 through tax exemptions will promote carbon neutral electricity including CO2 capture and storage.

Incentives for CCS - overview

Country	Existing or expected financial incentives?	Existing or expected financial disincentives?	Existing or expected program or funding?	Existing or expected Capture and storage pilot or demonstration projects?
EU	✓	×	✓	✓
Denmark	×	✓	✓	✓
Germany	✓	×	✓	✓
Italy	✓	×	✓	✓
The Netherlands	✓	✓	✓	✓
Norway	✓	×	✓	✓
The UK	✓	×	✓*	✓
USA	✓	✓	✓	✓
Canada	✓	×	✓	✓
Australia	✓	×	✓*	✓*
China	×	×	×	×

×: non existant; ✓: existant; * expected

Incentives for CCS – important findings

- **Clear momentum exists as projects are being deployed and technology continues to be researched and developed.**
- **In the EU, Norway, Australia, Canada and US, additional efforts for R&D programs and other financial incentives emerged in 2003.**
- **Identified the need for geologic sequestration to fit into carbon crediting and trading schemes (e.g., EU Emissions Trading's M&V Guidelines will need to include CCS.)**

Possible roadblocks to CCS

- **International treaties**
  - London Dumping convention
  - Oslo-Paris Convention
- **EU Water directive**
- **Public acceptance**
- **Cost**

