AEA Energy & Environment
From the AEA group

European Fossil Fuel Initiatives

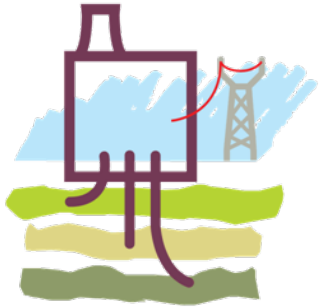
Peter Sage

Zero Emissions Power – Current Developments

Coal Research Forum, Advanced Power Generation Division Meeting, International Power, Rugeley, 20 June 2007

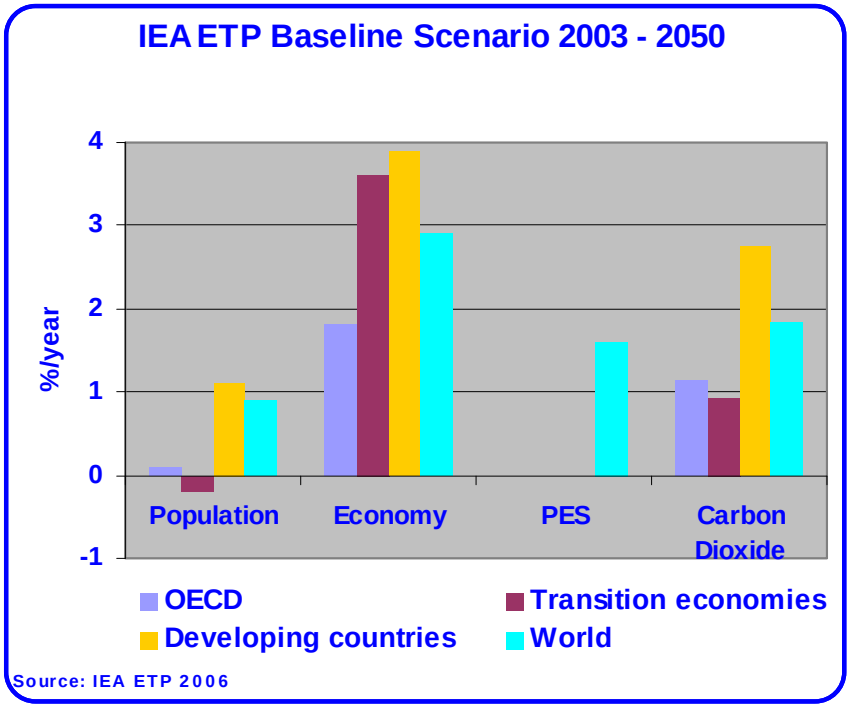
Outline of Presentation

- **The Global Energy Scene**
- **The Fossil Energy Coalition**
- **The European Technology Platform on Zero Emissions Fossil Fuel Power Plant**



