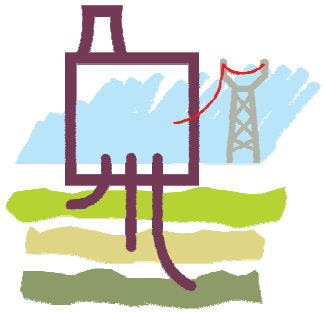
European Technology Platform for
Zero Emission Fossil Fuel Power Plants (ZEP)

The EU Flagship Programme for CCS

The key to achieving Europe's CO_2 emission targets

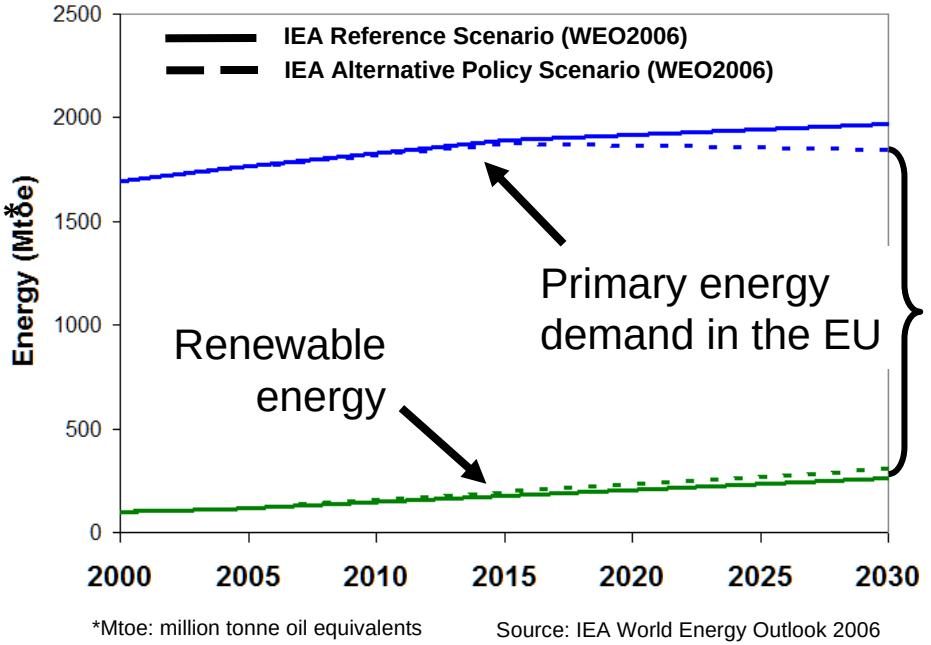
Gardiner Hill, Vice-Chair, ZEP

EU Sustainable Energy Week, January 2008



EU CO2 emission targets cannot be achieved *without* CCS

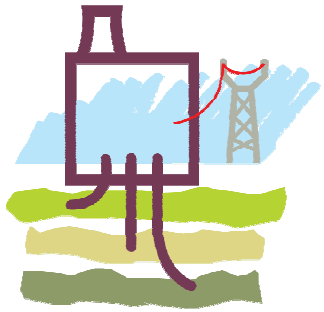
- Rising energy demand can't be met by Renewables alone
- CO2 emission targets can't be met by Renewables & energy efficiency alone
- CCS could reduce CO2 emissions by 50% by 2050



*Mtoe: million tonne oil equivalents

Source: IEA World Energy Outlook 2006

CCS is a key solution for combating climate change, within a portfolio of solutions



CCS: a powerful catalyst for change

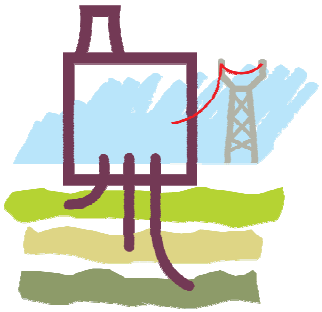
1. Can produce clean fossil fuel power through capturing & storing the CO2 - using new *and* existing plants

