

# Economics of CO<sub>2</sub> Capture and Storage

2<sup>nd</sup> International Symposium  
Capture and Geological Storage of CO<sub>2</sub>

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Howard Herzog / MIT Laboratory for Energy and the Environment

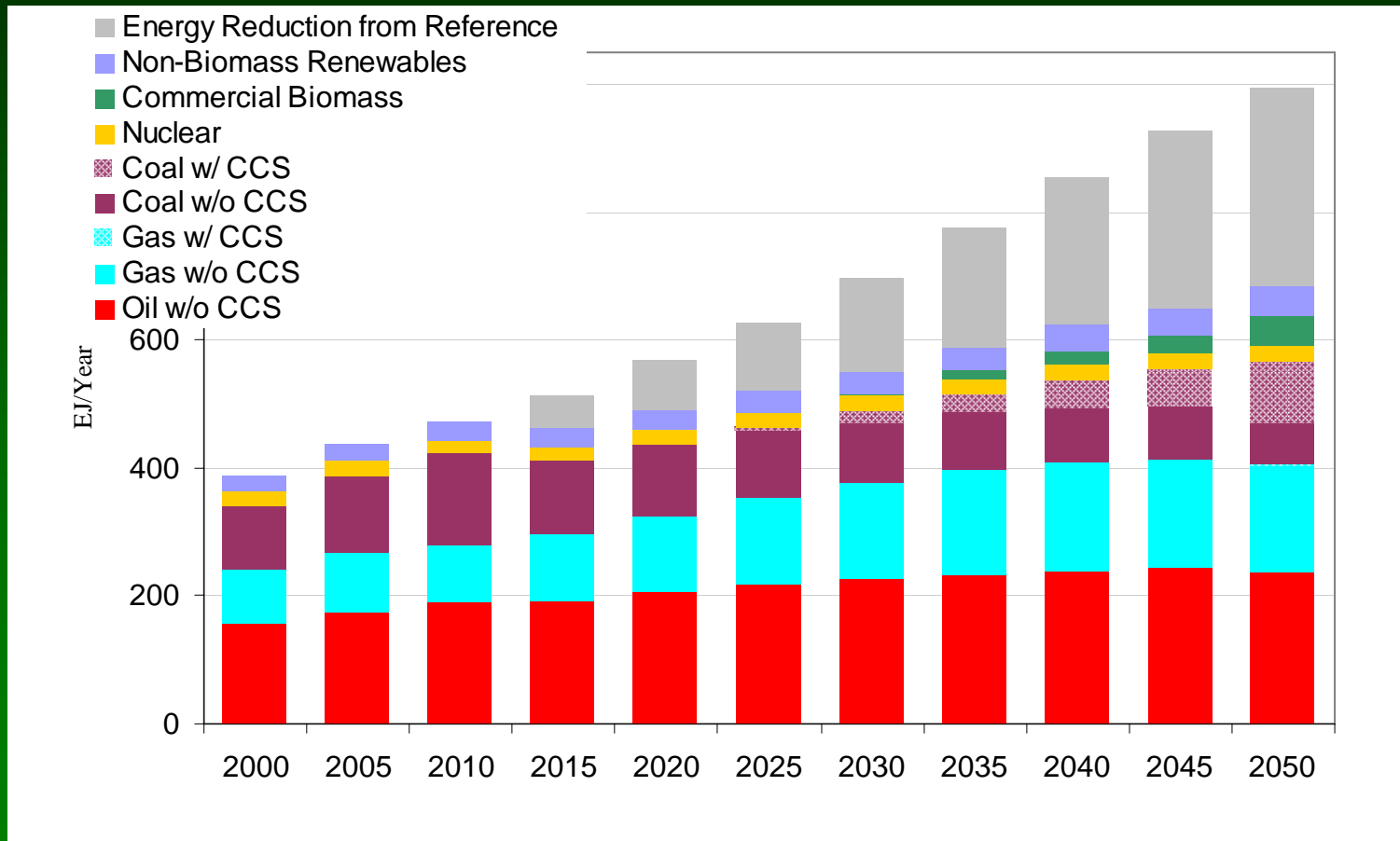
# CCS Economics

- Successful implementation of CCS will inevitably add cost for coal combustion and conversion. We estimate that for new plant construction, a CO<sub>2</sub> emission price of approximately \$30/tonne (about \$110/tonne C) would make CCS cost competitive with coal combustion and conversion systems without CCS. This estimate of CCS cost is uncertain; it might be larger or with new technology, perhaps smaller.

from MIT Coal Study - Executive Summary - March 2007

# MIT Coal Study Figure 2.4

## Global Primary Energy Consumption under High CO<sub>2</sub> Prices



# BP Abandons Plans to Build UK Carbon Capture Plant

**Reuters News Service – May 24, 2007**

British oil company BP on Wednesday abandoned plans to build a carbon capture and storage plant in Scotland, after a government energy review delayed a subsidy award.

# Duo ditch costly Draugen CO<sub>2</sub> plan

**Upstreamonline.com – 29 June 2007**

Statoil and Shell have dropped plans to inject carbon dioxide into the Draugen reservoir in a bid to enhance oil recovery, saying the move is uneconomical.