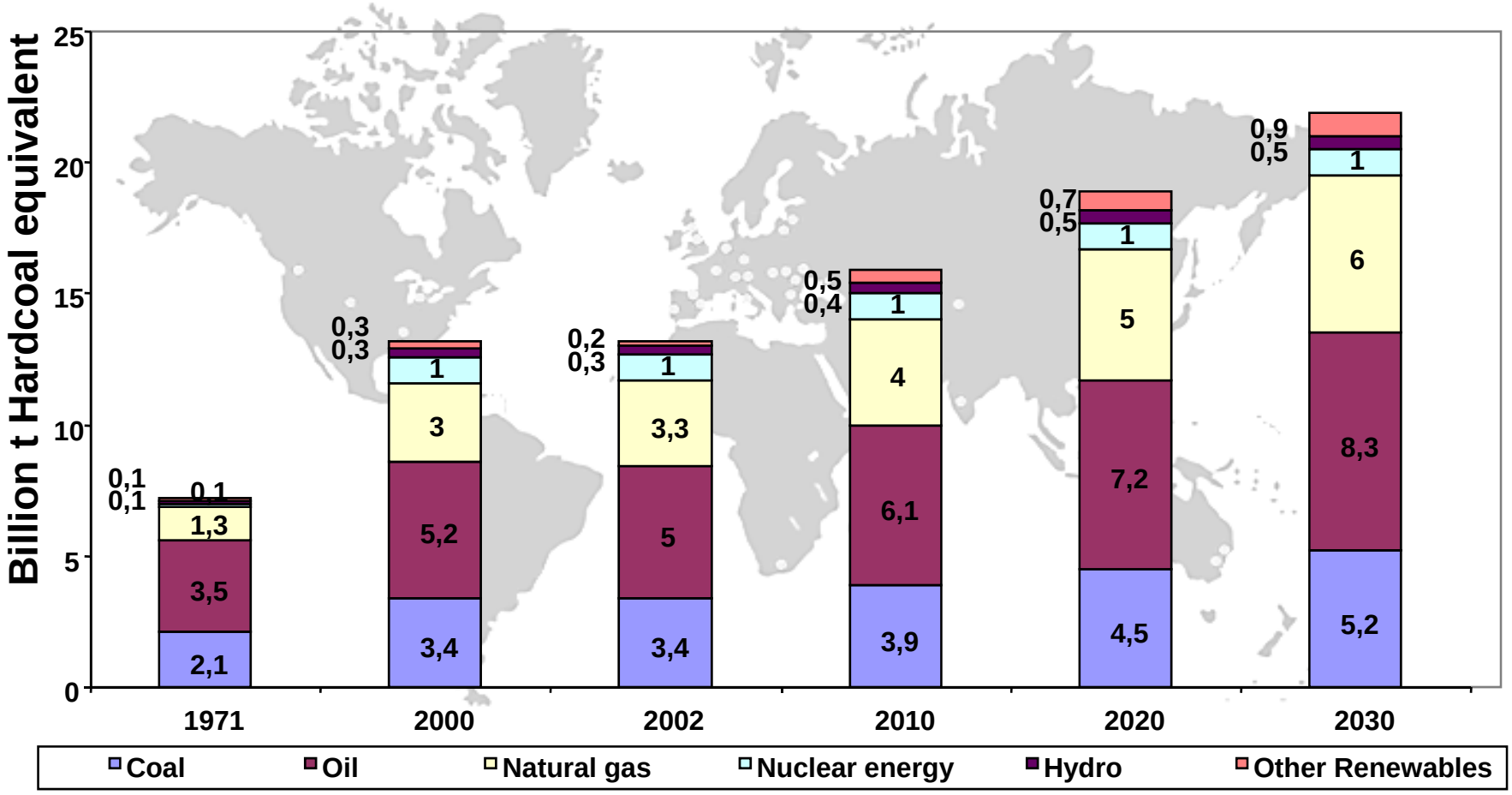
The Global Energy Scene

- Population and income growth
- Climate protection targets
- PES Increase
- Significant role of REN only in medium or long term
- Nuclear renaissance vs. acceptance
- Significant role of fossil fuels
- CO_2 emissions growth



Decarbonisation of energy supply needs the full range of technological solutions and further development of fossil fuel technology

Global Primary Energy Consumption



(Source: RAG)

FENCO – what is it?

- **FENCO – the Fossil Energy Coalition is a Coordination Action (CA) initiative being undertaken within the EC's Framework Programme 6**
- **It is one of many European Research Area Networks (ERA-NETs)**
- **It is a governmental initiative with partners being either government ministries or those bodies mandated by such ministries to manage programmes on their behalf**
- **The focus of FENCO is at the Programme rather than the project level**

Issues and Drivers for FENCO

Fragmentation of EU-wide energy technology research

- Up to 27 national research programmes
- Significant thematic overlap
- Lack of critical mass

Inefficiencies

- Lack of EU-wide coordination of research expenditures
- Decrease in competitiveness (especially at the EU level)

There would be benefit in coordination and harmonisation of programmes at EU level

FENCO: Focus and Objectives

To establish European level conformity of R&D programmes to meet the needs of

- EU members
- EU industry
- EU academia

To develop a fossil fuel energy technology path and identify:

- Opportunities to share knowledge
- Funding options to step-by-step improvement of fossil fuel energy technologies

The ultimate goal to enable EU Industry to compete effectively in the global market

