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CSLF meeting Delhi, 3 April 2006

European Commission Activities in CO₂ Capture and Storage



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EU Climate and Energy Policy

- ✓ **Reduction of EU greenhouse gas and other pollutant emissions**
 - EU Kyoto Commitment: **8% GHG reduction by 2008-12 compared to 1990 levels**
 - EU Strategy for “post-2012”: **Deeper reductions required afterwards**

- ✓ **Maintaining Security of Supply**
 - **Green Paper of March 2006: “European Strategy for Sustainable, Competitive and Secure Energy” - Common Energy Policy for Europe**

- ✓ **Promoting Competitiveness of the EU Industry**
 - Lisbon process





CO2 and Climate Change / Political Context

- **Conclusive evidence on the link between the increase of greenhouse gas concentration in the atmosphere and the measured temperature rises**
- **Kyoto protocol/ Post 2012**
 - ✓ **Outcome of COP-11 (Montreal Dec. 2005). The EU has asserted international leadership in the fight against climate change**
- **EC Communication (February 2005): “Winning the Battle Against Global Climate Change”. Technology “push and pull” to play an important role**
- **Second European Climate Change Programme (ECCP):**
 - ✓ **Stakeholder consultation on enabling legal framework for CCS in the EU**
- **EU Greenhouse Gas Emissions Trading Directive (Jan 05 onwards)**
Current prices around 25-27 €/tonne
- **Green paper on a common Energy Policy for Europe**
An integrated approach to tackle Climate Change
 - **Leading on Energy Efficiency : Action Plan (June 2006)**
 - **Renewable Energy Road Map**
 - **Carbon Capture and Storage (RTD + LSD)**
 - **European Energy Technology Plan**





Activities under Research Framework Programmes

Activities under FP5 and FP6 (See Annex)

- ✓ **Projects on Capture and Storage worth more than 170 M€**
- ✓ **Growth Initiative – “Quickstart” Programme : Hypogen. (Dynamis project started 1st March 2006)**
- ✓ **Co-ordination of member states activities, ERA-NET FENCO started in September 2005**
- ✓ **International Cooperation : Contribution 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**
 - **1st General Assembly in September 2006**

Activities under FP7 (See Annex)

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





Following Energy-4 Call for proposals

➤ New Topping up INCO FP6 Call

- ✓ Open to targeted third countries to participate in on-going FP6 projects
- ✓ Budget: ~ 3,2 M€ for Energy research
- ✓ Deadline for submission: 16 May 2006
- ✓ The Area of Capture and sequestration of CO₂, associated with cleaner fossil fuel is included in the call

http://fp6.cordis.lu/index.cfm?fuseaction=UserSite.FP6DetailsCallPage&call_id=278





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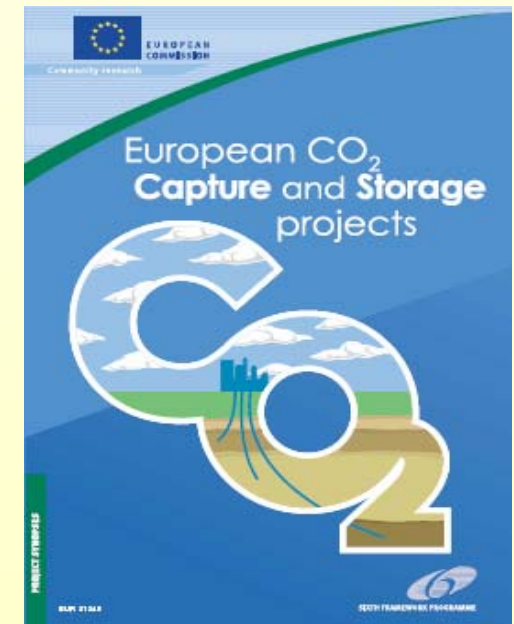
Activities under FP5 / FP6

✘ Capture R&D – Objectives

- ✓ 70-80 % of total cost - therefore primary objective is to decrease the cost of capture (to below 20 €/ton).
- ✓ Capture R&D - Scope:
 - pre-combustion capture
 - post-combustion capture
 - Oxyfuels

✘ Sequestration R&D - Objectives

- ✓ Long term stability;
- ✓ Risks and safety aspects;
- ✓ Build public confidence;
- ✓ Map and assess geological storage potential.





