



Preparing for the Hydrogen Economy by Using the Existing Natural Gas System as a Catalyst
Project Contract No.: SES6/CT/2004/502661

The NATURALHY-project: Preparing for the hydrogen economy by using the existing natural gas system as a catalyst

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NATURALHY is an Integrated Project funded by the European Commission's Sixth Framework Programme (2002-2006) for research, technological development and demonstration (RTD)



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Background

Main political drivers towards H₂

- Improvement of the energy security
- Reduction of the CO₂-emission (Kyoto, $\geq 8\%$ reduction by 2010)
- Improvement of region air quality





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DIRECTIVE 2003/55/EC

“... taking into account the necessary quality requirements, biogas and gas from biomass or other types of gas are granted non-discriminatory access to the gas-system, provided such access is permanently compatible with the relevant technical rules and safety standards.... ”

It can be argued that this Directive also applies to hydrogen!

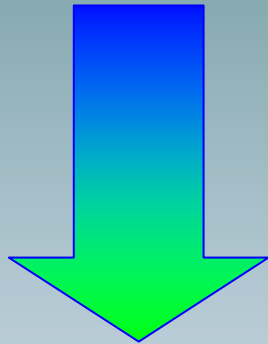




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Motivation

The transition to the hydrogen economy will be lengthy, costly and will require significant R&D



A PRACTICAL STRATEGY:
Examination of the potential of the
existing assets!



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What is the potential of the existing natural gas system for the delivery of:

- Hydrogen/natural gas mixtures (greening of natural gas)
- Pure hydrogen



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Value of mixtures

- Reduction of CO₂ emission (Greening of natural gas: 1% of n.g. energy replaced by CO₂ free H₂ results to reduction of ~9 Mton CO₂/y in the EU-25 countries)
- Potential of pure H₂-delivery by H₂-separation
- Raising public acceptance for H₂
- Offering H₂-producers a connection to end users
-





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Opportunity for natural gas

Smooth and short term introduction of H₂ into the society at **relatively low costs** by using the existing **widespread** natural gas system for mixtures of natural gas and H₂

However,: NATURALHY-project



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Hydrogen impact

Impact on chemical and physical properties of the gas:

- Combustion properties (safety, end user aspects)
- Pipeline material properties (durability, and the management thereof)
- Additional risks
- Management of the gas quality
- System design (compressors, ..)
- Gaseous and energy losses
- Energy capacity