To define technology paths towards zero emission power plants

FENCO Project Partners

Partners

FZJ – PtJ

BMWi

BMWA

AFI

Energinet.dk

GSRT

CERTH

SENTERNOVEM

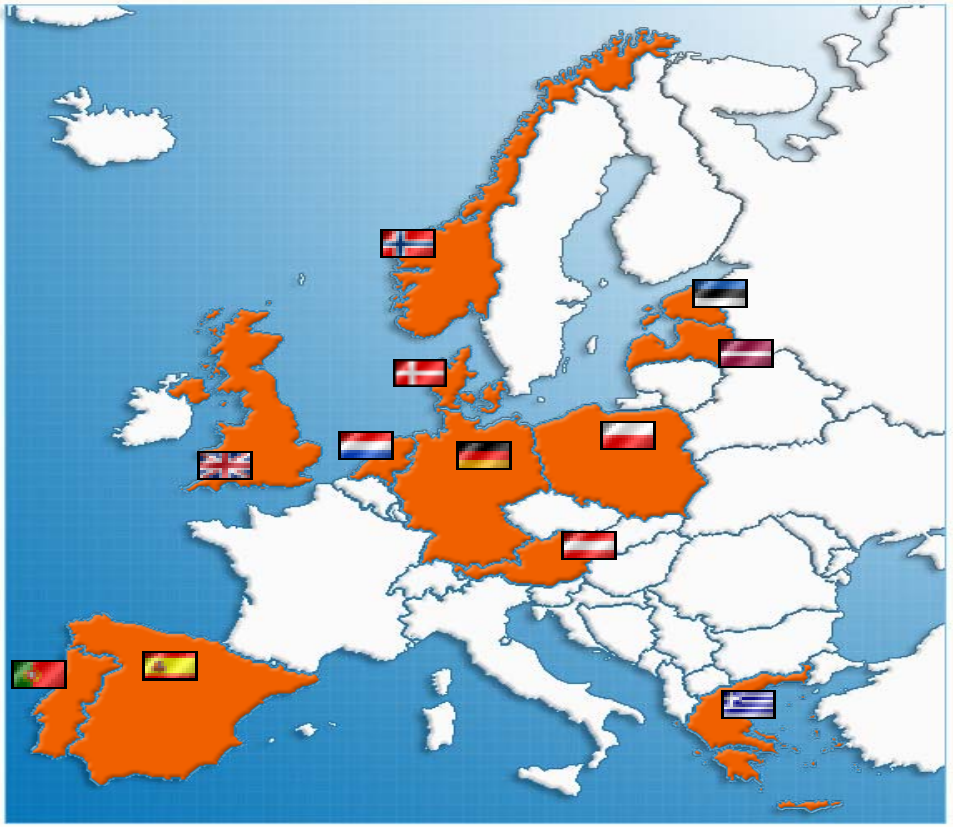
RCN

FCT

MEC

dti

AEA Energy & Environment



Affiliated Partners - Gig, MoEaC and MoE

:

FENCO – Work Packages

WP1 - Coordination and Management – PtJ, Germany

WP2 - Information Exchange and National Fossil Fuel R&D Programmes – AEA Energy & Environment, UK

WP3 - Strategic Activities – PtJ/STE, Germany and AEA Energy & Environment, UK

WP4 - Joint Actions – CERTH, Greece

WP5 - Trans-national R&D Activities – SenterNovem, Netherlands

WP6 – Communication and Dissemination – FCT, Portugal

WP2 – Gathering and Exchange of Programme Information

Questionnaire approach agreed

Built on existing ERA-NET questionnaires e.g. HY-CO, Bio-energy and SUSPRISE to develop FENCO-ERA questionnaire

Task sharing by Partners for information gathering

Questionnaire (spreadsheet based) included:

- General questions, contact details, etc.
- Technical scope of programmes
- Non-technical issues
- Programme operation and administration

Designed to enable easy subsequent incorporation into database

Programmes Database

Initial responses from questionnaire incorporated into a database

Preliminary analysis identified gaps and need for a further information

Supplementary questionnaire responses incorporated into database

Database presented at FENCO Workshop at Thessaloniki, 6 and 7 November 2006

A further database on non- EU and International Programmes is in preparation

National Programmes of FENCO Partner Countries

	Programme	Annual Budget (Mio €)	Number of Projects
Germany 	COORETEC GEOTECHNOLOGIEN	20 3,5	180 11
Austria 	AFFF	0,1	(1) just started
Denmark 	PSO-research & development-programme	10	60
Greece 	OPERATIONAL PROGRAMME COMPETITIVENESS “Collaborations for Research and Technological Development in sectors of national priority”. a. CP “Natural Environment and Sustainable Development”, b. CP ‘Renewable Energy Sources and Energy Saving’	Concerted Pro-gramme (CP) 10.8 5.2	12 projects under realisation
Netherlands 	Several	48,5	200
Norway 	Program for environmentally friendly gas power technology – CLIMIT	6,2	22
Portugal 	Energy Programme	3	50
Spain 	ENP, Clean use	23 / 1	102 / 8
UK 	Since 2005 CATS as follow-up of the Cleaner Fossil Fuel Programme (CFF)	10	60

Programme Evaluation Procedures

	COORETEC: Continuous Open Call, Evaluation by Projektträger, Single contracts GEOTECHNOLOGIEN: Open Call, Panel of international Experts, Joint Projects
	Two calls per year, assessment by an Advisory Committee
	One call per year. Evaluation by panels of experts, relevant to the thematic areas (peer view). Single contracts.
	Open call. Submission by collaborations of research entities and business enterprises. Evaluation by panels of experts, relevant to the thematic areas, invited from abroad (peer view). Single Contracts.
	1.Call and independent experts 2. Single contracts
	Selection mechanism is by using peer review (referees) and expert panels, similar to the EC system
	Call for proposals, Evaluation by independent panel of national and international scientists Proposals are classified and proposed for support depending on the budget availability
	Three calls per year, Evaluation Committee
	Open call with assessment by an Advisory Committee

