



**CSLF-P/T-2008-05
04 March 2008**

**POLICY GROUP
TECHNICAL GROUP**

**Application by Dynamis Project
for CSLF Recognition**

DECISION DOCUMENT

Note by the Secretariat

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Background

The Dynamis project has been nominated for CSLF recognition by the European Commission and Norway. Dynamis is the first phase of the €1.3 billion Hypogen program, which will result in construction and operation of an advanced commercial-scale power plant with hydrogen production with CO₂ management, with the goal of operation and validation in the 2012-2015 timeframe. The Dynamis project will assess the various options for large-scale hydrogen production, focusing on the technological, economic and societal issues. The CSLF Technical Group, at the Al Khobar, Saudi Arabia meeting on 27-28 January 2008, after reviewing the Project Submission Form provided by the Dynamis project, recommended the Dynamis project for recognition by the CSLF and passed it on to the Policy Group for its action.

This document presents the completed Project Submission Form that was provided by the Dynamis project sponsors.

Action Requested

The Policy Group is requested to approve the Dynamis project for CSLF recognition.

Conclusions

The Policy and Technical Groups are invited to note in the Minutes of this meeting that:

“The Policy Group approved the Dynamis project for CSLF recognition.”



CSLF PROJECT SUBMISSION FORM

PROJECT TITLE:

DYNAMIS – Towards hydrogen production with CO₂ management

PROJECT LOCATION:

The project is not at present directed towards a specific location but is in the process of nominating sites in Europe that will be suitable for large scale demonstration of CCS integrated with H₂ export.

PROJECT GOAL:

DYNAMIS targets to “Prepare for large scale H₂ production from decarbonised fossil fuels including CO₂ geological storage”. The main objective is to prepare the ground for large scale European facilities producing hydrogen and electricity from fossil fuels with CO₂ capture and geological storage. It has many similarities of FutureGen and is the first phase of the European HYPOGEN.

PROJECT OBJECTIVES:

Preparing for large-scale hydrogen production from decarbonised fossil fuels including CO₂ geological storage. The main objective is to 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.

PROJECT DESCRIPTION (non-technical):

In order for Europe to comply with the Kyoto Protocol there is a need for new low emission technologies - including decarbonised fuels and the use of hydrogen as an energy vector. In this perspective it becomes mandatory to enable efficient ways of isolating the CO₂ and storing it safely (for several thousand years) at reasonable cost and efficiency. This may lead to a new paradigm in the energy sector, pave the way for new energy sources and services, which – eventually – could give Europe a competitive edge in global markets.

The purpose of DYNAMIS is to investigate routes to large-scale cost-effective H₂ production with integrated CO₂ management for use in either power production or other aspects of society. It is designed as an element of the HYPOGEN initiative, part of the European Commission's Quick-Start Programme for the Initiative for Growth.

