Technology Roadmaps and their importance

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The European Union's "ZEP"

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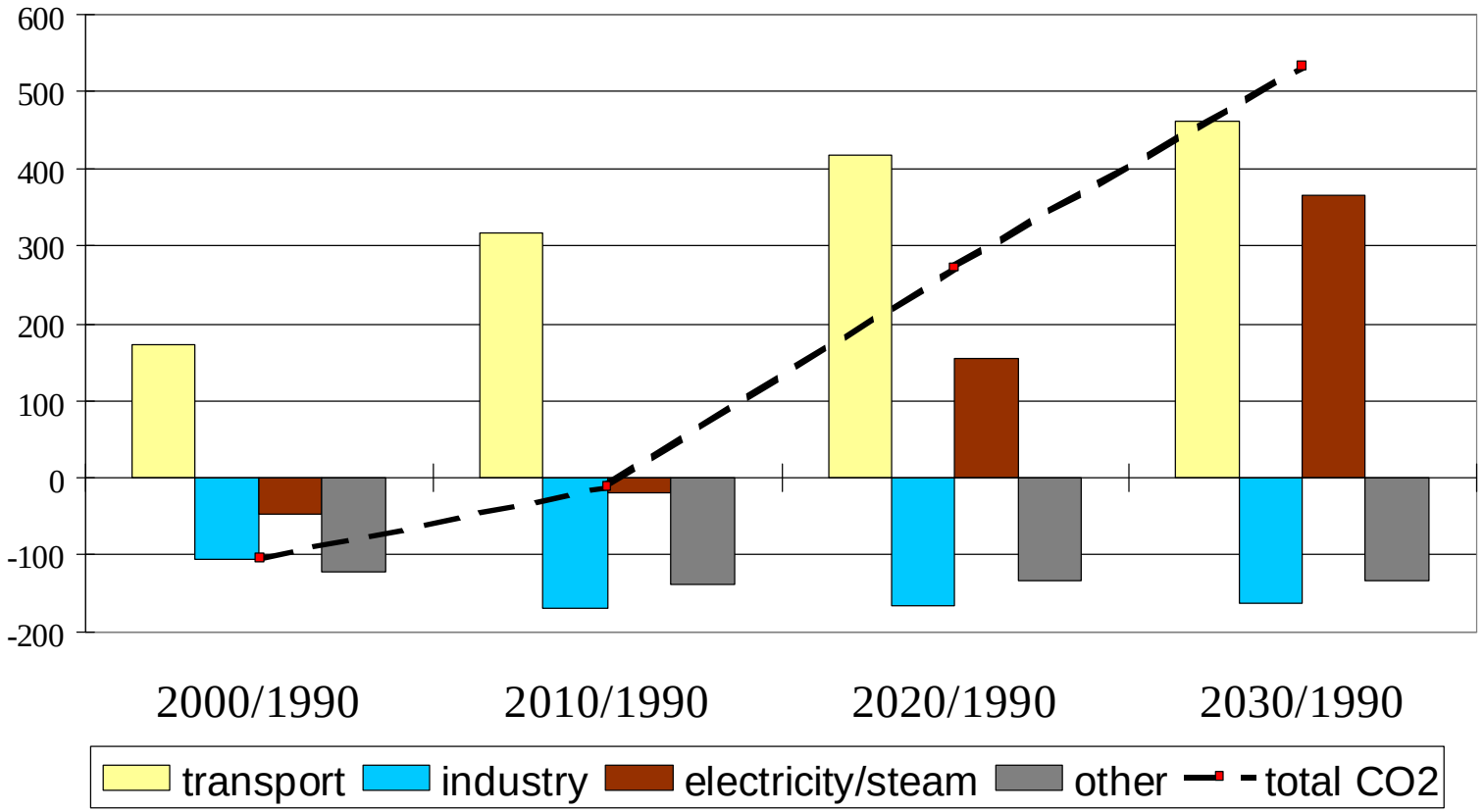
Pillars of EU Energy Policy