European Climate Change Programme II

- ✘ Stakeholder Working Group on Carbon Capture and Geological Storage
 - ✓ **Mandate:** explore options for an enabling legal framework for CCS in the EU
 - ✓ **Broad stakeholder participation** (ENGOs, industry, Member States, Commission)
 - ✓ 4 meetings, **final report to be adopted on 8 May 2006**
 - ✓ Issues for the final report: assessment of impacts, permitting framework, **incentives**, liability
 - ✓ Commission Communication, possibly with legislative Proposal **1st half of 2007**





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CSLF Projects

- ✘ **A significant number of CSLF recognised flagship projects are funded by the EC**
- ✘ **Outcome after recognition (both for the projects and the CSLF) needs to be monitored and valorised (PIRT)**
- ✘ **New projects with an important CSLF potential on stream in 2006. Submission for recognition will be assessed, vs. Credibility of the CSLF value added**





Proposed Priority Topics in Energy

Hydrogen and fuel cells

Energy savings and energy efficiency

Renewable electricity generation

CO2 capture and storage technologies for zero emission power generation

Renewable fuel production

Clean coal technologies

Renewables for heating and cooling

Smart energy networks

Knowledge for energy policy making





International Cooperation from a European Perspective

→ The IEA framework

- ✓ Participation in **GHG – IA**

European Members : UK, DE, DK, NL, FR, FI, SW, NO

- ✓ Participation in the **Clean Coal IA**

(UK, I, DK, AU, SW and sponsors from NL, DK, DE, ES)

- ✓ Participation in **IEA Working Party on Fossil Fuels**

UK, I, DE, DK, NL, FR, FI, SW, AU, IR, HU, CZ, GR, PT, ES, LU, B, TU,

→ Membership to the CSLF

- ✓ European Members : UK, I, DE, DK, NL, FR, GR, NO

→ Multiple bilateral agreements MS/EU and dialogues in place with e.g. US, Japan, China, India, Canada, Australia

The CSLF needs to complement, add value and optimize cooperation to accelerate development and facilitate deployment





Example: EU - China Cooperation

On 20 Feb 2006 an EU-China MoU was signed in Shanghai to cooperate on near-zero Emissions Power Generation Technology through CCS

EU-China Cooperation foresees three phases :

- Phase 1:** *Exploring the feasibility of, and options for, near-zero emissions coal technology in China through carbon dioxide capture and storage; 2007-2009*
- Phase 2:** *Defining and designing a demonstration project; 2009-2010*
- Phase 3:** *Construction and operation of a demonstration project.” 2011-2015*

The EU-China MoU linked with an UK-China MoU, focuses on PHASE 1

Similar activities worldwide, how can the CSLF add value?





Issues for the CSLF

- **Need for a shared understanding on vision, objectives and strategy (or strategies) and an agreed Action Plan**
- **More flexible and effective operational structures aimed at facilitating results (including a more transparent and participative management), particularly in view of enlarged membership**
- **Focus on identifying, recognising and valorising results of CSLF projects and activities as key vehicles to deliver CSLF relevant results**
- **Members to take active provision to facilitate funding of CSLF relevant projects/activities**





CONCLUSIONS

- **The European Energy, Environment, Research and External Relations Policies are aligned in adopting measures towards a more sustainable, secure and competitive energy, both in Europe and globally**
- **Together with Renewable Energy and Energy Efficiency, CCS technologies are now firmly present on the political agenda to tackle Greenhouse Gas Emissions**
- **After 3 years, the CSLF should objectively: assess progress and its ability in advancing towards its goal, and take steps for the adoption of a long term strategy and an action plan**
- **Consider a more dynamic management approach and efficient well balanced and more efficient process to stakeholder involvement**





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*Thank you for your
attention*

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ANNEX

Additional Information on on-going activities in European Commission in CO₂ Capture and Storage

CONTENT:

- ✓ **Climate Change Policy**
- ✓ **Activities in Research Framework Programmes –FP6**
- ✓ **The Technology Platform on Zero Emission Fossil Fuels Power Plants**
- ✓ **FP7**