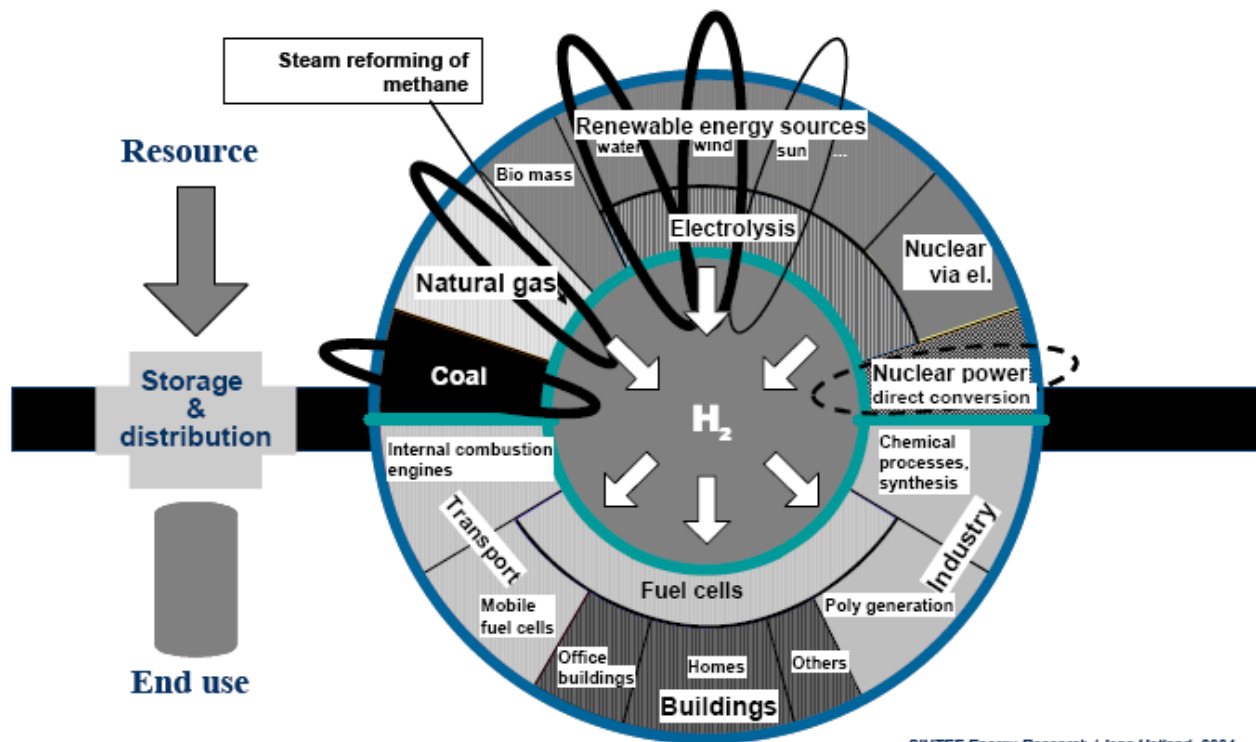
Foreseen to take 10-20 years, HYPOGEN has the goal of providing Europe with a realistic and economically viable route to a hydrogen economy (to be based eventually on renewable energy sources) and includes as an interim step the construction of a large-scale test facility for the production of hydrogen and electricity from decarbonised fossil fuels – with permanent CO₂ storage. DYNAMIS is the first step on that route, designed to rank the options and reduce the risk element for subsequent development of a full-scale pilot plant by industry post-2008.

Several technologies – green and black – may produce hydrogen, but only a few are able to provide hydrogen in very large volumes at reasonable cost (see figure). Therefore, decarbonised fossil fuels have been identified as the main route for hydrogen under the Quick-start Programme (HYPOGEN).

In order to make the best recommendation for a large-scale validation of aspiring technologies, DYNAMIS aims to assess and develop prerequisites for the HYPOGEN initiative. Hence, DYNAMIS will address supply routes and appraise the state of technology development, risk and societal impacts. Important aspects are:

- the assessment of key technologies versus yield, cost and emission index; and
- the availability and flexibility of primary energy sources.

This entails criteria for technology selection, including plausible locations for plants and CO₂ storage sites in Europe. DYNAMIS will further identify and rank candidate technologies, and differentiate between technologies that can be engineered and those that have to undergo research and development.

