

Project no.:
019672

Project acronym:
DYNAMIS

Project title:
**Towards Hydrogen and Electricity Production
with Carbon Dioxide Capture and Storage**

Instrument : Integrated project
Thematic priority : 6.1.3.2.4
Capture and sequestration of CO₂, associated with cleaner fossil fuels

Start date of project: 2006-03-01
Duration: 3 years

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Periodic Activity Report no. 1
Month 01-12

Publishable summary

Period covered: 2006-03-01 to 2007-02-28

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Project co-ordinator
SINTEF Energiforskning AS

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential , only for members of the consortium (including the Commission Services)	

Deliverable number:	D 1.1.A-1
Deliverable name:	Periodic Activity Report no. 1 – Publishable summary
Work package:	WP 1.1 Project Management and Co-ordination
Lead contractor:	01 SINTEF-ER

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PUBLISHABLE EXECUTIVE SUMMARY

The project

The DYNAMIS project is a three year integrated project within the sixth framework programme of the European Union. The contractual start date is 2006-03-01 and hence the project will be terminated at the end of February 2009. The total budget is 7,4 million Euro and the contribution from the European Commission amounts to 4,0 million Euro.

Overall objectives

The overall objective is preparing for large-scale hydrogen production from decarbonised fossil fuels including CO₂ geological storage. This implies that the project will prepare the ground for large-scale European facilities producing hydrogen and electricity from fossil fuels with CO₂ capture and permanent storage or, eventually, to be used for enhanced oil or gas recovery.

DYNAMIS responds to the growing interest in this field by addressing ways of decarbonising fossil fuels within a sustainable framework.

Five topical areas are identified as having a special bearing on the overall objective:

1. Decarbonisation of fossil fuels facilitating co-production of hydrogen and electric power generation.
2. Hydrogen separation including cleaning, conditioning and export facilities for piped, tanked or liquefied hydrogen.
3. New power cycles requiring a large-scale topping cycle based on gas turbines that operate on hydrogen or hydrogen-enriched fuels (still to be developed for their intended purpose).
4. Reliable storage of CO₂, via capture, pre-treatment, transport, and injection of CO₂ into geological structures or - optionally - for enhanced oil/gas recovery (EOR/EGR).
5. Societal anchorage, including legal, regulatory, funding and economic aspects, and public issues.

DYNAMIS undertakes by 2008 to substantiate that the following targets can be deemed achievable for practical operation by 2012 pursuant to the objectives of the current call:

- Power generation in the 400 MW class using advanced flow cycle(s) with hydrogen-fuelled gas turbines in the 250-300 MW class.
- Hydrogen production corresponding to 25-50 MW with the flexibility to adjust the output of the plant from 0 to 100% hydrogen.
- Produced hydrogen will be in accordance with the specifications of a European hydrogen infrastructure (beyond 2010).
- 90% CO₂ capture rate envisaged
- 50% capture cost reduction envisaged reckoned from a (current) level of €50-60 per tonne of CO₂ captured .

Hence, DYNAMIS undertakes to:

- Qualify and generalise methodologies to assess, research and perform required development work and rank technologies capable of co-producing hydrogen and electric power, including capture and safe storage of the CO₂. These pursuits will be characterised by potentiality, constraints and governing mechanisms.

- Validate candidate technologies: In order to coin the conceptual technology appropriate, validation in more directions is required to ensure viability in regards of versatility, environmental impact, and primary energy demand.
- Address challenges associated with scale-up when using multiprocessing schemes (in contrast to traditional unit operations), – and also pertaining to the integration with existing plants and systems.
- Reduce risk following a risk assessment study of candidate HYPOGEN technologies (judged necessary until recommendations be given for pursuing a subsequent HYPOGEN project by 2008.)

DYNAMIS is organised in five technical Sub-projects while two work packages for project management and co-ordination and lead project workshops are organised in the additional Sub-project SP1, see Figure 1.