Political Context

Rationale

- ✗ Kyoto protocol effective further to Russian ratification.
- ✗ EU set to decrease its GHG emission by 8% in 2008-2012 compared to 1990 under the Kyoto Protocol.
- ✗ Burden sharing agreement between Member States.
 - ✓ Providing differentiated objectives taking the situation of individual member states into account
- ✗ On track so far, but target could be missed in business as usual scenario.
 - ✓ Projections indicate that additional measures are required if the EU15 wants to achieve its goal, like buying emission permits from the new member states and developing countries (Flexible Mechanisms)
- ✗ Outcome of COP-11 / MOP1 (Montreal Dec. 2005) The EU has asserted international leadership in the fight against climate change:
 - Two tracks of official dialogue to prepare for Post 2010 negotiations**
 - 1) The Convention Track including all Parties (includes also United States and Australia)
 - 2) The Kyoto track (CDM, JI to be strengthened)





- ✗ **Renewable Energy Sources and Energy Efficiency** are recognised as Technological options for reducing emissions
 - ✓ **Green Paper on Energy Efficiency or *Doing More With Less*** (EC publication Jun 2005).
Main Message : "*Europe could save 20% of its energy by 2020*"
- ✗ **The new Green Paper "Common EU Energy Strategy"** adopted in March 2006
- ✗ **European Climate Change Programme (ECCP)** has identified most promising and cheapest routes.
 - ✓ **Second phase has started and includes exploring the potential of carbon capture and storage**
- ✗ **EU Greenhouse Gas Trading Directive – trading started Jan 05**
 - ✓ **The first ever large regional market**
 - ✓ **Prices in 2005 in the region of 30 €/ton**
- ✗ **"Linking" directive transferring CDM and JI credits into the EU GHG trading directive**
- ✗ **Commission Communication on a "Post-Kyoto" strategy**
 - ✓ **Clearly recognizes the role of technology**





FP6 – on-going projects

Project Acronym	Type of Action	Title	EU funding (M€)	Coordinator	Duration (months)	Start	No of Partners	No of countries
CO2SINK	IP	In-situ laboratory for capture and sequestration of CO ₂	8.7	Postdam Research C	60	1/4/04	14	8
ENCAP	IP	Enhanced capture of CO ₂	9.8	Vattenfall	60	1/3/04	33	9
CASTOR	IP	CO ₂ from capture to storage	8.5	IFP	48	1/2/04	30	12
CO2GEONET	NoE	Network of excellence on geological sequestration of CO ₂	6	BGS	60	1/4/04	13	7
ISCC	STREP	Innovative in-situ CO ₂ capture technology for solid fuel gasification	1.9	Univ. of Stuttgart	36	1/1/04	14	7





FP6 Third call – Dec. 2004 –
Projects started in 2006)

- **CO₂ capture and hydrogen production from gaseous fuels (IP)**
CACHET (7.5 m€ - coordinator BP)
- **The monitoring and verification of CO₂ geological storage (IP)**
CO₂REMOVE (8 m€ - coordinator TNO)
- **Preparing for large scale H₂ production from decarbonised fossil fuels including CO₂ geological storage (IP) (HYPOGEN PHASE1)**
DYNAMIS (4 m€ - coordinator SINTEF)
- **Advanced separation techniques (4 STREPs)**
CLC GAS POWER, C3-Capture, DeSANNS, HY2SEPS (7.6 m€ for the 4)
- **Mapping geological CO₂ storage potential matching sources and sinks (STREP)**
EU GeoCapacity (1.9 m€ - coordinator GEUS)

ABOUT 70m€ COMMITTED UNDER FP6
– FOR A TOTAL RTD EFFORT OF ABOUT 140m€





Other actions in FP6

- **The Energy-4 Call : closed on 10/01/2006.**
 - **Open for support to the transition to FP7 (coordination, TP), enhancing international dimension of EU-projects (CSLF, China), ECBM**
 - **Negotiations ongoing, Projects to start in Autumn 06**
- **The ZEP Technology Platform**
- **Growth Initiative – “Quickstart” Programme ; Hypogen : A demo plant in the EU**
- **Co-ordination of member states activities, ERA-NET (FENCO)**
- **International Cooperation : Support to the Carbon Sequestration Leadership Forum and IEA**





Demonstration of advanced NZEC Near-Zero emissions Coal technology through CCS in EU and China

The FP6 DYNAMIS project

Target

→ *Preparing for large scale H₂ production from decarbonised fossil fuels including CO₂ geological storage.*

The main objective

→ *To prepare the ground for large scale European facilities producing hydrogen and electricity from fossil fuels with CO₂ capture and geological storage.*

Coordinator : SINTEF (NO), budget 7.5 m€, EU-funding 4 m€, duration 3 years, started 1st March 2006.