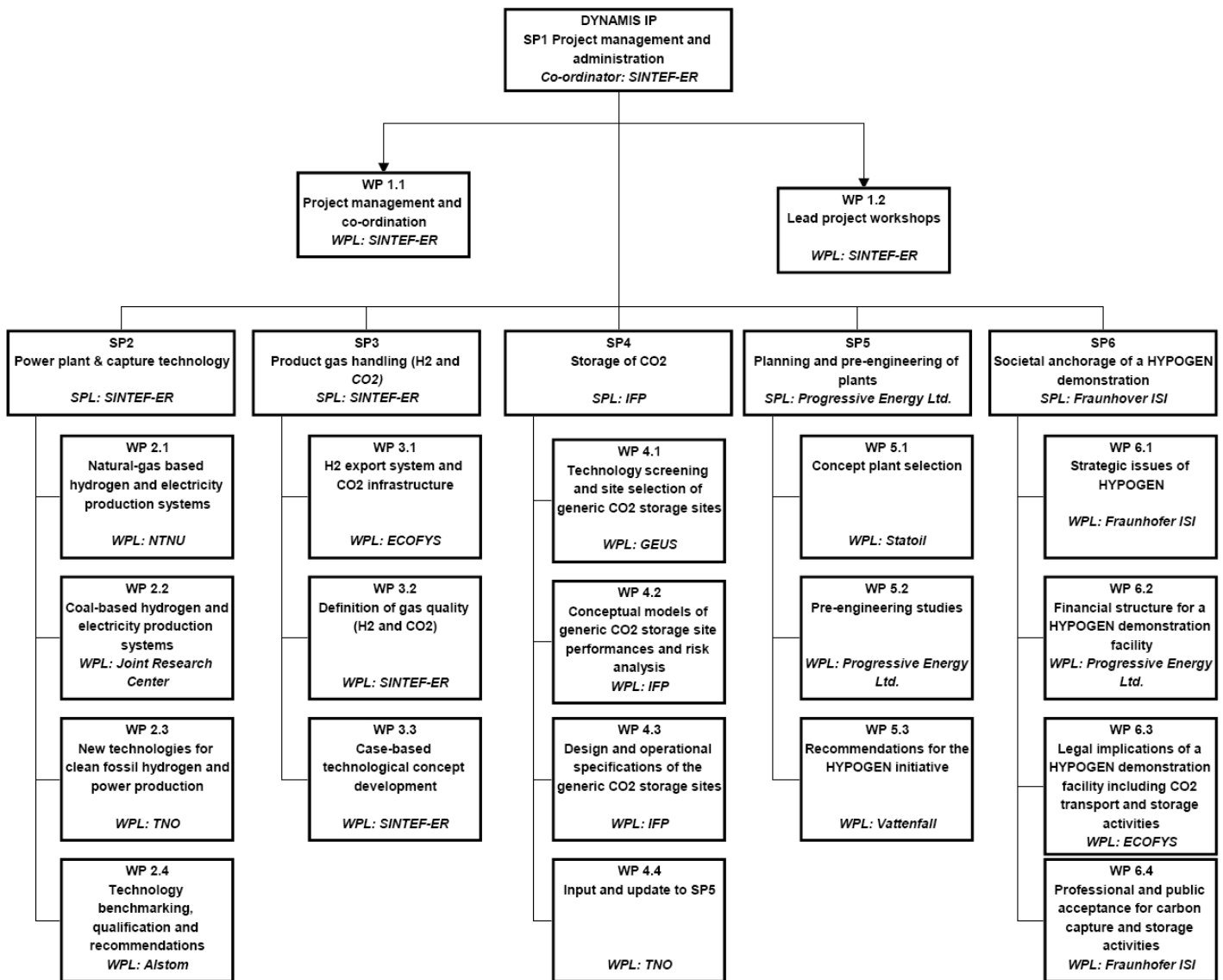


PROJECT DESCRIPTION (technical):

The figure below depicts the work breakdown structure of the project including all the sub projects (SP). DYNAMIS is organised as an integrated project (IP). The RTD activities are structured in 5 sub-projects:

DYNAMIS will:

- deliver appropriate information and provide recommendations for potential technologies, plants and sites for large scale hydrogen production with CO2 management from fossil fuels at a level intended for pursuing the pilot phase of HYPOGEN; and
- provide a framework for legal, financing and public perception of a HYPOGEN demonstration generate, exploit and disseminate new knowledge that contributes to the implementation of the EU energy and research policy.

