



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

NaturalHy – Why?

2nd NaturalHy Workshop
Amsterdam May 30, 2007

Gjalt Tiekstra
N.V.Nederlandse Gasunie



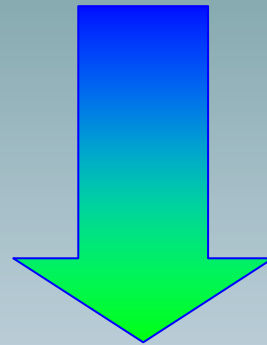
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Hydrogen Economy

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The transition to the Hydrogen-Economy will be lengthy, costly and will require significant R&D



PRACTICAL STRATEGY:

Examination of the potential of the existing assets!



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European gas network

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European Gas Network

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- **Current estimates for re-building an European gas network for Hydrogen transmission are in the range of: 200G Euro – 2000G Euro**
- **Long time needed for construction**



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The existing natural gas network

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Well developed:

- **Existing (short term availability, cost effective)**
- **Proven high level of process control and integrity management (excellent safety record)**
- **High capacity**
- **High level of public acceptance**



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The NATURALHY- project

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NATURALHY:

**Preparing for the Hydrogen Economy by
use of the existing Natural Gas system as a
catalyst**

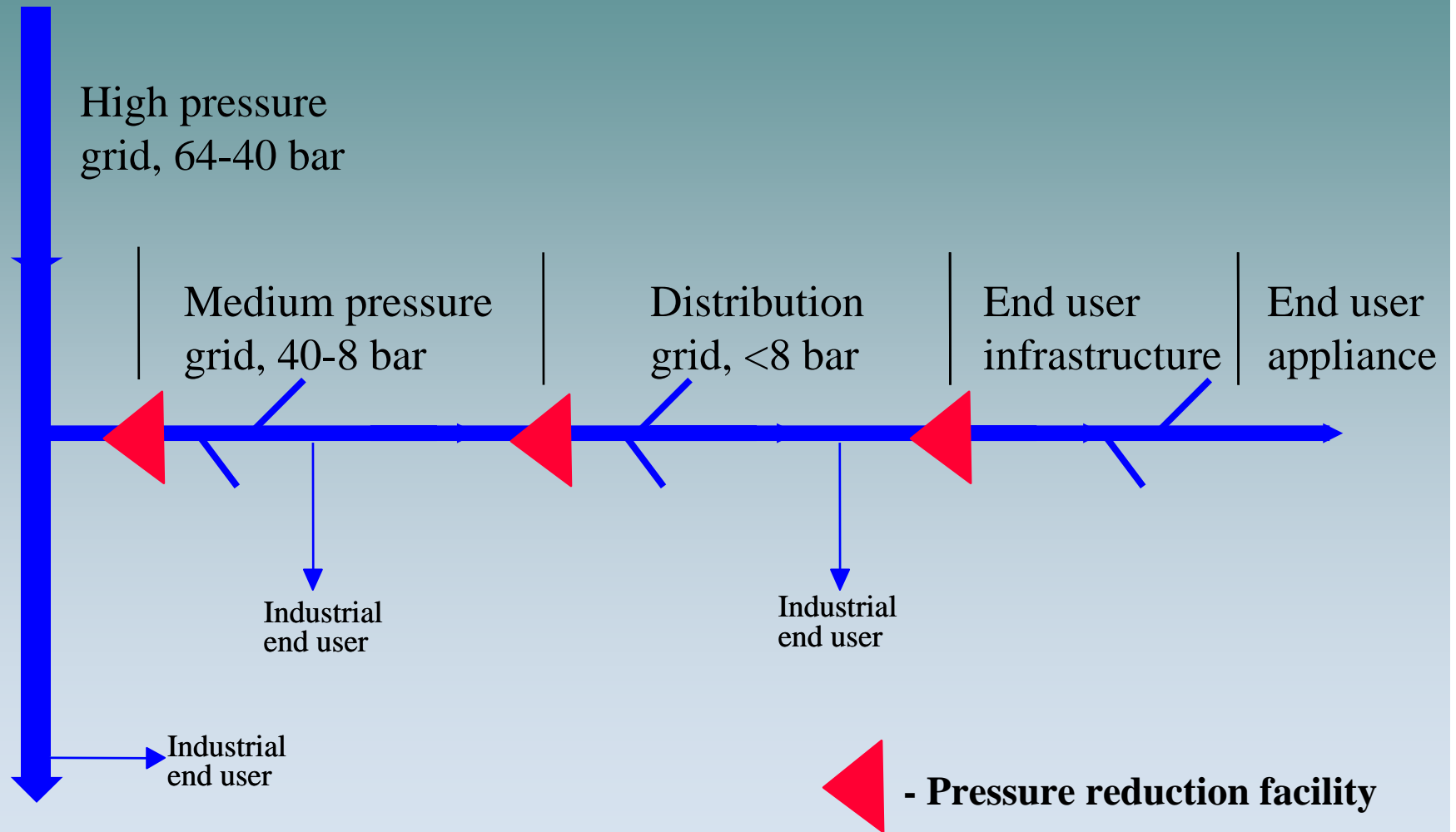


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Natural gas delivery chain

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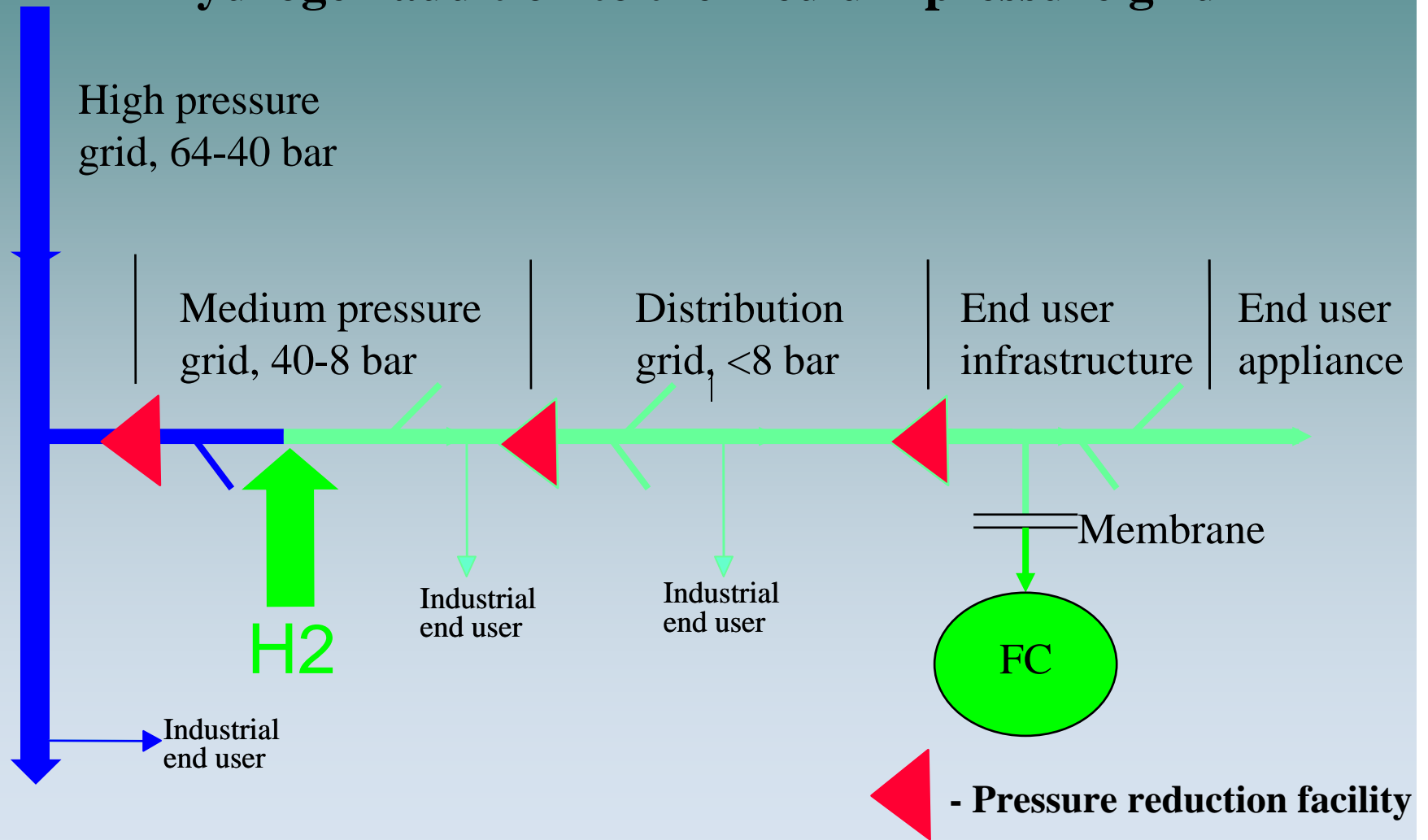
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H2-addition scenario