The FP6 COACH project

Target

→ *Prepare the ground for a demonstration of near-zero emissions coal technology through CCS in China*

The main objective

→ *Performing research activities in the context of the EU-China MoU overlooking and coordinating all EU-China Cooperation research activities*





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The Technology Platform for Zero Emission Fossil Fuels Power Plants (ZEP)

- A Strategic Item





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The Technology Platform on Zero Emission Fossil Fuel Power Plants

Scope

To drastically reduce the environmental impact of fossil fuel use, particularly coal, aiming at highly efficient power generation plants with near zero emissions. This will include CO₂ capture and storage, as well as clean conversion technologies leading to substantial improvement in plant efficiency, reliability and costs.

Concept

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 Technology Platform

Expected benefits :

- ✘ Accelerate the generation of new knowledge, innovation and the uptake of research and technologies;
- ✘ Remove obstacles to deployment at EU, MS, regional and local levels;
- ✘ Contribute to achieving a coherent and consistent policy and regulatory framework;
- ✘ Increase attractiveness of EU for researchers and investors;
- ✘ Increase public awareness, understanding and acceptance.





The Technology Platform

The Advisory Council

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

25 Members, balance between regional and sectorial 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, Consumers/Users groups, etc.)**
- Others necessary for the Platform.**





Technology Platform ZEP: Set Up and Vision

✗ EU Clean Fossil Power Initiative

- ✓ Aiming for critical mass programme
- ✓ Established European Technology Platform with EC
- ✓ Primary task to set technology agenda and deployment plan
- ✓ Major input to EC FP7 (2006-2013)

✗ ETP “Zero Emission Fossil Fuel Power Plants”

- ✓ Advisory Council formed 21Jun05 comprising senior individuals from :-
 - **6 Generators** : EoN, Endesa, ENEL, RWE, Vattenfall, Energie E2
 - **6 Equipment suppliers** : Ansaldo, ALSTOM, Air Liquide, Foster Wheeler, Mitsui Babcock, Siemens
 - **5 Oil/Gas** : BP, Shell, Statoil, Total, Schlumberger
 - **4 Researchers** : BGS, CIRCE, IFP, Polish CMI
 - **3 NGOs** : Bellona, CAN Europe, WWF

