Brussels

5 March 2008

CO_2 Capture and Storage - The Way Forward

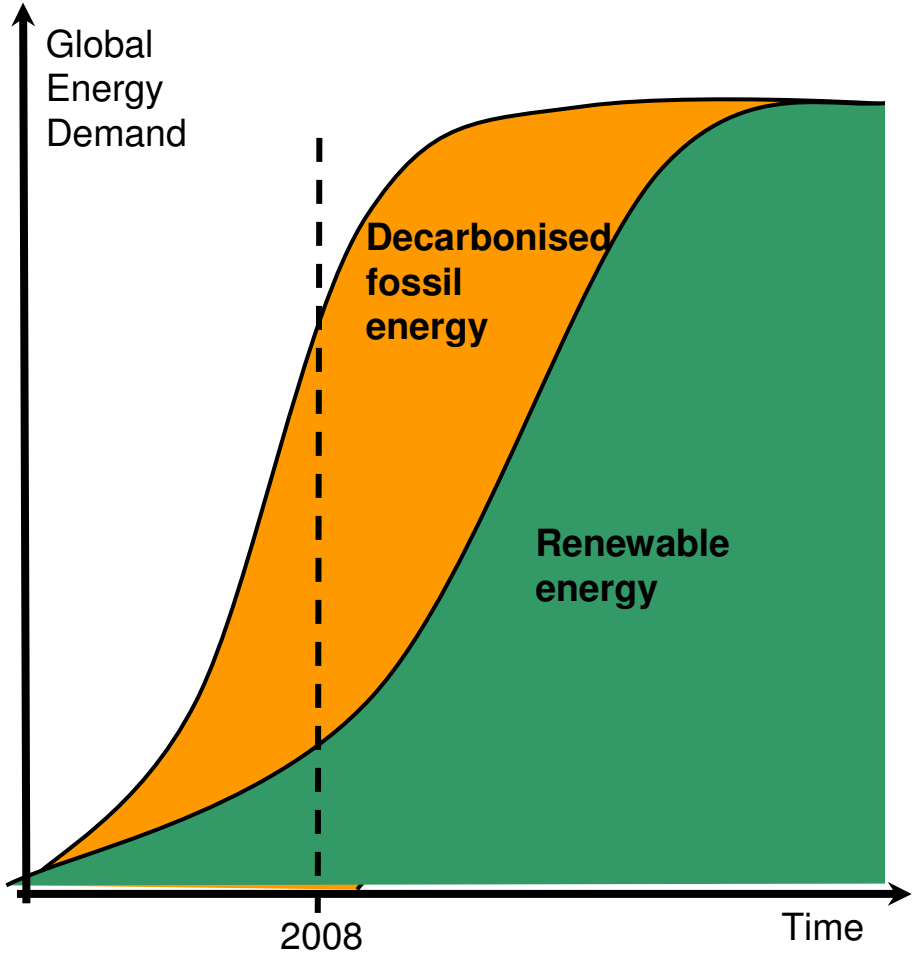
Frederic Hauge

President of the Bellona Foundation

E-mail: frederic@bellona.no

From Pollution to Solution

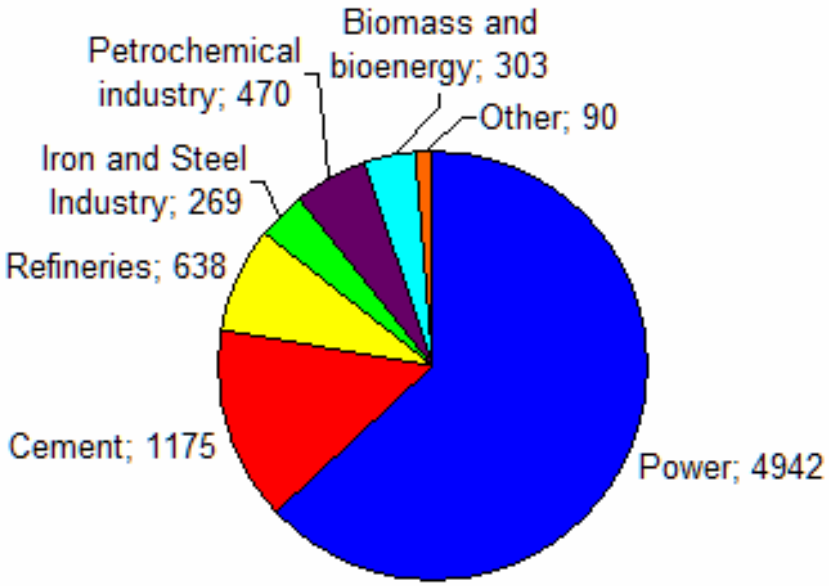
How to Combat Global Warming



- Global CO_2 emissions cut by 50-85 percent by 2050