- **Reduction of EU greenhouse gases and pollutant emissions**
  - **EU Kyoto Commitment : 8% CO_2 reduction by 2008-12 compared to 1990 and beyond. Much deeper reductions required by 2015-2025…**
  - **Maintaining Security of Supply**
    - **Green Paper of March 2006 on a Common Energy Policy for Europe**
- **Promoting Competitiveness of the EU Industry**
  - **Lisbon process**

Targets in the 2007 Energy Package

- **By 2020 – the three 20s:**
  - **20% reduction in greenhouse gas emissions compared to 1990 levels (30% if global agreement)**
  - **20% reduction in global primary energy use (through energy efficiency)**
  - **20% of renewable energy in the EU's overall mix (minimum target for biofuels of 10% of vehicle fuel)**
- **By 2050 : indicative 60 to 80% reduction in GHG**

However, present trend of CO_2 emissions….



The role of Coal…..

- Coal is a key contributor to the EU's security of energy supply and will remain so.
- However, coal can continue to make its valuable contribution to the security of energy supply and the economy of both the EU and the world as a whole **only with technologies allowing for drastic reduction of the carbon footprint of its combustion**.

For coal to continue…….

- Key issues that must be urgently addressed
  - Reduction of carbon emissions
  - Demonstration of Carbon capture and storage (CCS)
  - Deployment of CCS technologies in EU and globally

CCS Activities under the EU's Framework Research Programmes

Activities under FP5 and FP6

- **Projects on Capture and Storage worth more than 170 M€**
- **Co-ordination of member states activities, ERA-NET (FENCO)**
- **International Cooperation : Contribute to the Carbon Sequestration Leadership Forum, an objective in last 2 Call for Proposals**
- ***European Technology Platform on Zero Emission Fossil Fuel Power Plants launched on 1 December 2006***
  - ***2nd General Assembly on 3 Oct 2007***

Activities under FP7

- **CO2 capture and storage technologies for zero emission power generation**
- **Clean coal technologies**

Definition of a Technology Platform

Stakeholders getting together to define a Common Vision and a Research Agenda on key strategically important issues with high societal relevance where achieving Europe's future growth, competitiveness and sustainability objectives is dependent upon major research and technological advances in the medium to long term.

The Advisory Council

A high level group of committed and influential personalities to steer, monitor, initiate and push actions

Members, balance between regional and sectoral origins:

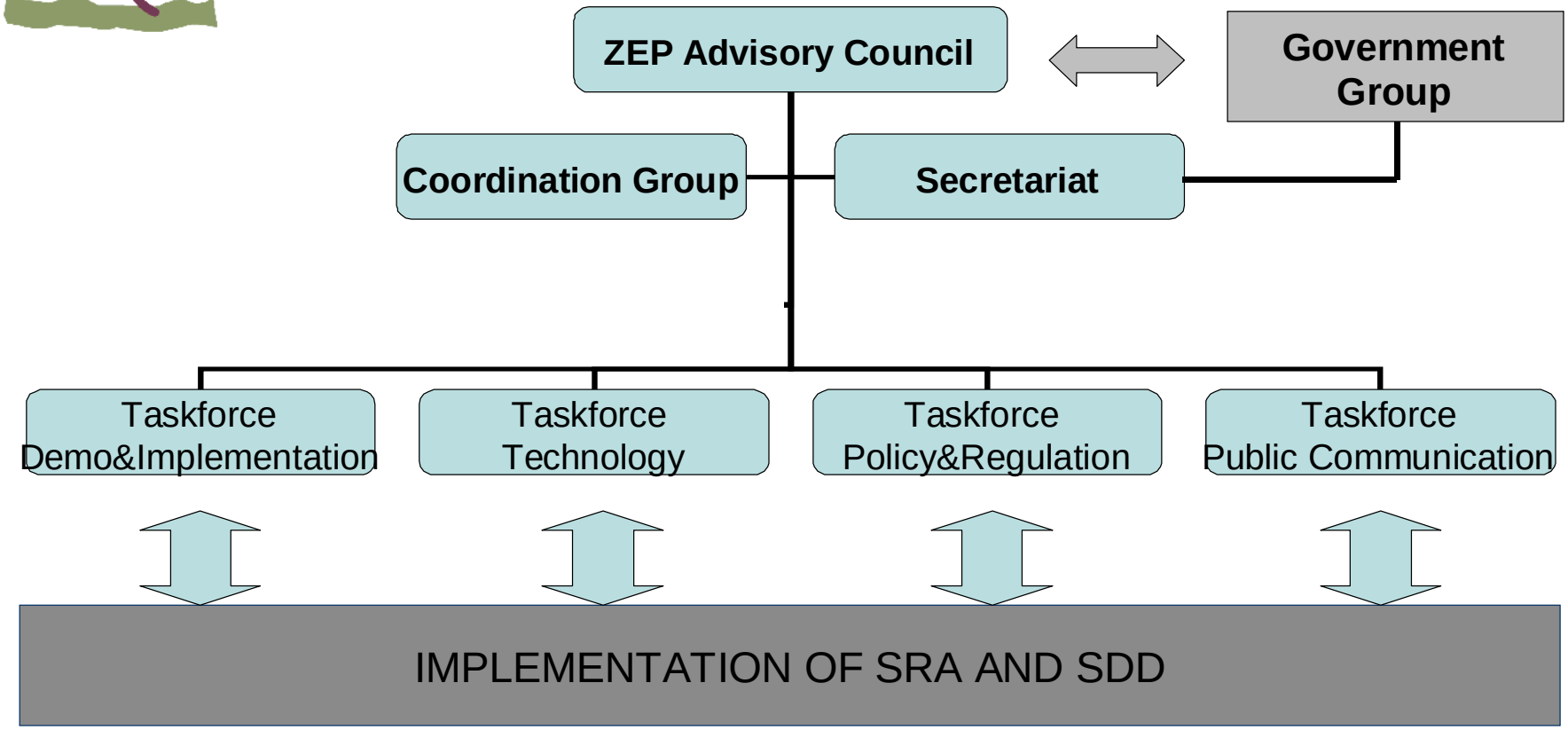
- **Utilities**
- **Energy Companies (Oil, Gas, Coal)**
- **Equipment Supply Industry**
- **Academic and Research organisations –public and private**
- **Public authorities and regulators – incl. the EC.**
- **Civil Society (e.g. Environmental NGO's organisations,**

Members of the Advisory Council

Advisory Council formed 21Jun05

- **6 Generators : EoN, Endesa, ENEL, RWE, Vattenfall, Energie E2**
- **6 Equipment suppliers : Ansaldo, ALSTOM, AirLiquide, Foster Wheeler, Mitsui Babcock, Siemens**
- **5 oil/gas companies : BP, Shell, Statoil, Total, Schlumberger**
- **5 researchers and 3 NGOs**
- **EC DGRTD, DGTREN, DGENV**

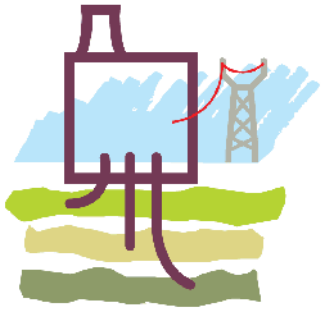
ETP ZEP :
Organisation and Support



SRA : Strategic Research Agenda

SDD : Strategic Deployment Document

High level of commitment and support from ~200 individuals in 19 countries
57% industry, 39% research, 4% NGOs



ETP ZEP :
Member State Government Group

- **Countries involved**
  - UK — Chair
  - Germany — Vice-Chair
  - Norway — Vice-Chair
- plus
  - Austria, Denmark, Finland, France
  - Greece, Italy, Netherlands, Poland
  - Portugal, Spain, Switzerland