2. Can produce large volumes of clean hydrogen which can be used for electricity or fuel

3. Can combine with biomass to achieve net *negative* emissions

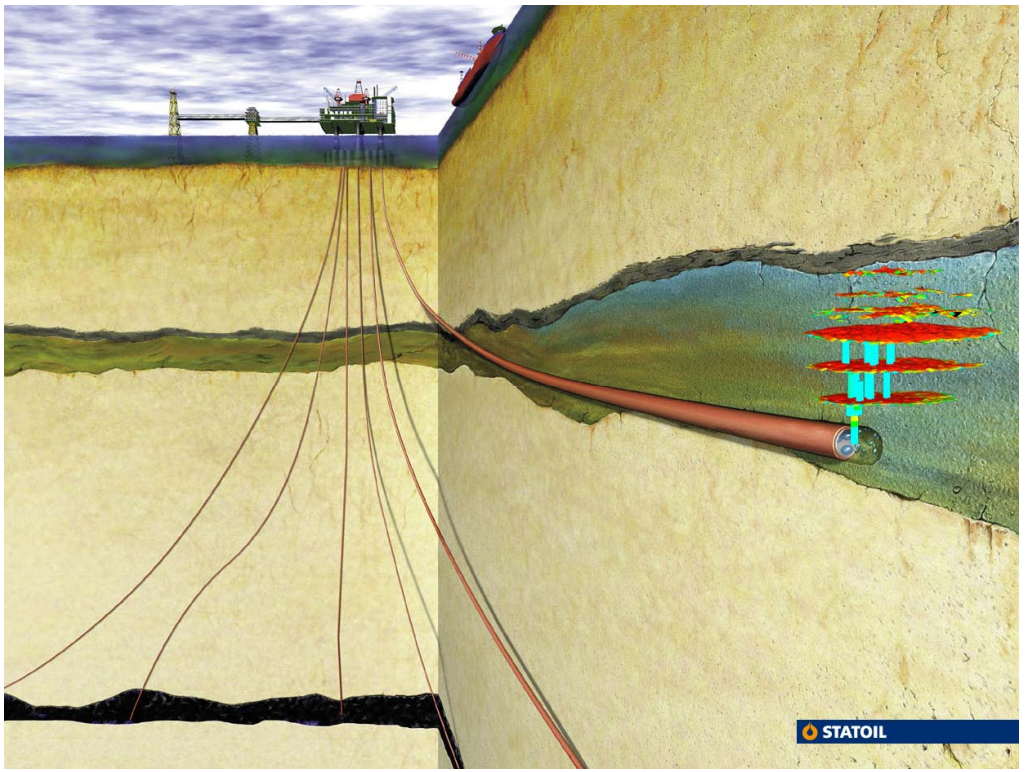
4. Can also apply to other industrial sectors e.g. cement plants, steel mills etc

…while ensuring a secure energy supply



CCS is already happening worldwide

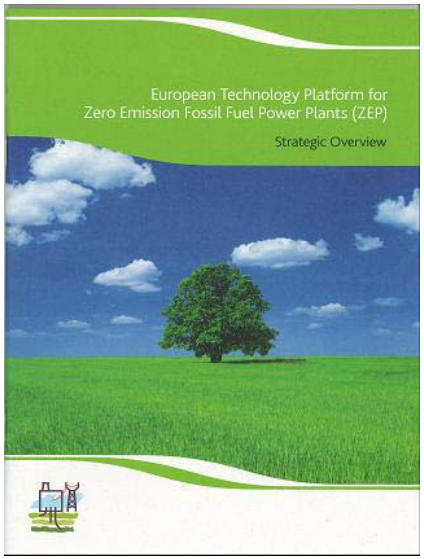
- **Sleipner, Norway**
  1 Mt/year since 1996
- **Permian Basin, US**
  70+ projects, total of 500 Mt/stored
- **In Salah, Algeria**
  1.1 Mt/y since 2004
- **Weyburn, Canada**
  2 Mt/y since 2000
- **K12B, Netherlands**
  some 100Kt/yr since 2004



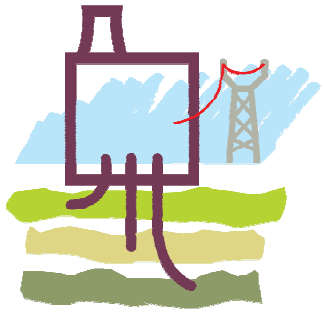
Now need to upscale, reduce costs and test the range of storage options…

The ZEP Technology Platform

- ZEP launched in Dec 2005, a coalition of scientists, industry and environmentalists
- Works closely with Member State Government Group
- Strategic Research Agenda (SRA) and Strategic Deployment Document (SDD) endorsed at First General Assembly, Sept 2006
- Four Taskforces established in Dec 2006
- EU Flagship Programme launched at Second General Assembly, Oct 2007



The Vision: to enable European fossil fuel power plants to have zero CO2 emissions by 2020



ZEP strategic recommendations adopted by EC

ZEP's Vision

"To enable European fossil fuel power plants to have zero CO2 emissions by 2020"

December 2005

ZEP's recommendation (SRA/SDD)

10–12 large-scale CCS demonstration plants to be in place and operational across Europe by 2015

