



# Zero Emission Fossil Fuel Power Plant” ZEP European Technology Platform


**Nick Otter**

Co-ordinator of ZEP Platform  
and  
Director of Technology and External Affairs, ALSTOM Power Ltd



## Contents of Presentation

---

- AN OVERALL VIEWPOINT
- THE EUROPEAN INITIATIVE : ZEP 
- THE WAY FORWARD : STRATEGY
- CONCLUDING REMARKS



## AN OVERALL PERSPECTIVE



## Key Touchstones

- **Importance of clean use of fossil fuels**
  - a critical transitional issue in getting to a sustainable energy future
  - an essential part of the portfolio
  
- **Importance of accelerating the take-up of clean fossil**
  - need for incentives for early action on `zero emission` power plant
  - stable financial and regulatory framework to get "many of a kind"
  
- **Importance of addressing issue worldwide**
  - use of high efficiency technologies, and .....
  - ..... prepare the way `zero emission`
    - retrofitting of high efficient coal plant with capture to avoid "carbon lock-in"
    - how to ensure new plant is "capture ready"
    - increase use of low carbon technologies



# ZEP



## “ZERO EMISSION FOSSIL FUEL POWER PLANT” EUROPEAN TECHNOLOGY PLATFORM



## EC FP7 Technology Platforms

- **A major new `instrument` for FP7**
- **Aim**
  - To provide a means to foster effective public-private partnerships between research community, industry and policy makers in order to deliver impetus to mobilise research and innovation towards achieving a common goal
    - **Establishment of critical mass actions**
    - **Deployment of technology**
    - **Industrial leadership**
- **Energy Topics**
  - Hydrogen and Fuel Cells (HFC)
  - Electricity Networks (SmartGrids)
  - Photovoltaics (PVTP)
  - Solar Thermal (ESTTP)
  - Biofuels
  - **Zero Emission Fossil Fuel Power Plants (ZEP)**
    - **Basis for Joint Technology Initiatives**
    - **Strategic in nature for Europe**

Embraces CCT and ZEPG  
themes in FP7



## ZEP: Set Up and Vision

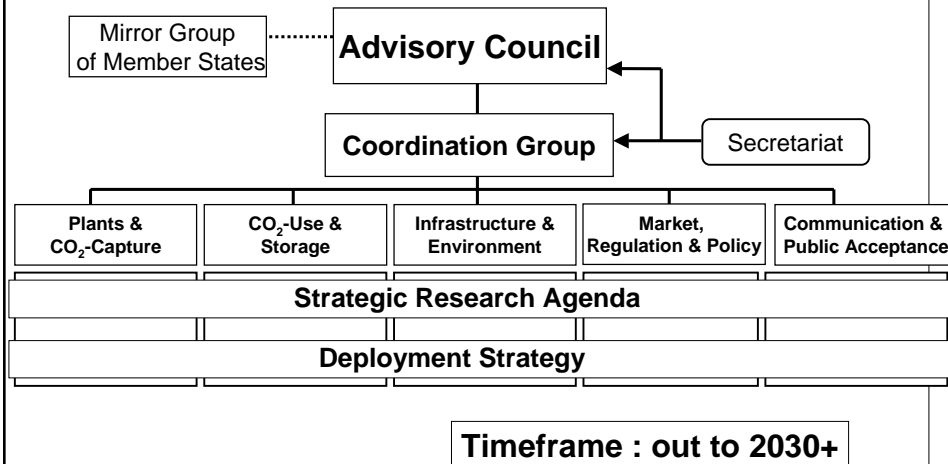
- **EU Clean Fossil Power Initiative**
  - Aiming for critical mass programme in Europe
  - Established European Technology Platform with EC
  - Primary task to set **technology agenda and deployment plan**
  - Major input to EC FP7 (2007-2013)
  
- **ETP “Zero Emission Fossil Fuel Power Plants”**
  - **Advisory Council** formed 21 Jun05 comprising senior individuals from :-
    - 6 Generators
    - 6 Equipment suppliers
    - 5 Oil/Gas
    - 4 Researchers
    - 3 NGOs
  - **Formally launched, Brussels 1 Dec05**
  - **First General Assembly 12-13 Sep06**