Chair : Haege/Vattenfall

Vice Chairs : Appert/IFP
Hill/BP
Soothill/ALSTOM
Valero/CIRCE

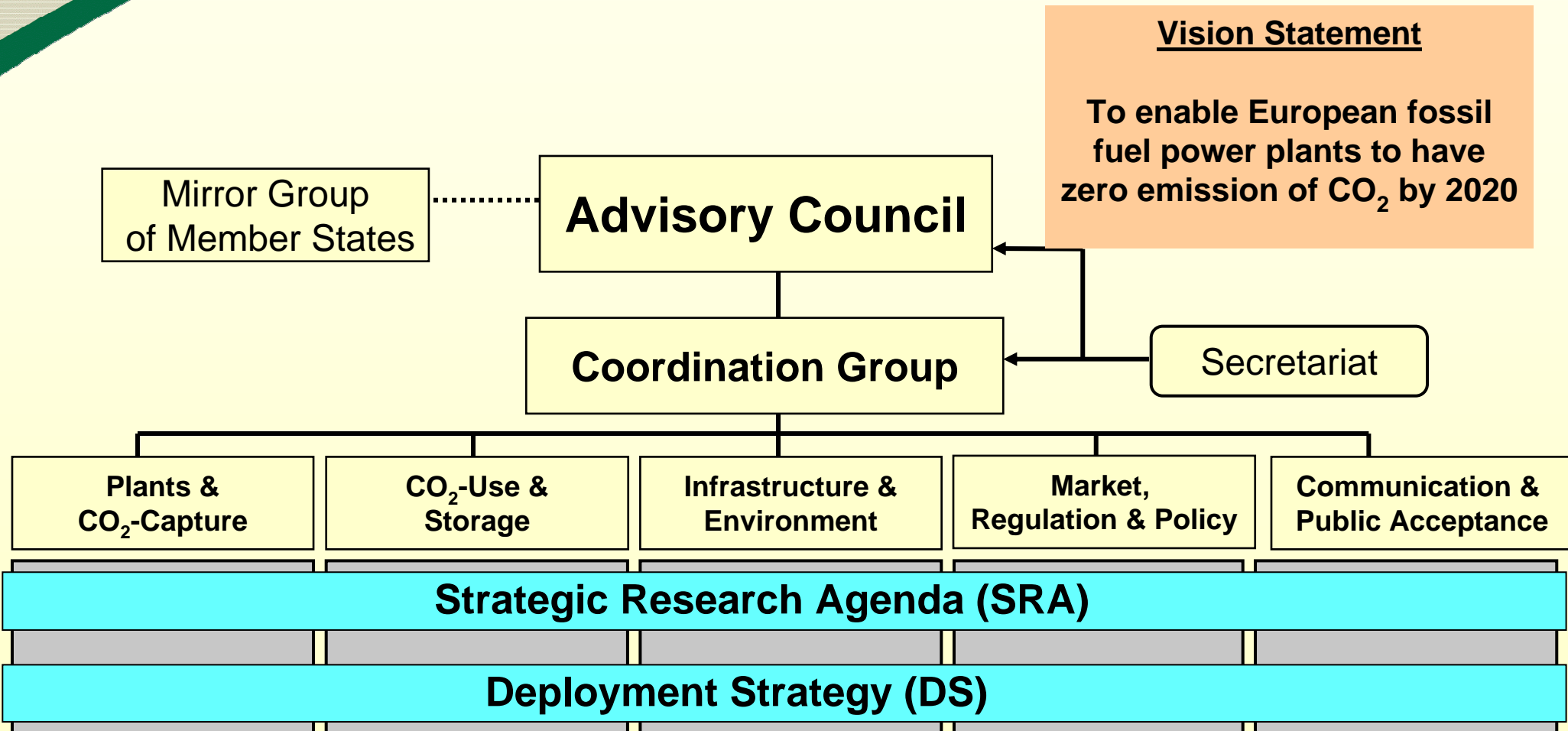




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Technology Platform ZEP: Organisational Structure





Technology Platform ZEP: WGs : Member Nationality

WG	1	2	3	4	5	Sum
Germany	3	6	2	4	2	17
France	3	3	1	2	3	12
Austria	1				1	2
Sweden	1				1	2
Finland	1		1			2
UK	4	1	2	2	2	11
Norway	1	3	2	2	1	9
Italy	1	2	2	3	1	9
Poland	1		1			2
Denmark	1	1				2
Spain	2	3	2	2	1	10
The Netherlands	2	1	1		1	5
Belgium	1			1	1	3
Switzerland						
Greece	1	1	1			3
Slovakia		1				1
Portugal	1					1
Iran			1			1*
US			1			1*
Venezuala			1			1*
Total	24	22	18	16	14	94