September 2006

European Commission communication

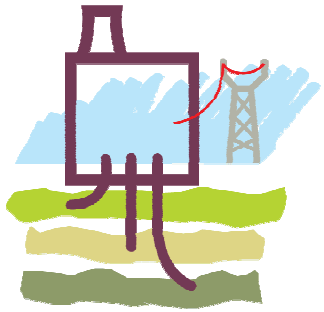
To bring environ-mentally safe CCS with new fossil fuel power plants, if possible by 2020

Jan 2007

European Council recommendation

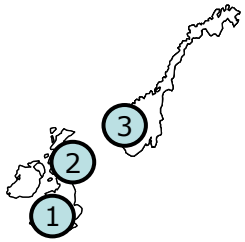
To establish a mechanism to stimulate construction and operation by 2015 of up to 12 demonstration plants of sustainable fossil fuel technologies in commercial power generation

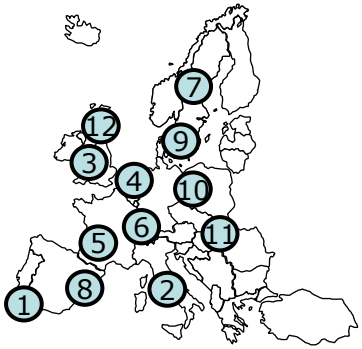
March 2007



Why an EU Flagship Programme is essential

The EU Flagship Programme



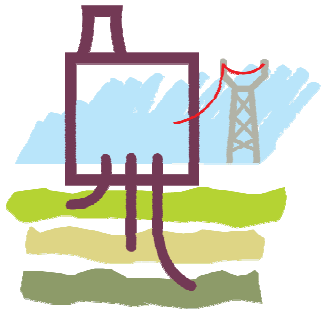


"Disparate projects with no strategy for sharing"

"A highly visible, integrated set of projects, Europe-wide"

- **Kick-start the wide-scale deployment of CCS in Europe – and beyond**
- **Ensure a geographical & technological spread of projects**
- **Accelerate learning through knowledge sharing & avoid duplication of effort**
- **Ensure scope for trans-national projects**
- ***Drive down the costs of CCS so less than the price of carbon***

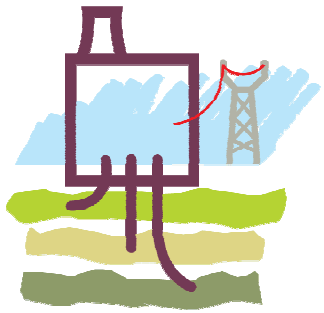
The goal: to make CCS commercially viable by 2020



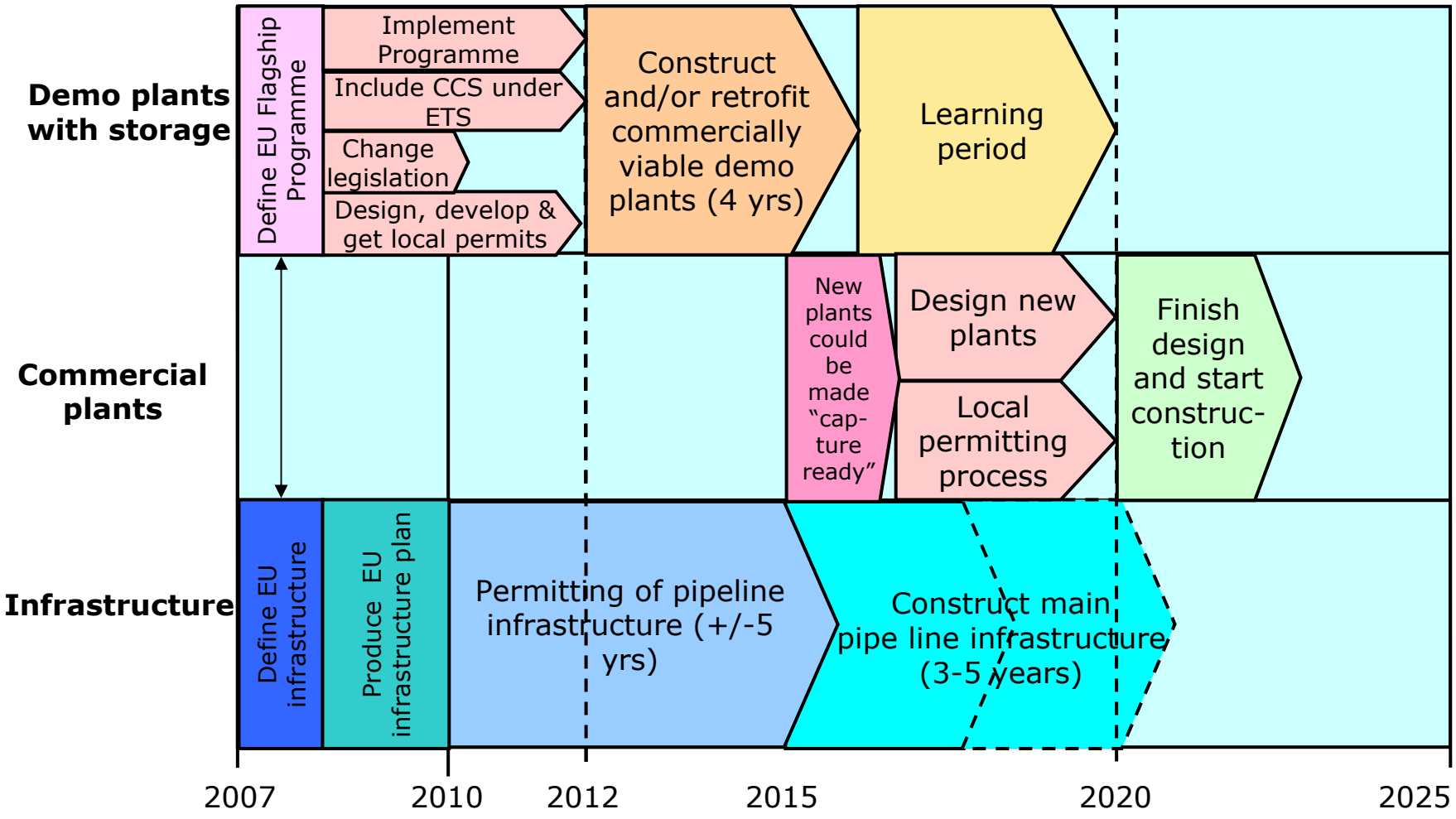
Which projects will be included in the EU Flagship Programme?