FENCO WP3: Preliminary Analysis of National Activities

Activity	Advanced fossil plants and CO2 Capture	CO2 use and storage	Infra-structure and environment	Market regulation and policy	Communica-tion and public acceptance
Watching brief	EL, Pt, L, P	EL, L, P, Pt	A	A,	A, Pt
R&D	A	A	(D). Dk, F, N, NL, UK	D, Dk, F, NL, N, UK	F, NL, UK (D)
R&D and pilot plant demonstration	E, F, Dk, NL	E, F	N/A	N/A	?
R&D, pilot and full-scale demonstration	N, D(?), UK(?)	N, NL(?), D(?), UK(?)	N/A	N/A	?

Potential areas for collaboration

- Monitoring and assessment of full-scale CO2 storage projects.
- R&D on infra-structure, long-term integrity and environmental impacts of CO2 storage.
- R&D to support market regulation and policy development.
- R&D to support communication and public acceptance strategies.
- R&D and pilot plant demonstration of CO2 use and storage.
- R&D and pilot plant demonstration of advanced fossil plant and CO2 capture

Conclusions of preliminary analysis

The assessment has identified a preliminary list of broad areas for EU level collaboration and programmes.

The most difficult area is support for full-scale CCS demonstration because of cost, commercial competition, IPR, and because national programmes have less leverage over these projects.

The analysis has not looked at sub-technical areas (e.g. post combustion vs. pre-combustion vs. oxy-fuel) to consider if there are subsidiary issues.

All bar one FENCO respondents indicated that national programmes could collaborate on a task share but not a cost share basis.

FENCO – current position

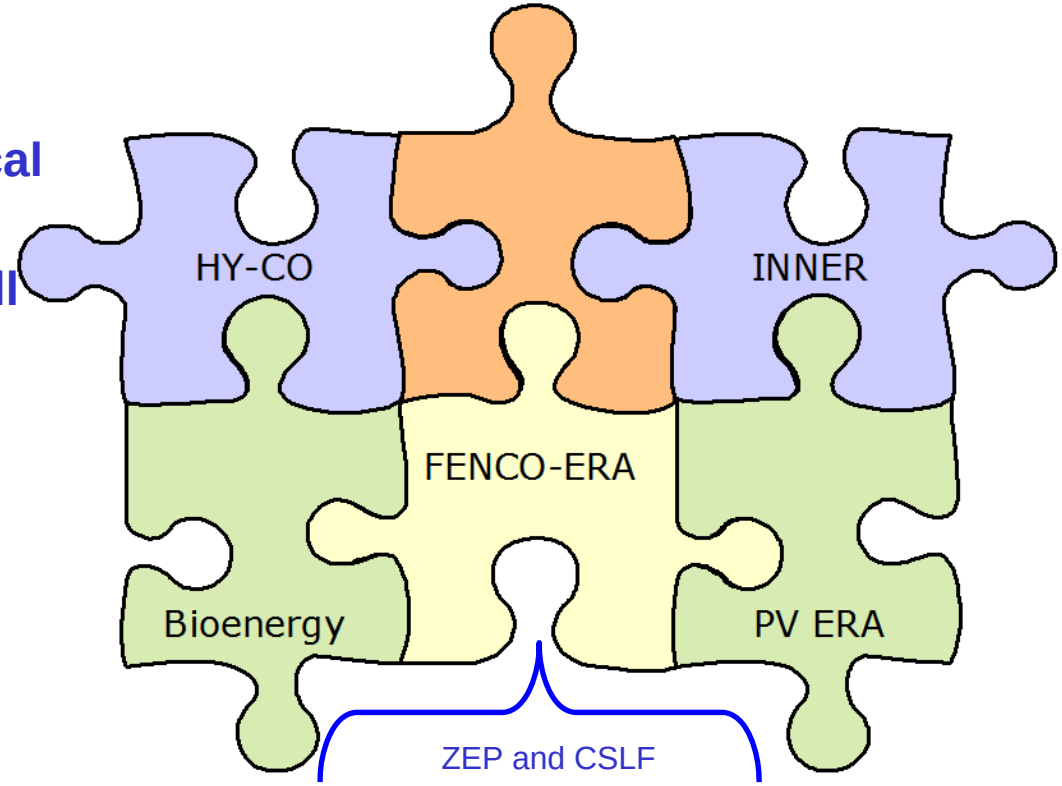
A workshop was held at Vienna in April 2007 to:

- **Exchange experience of common calls**
- **Review common call procedures**
- **Identify possible themes for common calls within FENCO**
- **Discuss the thematic priorities for the ZEP**

Subsequent FENCO working meetings at Vienna in May 2007 and Berlin in June 2007 are progressing towards a common call

FENCO – Links to other initiatives

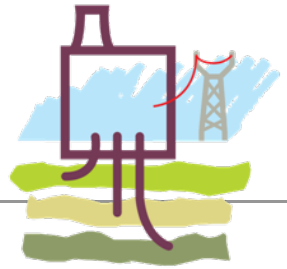
- **Opportunity to create a critical mass activity in Europe**
- **Needs to be part of an overall strategic framework addressing clean fossil fuels as a key element of the energy portfolio**



FENCO and the ZEP ETP

- **FENCO – Governmental lead**
- **ZEP – Facilitated by the EC but Industry lead**
- **However commonality of membership of FENCO Executive Committee and ZEP Government Coordination Group. Joint meetings held where appropriate**
- **Some complementary activities**

ZEP Set-up and Vision



The Vision: To enable European fossil fuel power plants to have zero emission of CO_2 by 2020.

Primary task to set strategic research agenda (SRA) and deployment document (SDD) as major input to EC FP7 (2007 - 2013)

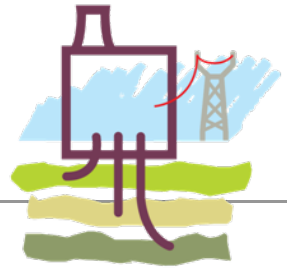
Advisory Council formed in June 2005

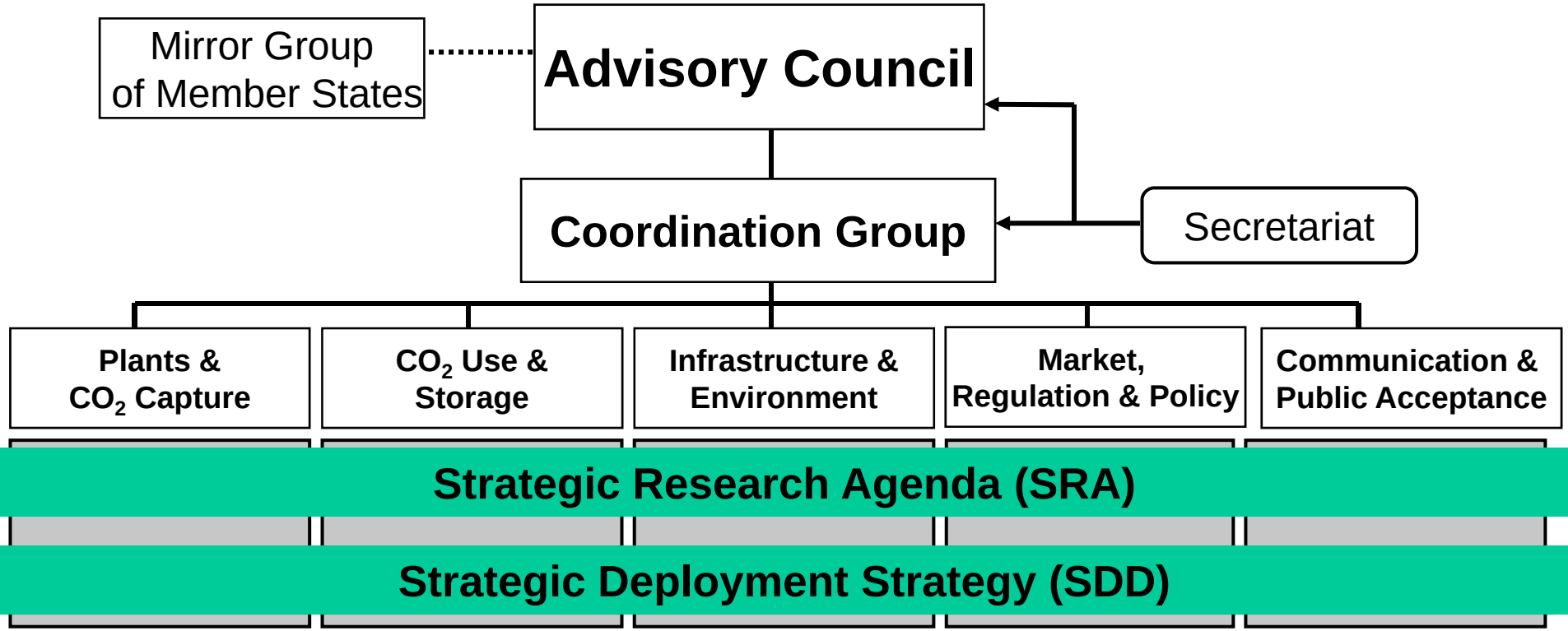
- **6 Generators**: E.ON, Endesa, Enel, Energi E2, RWE, Vattenfall
- **6 Equipment suppliers**: Ansaldo, ALSTOM, Air Liquide, Foster Wheeler, Mitsui Babcock, Siemens
- **5 Oil and Gas**: BP, Shell, Statoil, Total, Schlumberger
- **5 Research**: BGS, CIRCE, IFP, Polish CMI, GEUS
- **3 NGOs**: Bellona, Climate Action Network Europe, WWF
- Chair: Kurt Haege/Vattenfall Vice-Chairs: Olivier Appert/IFP, Gardiner Hill/BP, Charles Soothill/ALSTOM