- **Support from EC**
  - FENCO (Clean Fossil Energy) Co-ordination Action

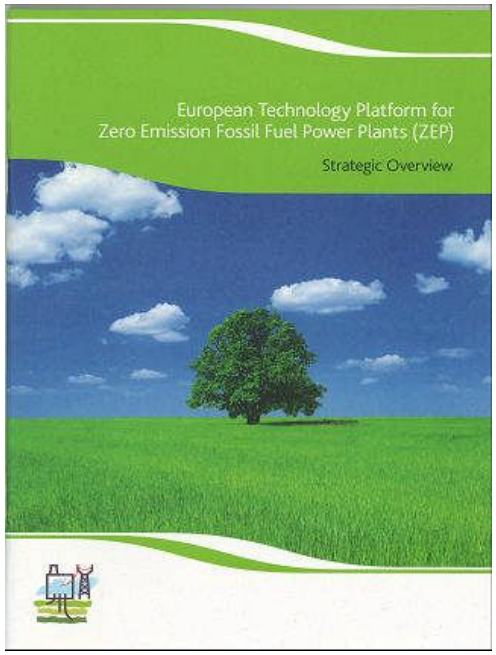
Increasingly important to engage more fully with Governments ……. in Europe and world-wide

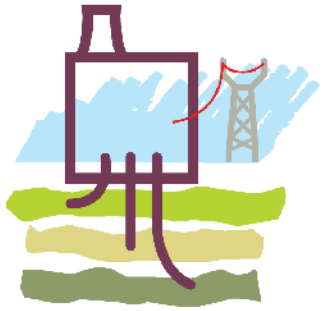
ETP ZEP :
Strategic Recommendations

SRA : set a major R&D action to reduce costs and risks of deployment

SDD : accelerate the market for efficient zero emission power plant

- Urgently implement 10-12 integrated large scale CCS demonstration projects EU-wide
- Establish a robust technology action across whole of CO_2 chain
- Kick start the CO_2 value chain with urgent short and long term commercial incentives
- Establish a regulatory framework for storage
- Gain public support through a comprehensive public information campaign





ETP ZEP :
Recommendations adopted by EU Council

The ZEP Vision

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

December 2005

The ZEP recommendation (SRA/SDD)

10 – 12 large scale demonstration plants that will be in place and operational by 2015 across Europe

September 2006

European Commission communication

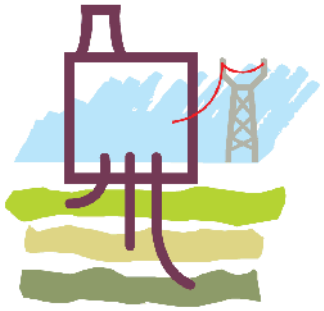
To bring environmentally safe CCS with new fossil fuel power plants, if possible by 2020

January 2007

European Council recommendation

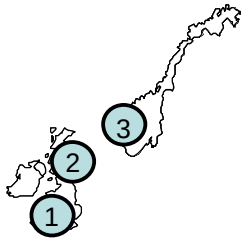
To establish a mechanism to stimulate construction and operation by 2015 of up to 12 demonstration plants of sustainable fossil fuel technologies in commercial power generation

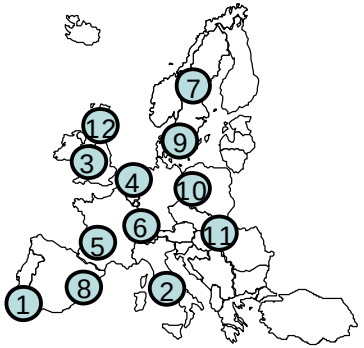
March 2007



Why an EU Flagship Programme is essential

The EU Flagship Programme



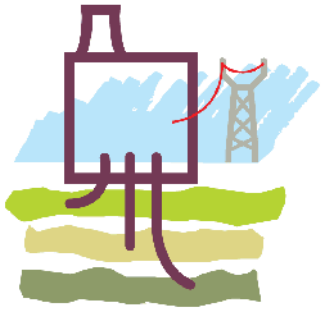


"Disparate projects with no strategy for sharing"

