



EUROPEAN
COMMISSION

Community Research

LARGE CCS PROJECTS MEETING AND WORKSHOP

AGENDA and DYNAMIS Presentation

Brussels - Belgium

September 5, 2006



Meeting Agenda

1. Welcome to the Large CCS Projects Co-ordination meeting and WS
 - ✓ Background, objectives and targets
 2. The Commission's holistic view on CCS development in Europe
 3. DYNAMIS Recap- deliverables
 4. Review of major EU project objectives and results, how can the project interact/contribute/liaise with DYNAMIS (10 min each)
 - ✓ ENCAP
 - ✓ CASTOR
 - ✓ CACHET
 - ✓ CO2GEONET
 - ✓ CO2REMOVE
 - ✓ CO2SINK
 5. Discussion
- Lunch (12.15-13.15) outside meeting room
6. Review of industrial/national projects/incentives, how can DYNAMIS contribute to progressing the initiatives
 - streamlining- interaction (15 min each)
 - ✓ ZEIGCC – RWE
 - ✓ TBO/Heidrun/Draugen – Shell/Statoil
 - ✓ DF1 and DF2 - BP
 - ✓ Schwartze Pumpe- Cottbus – Vattenfall
 - ✓ E.ON – IGCC plans
 - ✓ GE- IGCC with capture – Poland
 - ✓ COACH/NZEC
 - ✓ TOTAL Lacq- Oxy-fuel
 7. Coffee Break 15.15-15.45
 8. Discussion (in lieu of item 4 and 6)
 9. Conclusion and follow-up (16.45)
 10. Close

A. Perez Sainz

P. Dechamps
N. A. Rökke

L. Brandels
P. LeThiez
Rich Beavis
N.J. Riley
E. Elewaut
G. Borm

Moderator: EU/Dynamis

K. J. Wolf
B. Berger
Rich Beavis
L. Strømberg
Robin Irons
Bart Stoffer
F. Kalaydjian
L. de Marliave

Moderator: EU/Dynamis
EU/Dynamis





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	10.7	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 gasification	1.9	Univ. of Stuttgart	36	1/1/04	14	7





FP6 Third call –Dec. 2004

New Projects

- **Preparing for large scale H₂ production from decarbonised fossil fuels including CO₂ geological storage (IP) (HYPOGEN PHASE1)
*DYNAMIS (4 m€ - coordinator SINTEF)***
- **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)***
- **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€**





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A step towards the first HYPOGEN plant, producing hydrogen and electricity with near zero emissions

Nils A. Røkke
Co-ordinator DYNAMIS



Slide n° 5



Outline

- ✘ Background
- ✘ The roadmap towards HYPOGEN
- ✘ Description of Dynamis, deliverables
- ✘ Dynamis in accordance to other EU-projects
- ✘ Suggested actions for co-operation schemes





What we target to achieve in/by this meeting

- ✘ What are the projects, information about the projects- who are the main players
- ✘ Unified view of the various CCS actions
 - ✓ Timelines, decision gates and resources
- ✘ Information exchange schemes
- ✘ Establish links and hopefully bodies/actions to ensure coherence
- ✘ Make best use of the resources
- ✘ Comprehend the views into a common position versus the ZEP visions- report to GA