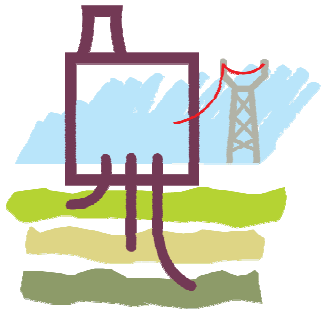
- CCS projects to be incorporated in line with the framework & selection criteria developed by ZEP
- Member State projects to form the basis of the Programme, provided they are willing to share experience and lessons learned
- As more projects appear these will build to a critical mass, resulting in a full EU-wide approach

Accelerating the development of the full range of CCS technologies - Europe-wide

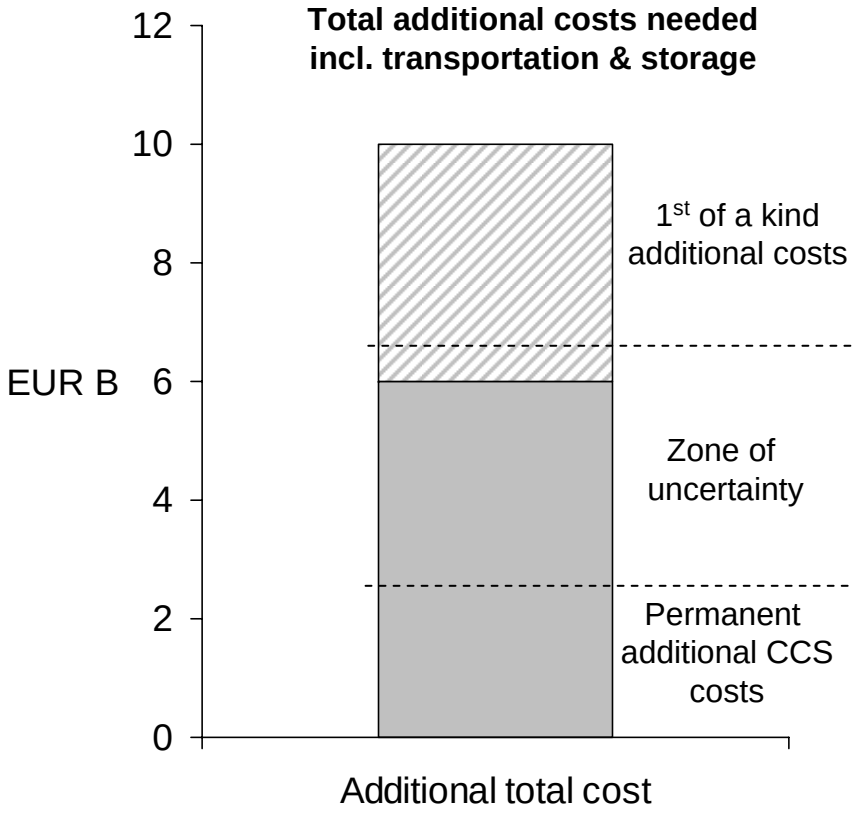


Time is running out





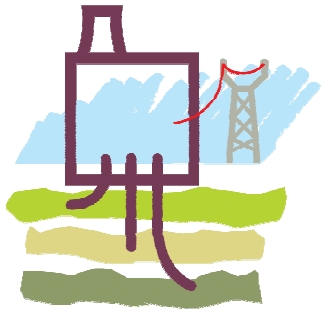
How much will the EU Flagship Programme cost?



Note: Cost data are based on the analysis of literature sources (DOE/NETL, IEA GHG, IPCC) from the period 2001 – 2005. They are uncertain, but widely accepted and should be taken into account when designing policies. Source: CCC Report: ZEP:Analysis of funding options for CCS demonstration plants (September 2007)

- **Additional CCS-related costs €6-10B** for 10-12 demo projects
  - **First Movers will incur unrecoverable costs** from making accelerated investments at scale in immature technology
  - **First Movers will also incur Market Risk** because investment relies on returns from a low-carbon power market that doesn't yet exist

Following the precedent set by other low-carbon technologies…



Economic incentives are vital

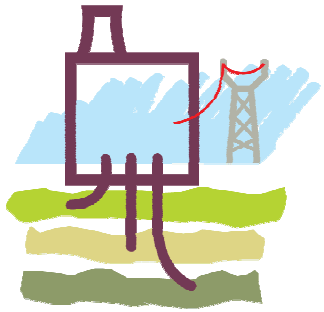
First Mover costs could be shared through

- Member State support (State Aid)
  - Feed-in tariffs
  - Decarbonised electricity certificates
  - Mandatory introduction of CCS
- The EU Emissions Trading Scheme (EU ETS)
  - Revenues generated from the auctioning of EU Allowances for CO2 emissions (EUAs)
  - The allocation of additional EUAs

Market Risk could be shared through

- An underwriting agreement that provides limited, specific support for the future price of EUAs - role for the European Investment Bank?