- This can only be achieved by <u>combining</u>:
  - Energy efficiency
  - New renewables
  - Hydropower
  - Increase biomass-absorption of CO_2
  - CCS

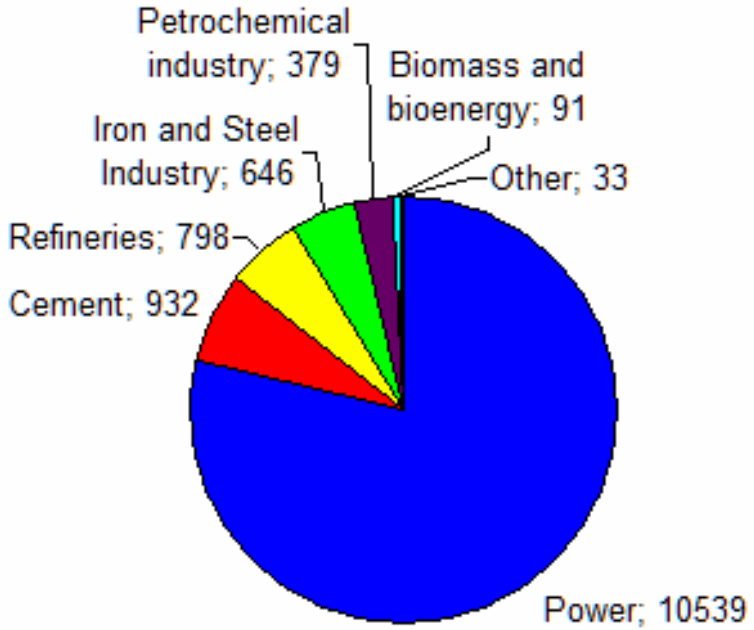
Large CO_2 sources

Number of sources > 0.1 M ton/yr



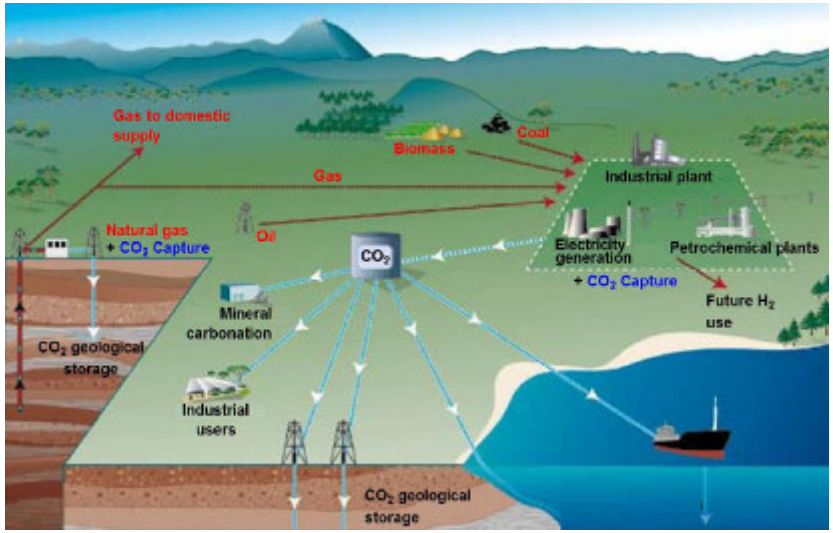
Source: IPCC 2005

CO_2 emissions (M ton/yr)