Background

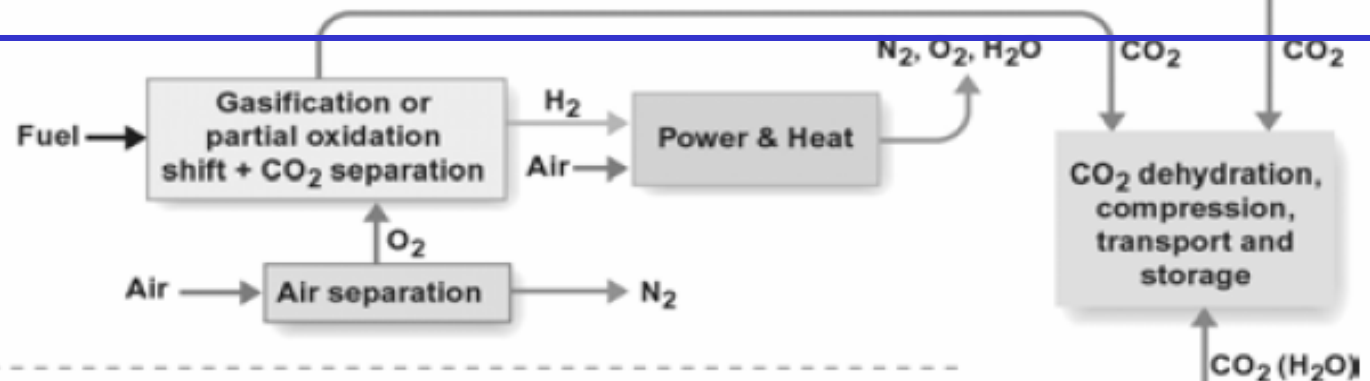
CO₂ capture from power generation

Post-combustion capture

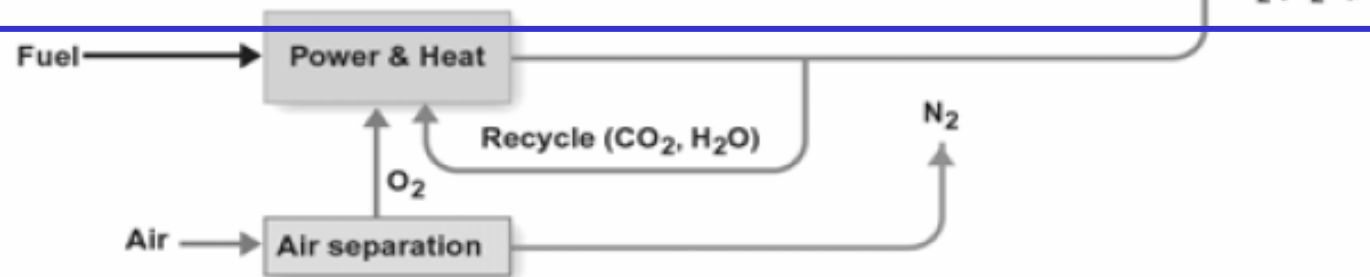


Pre-combustion capture

HYPOGEN



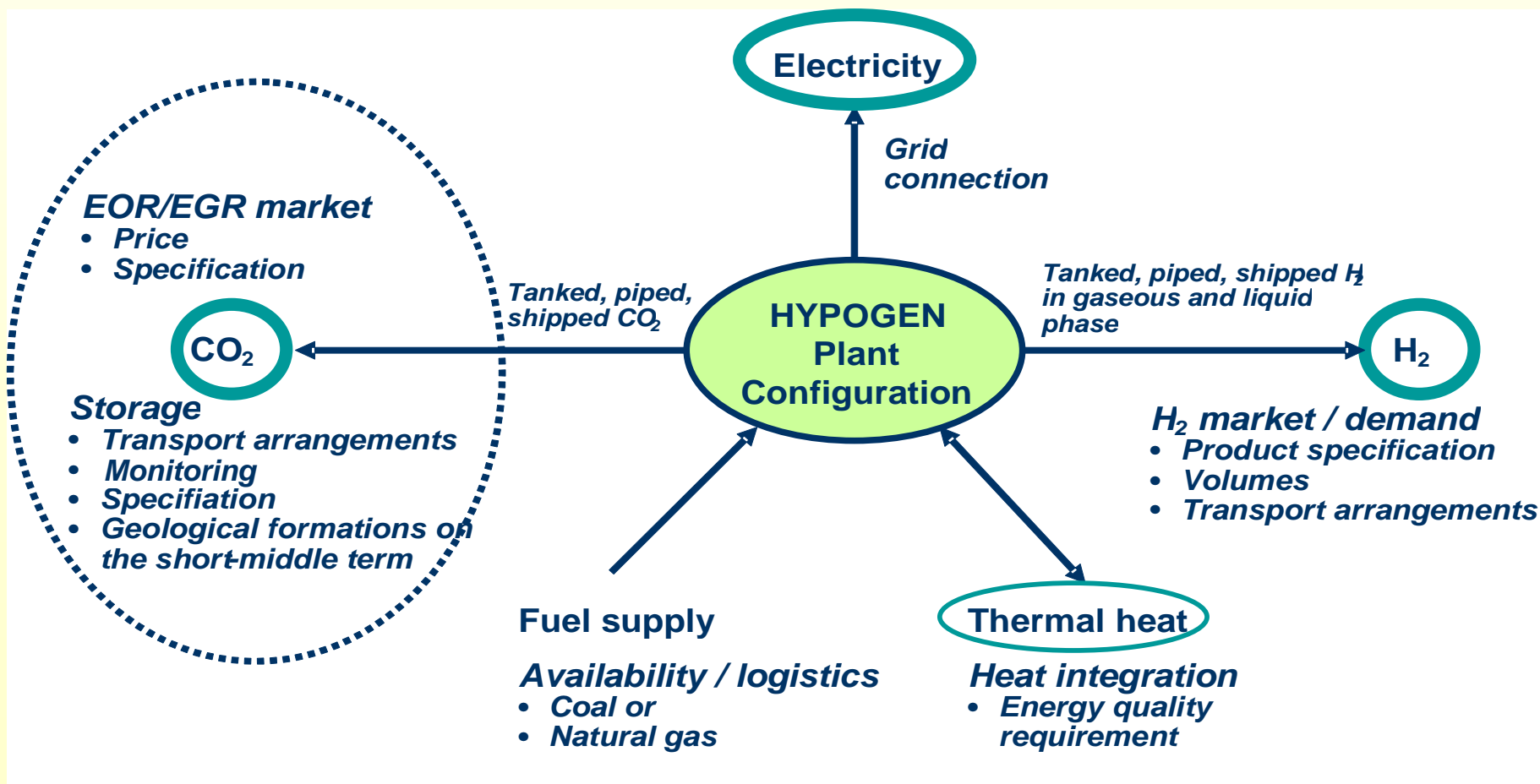
O₂/CO₂ recycle (oxyfuel) combustion capture





Background

HYPOGEN – HYdrogen POWer GENeration



Background

HYPOGEN – HYdrogen POver GENeration

- ✘ The Quick-start Programme of the European Initiative for Growth:
 - Hydrogen Economy as one of the key areas for investment in the medium term (2004-2015)
 - HYPOGEN and HYCOM

- ✘ HYPOGEN – 1.3 billion €