Formally launched 1 Dec 2005

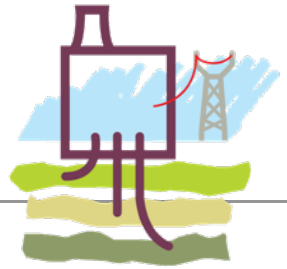
European Technology Platform ZEP: Zero Emission Fossil Fuel Power Plants

Organisational structure





ZEP Action : Key Outputs and Timing

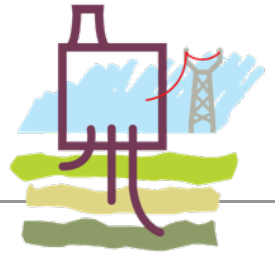


- **Launch event 12.2005**
- **Vision paper 05.2006**
- **Brochure 08.2006**
- **Working reports 09.2006**
- **SRA and SDD 09.2006**
- **www.zero-emissionplatform.eu**
- **1st General assembly 12./13.09.2006, Brussels**
- **Task forces to implement SRA/SDD recommendations 01.2007**
- **2nd General assembly 2./3.10.2007, Paris**

Active future role:

- **Support project development (e.g. JTIs)**
- **Support dialogue about developing roadmap**
- **Mobilise exploratory research**
- **Support international cooperation (projects, workshops, exchange programs)**
- **Assess technology and project areas**
- **Define and promote regulatory requirements and commercial incentives**
- **Define and execute communication strategy**
- **Find financial sources (industry, EU, national)**

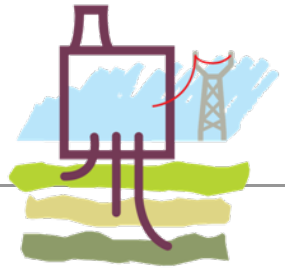
SRA Recommendations



The Strategic Research Agenda **describes a collaborative programme of technology development for reducing the costs and risks of deployment**

- **Urgently implementing 10-12 integrated, large-scale CCS demonstration projects Europe-wide**
- **Developing new concepts already identified, but not validated, for demonstration by 2010-2015 and implementation beyond 2020**
- **Supporting long-term exploratory research into advanced, innovative concepts for implementation of next-generation technology by 2050**
- **Maximising cooperation at national, European and international level**
- **Strengthening and accelerating R&D priorities to support the Strategic Deployment Document, informed by experience from demonstration projects and parallel R&D projects.**

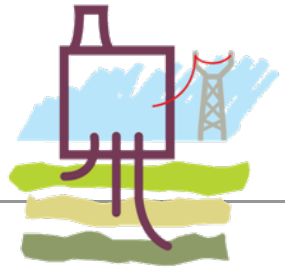
SDD Recommendations



The Strategic Deployment Document **outlines how to accelerate the** market for **efficient zero emission power production**.

- **Kick-starting the CO_2 value chain with urgent short- and long-term commercial incentive**
- **Establishing a regulatory framework for the geological storage of CO_2**
- **Gaining public support via a comprehensive public information campaign:**
- **Establishing robust RD&D funding under the FP7 and national programmes:**
  - Improve energy conversion efficiency, reduce cost and reduce scale-up risk of CO_2 capture technology
  - Undertake EU-wide mapping of large CO_2 sources and geological storage
  - By 2008, establish a “Joint Technology Initiative” as part of a portfolio of mechanisms for maximising European co-operation.