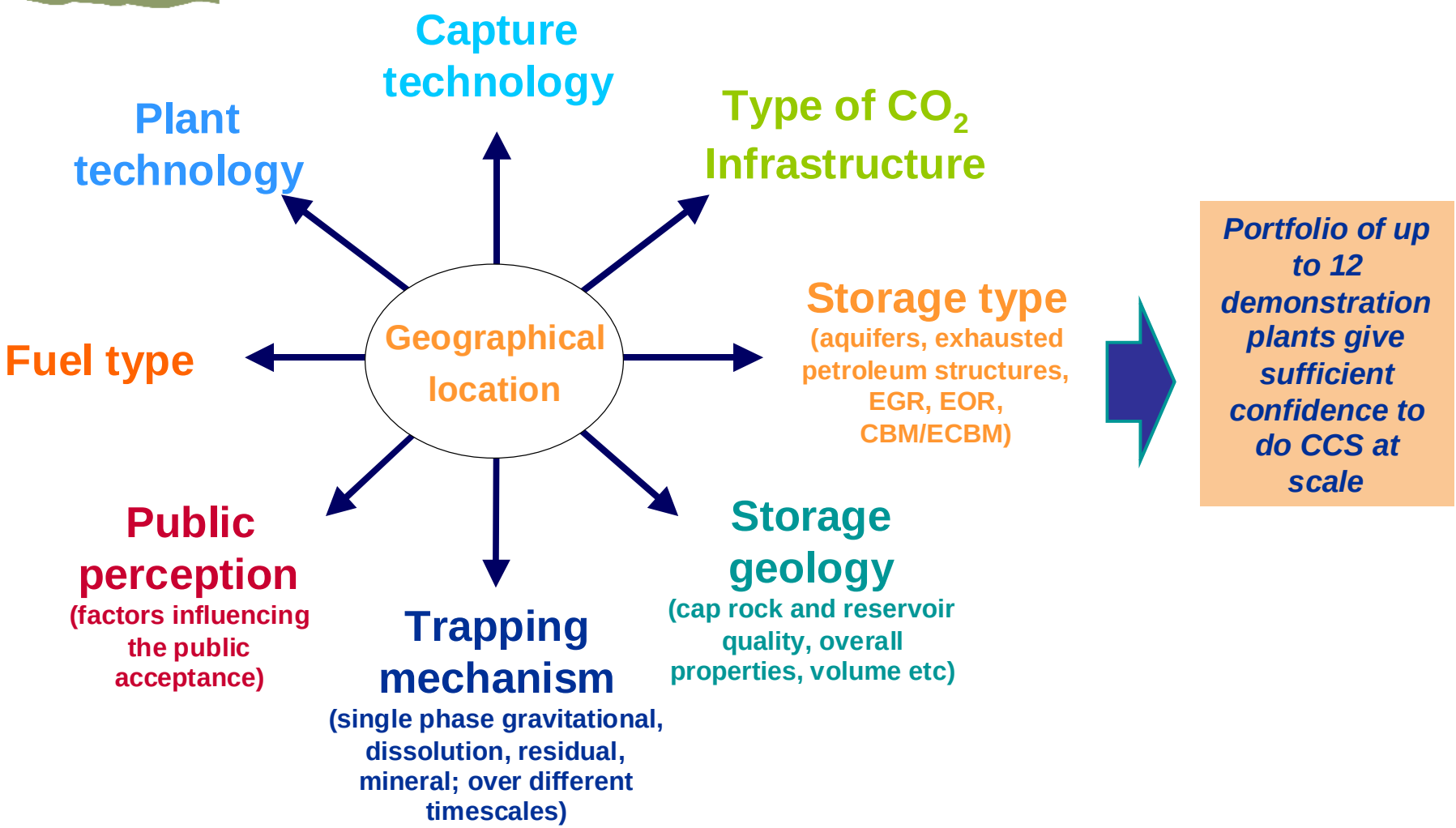
"A highly visible, integrated set of projects, Europe-wide"