CCS Potential: 80 % Emission reduction

The CCS Potential



Recent publication in the International Journal of Greenhouse Gas Control:

CCS can reduce CO_2 emissions in the EU by

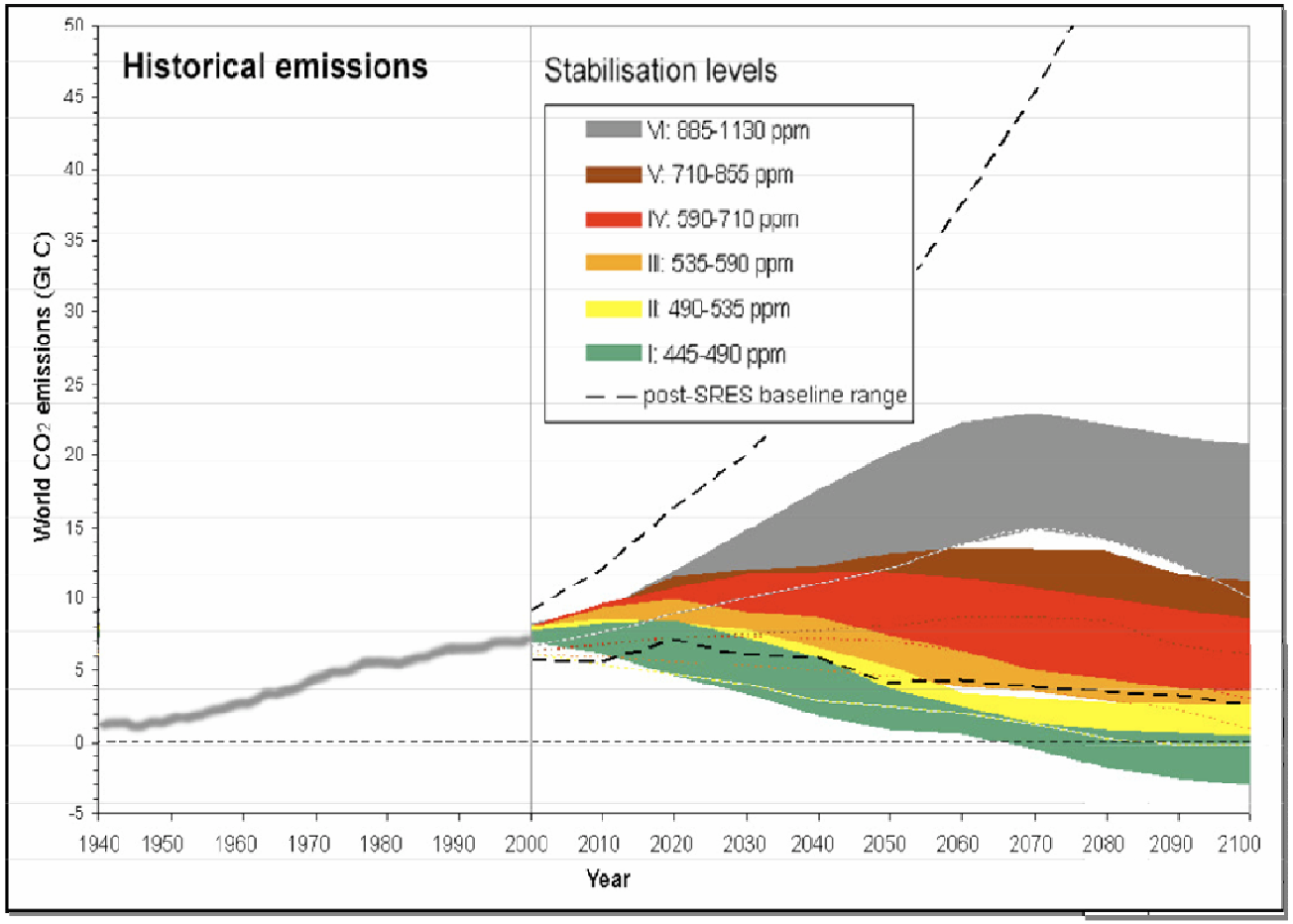
54 percent

in 2050 compared to emissions today

(Stangeland, International Journal of Greenhouse Gas Control, October 2007)

Is global warming unavoidable?