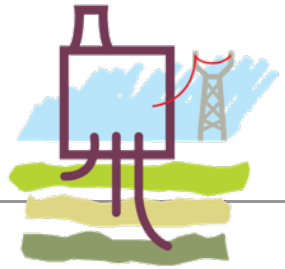
Four Task Forces Established



Objective to drive forward SDD and SRA recommendations

- **Technology**
- **Demonstration and Implementation**
- **Policy and Regulation**
- **Public Communication**

Four Key Taskforces (1)



TECHNOLOGY

Organise R&D

- Map R&D needs and identify gaps and priorities
- Provide input for FP7 update
- Improve coordination between national programmes and FP7
- Maintain ZEP papers through technology assessment

Secure funding

- Map need of additional funding for R&D
- Via public bodies and PPPs

Network and disseminate

- Organise technical days at networking researchers and industry

DEMONSTRATION & IMPLEMENTATION

Organise and finance demonstration projects

- Specify 10-12 demo projects (technology, location, contractors, financing)
- Initiate PPPs
- Establish cooperation between industrial partners
- Initiate projects in eastern & southern Europe, India and China

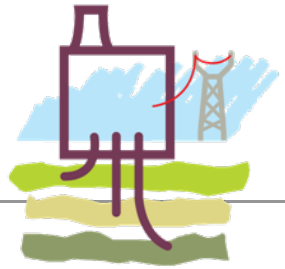
Disseminate the knowledge

- Organise events and communicate best practise

Map regulatory problems

- Develop framework for risk analysis
- Map existing legal barriers

Four Key Taskforces (2)



POLICY & REGULATION

Close cooperation with EU to identify regulatory issues

- Regulatory work DG TREN, ENV, …
- Public funding for R&D (FP7, JTI, EIB, …)

Coordinate between ZEP TFs, EC and national governments

Develop commercial incentives

Ensure that CCS is introduced under ETS

Propose regulation corresponding to GHG avoidance costs

Map MS' involvement and disseminate best practice

PUBLIC COMMUNICATION

Develop and execute communication strategy

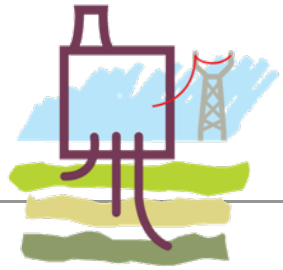
- Educational task
- Political debate/parliament

Push implementation of CCS in Member States

Involve NGOs

Ensure transparency and communication of results

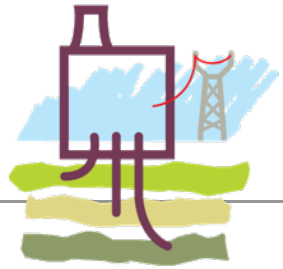
ZEP Country Profiles



- Country Profiles are being produced via the ZEP Government Coordination Group to assist the Task Forces – these have a common structure including:
  - Background information, national energy context, etc.
  - R&D, both public and private
  - Implementation activities
  - Public acceptance
  - Government policy
  - Lessons for ZEP – what can we learn from this MS?

- Drafts presented at ZEP AC meeting, Potsdam, 12th June 2007

ZEP: Summary



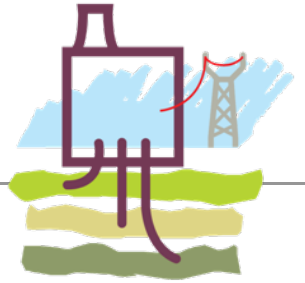
A major initiative addressing a key issue

- Setting pathway for zero emission fossil fuel power generation
- Important in European and global context
- Technology applicable for world application
  - Retrofit
  - New plant

A major action involving all stakeholders

- All appropriate industrial sectors
- Research community and technology providers
- NGOs
- Governments

A Triple Approach



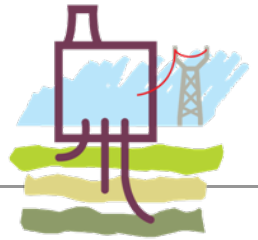
Reducing emissions and increasing efficiency in ecologically and economically optimised steps

- Modernisation of existing plants: SO_2, NO_x, dust, retrofit
- Construction of new state-of-the-art power plants

Development of high-efficiency power stations with the aim to minimise consumption of resources and reduce specific emissions, particularly those of CO_2