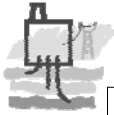
### Vision Statement

**To enable European fossil fuel power plants to have zero emission of CO<sub>2</sub> by 2020**



## ZEP: Organisational Structure





## ZEP: Members of Advisory Council

UNECE  
SUSTAINABLE ENERGY COMMITTEE  
GENEVA 26-28<sup>TH</sup> November 2006

### Generators

Kurt Haege	Vattenfall AB(Chair)	: Germany
Bernhard Fischer	E.ON Energie AG	: Germany
Santiago Sabugal Garcia	ENDESA Generation	: Spain
Johannes Lambertz	RWE Power AG	: Germany
Gennaro de Michele	ENEL	: Italy
Hakon Mosbech	ENERGI E2 A/S	: Denmark

### Equipment Suppliers

Charles Soothill	ALSTOM (Vice-Chair)	: UK
Harry Lampenius	Foster Wheeler	: Finland
Iain Miller	Mitsui Babcock	: UK
Norbert Koenig	Siemens AG Power Generation	: Germany
Francois Jackow	Air Liquide	: France
Giuseppe Zampini	Ansaldo Energia SpA	: Italy

### Oil/Gas

Gardiner Hill	BP (Vice-Chair)	: UK
Jean-Michel Gires	Total SA	: France
Philippe Lacour-Gayet	Schlumberger	: France
Graeme Sweeney	Shell Gas and Power	: UK
Arve Thorvik	Statoil	: Norway

### Research

Olivier Appert	IFP (Vice-Chair)	: France
Antonio Valero	CIRCE (Vice-Chair)	: Spain
Niels Peter Christensen	GEUS	: Denmark
Josek Dubinski	CMI	: Poland
David Falvey	BGS	: UK

### NGOs

Frederic Hauge	The Bellona Foundation	: Norway
Kirsten Macey	Climate Action Network Europe	: Belgium
Stephan Singer	WWF International	: Belgium



UNECE  
SUSTAINABLE ENERGY COMMITTEE  
GENEVA 26-28<sup>TH</sup> November 2006

## ZEP : Member State Mirror 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

**Engagement with Governments**



## ZEP: Organisation Engagement

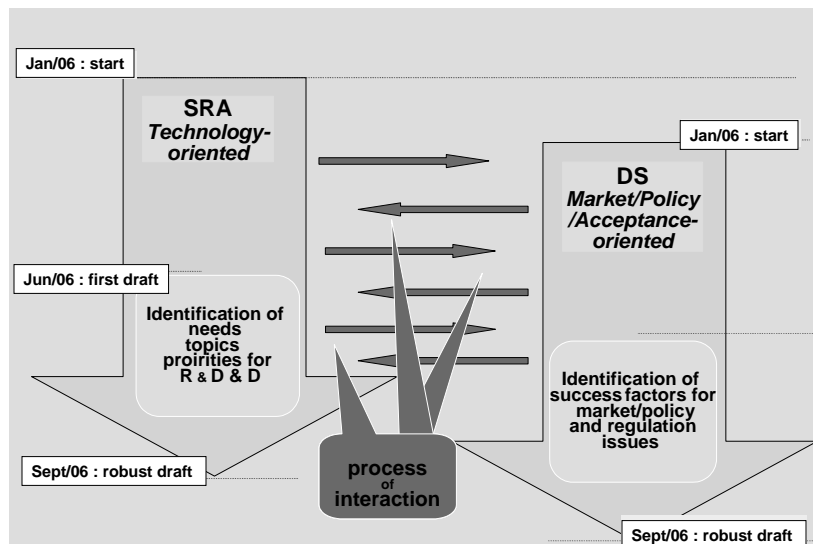
WG	1	2	3	4	5	Total	%
Generators	7	4	2	7	4	24	26
Suppliers	7	2	5	3	1	18	19
Oil/Gas&Infrastructure	2	3	7	2	2	16	17
Research	6	11	3	3	4	27	29
NGO	1	2	1	2	2	8	9
<b>Total</b>	<b>23</b>	<b>22</b>	<b>18</b>	<b>17</b>	<b>13</b>	<b>93</b>	
<b>%</b>	<b>25</b>	<b>24</b>	<b>19</b>	<b>18</b>	<b>14</b>		<b>100</b>