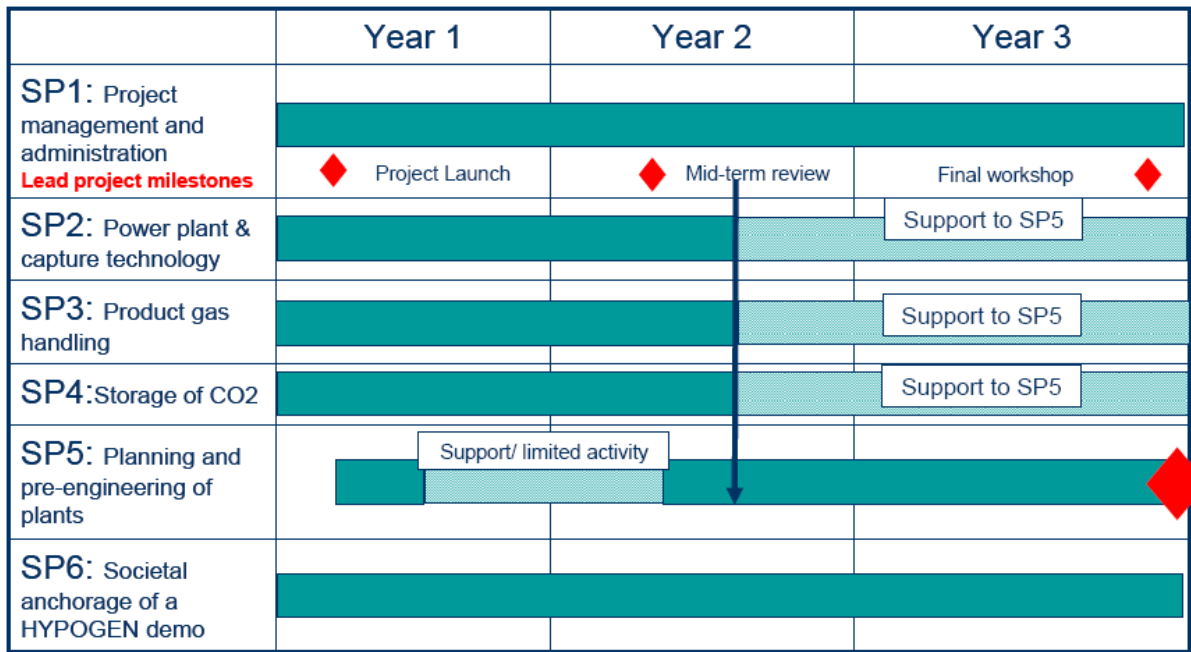


PROJECT TECHNOLOGIES:

(check all that apply)

- CO₂ Capture
- CO₂ Transport
- CO₂ Storage with Enhanced Oil Recovery
- CO₂ Storage with Enhanced Coal Bed Methane Recovery
- CO₂ Storage with Enhanced Natural Gas Recovery
- CO₂ Storage with No Secondary Recovery
- CO₂ Measurement, Monitoring, and Verification of Storage (MMV)
- Identification of potential CO₂ storage sites
- Identification of target CO₂ sources
- Economic and/or Environmental Evaluation and/or Risk Assessment
- Other (please describe):
DYNAMIS provides a link between the Hydrogen and CCS communities

PROJECT TIMELINE:



The figure above shows the timeline for DYNAMIS. DYNAMIS was started in March 2006 and will run to march 2009. The project is soon entering into the mid-term review where a shortlist of candidate sites will be proposed- presumably both for gas and coal.

Has the project already progressed through the early phases of planning, such as (but not exclusively) documenting the project scope, outputs and outcomes? YES

Has the project management identified the magnitude of resource requirements sufficient to achieve the major milestones of the project? YES

Has the project management identified funding sources for the project? YES- IT IS AN EU FP6 PROJECT

Will the project be able to meet its major milestones prior to the expiration of the CSLF Charter (currently 2013)? YES BUT THE PROJECT CANNOT GUARANTEE THE INDUSTRIAL UP TAKE OF THE RESULTS

INFORMATION AVAILABILITY:

DYNAMIS - being the first phase of HYPOGEN has a long deliverables list which has deliverables that are both restricted and unrestricted. All unrestricted information is publicly available and other restricted deliverables can become made available upon request and agreement by the Executive Board of the project.

Is the project management willing to share non-proprietary project information with other CSLF Members? __YES____

Will the expected information from the project be sufficient to allow others to make informed estimates of the technology's potential technical performance, costs, and benefits for any future applications? __YES____

Will English-language project summaries be available for posting at the CSLF website? __YES- YEARLY____

DISSIMILARITY TO OTHER CSLF PROJECTS:

DYNAMIS is the only EC funded project that is specifically addressing pre-combustion plants and the realization of such technologies. We are not aware of similar project initiatives taken at an European level.

RELEVANCE TO CSLF GAPS ANALYSIS:

Responds to the need for demo's and for quality regulations for H₂ and CO₂.

PROJECT CONTACTS:

Co-ordinator: Dr. Nils A. Røkke, SINTEF Energy Research, 7465 Trondheim – Norway, phone: +4795156181, e-mail: nils.a.rokke@sintef.no

What restrictions, issues, or costs will be assumed by any visitors to the project site? No site at present, such issues will have to be dealt with on a case to case basis

OTHER PROJECT TEAM MEMBERS:

Co-ordinator:

SINTEF Energy Research

Partners:

ALSTOM (Schweiz)

AGALSTOM Power Centrales

ALSTOM Power Environment ECS France

BP International Ltd

Bundesanstalt für Geowissenschaften und Rohstoffe

E.ON UK plcEcofys b.v.

ENDESA Generación S.A.

ENEL Produzione S.p.a.

