"Hydrogen – does it have a future in natural gas networks?" The NATURALHY project

NATURALHY workshop, IGRC2008, Paris, 09 October, 2008

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Why use other gases, like biogas and hydrogen?

- Stimulants; Reduction of CO2 emissions, Reliability of energy supply
- Regulations: EU-Directive: Assessment of the potential of the existing assets!

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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…."

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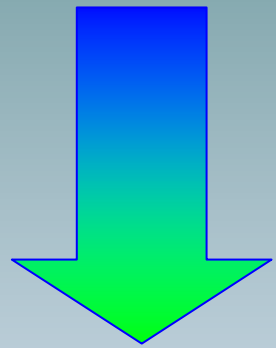
The transition to the Hydrogen-Economy will be lengthy, costly and will require significant R&D



PRACTICAL STRATEGY:

To assess the potential of the existing assets!

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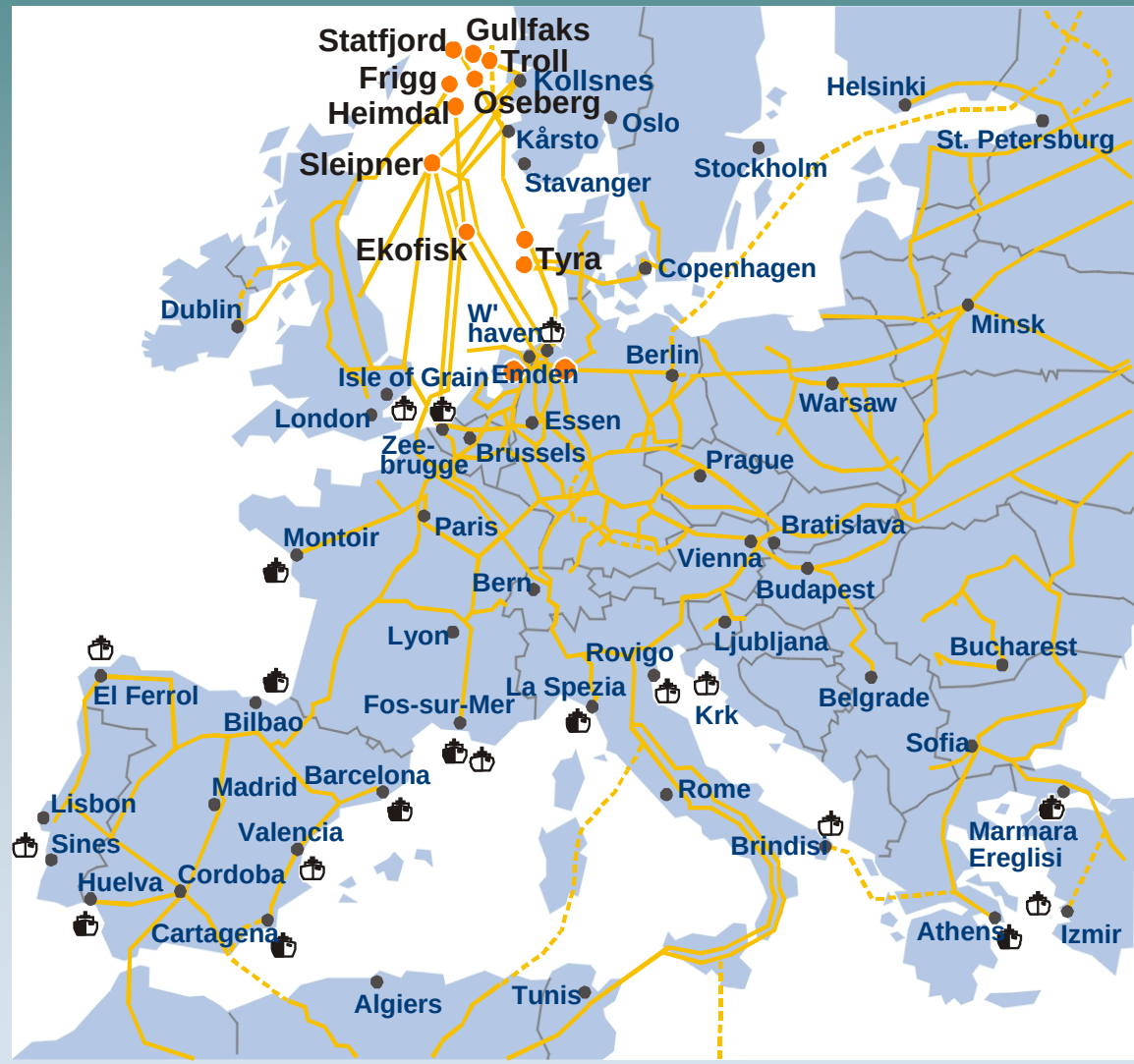
European NG transmission system

Pipelines
- Existing
- planned or under construction
- natural gas fields

Liquefied natural gas (LNG) receiving terminal
- in operation
- planned or under construction



Source: E.ON-Ruhrgas

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European Gas Network

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

- **Example: EU (without Russia)**

Transmission lines: 214.000 km
Distribution lines : 1.444.000 km
Number of customers: ~ 125 Million