Hydrogen addition to the medium pressure grid



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Hydrogen impact

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Adding hydrogen to natural gas will have an effect on:

- **Pipeline material properties**
- **Integrity management for pipelines**
- **Risk (p.o.failure x effect)**
- **Gas quality management**



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NaturalHy: objectives

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- **To define the conditions under which hydrogen can be added to natural gas in the existing system**
- **To assess the “greening of gas” options**
- **To develop membranes for hydrogen separation**
- **To map out the socio-economic and environmental consequences of the NATURALHY-approach**

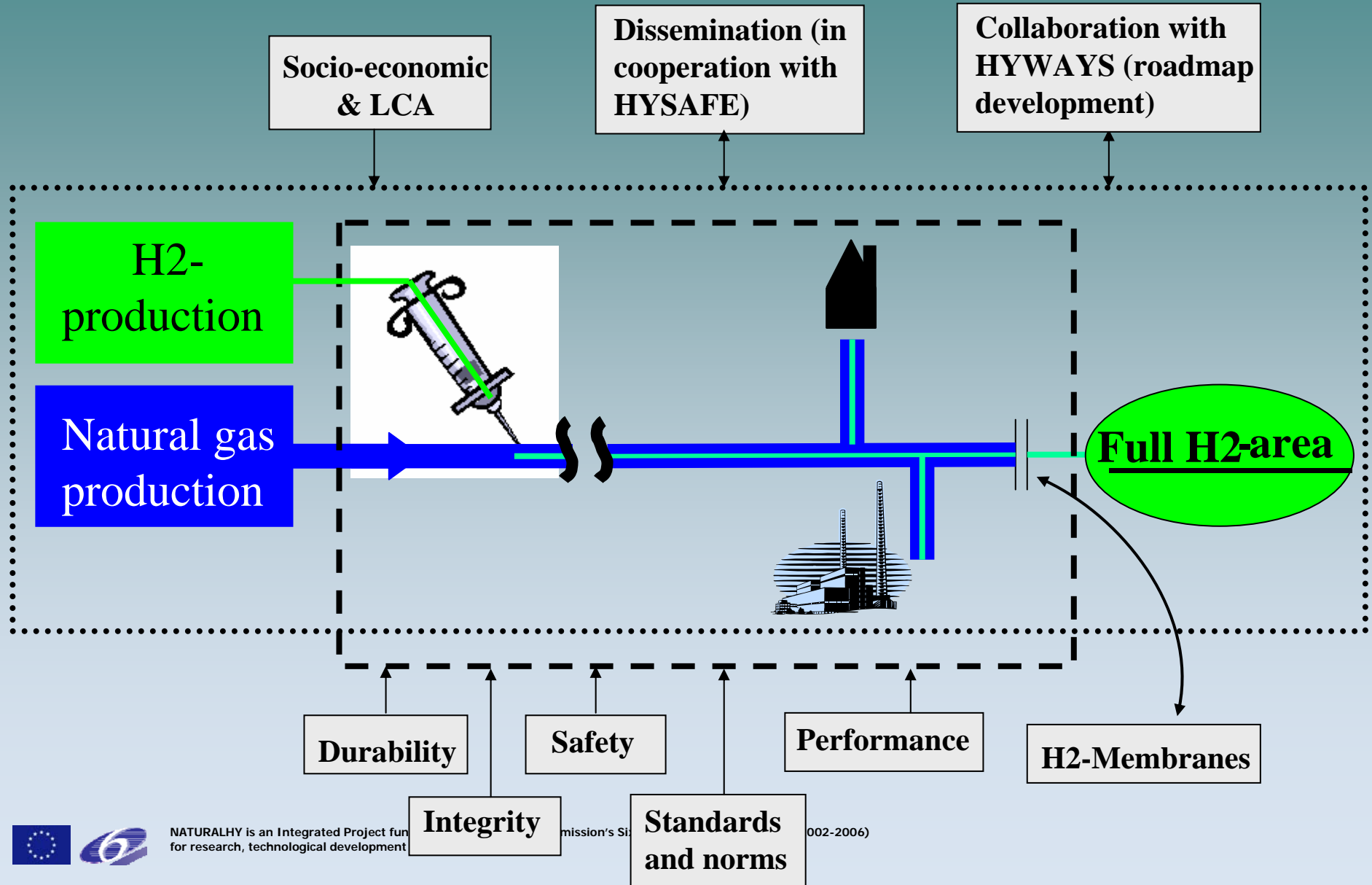


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NaturalHy: Scope

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Integrity

mission's Si

Standards and norms

002-2006)



NaturalHy: Main Deliverables

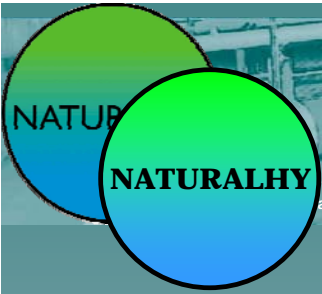
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- **Assessment tool**
- **Membranes for H₂ separation**
- **Socio-Economic and LC Assessments**
- **Belief and enthusiasm of the stakeholders**



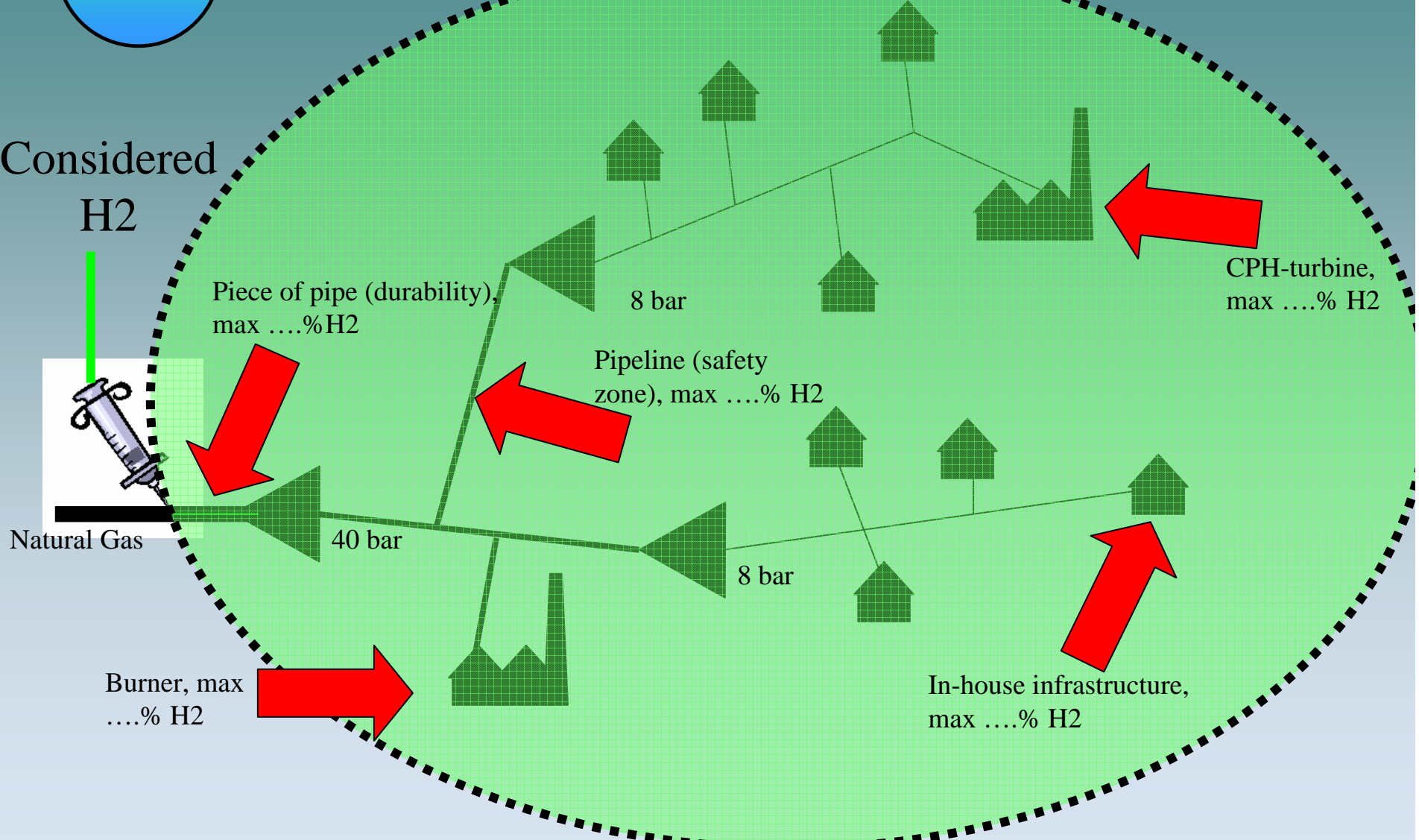
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NaturalHy: Assessment Tool