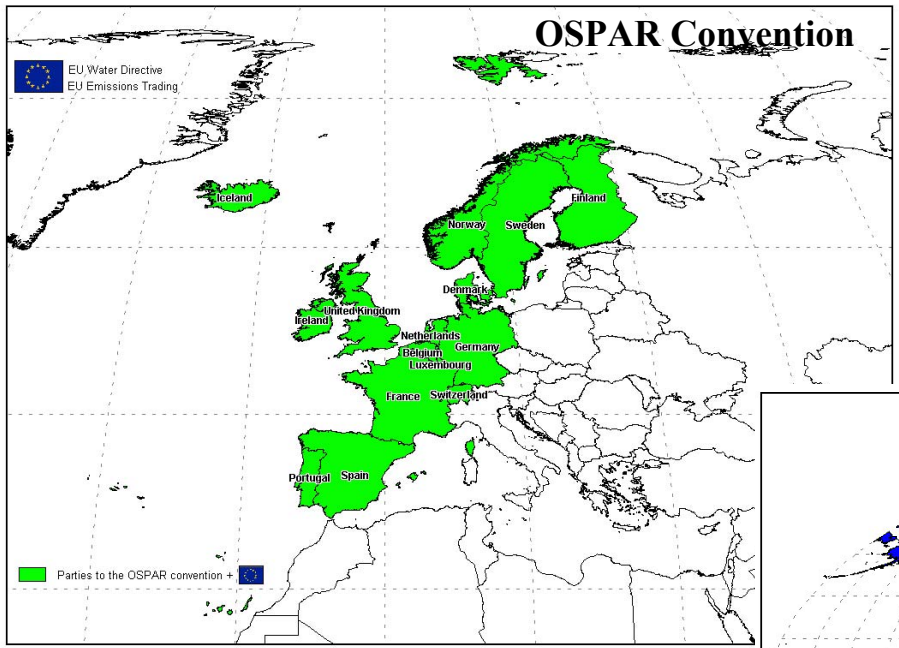
Possible roadblocks to CCS

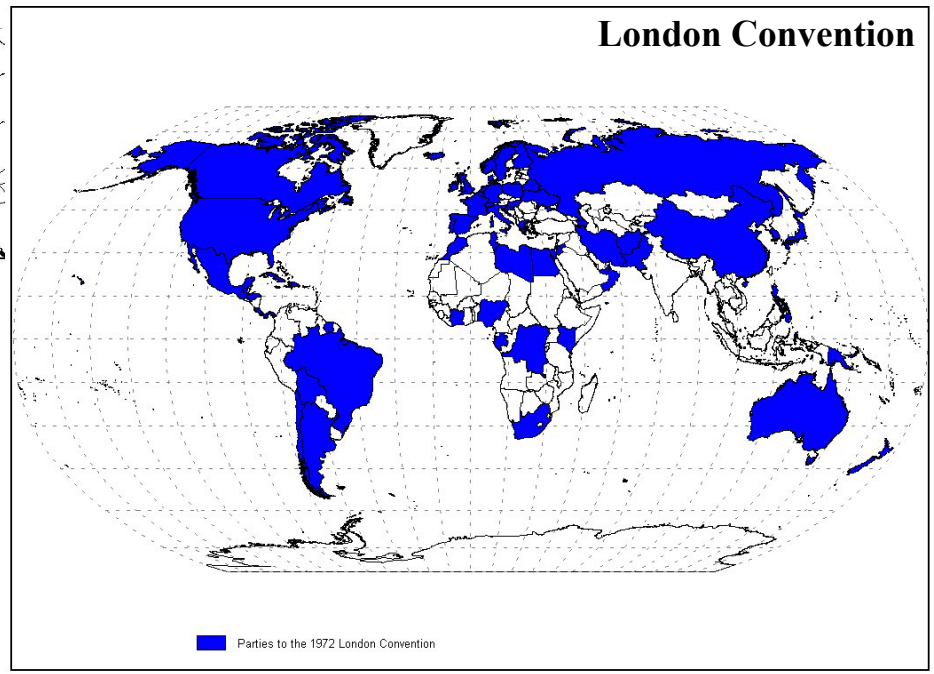
London and OSPAR Conventions

- **The overall intent of these treaties is to prohibit the dumping of wastes.**
- **The definition and handling of CO2 will be an important determinant for implementation, particularly in offshore locations. Three factors are relevant:**
  - Whether the captured CO2 is being stored or is, in effect, being disposed of
  - Whether the CO2 is being placed in the water column or in the seabed and its subsoil as part of a scientific experiment as a prelude to CO2 capture and storage or as part of the CO2 capture and storage process
  - Whether the CO2 contains impurities resulting from the capture stage (e.g. H2S).

Possible roadblocks to CCS

Parties to London and OSPAR Conventions





Possible roadblocks to CCS

London and OSPAR Conventions

- The discussions around the relevance of the London and OSPAR to CO2 capture and storage have only just begun.
- To make changes to the language or to clarify the intent of specific provisions will require long negotiations between nations that are parties to these international treaties.
- Therefore, the lack of clarity in these issues poses a potential barrier to the offshore deployment of CO2 capture and storage.
- Amendments may be needed to develop the appropriate regulations of CO2 storage within the frameworks of the Conventions

Possible roadblocks to CCS

EU Water Framework Directive

- **The EU Water Framework Directive aims to "maintain and improve the aquatic environment in the Community." The Directive has two main objectives:**
  - Achieve and maintain water quality ('good status') by the deadline of 2015;
  - Ensure that the quality of all ground and surface water does not deteriorate below present status.
- **The Directive defines a pollutant as:**
  - "the direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems which result in damage to material property, or which impair or interfere with amenities and other legitimate uses of the environment."
  - CO2 is not on the Directive's lists of pollutants or dangerous substances.