Agreed recommendations as of
10Jan06

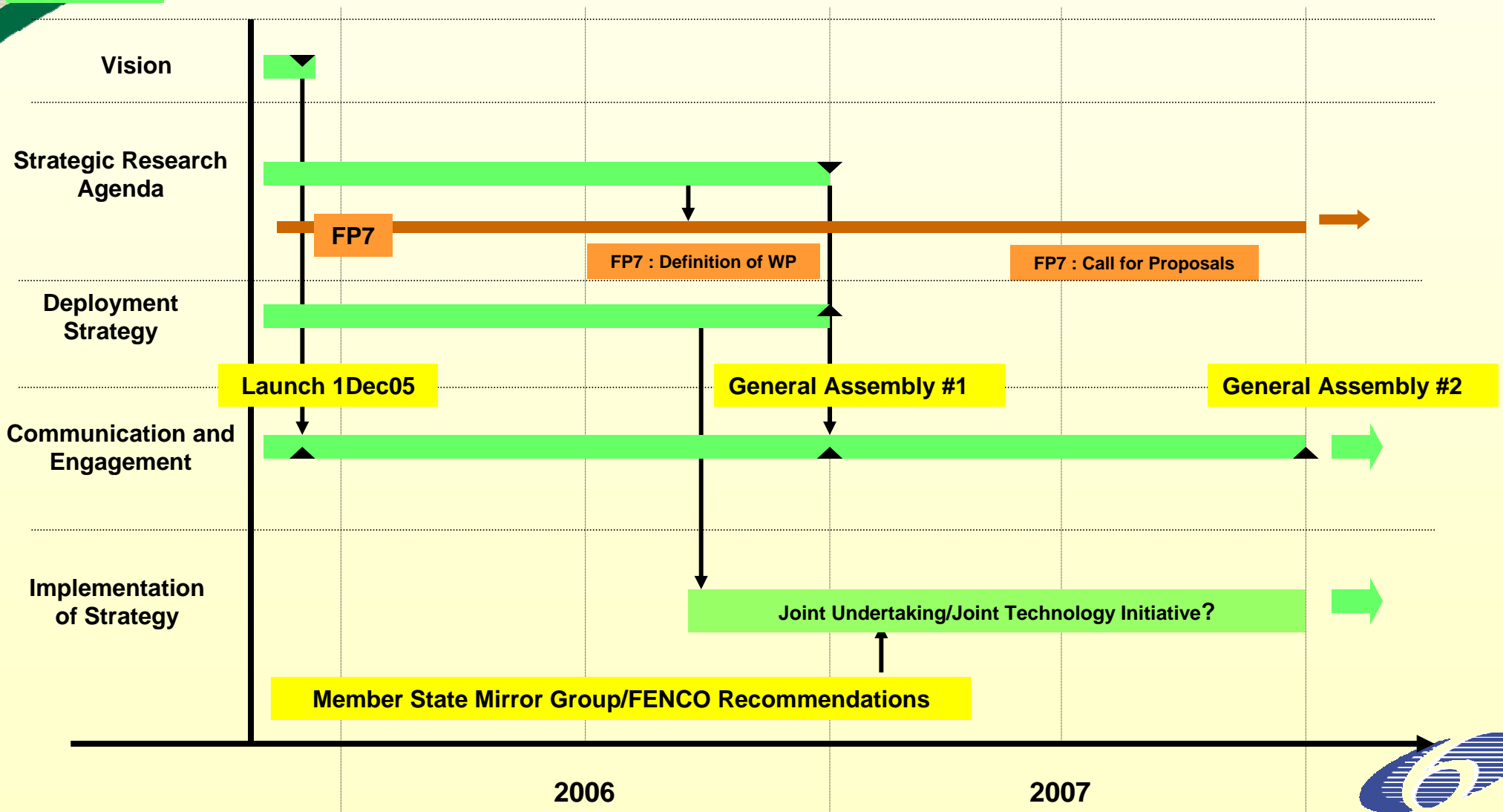
Member/Associated States	17
Others (* Non EU person in EU companies)	3



ZEP ETP Action Plan :

High Level 2-Year Milestones and Timing

Key Tasks





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Energy Research in FP7

-What we are planning to do



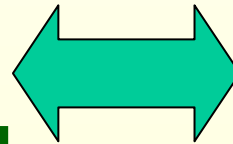


RTD policy drivers

LISBON

(March 2000)

Most competitive and
dynamic knowledge-
based economy by 2010



BARCELONA

(March 2002)

Need to boost RTD
Aim: 3% of EU GDP
by 2010 (2/3 private)

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KNOWLEDGE**

European Research Area





WHAT'S NEW in FP7 (as proposed by the Commission)

