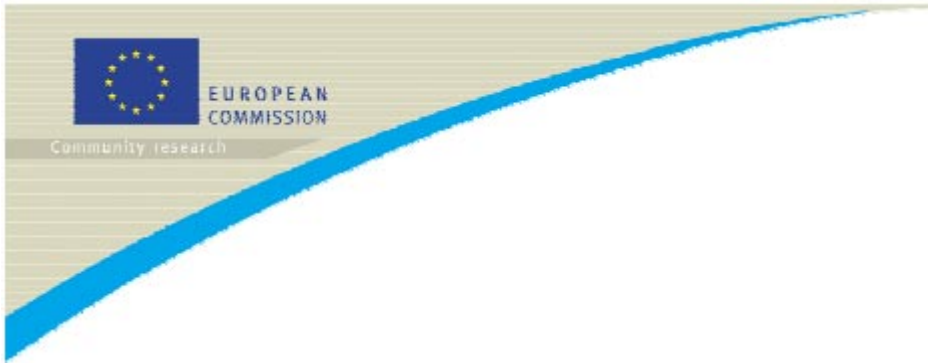


Preparing for the hydrogen economy by using the existing natural gas system as a catalyst (NATURALHY)

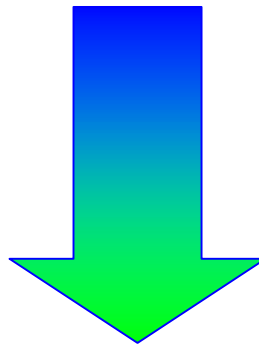
Contract no.: SES6/CT/2004/502661

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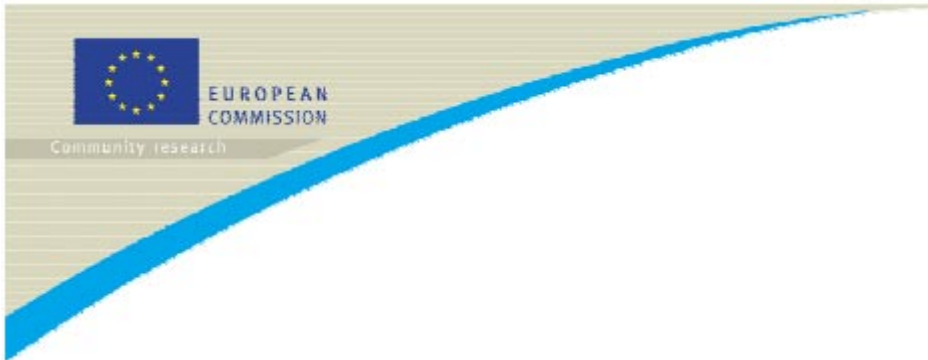
N.V. Nederlandse Gasunie



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



PRACTICAL STRATEGY



Objectives

- **To determine the conditions under which the existing natural gas system (transmission and distribution infrastructures & end user infrastructure and appliances) can be used for mixtures of hydrogen and natural gas**
- **To develop devices to subtract hydrogen from mixtures of hydrogen and natural gas**
- **To carry out socio-economic and Life Cycle Assessments of the NATURALHY-approach**





EUROPEAN COMMISSION

Community research



Socio-economic & LCA

Dissemination (in cooperation with HYSAFE)

Collaboration with HYWAYS (roadmap development)