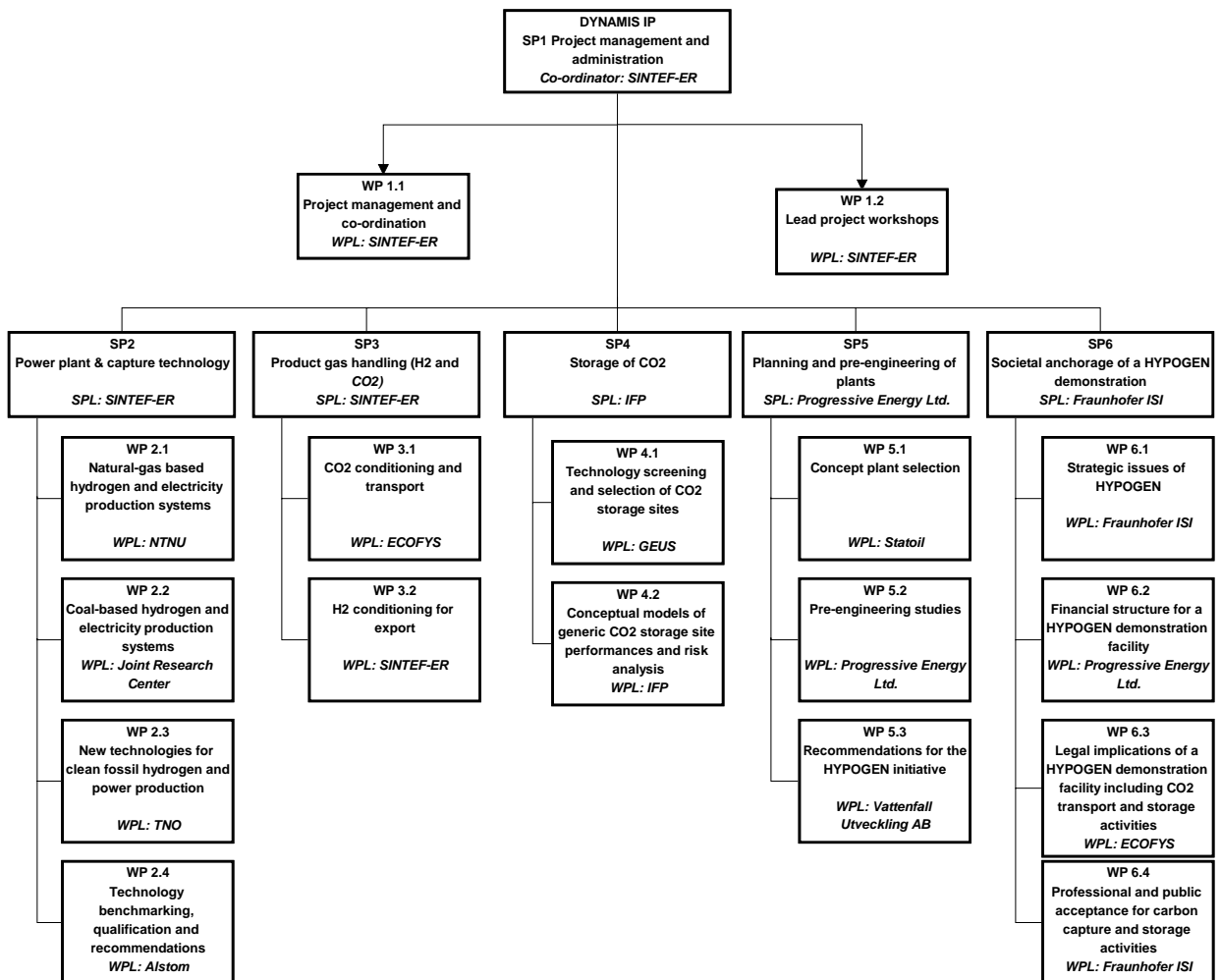


Figure 1: Work Breakdown structure.

The contractors

The DYNAMIS consortium has been established by leading European enterprises and RTD providers comprising 29 legal entities spread within nine EU Member States and two Associated countries (Norway and Switzerland). The consortium exhibits a full value chain of stakeholders and can be thought of as four inter-related islands of proficiency organised for joint actions towards demonstration of large-scale co-production of hydrogen and power:

- a) 14 RTD providers (research institutes and universities - plus Vattenfall Laboratory and STATOIL Research Centre)
- b) 7 technology providers (leading manufacturers of energy and power equipment and engineering companies including 1 SME having an important role to play as the leader of SP5 and WP5.2)
- c) 7 energy providers (in power generation and fossil fuel supply)
- d) 1 financing institution

DYNAMIS employs a strong team of professionals that gathers the critical mass that is capable of achieving the stated targets. The strong involvement by the industries is conceived as a commitment for rapid usage of the project results. Based on the partners' business areas, resources and determination, the partners will be highly capable of providing the skills, knowledge and resources for pursuing the project objectives.

The RTD providers constitute an eminent group that jointly represents a leading position in energy systems, technologies and knowledge pertaining to H₂ production and CO₂ capture. All and every RTD provider can list topical familiarity of significant relevance to DYNAMIS. The RTD providers also represent a high degree of complementarity in the sense that they all offer skills and capabilities that are needed to broach technologies for integrated power and hydrogen production including carbon capture.

The technology providers are among the largest and most significant industries in Europe - of all sectors - having a leading international position in energy and processing technologies, and also in other technological areas. The manufacturers cover a wide range of knowledge and skills, and are supplying state-of-the-art technologies pertaining to energy and power worldwide. In general terms the technology providers are defined as competitors. Their participation is highly relevant to DYNAMIS – especially for providing key components for H₂ production from fossil fuels, H₂ processing, pre-combustion processing and capture equipment.