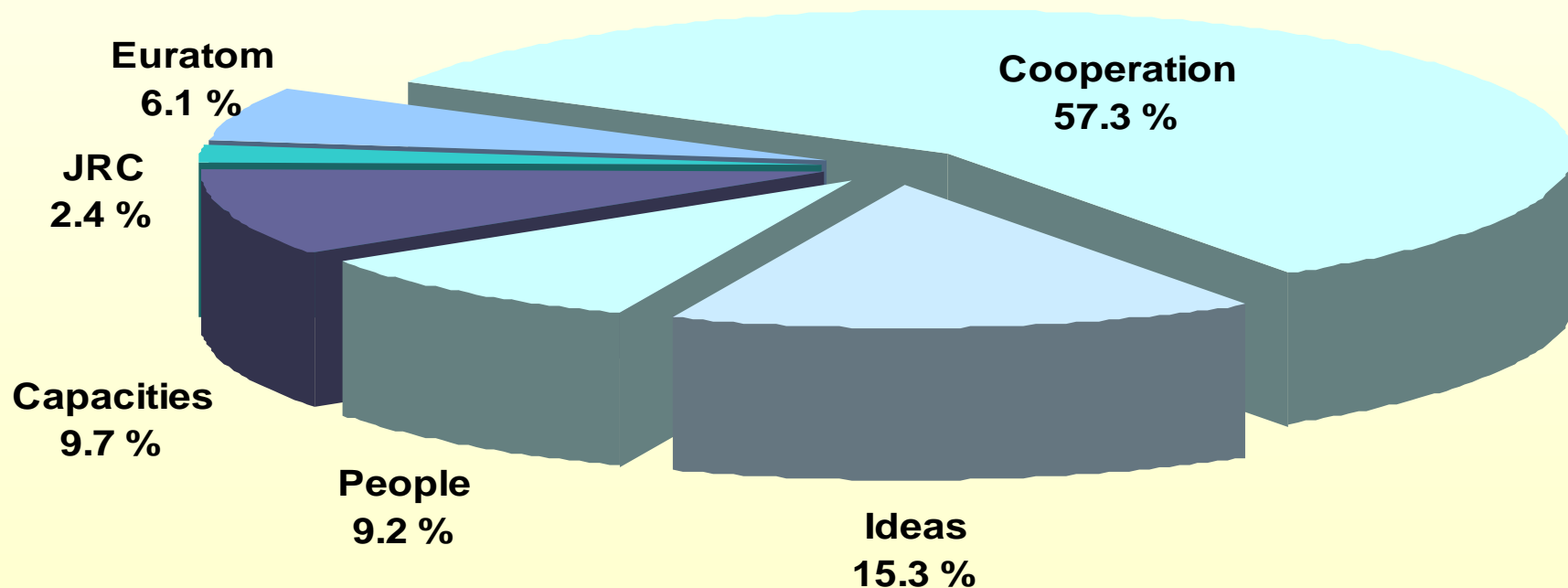
- Overall Budget increased by 2013: 75+ more than in 2006
- Emphasis on RTD themes rather than on “instruments” – **Continuity**.
- Significant **simplification** of its operation
- Focus on developing research that meets the needs of European industry, through the work of **Technology Platforms** and the new *Joint Technology Initiatives*
- Basic research - Establishment of a *European Research Council*
- Other new topics: Research Infrastructures, Regions of Knowledge, Risk-Sharing Facility (EIB).
- Programme length: 7 years

(New proposal of the Commission
to follow the agreement on financial perspectives)





Seventh Framework Programme Commission proposal (7 years)



Simplified timetable

- × FP7 proposal of the Commission – April 2005
- × FP7 adopted by Council and Parliament – summer 2006
- × First calls for proposals – late 2006