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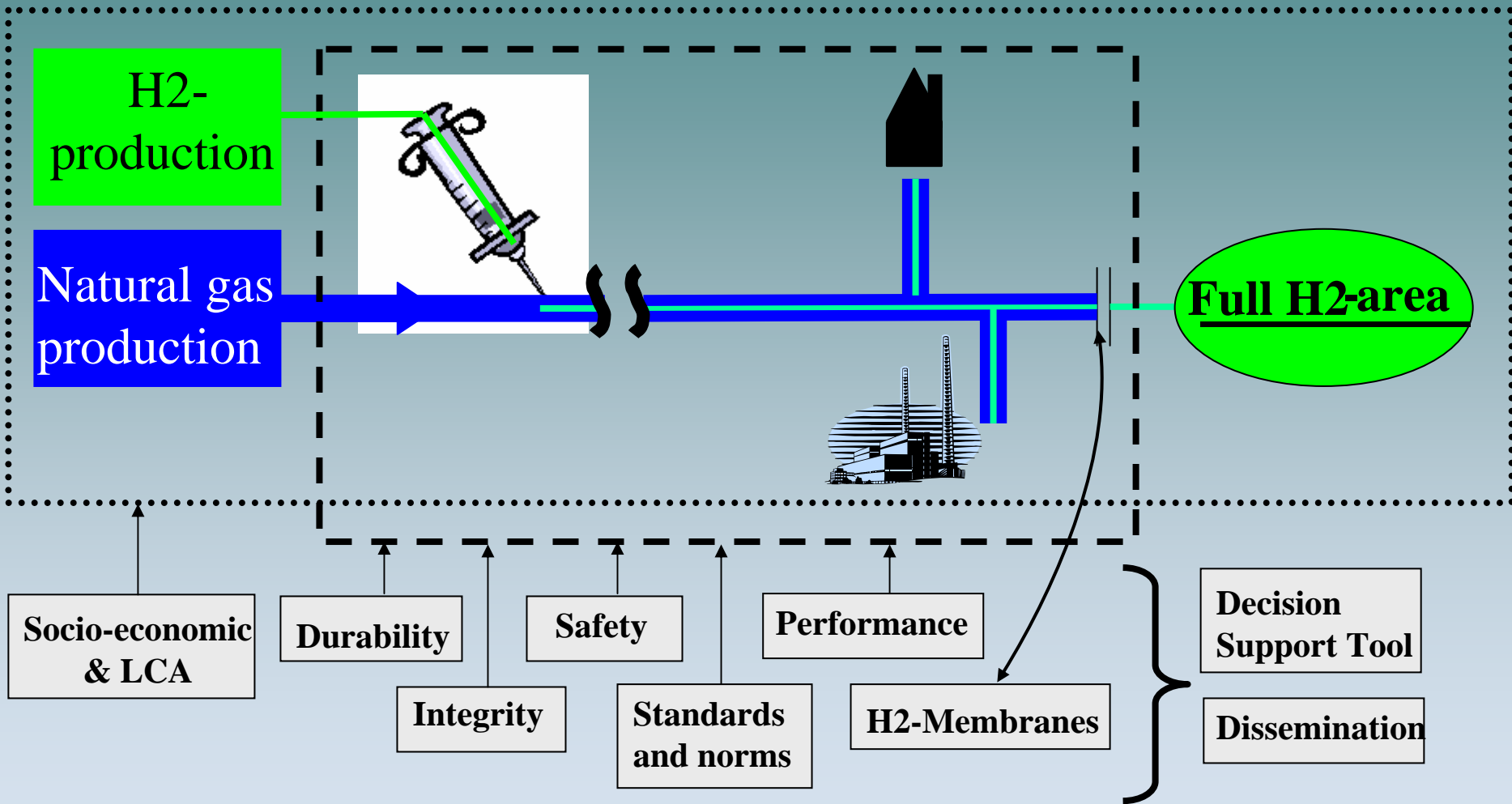
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NATURALHY objectives

- To define the conditions under which hydrogen can be added to natural gas in the existing system with acceptable consequences
- To develop membranes for hydrogen separation
- To map out the socio-economic and Life Cycle aspects of the NATURALHY-approach



Overview





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Characteristics

- 39 European partners
- Integrated Project within the 6th European Funding Programme (FP6)
- Project budget: 17.3 M€, EC grant: 11 M€
- Start 1 May 2004, duration 5 years
- Recognised as IPHE-project





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Main Deliverables

- Assessment tool (to map out the consequences of a considered H₂-addition at a specific point of a grid)
- Membranes for H₂ separation
- Socio-economic and Life Cycle Assessment
- Belief and enthusiasm of the stakeholders





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Partners (1)

Gas companies and gas research institutes

CONTINUON BP DBI-GUT DEPA DGC Gaz de France GERG IFP IGDAS ISQ National Grid PLC
Naturgas Midt-Nord N.V. Nederlandse Gasunie
Shell Hydrogen Statoil Total

Manufacturers and consultants

CETH CMI CSM EXERGIA GE/PII SAVIKO
SQS TOG

Partners = leading partners



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Partners (2)