The goal: drive CCS costs down…and the price of carbon up

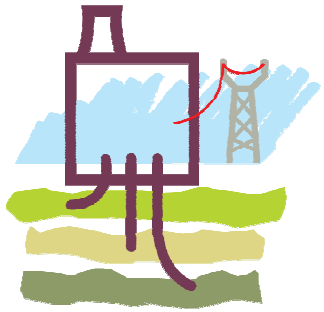


EU Energy & Climate Change proposals

ZEP applauds the EU in its strong and clear leadership in CCS;

- ✓ Recognition of CCS as a crucial technology in mitigating climate change
- ✓ Highlighting the URGENCY to enable near zero emissions fossil fuel power and the need for CCS demonstrations to maintain European lead in this technology and future European industrial competitiveness
- ✓ Proposal for CCS Directive, which aims to resolve all major CCS-related legislative issues and provide a regulatory framework
- ✓ Proposal to launch “European Industrial Initiative” on CCTS
- ✓ Proposal to include CCS in post 2012 European Trading Scheme
- • **But: Big hurdle remaining is how to fund First Mover projects**

ZEP applauds the Commission for its pioneering work



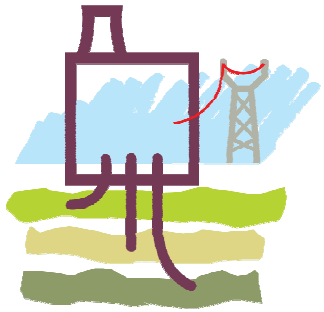
Conclusion

1. The EU will not achieve its CO_2 emission targets *without* CCS

2. CCS will not be commercially viable by 2020 *without* an EU Flagship Programme

3. An EU Flagship Programme will not materialise *without* private and public co-investment (via economic incentives)

Without EU funding there will be no EU Flagship Programme - a clear policy direction must be taken by mid-2008 at the latest



Next steps

- Include the EU Flagship Programme in the European Strategic Energy Technology (SET) Plan and implement a detailed study of funding options and other key aspects
- Determine the most economically feasible CO2 infrastructure
- Consider interfaces outside Europe to kick-start CCS in large CO2 emitting countries, e.g. China, India
- The 2008 EU Spring Council needs to issue a strong statement on financial support

The EC and Member States must work together to implement the EU Flagship Programme

CO_2 Capture & Storage

A key solution for combating climate change

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