A CO_2 concentration above the climate critical threshold seems unavoidable no-matter what realistic future emission scenario are used



Carbon Negative – The Idea

The idea:

- Remove CO_2 from the atmosphere

How:

- Biological material consumes CO_2 during growth
- The biomass is combusted in a power plant
- Emitted CO_2 is captured and stored underground (CCS)

What's new:

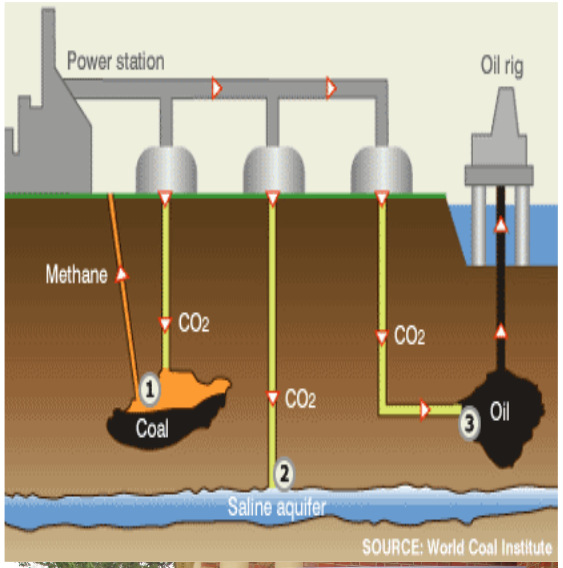
- Large scale combination of CCS and biomass (algae/jatropha)

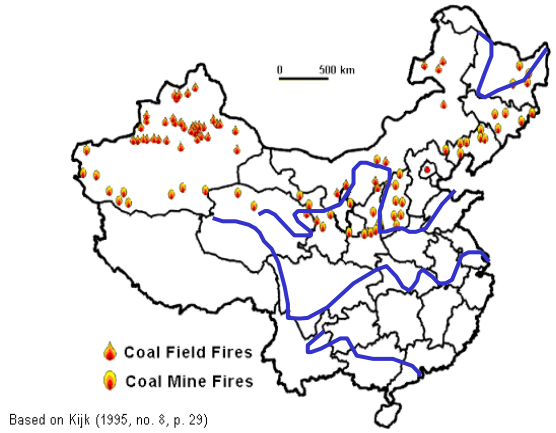
Fast growing Jatropha

Large scale algae production

EU Flagship program for CCS will create new possibilities

- Security of supply: EOR/ ECBM
- H_2 production with CCS
- Fuell Cell for power production and ships
- CCS used for industry.steel and melting industry, cement, petrochemical plants, refineries, chalk and fertilizer
- Captured CO_2 could be used for putting out coal mine fires in China
- Bio-energy with CCS is carbon negative





Based on Kijk (1995, no. 8, p. 29)

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The Way Forward: Copenhagen 2009

COP15 COPENHAGEN 2009
UNITED NATIONS CLIMATE CHANGE CONFERENCE
DENMARK'S HOST COUNTRY WEBSITE

The objective

- International agreement on reducing global GHG emissions
- More ambitious and legal binding agreement than Kyoto

Critical issues

- Including CCS in CDM

The Challenge

- 80 % of global energy production is based on fossil fuel
- Global energy demand is increasing
- 2/3 of the global population:
  - Need to increase the standard of living
  - Will require increasing energy demand
- CO_2 emissions must be reduced by 50-85 % by 2050

“Weapons” available to combat climate change:

- Energy efficiency
- New renewables
- Nuclear
- Hydropower
- Increase biomass-absorption of CO_2
- CCS

EU - US co-operation on CCS…

- Important for security of energy supply
- Reduction of cost
- Rapid global deployment of CCS technology
- New playing-field for international cooperation and agreements
- Common interest for a global CO_2 tax on the CO_2 intensity of products?