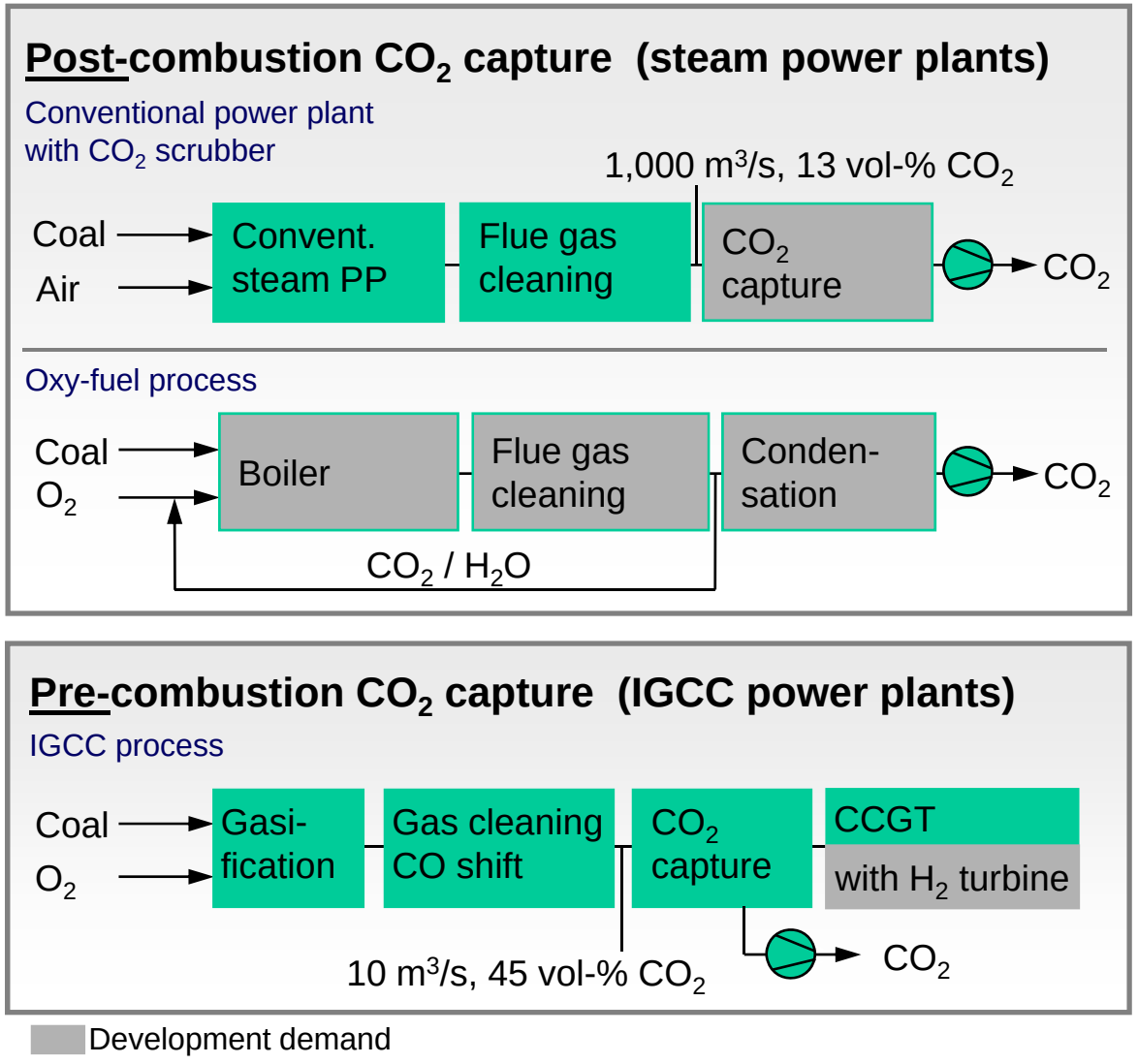
New Technologies for CO_2 capture and storage

Main Technology Options for CO_2 Capture from Power Plants



Three technologies seem capable to fulfil the primary target to 2020

- All largely contain known technology and components
- All need optimization, scale up and process integration
- Power process efficiency increase is always a supporting activity



To Summarise…..

- Fossil fuels - global use will increase during the next decades
- The CLEAN COAL concept fits in the context of climate protection as well as security of supply
- The Technology platform ZEP wants to give a major thrust to the development of the CO_2-free power plant
- FENCO will help to coordinate underpinning R&D to achieve this

UK Demonstration Plant

AEA Energy & Environment
From the AEA group

- **Competition announced in March 2007 budget**

- **Details included in May 2007 Energy White Paper**

For Further Information…

AEA Energy & Environment
From the AEA group

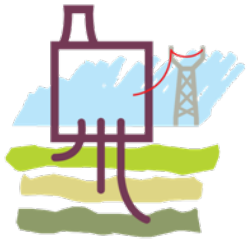
Please refer to the following web sites:

www.fenco-era.net

FENCO ERA-NET
Fossil Energy Coalition

and

www.zero-emissionplatform.eu



Thank you for your attention.