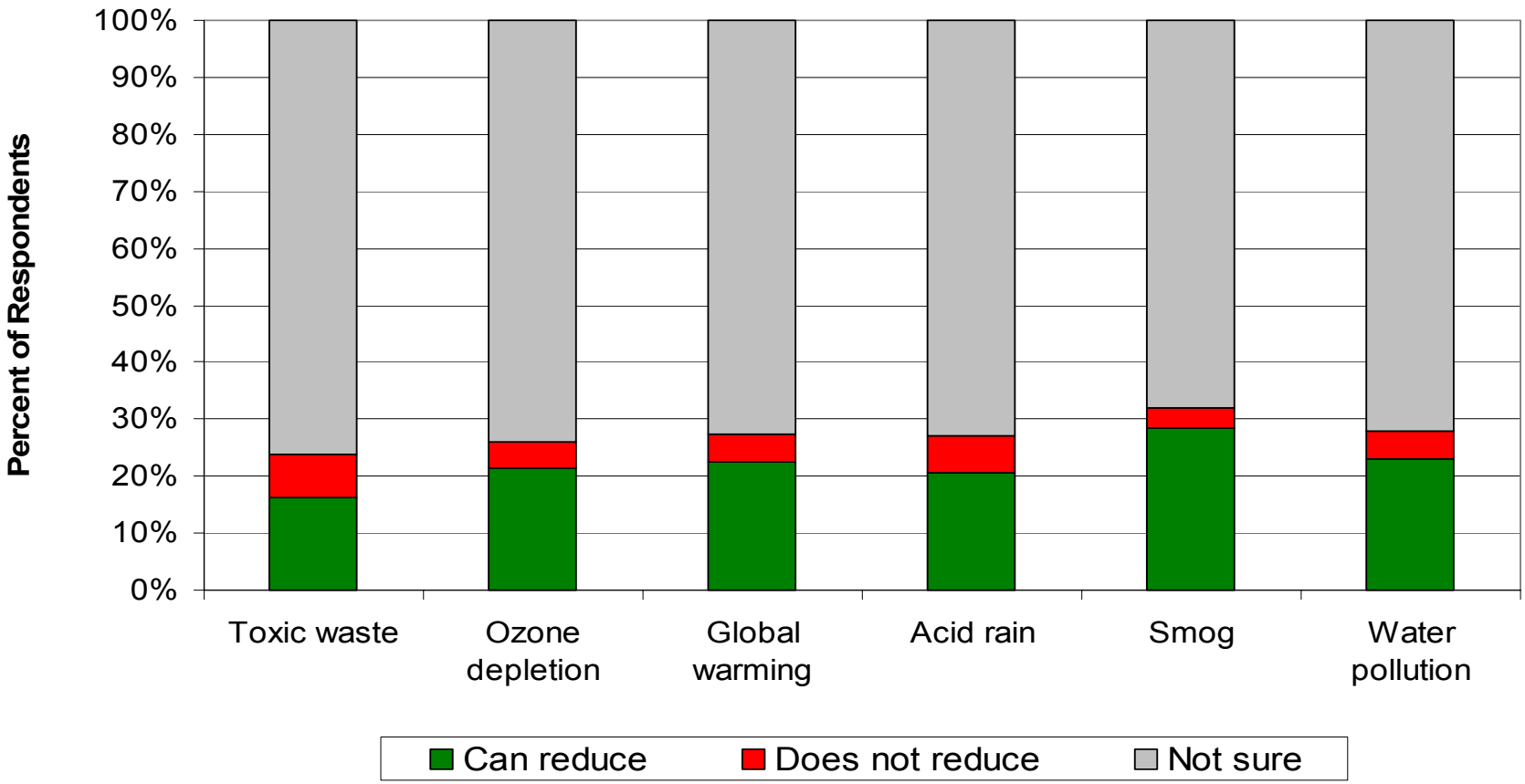
Possible roadblocks to CCS

Public awareness - 1

- **Results of a Public Awareness Poll - US**
  - What environmental concerns can carbon sequestration or carbon capture and storage reduce?
  - Panel members given a list of 6 environmental concerns and asked if carbon sequestration or carbon capture and storage can reduce or does not reduce each. Panel members could also indicate they were not sure.

- Source: MIT Carbon sequestration initiative - Tom Curry, Howard Herzog, et al.

Select if "carbon sequestration" or "carbon capture and storage" can reduce each of the following environmental concerns.