Involvement from >60 organisations

Industry ~60%  
Research ~30%  
NGO ~10%



## ZEP Action : Key Outputs and Timing





# ZEP



## STRATEGIC RECOMMENDATIONS

**Strong endorsement at ZEP General Assembly  
Brussels 12-13<sup>th</sup> September 2006**



## SRA Recommendations

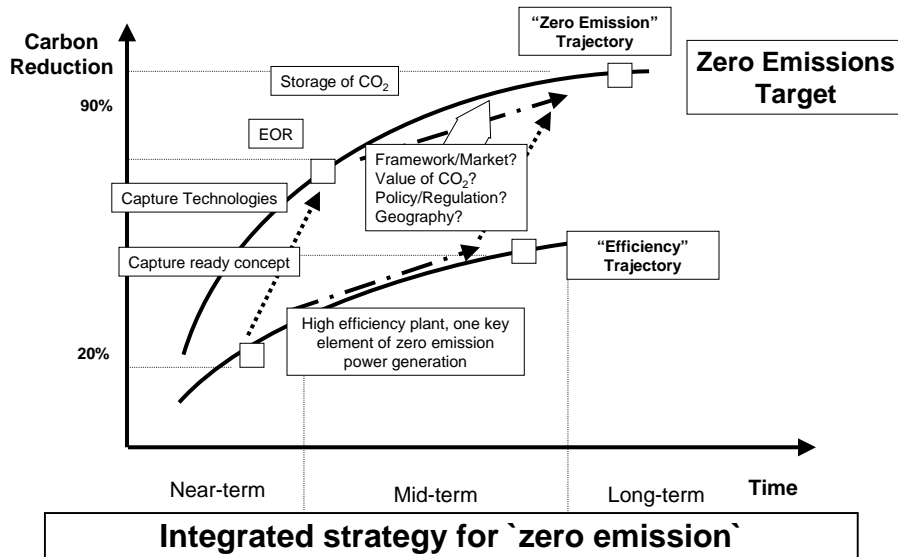
**The Strategic Research Agenda** describes a collaborative programme of technology development for reducing the costs and risks of deployment

- *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.*



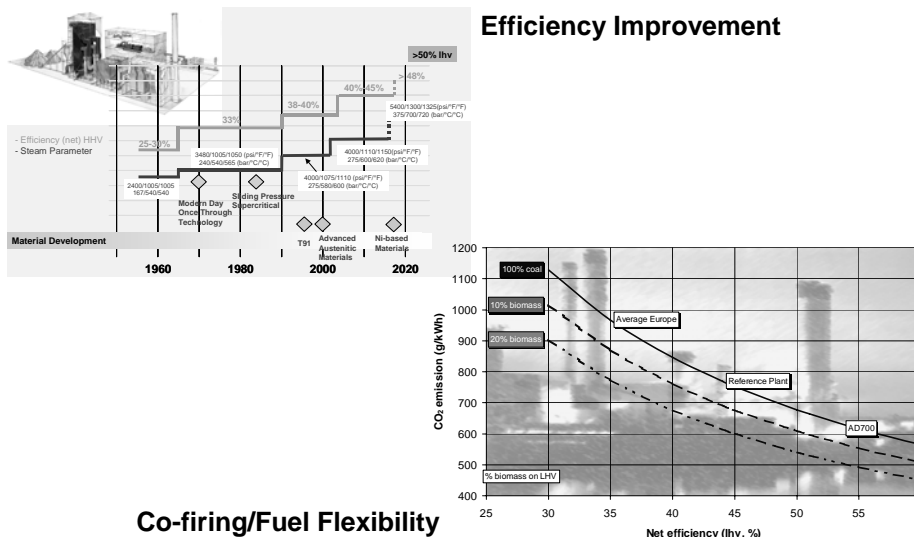
## Pathway to zero emission power for fossil fuels