- **Current estimates for re-building a European gas network for Hydrogen transmission are in the range of: 200 billion € – 2000 billion €**

- **Long time needed for construction**

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Hydrogen Economy

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- During the transition to a full hydrogen economy the amount of hydrogen used will increase and large volumes of hydrogen need to be transported
- Pipelines are the most economic and efficient means to transport large volumes of gas over a certain distance < ~3000 km
- Transporting mixtures of NG/H2 in the existing network allows for a gradual increase of the amount of hydrogen during the transition period
- In this way the introduction and public acceptance of hydrogen will be facilitated

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The existing natural gas network

Current natural gas network is 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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Natural gas delivery chain

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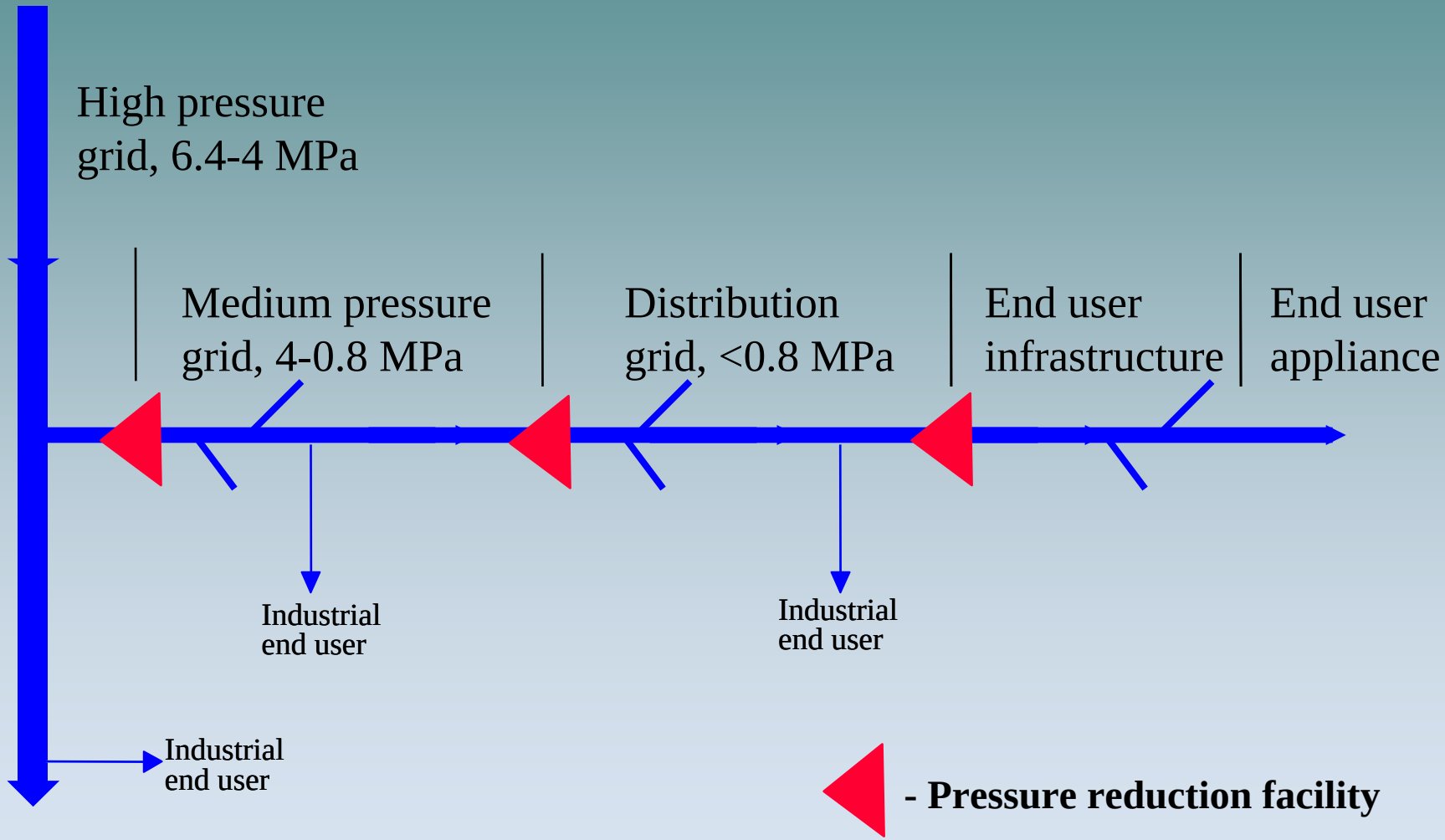