the Hydrogen Economy by Using the Existing Natural Gas System & Catalyst
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Considered
H₂



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The Catalytic effect

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When a long-term economic perspective exists for the production + transmission + distribution + end use of large volumes of hydrogen, the investment barriers for the HE will be lowered



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NaturalHy: Facts & Figures

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- **39 European partners**
- **Integrated Project within EC's 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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NaturalHy: Work Packages

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Socio-econ. +LCA	N. Mortimer	Loughborough University
Safety	G. Hankinson/B. Lowesmith	Loughborough University
Durability	I. Alliat	Gaz de France
Integrity	G.Müller-Syring	DBI-GUT
End Use	C. Komodromos	University of Oxford
Dec. Support Tool	P. Bartlam	ISQ
Dissemination	G. Vlondakis	Exergia
Coordination	G.Tiekstra	N.V. Nederlandse Gasunie



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NaturalHy: Partners (1)

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Gas companies and gas research institutes

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

Manufacturers and consultants

CETH CMI CSM Exergia GE/PII SAVIKO SQS TOG



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NaturalHy: Partners (2)

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Universities, Institutes and NGO's

Ecole Nationale d'ingenieur de Metz Högskolan i Borås

Leeds University Loughborough University NTUA

NTNU TU Berlin University of Oxford

CEA COGEN ECN HSE NEN PLANET TNO

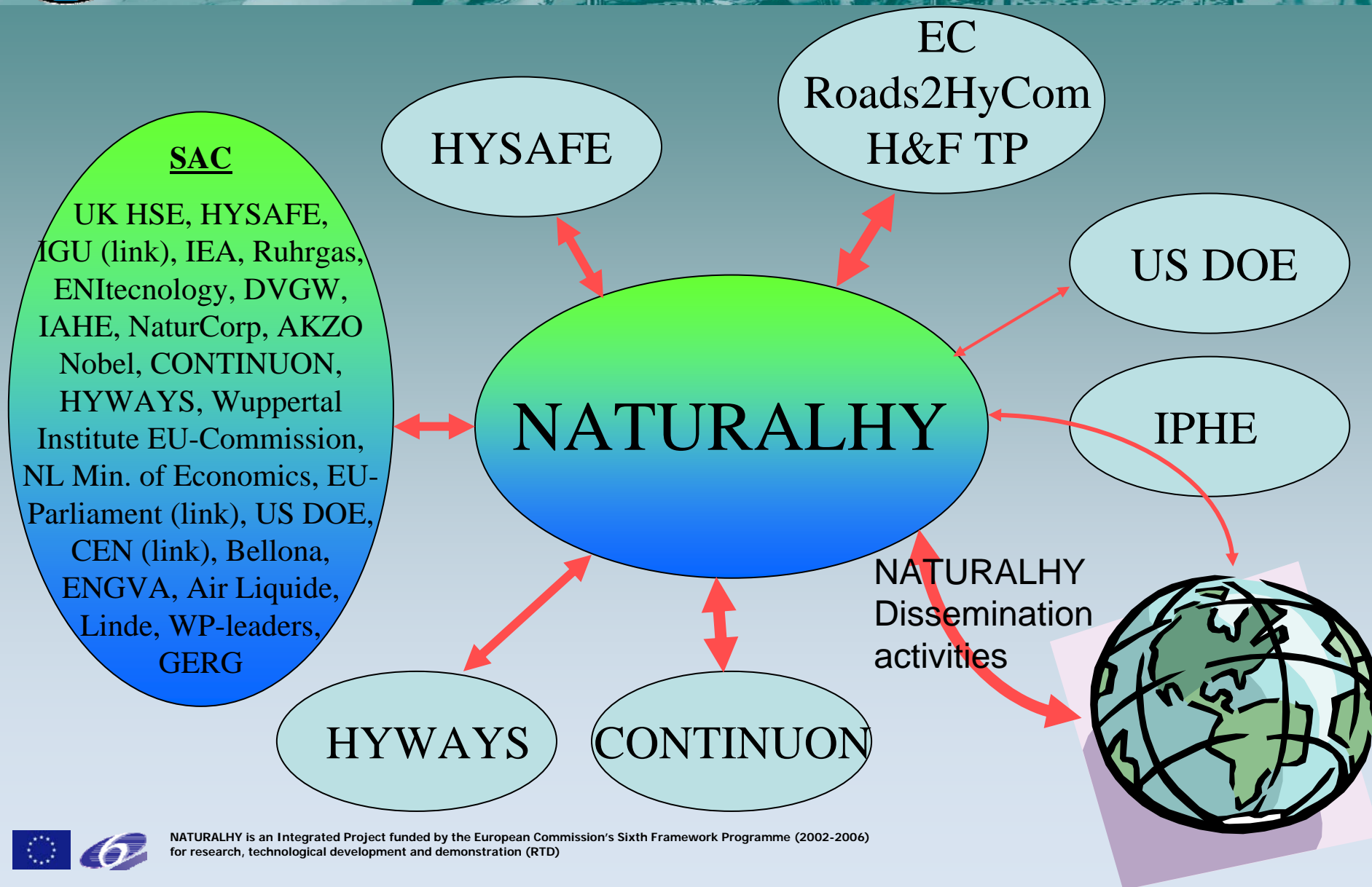
TUBITAK



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NaturalHy: connected to the world

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NaturalHy: Strategic Advisory Committee

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- Safety: HYSAFE, UK Health Safety Executive,
- Energy/natural gas: CONTINUON, DVGW, NaturCorp, ENItecnology, GERG, IAHE, IEA, IGU (link), Ruhrgas
- Policymaking: EU-Commission, EU H&FC Platform (link), EU-Parliament (link), HYWAYS, NL Min. of Economics, US DOE
- Regulations: CEN (link)
- Environment/socio economics: Bellona, Wuppertal Institute, WWF
- End use: ENGVA, AKZO-NOBEL



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NaturalHy: Workshop Presentations

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Durability

I. Alliat

Gaz de France

Integrity

G.Müller-Syring

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Safety

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Thank you for your attention

Gjalt Tiekstra

Coordinator NaturalHy project

naturalhy@gasunie.nl

www.naturalhy.net



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