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

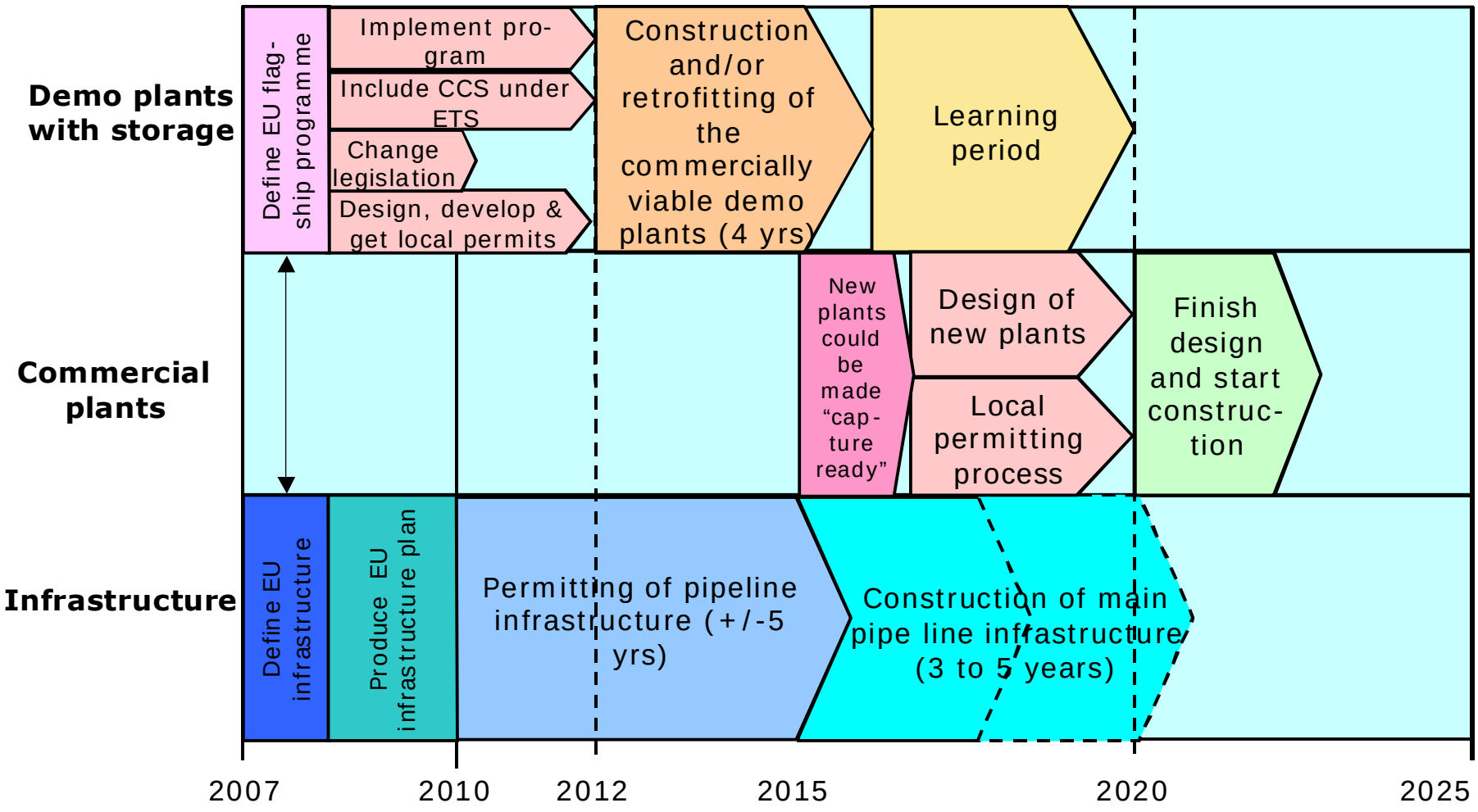
The goal: to make CCS commercially viable by 2020