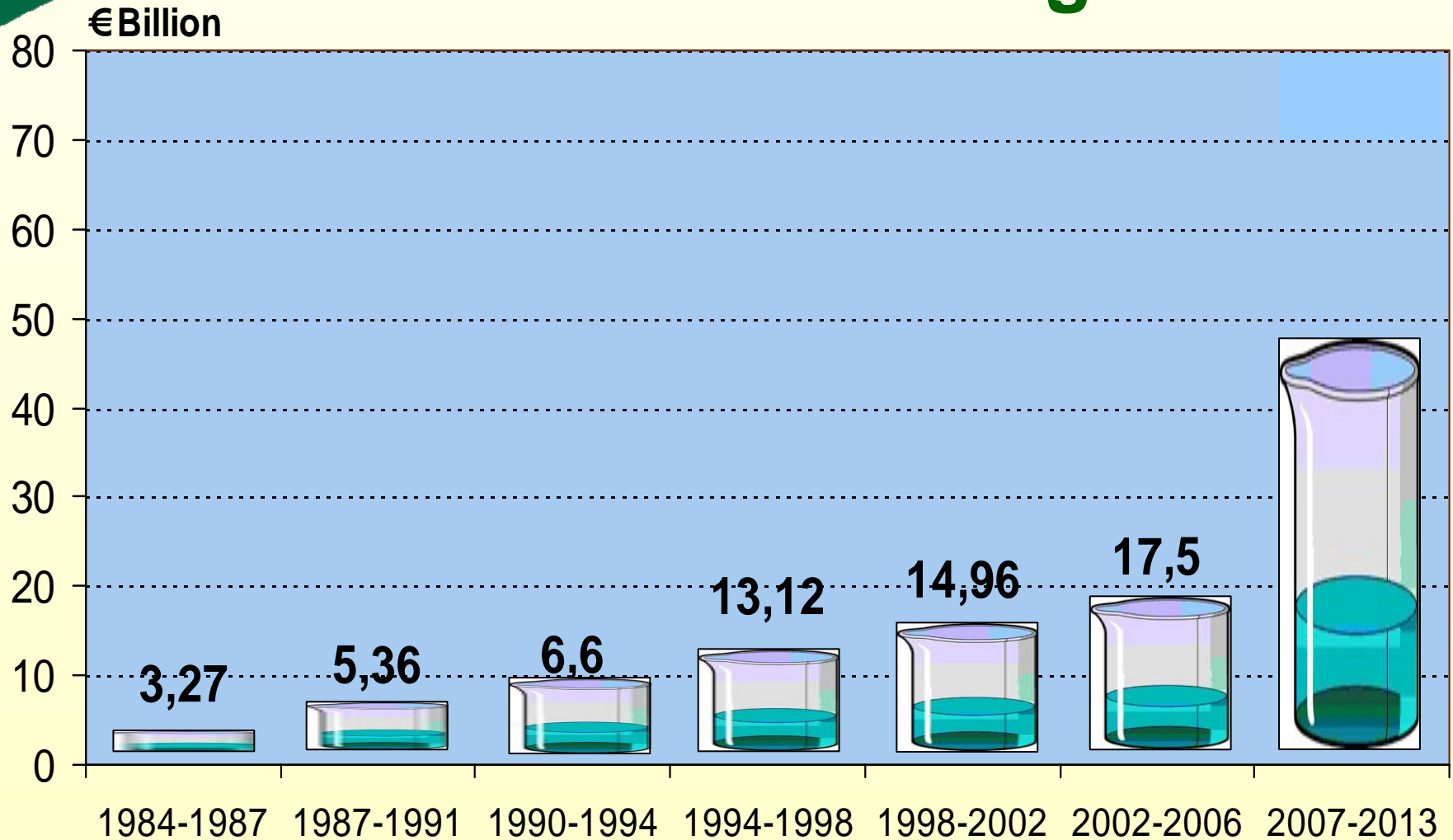




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Budgets of the EU Framework Programmes





FP7 (2007-2013)

'Cooperation' proposed budget breakdown per theme

Theme	Budget Breakdown (% of total)
1. Health	18.7
2. Biotechnology, food and agriculture	5.5
3. Information society	28.5
4. Nanotechnologies, materials and production	10.9
5. Energy	6.6
6. Environment	5.7
7. Transport	13.4
8. Socio-economic research	1.8
9. Security and space	8.9





OBJECTIVE

Transforming the current fossil-fuel based (carbon intensive) energy system into a more **sustainable** (low carbon) one based on a diverse portfolio of energy sources and carriers combined with enhanced energy efficiency, to address the pressing challenges of **security of supply** and **climate change**, whilst increasing the **competitiveness** of European industries.





FP7 – Proposed Priority Topics in Energy

Hydrogen and fuel cells

**Energy savings and energy
efficiency**

Renewable electricity generation

**CO2 capture and storage
technologies for zero emission
power generation**

Renewable fuel production

Clean coal technologies

**Renewables for heating and
cooling**

Smart energy networks

Knowledge for energy policy making





Clean Power Generation in FP7

- ✓ **CO2 Capture and Storage technologies for zero emission power generation**
To drastically reduce the environmental impact of fossil fuel use_aiming at highly efficient power generation plants with near zero emissions based on CO2 capture and storage technologies.
- ✓ **Clean Coal Technologies**
To substantially improve plant efficiency, reliability and cost through development and demonstration of clean coal conversion technologies
- ✓ **Zero Emission Power Plants** a possible topic for a future PPP (JTI/JU)





Non Nuclear Energy Research in FP7

- Reinforcement of the International cooperation - Opening of the Energy RTD programme to participants from third countries
- Specific cooperation actions between EU and third countries in support to established bilateral and multilateral cooperation agreements and dialogues
 - **Bilateral: Policy, strategy, climate change and energy dialogues (policy/strategy/technology ...)**
 - **Multilateral: CSLF, Implementing Agreement's of IEA**
- Key to identify in advance (now) specific cooperation topics/issues to be included in work programmes on time
- First calls for proposals – late 2006 closing end of March 2007 (Tentative)





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Staying Informed

Energy Policy on Europa

http://europa.eu.int/comm/energy/index_en.html

Energy Research on Europa

http://europa.eu.int/comm/research/energy/index_en.html

CORDIS FP6 Service:

<http://www.cordis.lu/fp6/>

Call information and documentation:

access from: <http://fp6.cordis.lu/fp6/calls.cfm>

Energy research helpdesk:

rtd-energy@cec.eu.int