Universities, Institutes and NGO's

ENIM Högskolan i Borås Leeds University

Loughborough University NTNU NTUA TU

Berlin University of Oxford

CEA COGEN ECN HSE NEN PLANET TNO
TUBITAK

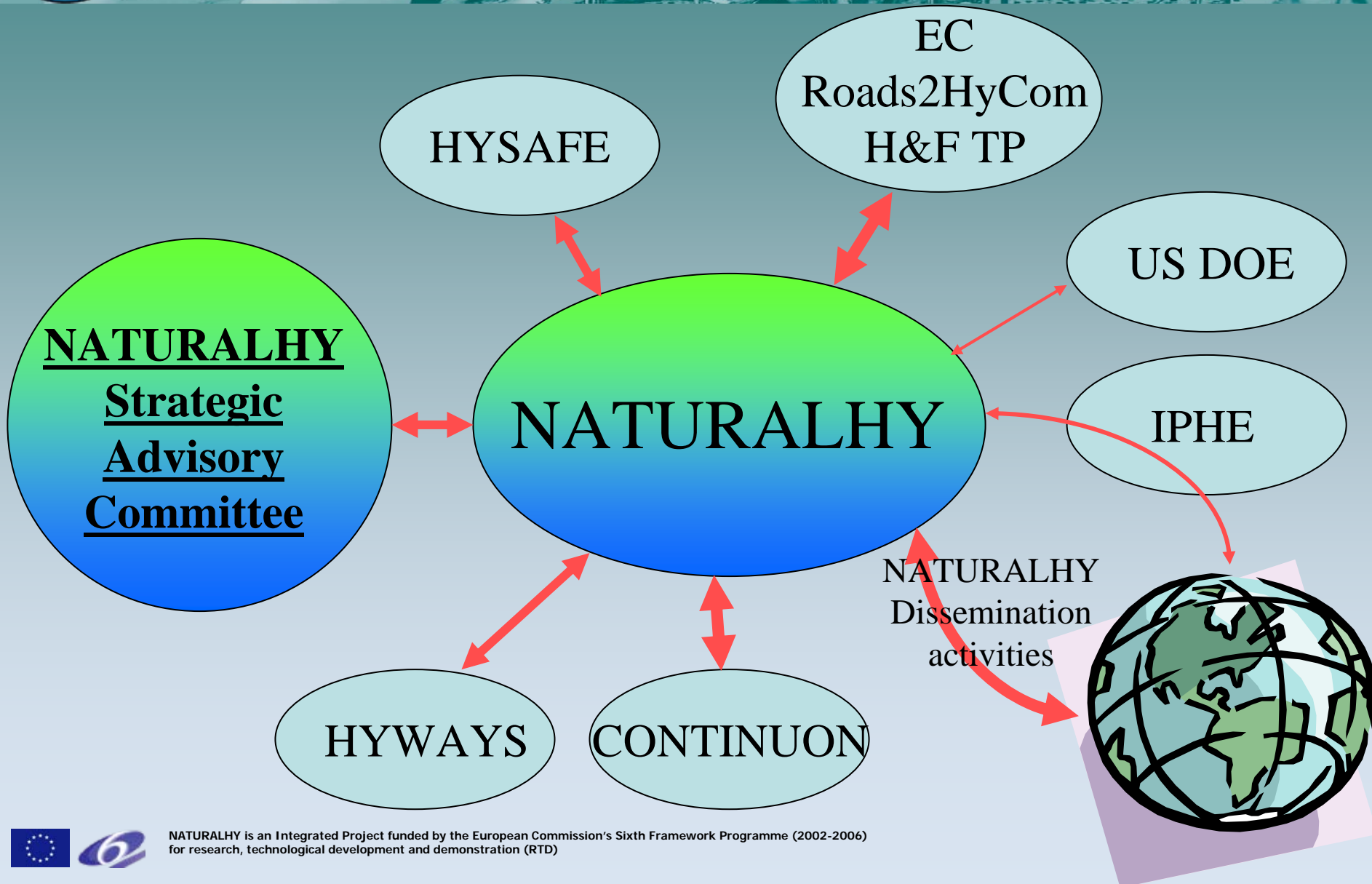


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NATURALHY connected to the world

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Strategic Advisory Committee (1)

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- **Safety:** HYSAFE, UK Health Safety Executive
- **Energy/natural gas:** Air Liquide, CONTINUON, DVGW, NaturCorp, ENItecnology, GERG, IAHE, IEA, IGU (link), Linde, Ruhrgas, TPAO
- **Policymaking:** EU-Commission, EU H&FC Platform (link), EU-Parliament (link), HYWAYS, Roads2HyCom, US DOE





Strategic Advisory Committee (2)

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- **Regulations:** CEN ([link](#))
- **Environment/socio economics:** Bellona, Wuppertal Institute
- **End use:** ENGVA, AKZO-NOBEL

Organisations, potentially interested in participation in this Committee, are kindly invited to contact me!





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Preliminary results

- H₂ does not separate from a layer of H₂/n.g. in a confined room
- H₂ has a significant impact on the laminar and turbulent flame velocity
- Mixtures up to 50% H₂ in n.g. are not critical for the crack propagation in X52 steel pipes
- The permeability of H₂ through PE pipes is about 8x the permeability of n.g.





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Thank you for your attention

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