 - Develop the first large scale test facility for production of hydrogen and electricity from de-carbonised fossil fuels, with geological storage of CO₂.
 - In operation in 2012



HYPOGEN overall timeline & budget

- ✘ Phase 0 Feasibility Study by JRC (2004)
- ✘ Phase 1 Measures within FP6, DYNAMIS (2006-2008) 7.5 M€
- ✘ Phase 2 Pilot Scale Demonstrations (2008-2010) 290 M€
- ✘ Phase 3 Demonstration Plant Construction (2008 – 2012) 800 M€
- ✘ Phase 4 Operation and validation (2012-2015) 200 M€

SUM

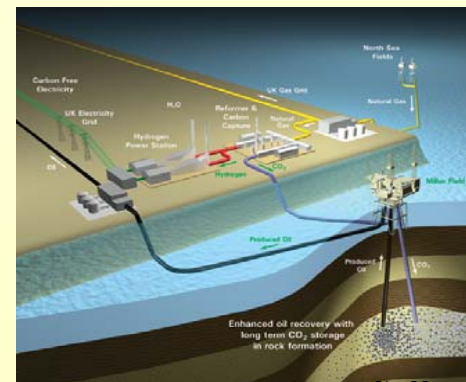
~1300 M€



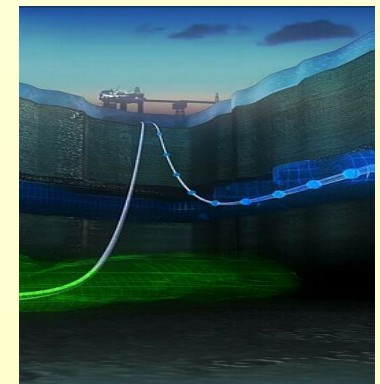
Pic. Siemens



Pic. Vattenfall



Pic. BP



Pic. Statoil



Phase 0

Outcome HYPOGEN pre-feasibility study

Recommendations for next phase:

- ✘ Investigate technologies for natural gas AND coal
- ✘ Apply commercial technologies → minimizing the risks
- ✘ Flexibility (H₂ vs. Electricity)
- ✘ Address risk of CO₂ storage
- ✘ Site selection of HYPOGEN → close to market
- ✘ Adequate financing solutions should be investigated and developed in an early phase of the programme

Phase 1

Dynamis – feasibility study

- ✗ Investigate viable routes for large-scale cost-effective combined H₂ and electricity production with integrated CO₂ capture and storage, probably combined with EOR.

Project metrics;

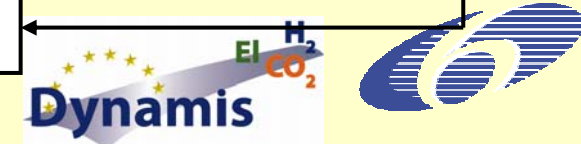
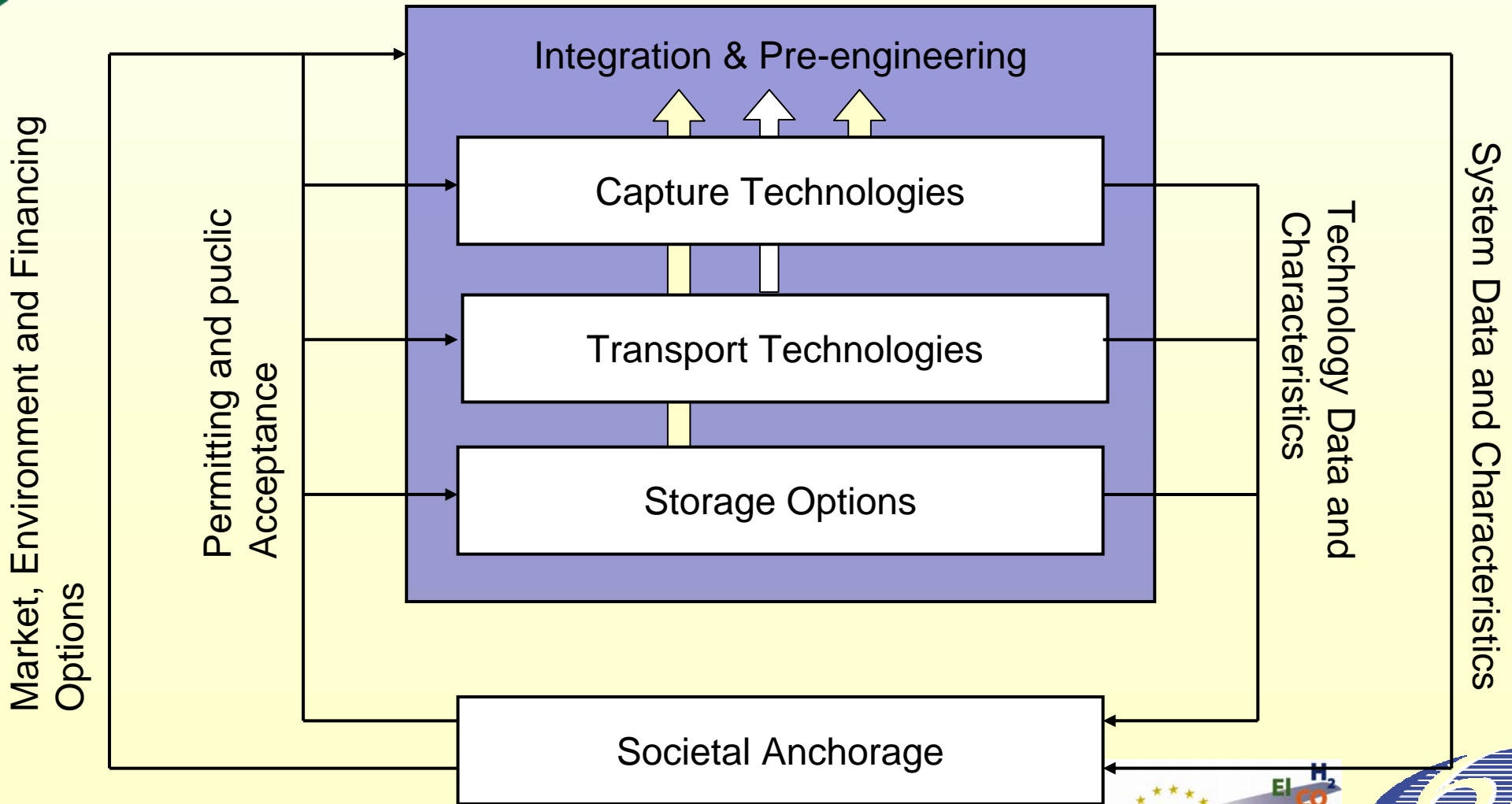
- ✗ Start-up March 2006
- ✗ 30 partners – 8 EU member states, 1 associated country, 1 other
- ✗ 14 RTD providers, 7 technology providers, 8 energy providers and 1 financing institution
- ✗ SINTEF Energy Research co-ordinator
- ✗ 7.4 M€ of which 4 M€ funded by the European Commission