UNECE  
SUSTAINABLE ENERGY COMMITTEE  
GENEVA 26-28<sup>TH</sup> November 2006



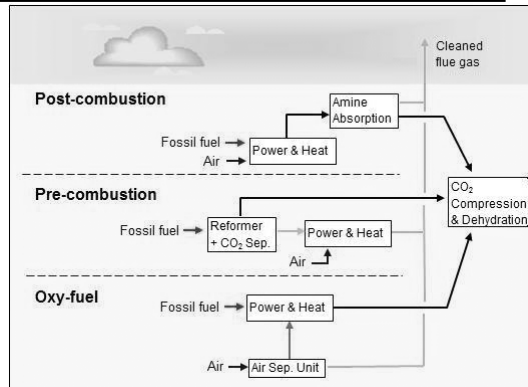
## Carbon Abatement Technologies

UNECE  
SUSTAINABLE ENERGY COMMITTEE  
GENEVA 26-28<sup>TH</sup> November 2006





## Carbon Capture Technologies



- Accepted need for a portfolio approach
- All technologies need to be addressed
- Retrofit and new plant application



## Post Combustion CO<sub>2</sub> Capture

- **Amine Based Systems**
  - Further Improvements in Solvents
  - Application of Membranes Technologies
- **Ammonia**
  - Lower than Amine Cost and lower steam use than for Amine
- **Frosting**
  - Uses refrigeration principle to capture CO<sub>2</sub> from Flue Gas.

**New plant  
and retrofit  
application**

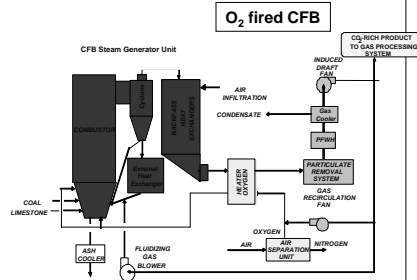
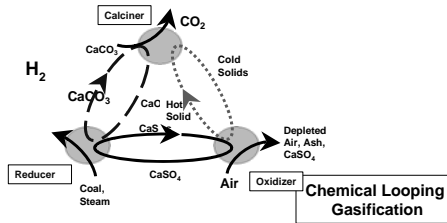
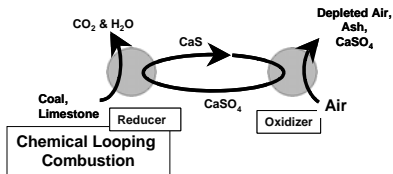
**Focused on Reducing Cost and Power Usage**





## Advanced Capture Processes

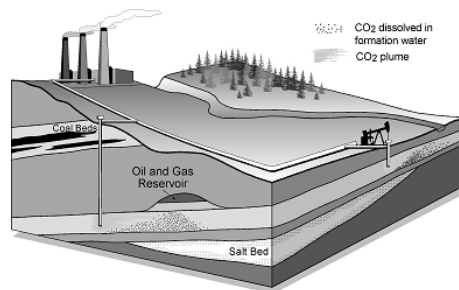
- Oxygen Fired CFB
- Chemical Looping
  - Combustion
  - Gasification



## CO<sub>2</sub> Storage

### Key Issues

- Cost Reduction
- Public Acceptance
- Safe and Effective Storage
- Developing the Legal, Regulatory & Fiscal Framework



**Safety and acceptance of CO<sub>2</sub> storage**



## **SDD Recommendations**

---

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

*Kick-starting the CO<sub>2</sub> value chain with urgent short- and long-term commercial incentives*

*Establishing a regulatory framework for the geological storage of CO<sub>2</sub>*

*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<sub>2</sub> capture technology*
- *Undertake EU-wide mapping of large CO<sub>2</sub> sources and geological storage*
- *By 2008, establish a "Joint Technology Initiative" as part of a portfolio of mechanisms for maximising European co-operation.*



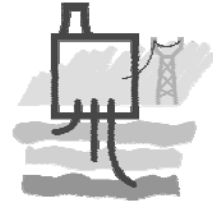
---

## **CONCLUDING REMARKS**



## 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
  - Appropriate industrial sectors
    - Generation
    - Oil/gas companies
    - Equipment suppliers
    - Fuel providers
  - Research community and technology providers
  - NGOs
  - Governments
- Major input to shaping of FP7 Work Programme



[www.zero-emissionplatform.eu](http://www.zero-emissionplatform.eu)



## Zero Emission Fossil Fuel Power Plant” ZEP European Technology Platform

**Nick Otter**

Co-ordinator of ZEP Platform  
and  
Director of Technology and External Affairs, ALSTOM Power Ltd