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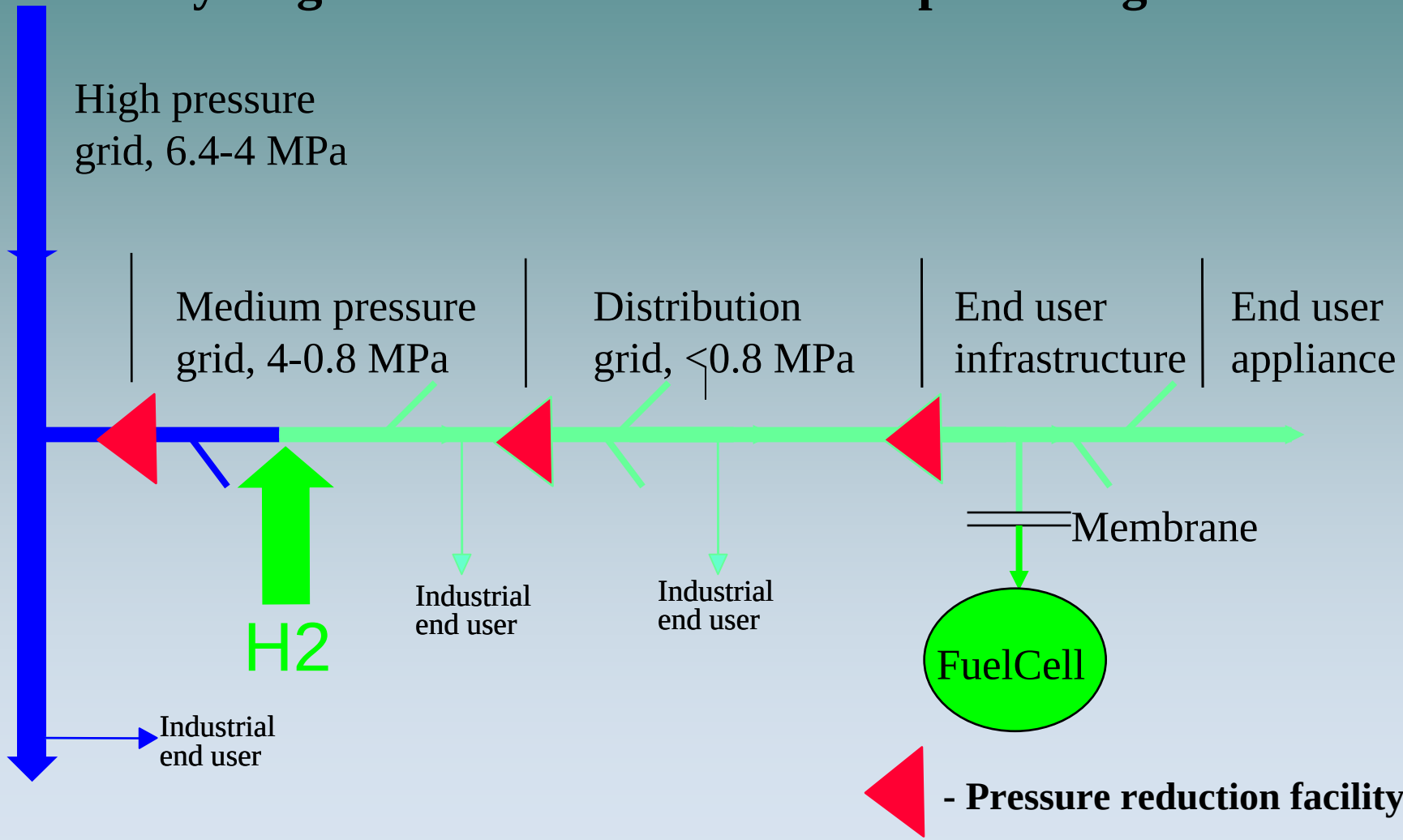
H2-addition scenario

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
- Safety Risk (probability of failure X effect)
- Gas quality management & End-use
- The required Regulations, Codes & Standards

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NATURALHY: objectives

Preparing for the Hydrogen Economy by Using the Existing Natural Gas System as a Catalyst
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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”option (“green” H2)
- To develop membranes for hydrogen separation and assess the “transport of H2” option
- To map out the socio-economic and environmental consequences of the NATURALHY-approach
- To develop a Decision Support Tool for the gas operator to decide whether to inject H2 in an existing network.

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NATURALHY: 8 Workpackages

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

- **WP1: Life Cycle and Socio Economic Assessment**
- **WP2: Safety aspects**
- **WP3: Durability of pipeline material**
- **WP4: Integrity management**
- **WP5: Separation and End-use**
- **WP6: Decision Support Tool (DST)**
- **WP7: Dissemination**
- **WP8: Coordination**

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NATURALHY: Work Package Leaders

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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	**A. Bhattacharya/C. Komodromos**	**University of Oxford**
Dec. Support Tool	**P. Bartlam**	**ISQ**
Dissemination	**G. Vlondakis**	**Exergia**
Coordination	**G.Tiekstra/F. Koopman**	**N.V. Nederlandse Gasunie**

NATURALHY Project Executive Committee:
All WP-leaders + Representative of GERG, D. Pinchbeck

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NaturalHy: Facts&Figures

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- 39 European partners
- Integrated Project within EC's FP6
- Project budget: 17.3M€; EC grant: 11 M€
- Start 1 May 2004, end of project October 2009
- Recognised as IPHE-project

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Thank you for your attention

Gjalt Tiekstra

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