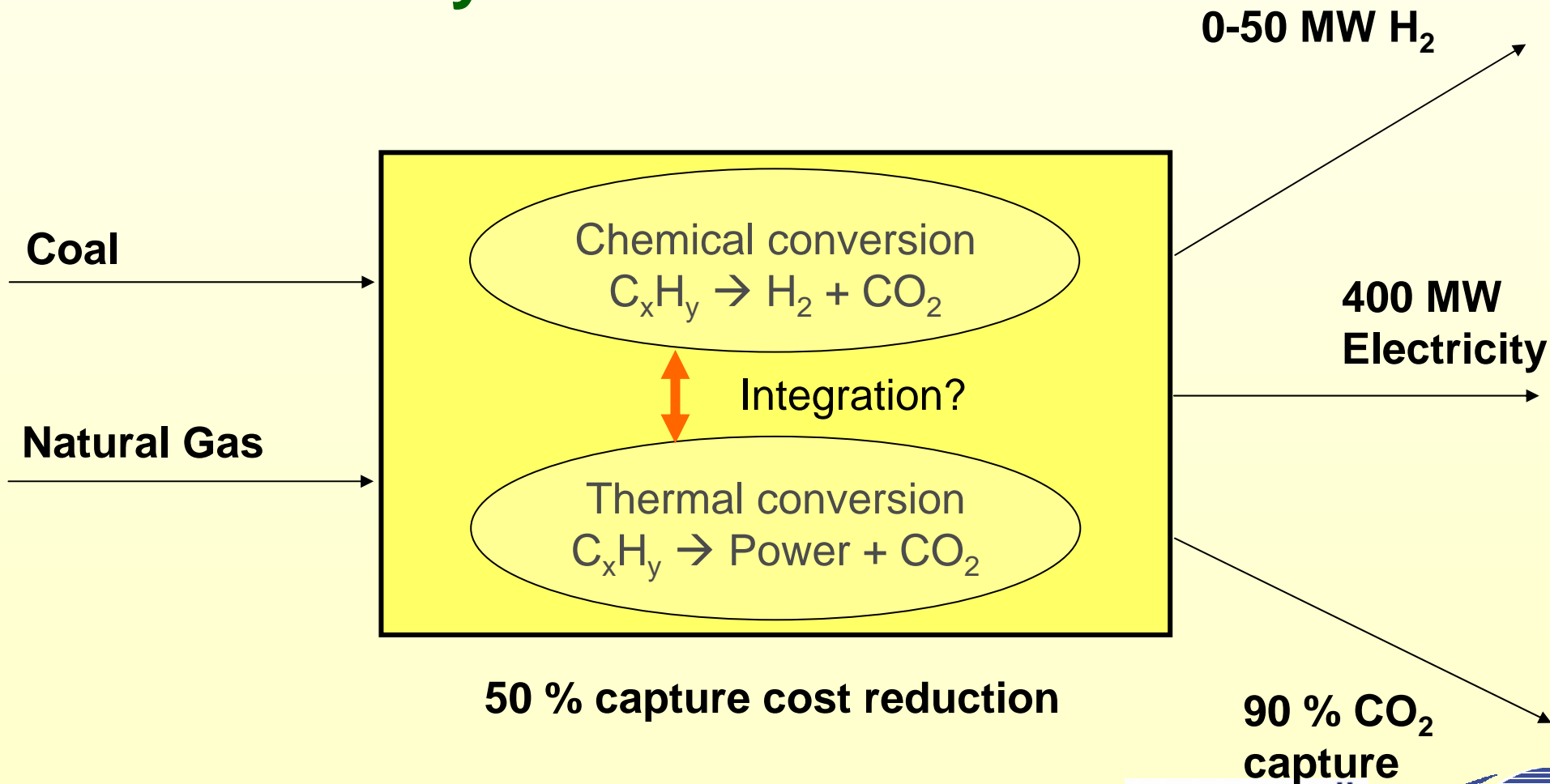


Phase 1

Dynamis – Sub-projects



Phase 1 Dynamis → HYPOGEN



DYNAMIS - Objectives

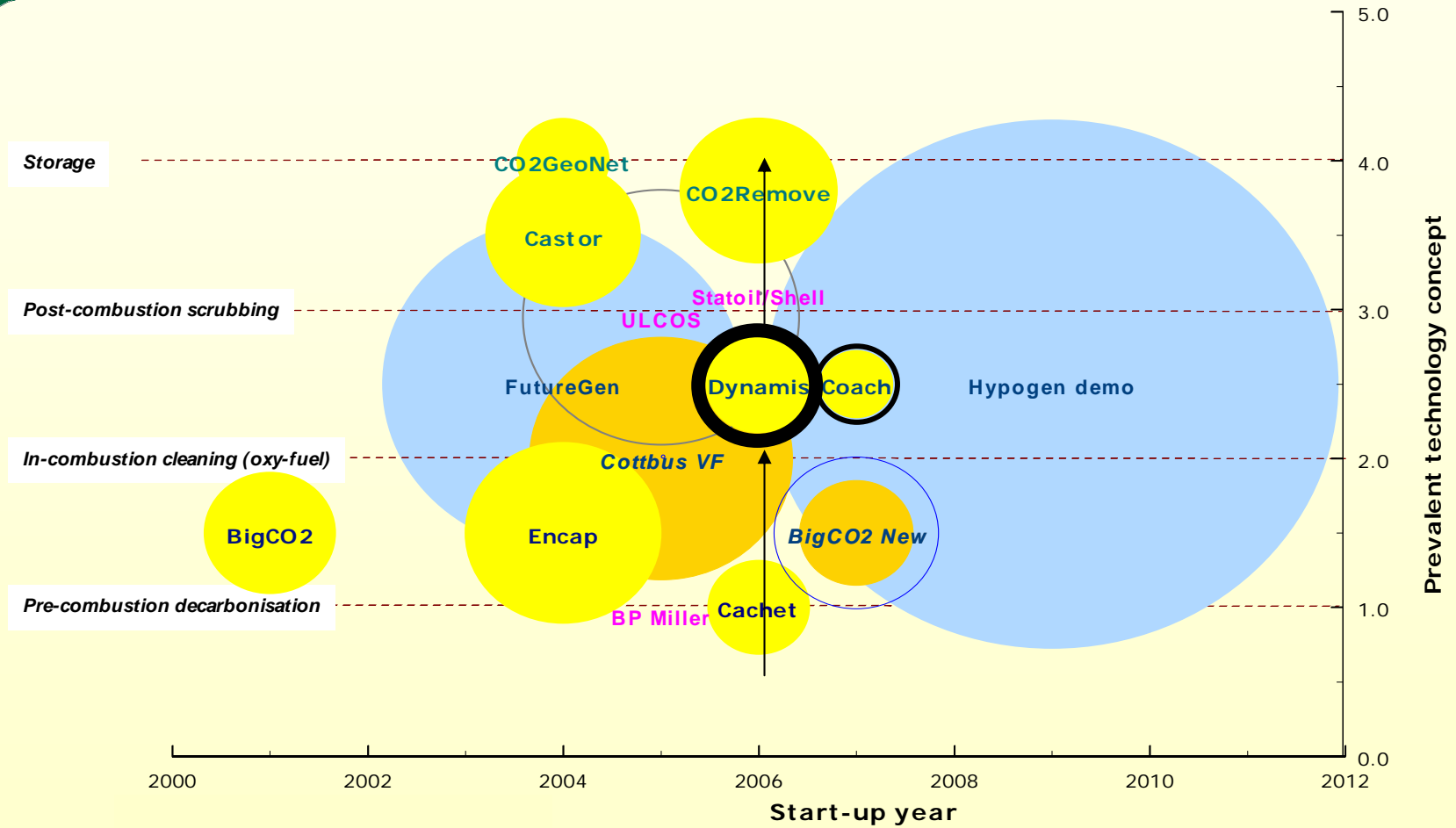
Target (2012):