# SaskPower Shelves Clean-coal Project

**Globe and Mail – September 7, 2007**

It was supposed to herald the era of "clean coal," but Saskatchewan now says a proposed coal-fired power plant that would capture and store carbon dioxide is simply too expensive.

Mr. Youzwa said the feasibility study conducted by the utility over the past year concluded that the technology is sound.

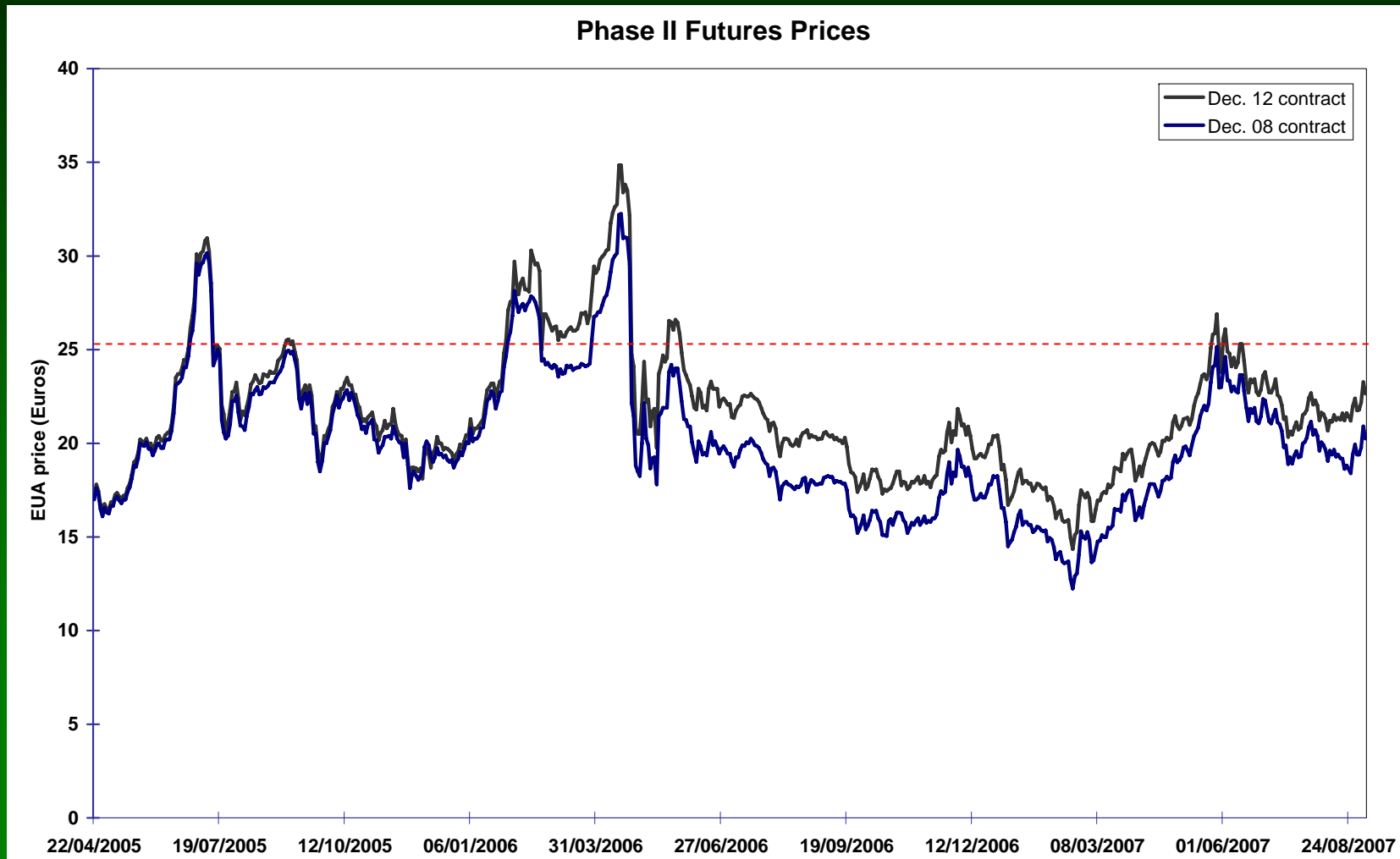
"But given the need for new supply by 2010, and given the costs of clean coal at this early stage in its development, it would have been premature to proceed to the construction phase at this time."

Gary Wilkinson, senior vice-president at SaskPower, said the projected capital cost of the project soared to \$3.8-billion from \$1.7-billion.

# Critical Question

- Is it reasonable to expect to build 100s of coal-fired power plants with CCS by 2050 when we are having so much trouble building just one today?