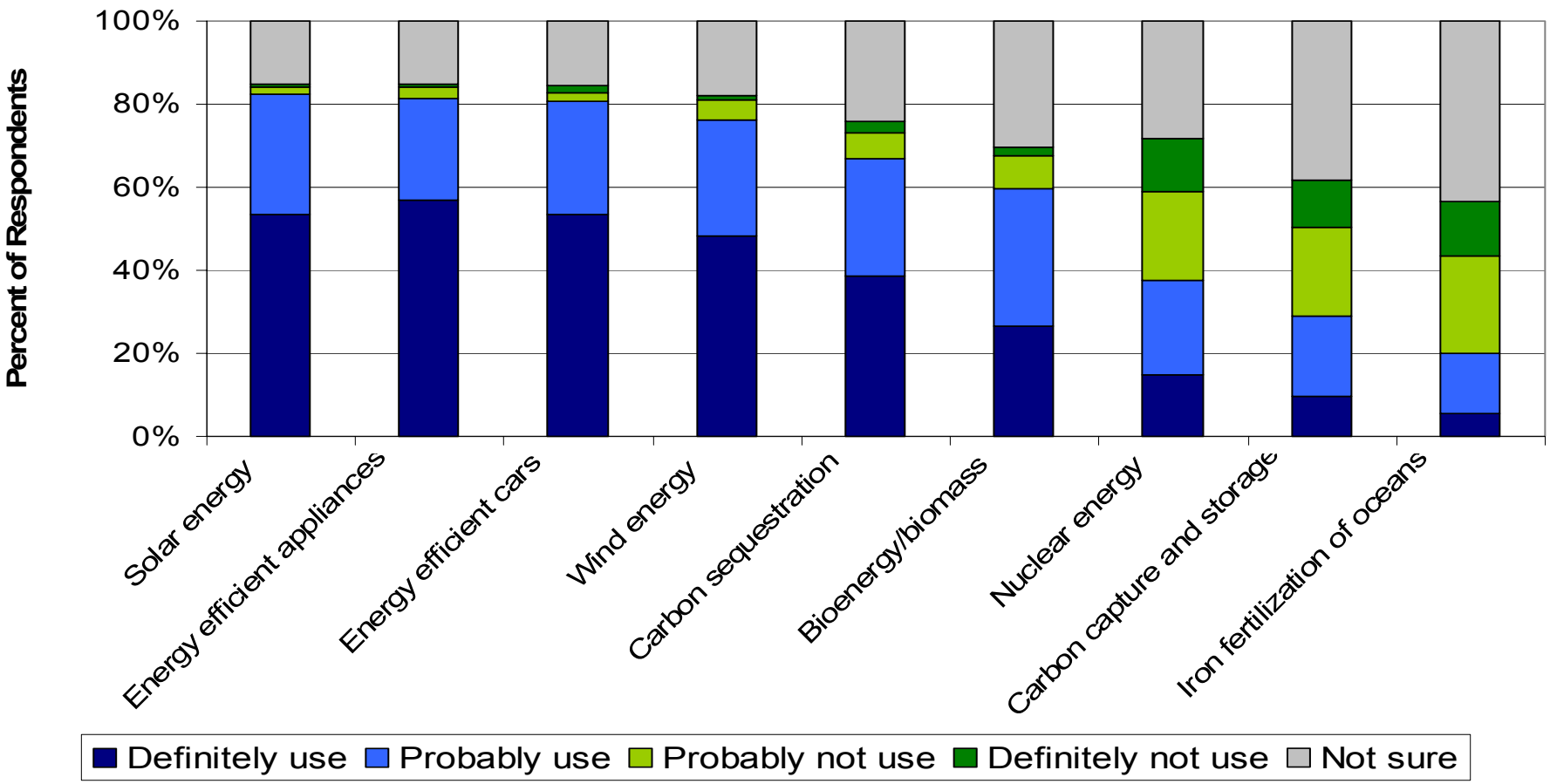
Possible roadblocks to CCS

Public Awareness - 2

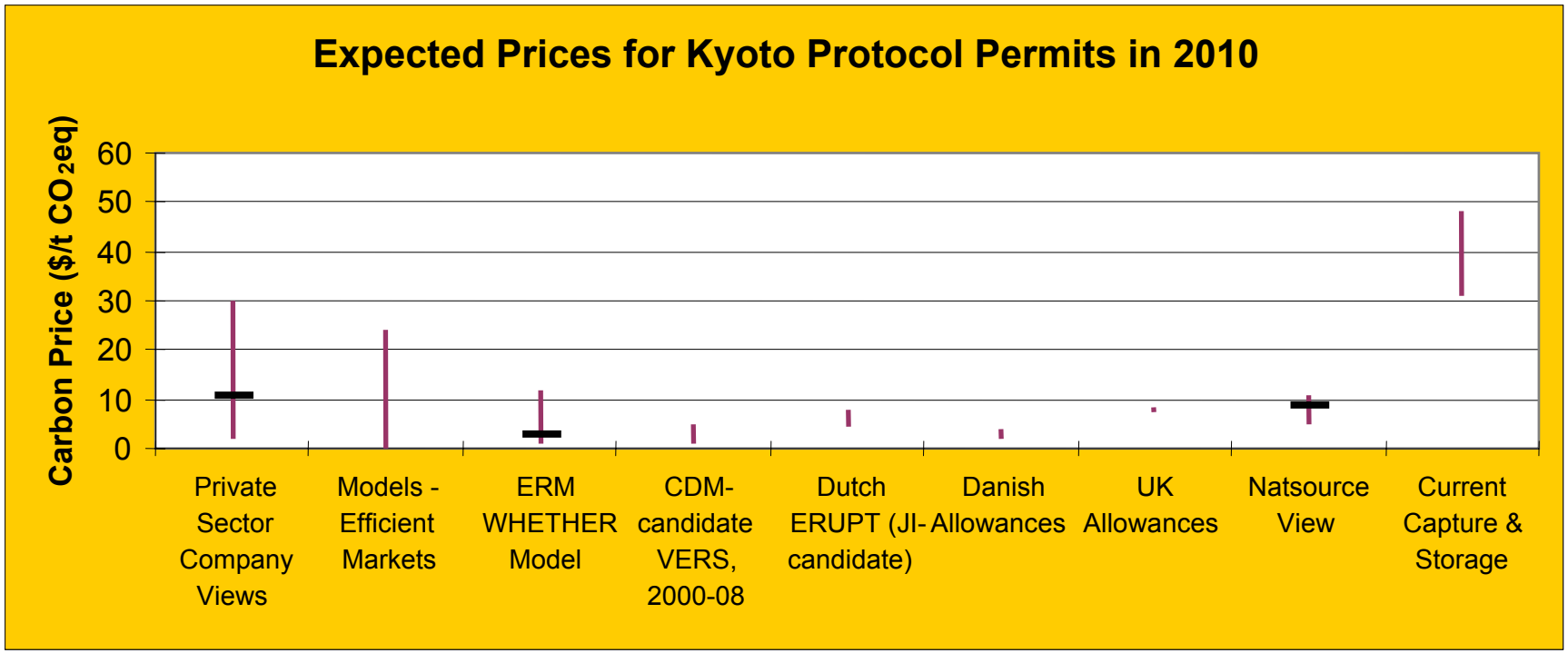
- **What technologies would the public use to address global warming?**
- **Panel members given a list of 9 technologies and asked to indicate if they would definitely use, probably use, probably not use, or definitely not use each technology to address global warming. Panel members could also indicate they were not sure**