1. 400 MW power generation using advanced flow technology with hydrogen-fuelled gas turbines
2. 0-50 MW H₂
3. 90% CO₂ capture rate
4. 50% capture cost reduction

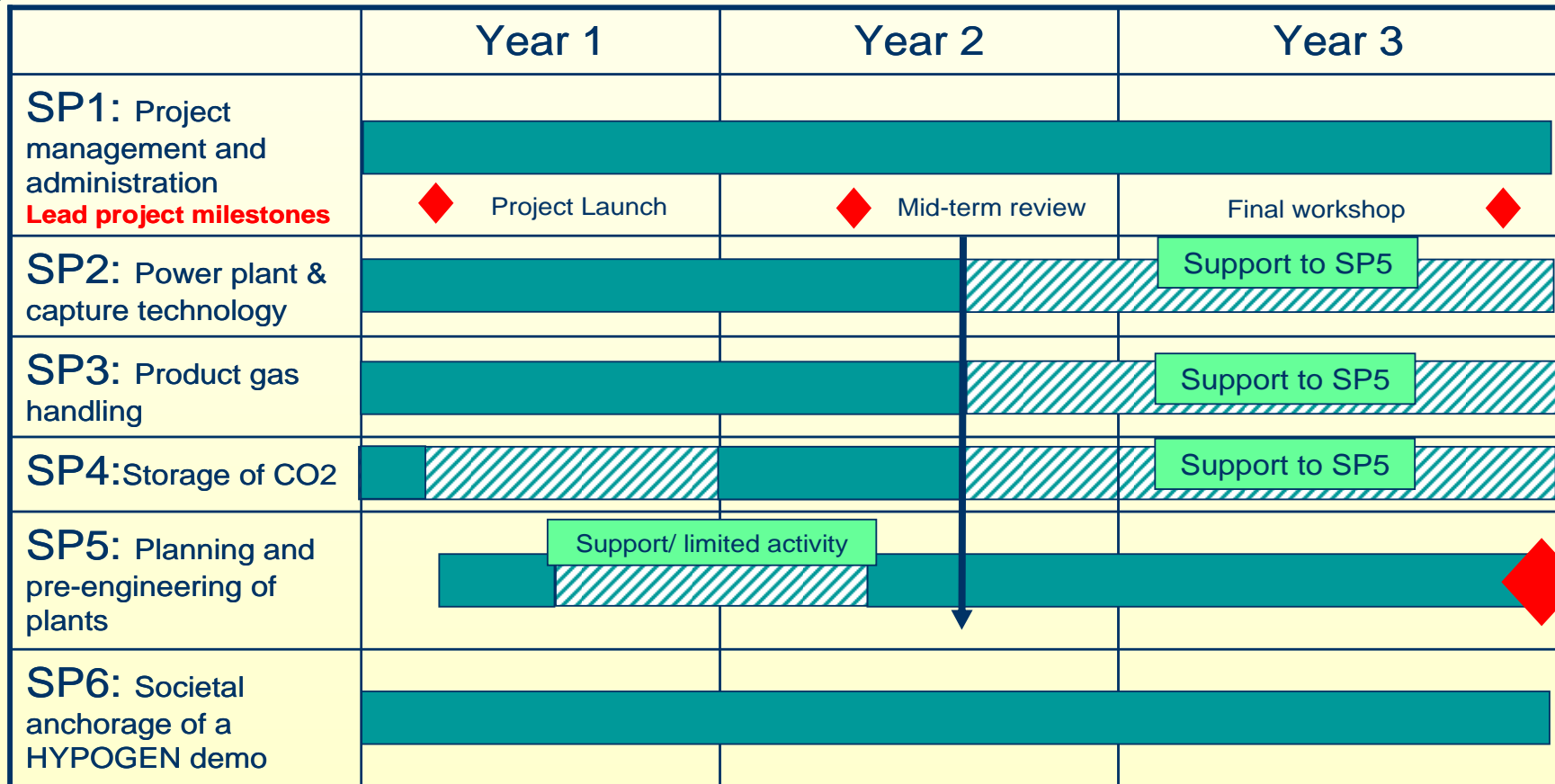
Emphasis:

1. Decarbonised fossil fuel power generation
2. H₂ separation export of piped, tanked or liquid hydrogen
3. New power cycles
4. Reliable storage of CO₂
5. Societal anchorage

CCS projects by start-up year and size



DYNAMIS Overall Project Schedule



What will DYNAMIS deliver?

- ☛ A coherent view of
 - ☛ Options for CCS plants in Europe
 - ☛ Fuels
 - ☛ Preferred Technology
 - ☛ Example locations
 - ☛ Storage and EOR possibilities
 - ☛ Financing schemes
 - ☛ Regulatory restraints and possibilities
 - ☛ Non-technical barriers
 - ☛ Societal views of a Hypogen demonstration
- ☛ A pre-engineering basis suitable for uptake in the next phase of Hypogen

How can we make DYNAMIS delivering the right deliverables?

1. What is your project/initiative about
 1. What is the project plan in terms of decision gates and required funding?
 2. Where, who and when?
2. What needs to be in place to make your initiative happen?
3. How can DYNAMIS help your initiative or vice versa to promote a concerted action in Europe towards CCS deployment?
 1. Realising Hydrogen via pilots or full scale demo
 2. Timescales versus DYNAMIS
 3. Hydrogen – key or pacing in a CCS context
 4. Structure of DYNAMIS outcome to ensure commercial up-take in your project

DYNAMIS shall be flexible!



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DYNAMIS
HYPOGEN Ph 1
DYNAMIS Consortium
Deliverables x, y,z
Integrated outcome open
for industrial up-take

PILOTS?
HYPOGEN Ph 2
Consortium?
Deliverables
Availability?

LARGE SCALE PLANT
HYPOGEN Ph 3
Industrial Consortium
/Owner
Targets erection
of new plant

OPERATION
HYPOGEN Ph 4
Commercial?
Show-case



Ideas to promote co-operation and exchange

- ✘ Semi-annual alignment project meetings
 - ✓ Progress
 - ✓ Streamlining schemes (if req'd), progressing innovative ideas, make best use of shared information
- ✘ Establishing an industrial contact group towards DYNAMIS with appropriate steps to ensure required IPR management/control
- ✘ DYNAMIS access to your projects – open for your views

- ✘ Can be done immediately:
 - ✓ Links from respective web pages
 - ✓ Creating an extended newsletter list encompassing key people in the various initiatives