# Carbon Prices – EU Trading System



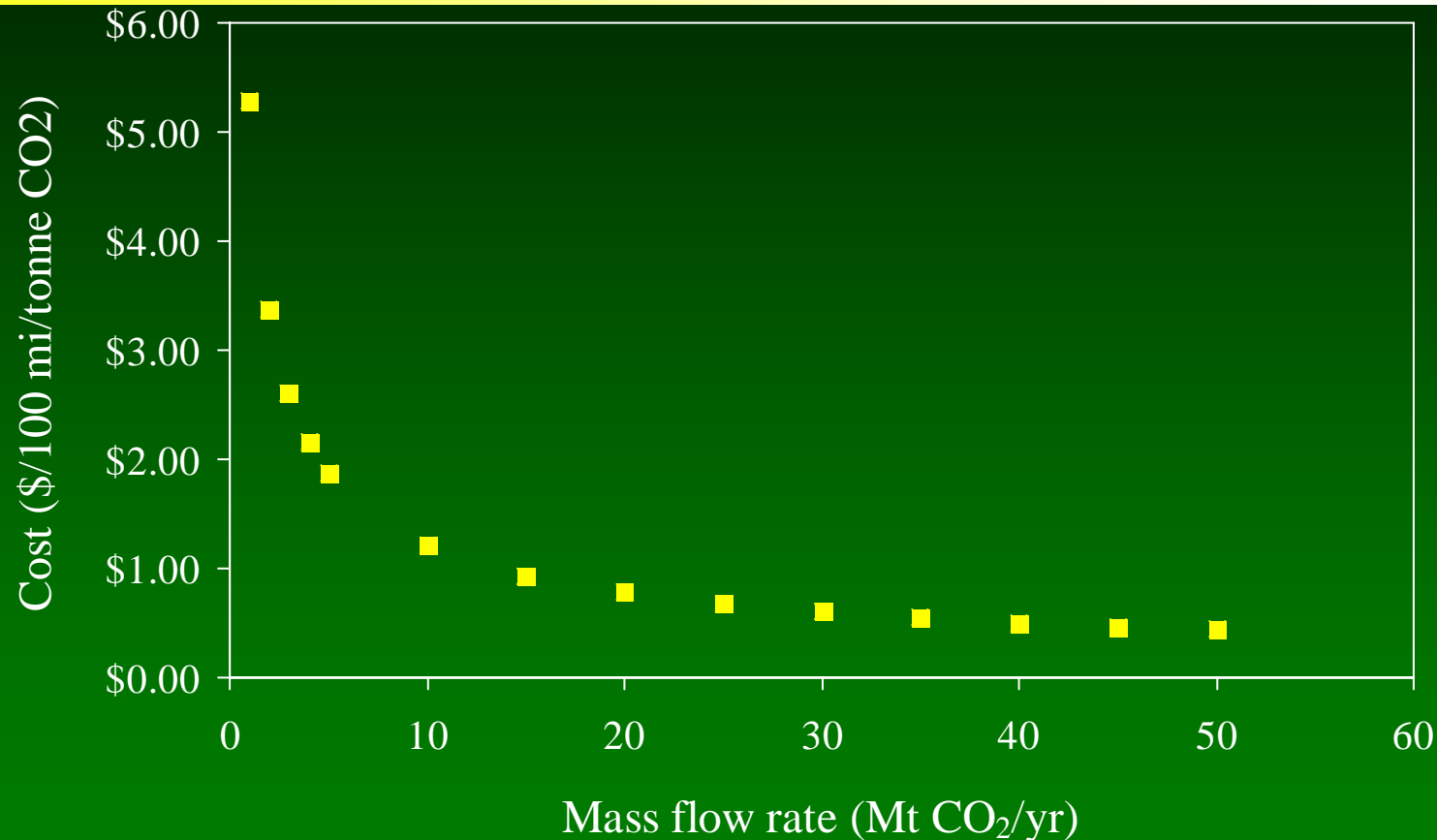
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# CCS Costs

- Projected CCS Costs (from MIT Coal Study)
  - additional \$20-30 per MWh to cost of electricity
  - \$30-45/tonne CO<sub>2</sub> avoided
- This cost assumes:
  - 2005\$
  - n<sup>th</sup> plant
  - Today's technology (i.e., no technological breakthroughs required)
  - Regulatory issues resolved without imposing significant new burdens
  - Operations at scale (i.e., transition costs not included)
- Cost today at least 50% higher

# Economies of Scale Example

## Cost of CO<sub>2</sub> Pipeline Transport



Economies of scale reached at 10 Mt CO<sub>2</sub>/yr  
(1500 MW<sub>e</sub> of coal-fired power)

# Estimates for CCS Plants

- Summer 2007
  - Coal –\$50/tonne CO<sub>2</sub> avoided
  - Gas – \$75/tonne CO<sub>2</sub> avoided
- EOR can give credit up to \$20/tonne CO<sub>2</sub>
- Best economics for plants that do not require large capture costs (e.g., Sleipner, In-Salah, Weyborn)

# Summary

- Long-term economic projections are different than shorter-term economic realities
- In the shorter term (at least through 2020), CO<sub>2</sub> prices by themselves will be insufficient to stimulate large-scale deployment of CCS
  - First of kind issues must be addressed
  - Need to build up infrastructure
  - RD&D is needed to achieve technological readiness
- Current funding levels are too low – significantly higher short-term budgets (public and private) are needed to achieve long-term goals

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