- Source: MIT Carbon sequestration initiative - Tom Curry, Howard Herzog, et al.

Would you use these technologies to address global warming?



Cost for Carbon capture and storage
A short term roadblock?



- **Cost of Capture & Storage expected to be too high to compete in the short term (to 2012)**

**Assessment of Private Sector Anticipatory Response to GHG Market Development, Natsource LLC with GCSI for Environment Canada, July 2002*

Recent developments – increased attention to CCS opportunities

- **Carbon sequestration leadership forum**
  - 16 countries including EU
  - facilitate development and availability of technologies for CCS
- **US**
  - Regional Carbon Sequestration Partnerships
    - expanded federal efforts to encourage US regional approaches to CCS, in partnership with State and local governments, academics, national research institutions, industrial firms, environmental groups and other NGO's
  - Futuregen
    - 10-year demonstration project to create the world's first coal-based, zero-emissions electricity and hydrogen power plant – 1 bn $ funding
- **Norway**
  - Government announce a fund of 250 m Euro for gas and CCS technology development

Recent developments – increased attention to CCS opportunities

- **Canada**
  - Potential Canadian CSLF-project
    - enhanced coal bed methane
  - Industry initiative
    - ROSCO2 – recovery oil sands CO2

- **EU**
  - Hypogen
    - large scale test facility for production of hydrogen and electricity – 1,3 bn Euro demonstration programme
  - EU emissions trading (ETS)
    - Inclusion of CCS in EU ETS
    - Draft monitoring and Reporting Guidelines for handling CCS being prepared

Key Messages - 1

- **Clear momentum exists as projects are being deployed and technology continues to be researched and developed**
- **The London Dumping Convention and the OSPAR Convention ("Oslo Paris Convention) may apply to CO2 capture and storage deployment offshore in geologic formations. Issues for clarification may require several years of intergovernmental negotiations in order to accommodate such deployment**
- **In general, there is little policy and regulatory development specifically addressing CO2 capture and storage in individual countries**
- **Specific countries (Netherlands, Norway, Canada, United Kingdom (UK), United States (US)) are moving in the direction of policy development specific to CO2 capture and storage**

Key Messages - 2

- **Public awareness is low to non-existent. Some NGOs will likely play key role in public acceptance of the technology**
- **Some non-government organizations (NGOs) and the public in the European Union are becoming slightly less skeptical of the technology. However, it is still too early to assess the level of public skepticism, which will become clearer when specific projects are reviewed for permitting or licensing**
- **Existing and emerging financial incentives in the countries studied are focused principally on research and development. Such incentives are needed to improve the cost-effectiveness for deploying CO2 capture and storage technology**

Key messages - 3

- **CO2 capture and storage technology is becoming recognized and credited in some regulatory regimes, though it is not yet widely recognized nor credited. A monitoring and verification framework is needed to achieve wide recognition and crediting**
- **There is a need for geologic sequestration to fit into carbon crediting and trading schemes**

Thank you for your attention

Members of the team and consultant

- **From CCS companies:**
  - Jan Hartog (Shell)
  - Arthur Lee (ChevronTexaco) – Team Lead
  - Georgia Callahan (ChevronTexaco, alternate)
  - Bill Senior (BP) / Mark Akhurst (BP, alternate)
  - Alison Taylor (Suncor) / Geoff Johns (Suncor)
  - Frede Cappelen (Statoil)
  - Dag Christensen (Norsk Hydro)
  - Giuseppe Iorio (ENI, also Board member)
  - Jim Provias (Suncor, also Board member)
- **From ERM**
  - Lee Solsbery
  - Cecile Girardin