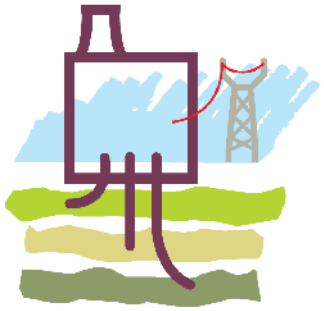


ETP ZEP :
Scope of the EU Flagship Programme



ETP ZEP :
Urgency of issue – no time to lose





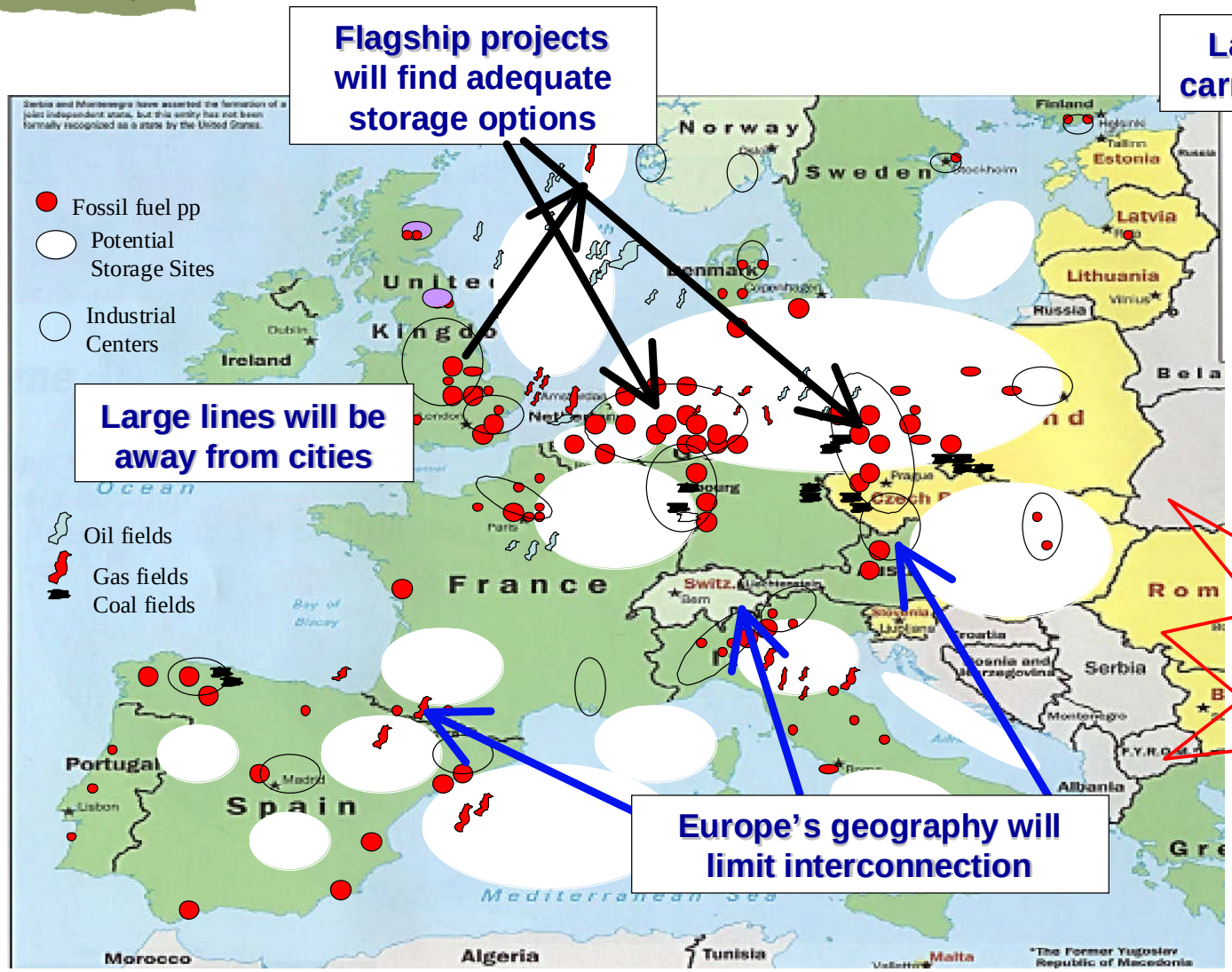
ETP ZEP :
EU SET Plan - major outcome of 2007 Council