The energy providers are basically suppliers of fossil fuels (both gas and coal) and power companies, representing the end-users of fossil fuels. They are strongly involved in the operation of thermal power plants. As they are facing a need for reducing their greenhouse gas emissions, they have committed themselves to be in the forefront of new power generation and capture technologies and are desirous of making use of the DYNAMIS results as appropriate. The suppliers of fossil fuels include several oil & gas companies (STATOIL, BP) and one coal supplier (SNSK) whereas the power companies are directly involved in the supply of both coal and gas. The energy providers have significant operations in 5 European countries.

In Table 1 the 29 Contractors who have acceded to the Contract with the European Commission are listed. In addition to these Contractors two participants have signed the Consortium Agreement; Norsk Hydro ASA and Vattenfall AB. They have decided to support the DYNAMIS project financially and hence they are defined as Third parties in Annex I to the Contract.

Table 1: Participants list.

Role	Nr.	Name	Short name	Country
CO	1	SINTEF Energiforskning AS	SINTEF-ER	NO
CR	2	STATOIL ASA	STATOIL	NO
CR	3	BP	BP	UK
CR	4	Store Norske Spitsbergen Grubekompani	SNSK	NO
CR	5	Vattenfall Utveckling AB (new legal name: Vattenfall Research and Development AB)	VUAB (VRD)	SE
CR	6	E.ON UK plc	EON	UK
CR	7	Endesa Generación, S.A.	ENDESA	ES
CR	9	Enel Produzione S.p.a.	ENEL	IT
CR	10	Alstom Power Centrales SA	APC-FR	FR
CR	11	Alstom (Schweiz) AG	AP-CH	CH
CR	12	Alstom Power Environment ECS France	APE-FR	FR
CR	13	Siemens Aktiengesellschaft	SIEMENS	DE
CR	14	Air Liquide SA	AIR-L	FR
CR	15	Etudes et Production Schlumberger	SLB	FR
CR	16	Progressive Energy Limited	PEL	UK
CR	17	Société Générale London Branch	SG	UK
CR	18	SINTEF	SINTEF-GR	NO
CR	19	SINTEF Petroleumsforskning AS	SINTEF PR	NO
CR	20	Joint Research Center	JRC	NL
CR	21	Fraunhofer ISI	FH-ISI	DE
CR	22	Institut Français du Pétrole	IFP	FR
CR	23	British Geological Survey	BGS	UK
CR	24	Ecofys b.v	ECOFYS	NL
CR	25	Geological Survey of Denmark and Greenland	GEUS	DK
CR	26	Netherlands Organisation for Applied Scientific Research	TNO	NL
CR	27	IEA Environmental Projects Ltd.	IEA EPL	UK
CR	28	Bundesanstalt für Geowissenschaften und Rohstoffe	BGR	DE
CR	29	Technical University of Sofia	TUS	BG
CR	30	Norwegian University of Science and Technology	NTNU	NO

*CO = Coordinator, CR = Contractor

Use and dissemination of knowledge

The dissemination of knowledge generated by and within DYNAMIS will be directed towards different target groups and stakeholders, at various classification levels. Knowledge aggregated in deliverables may be protected or open for distribution in accordance with the classification codes given in Description of Work, Annex 1 to the Contract between Co-ordinator and the Commission.

Lead Project Workshops

A separate work package has been defined to harmonise the knowledge and content of the project with all the stakeholders and to provide a Project Policy Document (PPD). The PPD is not classified (i.e. public). The PPD will define the firm framework of the work to be conducted in terms of technology, plant locations and storage site selection.

During the first reporting year, three lead project workshops were planned and conducted under DYNAMIS: a) Kick-off (Oslo, March 2006), b) Large CCS Projects Meeting (Brussels, Sep 06) and c) Synergy between HYPOGEN and the Hydrogen Economy (Brussels, Jan 07). The two latter were organised in close collaboration with the European Commission and its Joint Research Centre (JRC).

Web-site

A web-site has been established that contains available public information. The web-site address is: <http://www.dynamis-hypogen.com/>

Furthermore, a project hotel (eRoom) has been established. This eRoom functions as a working platform for the DYNAMIS project, as it keeps track of all relevant information and live documents, thus offering a joint office library among all partners and the several contributors.

Presentations

Numerous presentations pertaining to DYNAMIS have been given in and outside Europe (also in China). Most of these presentations are available at the web-site.

The project has also been presented in the press.

Publishable results

During the first reporting year the following non-classified deliverables have been made available:

- D1.2.1 Project Policy Document revision 1
- D4.1.1 Short list of potential CO₂ storage sites
- D6.1.1 Framework and reference data report
- D6.1.3 Emission trade market assessment study for a HYPOGEN plant
- D6.2.3 Evaluation of potential role of EIB Finance & Public/private partnership¹
- D6.4.1 EU-wide mapping report of existing findings on public perception and acceptance of CCS



www.DYNAMIS-hypogen.com

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¹ EIB: European Investment Bank