Etudes et Productions Schlumberger

European Commission - DG JRC – Institute for Energy

Fraunhofer Institute for Systems and Innovation Research

Geological survey of Denmark and Greenland

IEA Greenhouse Gas R&D Programme

Institut Français du Pétrole

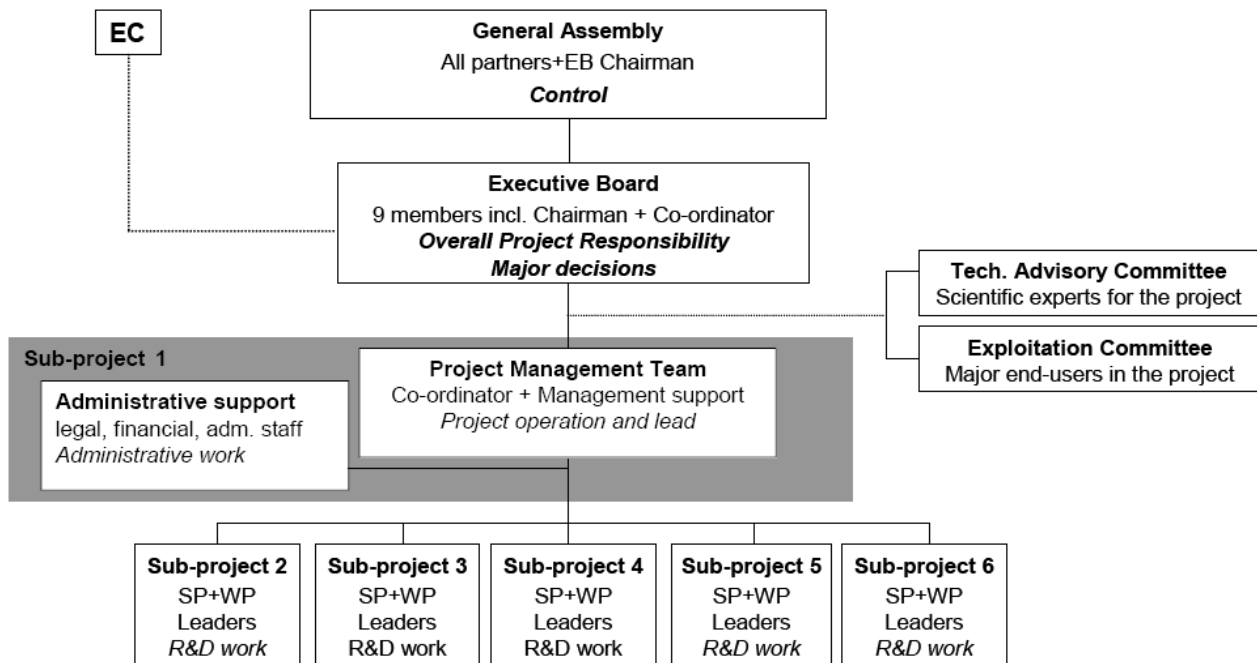
L' AIR LIQUID

ENatural Environment Research Council (British Geological Survey)

Partners (cont.):

Netherlands Organisation for applied Scientific Research (TNO)
Norsk Hydro ASA
Norwegian University of Science and Technology
Progressive Energy Ltd
SHELL Hydrogen B.V.
Siemens Aktiengesellschaft
SINTEF
SINTEF Energy Research
SINTEF Petroleumsforskning AS
Société Générale London Branch
Statoil
Store Norske Spitsbergen Kulkompani AS
Technical University of Sofia
Vattenfall AB
Vattenfall Research and Development AB

Management structure:

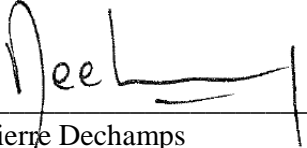


PROJECT WEBSITES:

Project web page: <http://www.dynamis-hypogen.com/>

PROJECT NOMINATORS:

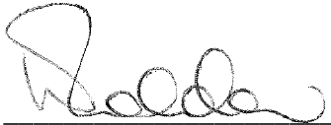
In order to formalize and document the relationship with the CSLF, the representatives of the project sponsors and the delegates of Members nominating the project must sign a Project Submission Form specifying that relationship before the project can be considered.



Pierre Dechamps
E.C. Project Officer
(Project Sponsor, European Commission)



Nils A. Røkke
SINTEF Energy Research
(Project Sponsor, Norway)



Wiktor Raldow
European Commission
(CSLF delegate)



Jostein Dahl Karlsen
Norway
(CSLF delegate)