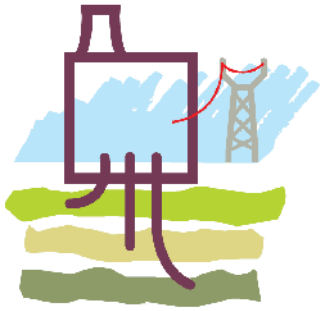
- ZEP Input to EU Strategic Energy Technology [SET] Plan
  - Holistic approach embracing all key issues

- Key Elements
  I. Large scale integrated demonstration = ZEP Flagship Programme
  II. Research and Technology Development = next generation technology, FP8 etc
  III. CO_2 Infrastructure = pan European network issues
  IV. Public Communication = major awareness campaign
  V. Regulatory Framework = long term safe reliable storage
  VI. Fiscal Framework = short term demonstration incentives and long term investment structure
  VII. EU ETS = inclusion of CCS in emissions trading schemes
  VIII. International Collaboration = engagement of countries like China and India

EU SET Plan helps to put ETP ZEP Actions into long term overall context

ETP ZEP :
Importance of pan-EU infrastructure/storage



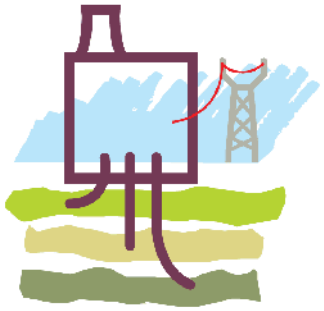


ETP ZEP :
Public support is key to implementation

Research shows that

- Without explanation, people tend to view CCS negatively:
  - Fossil fuels perceived to be bad
  - Is CO_2 storage safe?
- With explanation, people tend to view CCS positively:
  - Rising energy demand cannot be met by renewables alone
  - CO_2 emission targets cannot be met by renewables & energy efficiency alone
  - CCS can reduce CO_2 on a massive scale – by over 50% by 2050
  - CO_2 storage is safe and 'natural'

A comprehensive public information campaign is essential



ETP ZEP :
Concluding Remarks

To date the ETP ZEP has proved to be a considerable success story

- a highly significant, visible and effective initiative, in Europe and worldwide
- brought together the many different stakeholders in industry, research and NGOs in a consensus manner ….. for the first time
- set the future direction and needs for clean fossil fuel power generation over the next few decades

but …….

- need to establish the right conditions to have the confidence for a significant roll out of the technology post 2020.
- need to use the basis established to follow through on the actions so far …….. within Europe and world-wide
- **there is no time to lose ……. high degree of urgency for action**

In summary ……

- The EU must reduce its emissions from fossil fuel use
- A major first step is to reduce emissions from fossil-fuel burn in electricity production
- Improved efficiency followed by CCS is the way to go
- The ZEP is providing excellent support to EU policy to move towards lower emissions from fossil fuel use
- Its members also strongly support the EU's international co-operation efforts on CCS.

Answers to questions

- It brings together a wide range of stakeholders to develop a single vision and programme
- Difficulties in obtaining a consensus from such a wide range of actors
- The stakeholders have a far greater influence on policy working together than individually. So …….just do it!