H2-production

Natural gas production

Full H2-area

Durability

Integrity

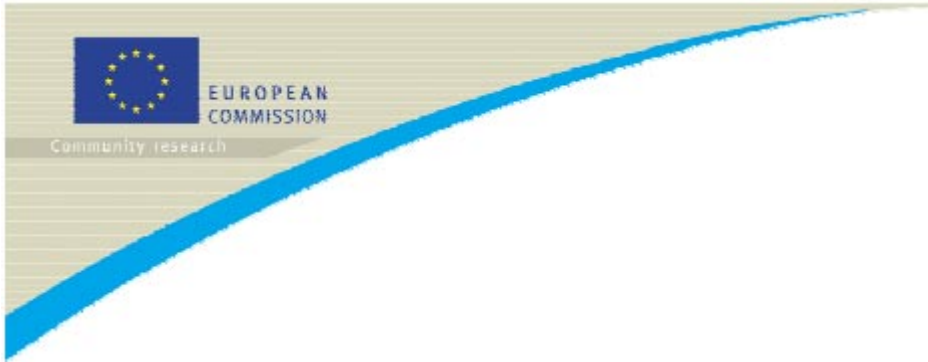
Safety

Standards and norms

Performance

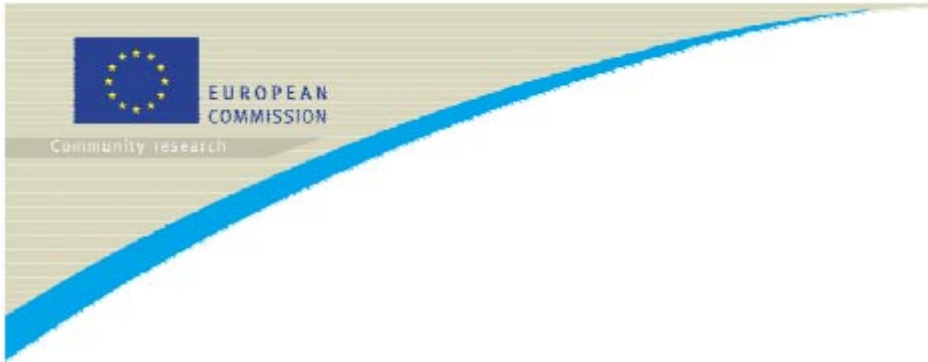
H2-Membranes





Alignment to the objectives of the DS and SRA by supporting the transition to hydrogen by taking advantage of the existing natural gas system:

- **To connect hydrogen production and demand, and to match their patterns**
- **To increase the acceptance of hydrogen by the end users and other stakeholders**
- **To prepare stakeholders for the introduction of hydrogen**

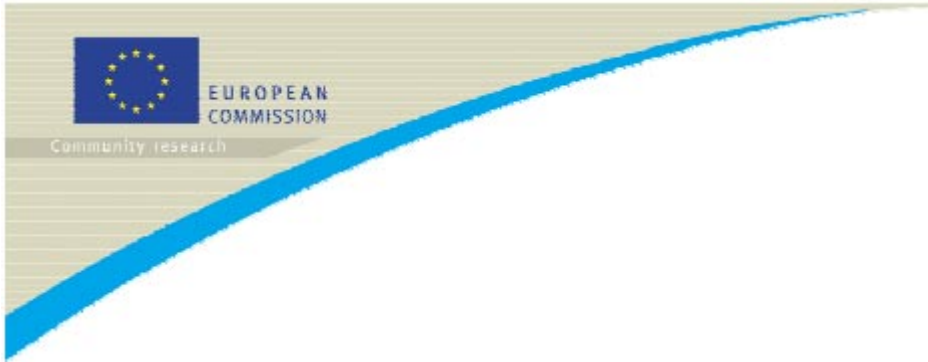


The DS does not give so much detail about the development of a hydrogen pipeline infrastructure and the role of the existing natural gas system therein.

The NATURALHY-project maps out the value of the existing natural gas system for hydrogen delivery

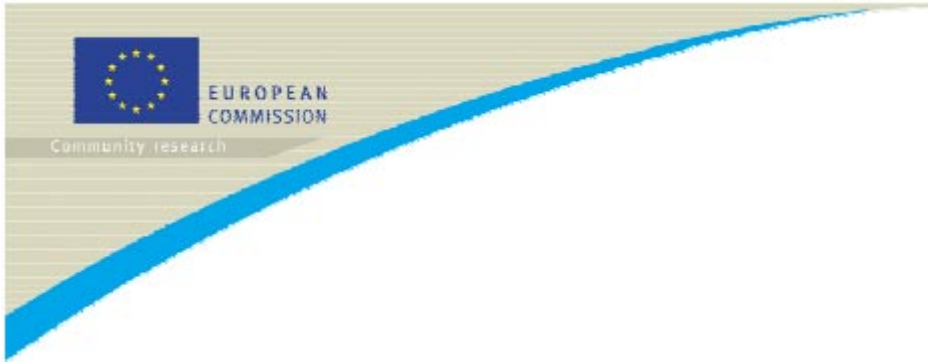
Key words: safe, cost effective, high capacity, widely spread, short term availability, well controlled, possibility of a smooth introduction of hydrogen into the society





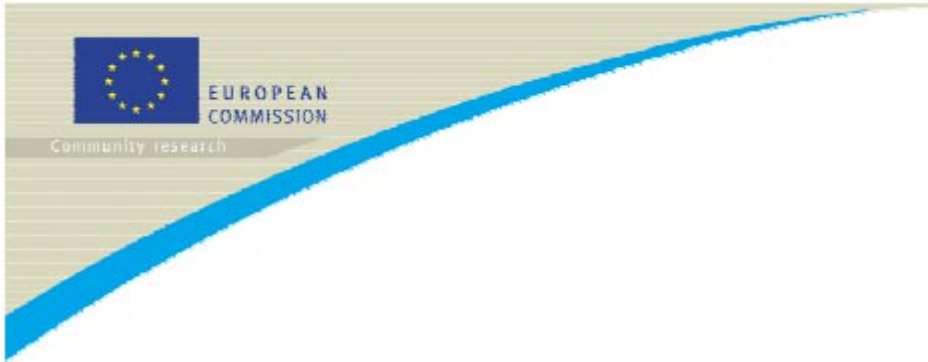
For the development of a new hydrogen delivery pipeline infrastructure a sound long term economic perspective is crucial:

- **Well defined markets (volumes, profiles, locations,....)**
- **Well defined feeding points (centralised/decentralised/hybrid production)**
- **Relation with other sustainable energy carriers (including biogas)**



It is important to remain realistic:

- **In developing a strategy concerning the transmission and distribution of large volumes of hydrogen by pipelines**
- **In developing a policy for meeting the future total energy demand with sustainable energy carriers**



Main Deliverables of NATURALHY:

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





EUROPEAN COMMISSION

Community research

NATURALHY assessment tool



Considered addition of

H₂



Natural Gas

Piece of pipe (durability), max ..%

8 bar

Pipeline (safety zone), max ..% H₂

40 bar

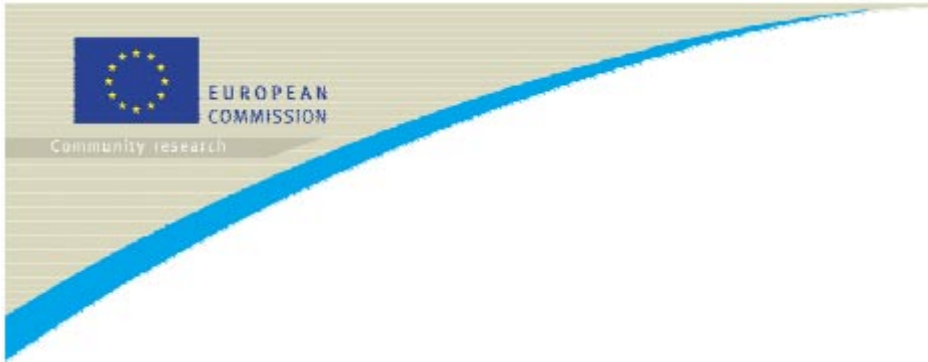
8 bar

CPH-turbine, max ..% H₂

Burner, max ..% H₂

In-house infrastructure, max ..% H₂

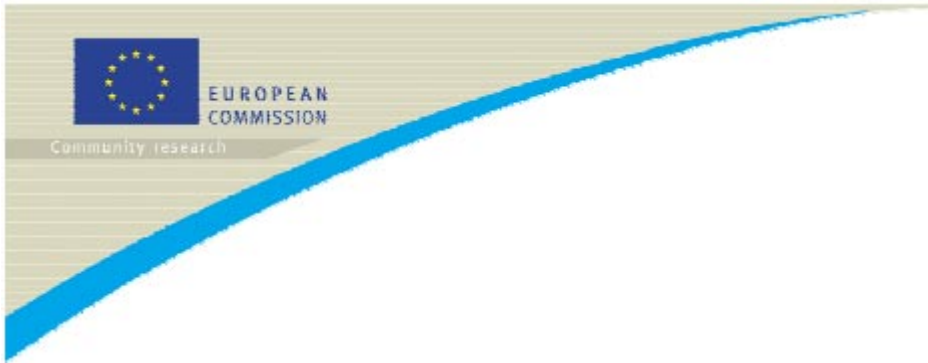




Main Deliverables:

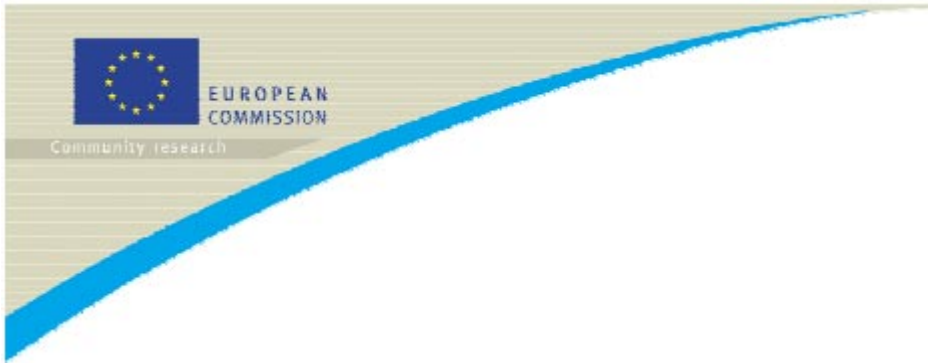
- **Assessment tool**
- **Membranes for H₂ separation**
- **Socio-Economic and LC Assessments**
- **Belief and enthusiasm of the stakeholders**





Alignment to the objectives of the DS and SRA by supporting the transition to hydrogen by taking advantage of the existing natural gas system:

- ≡ To connect hydrogen production and demand, and to match their patterns
- **To increase the acceptance of hydrogen by the end users and other stakeholders**
- **To prepare stakeholders for the introduction of hydrogen**



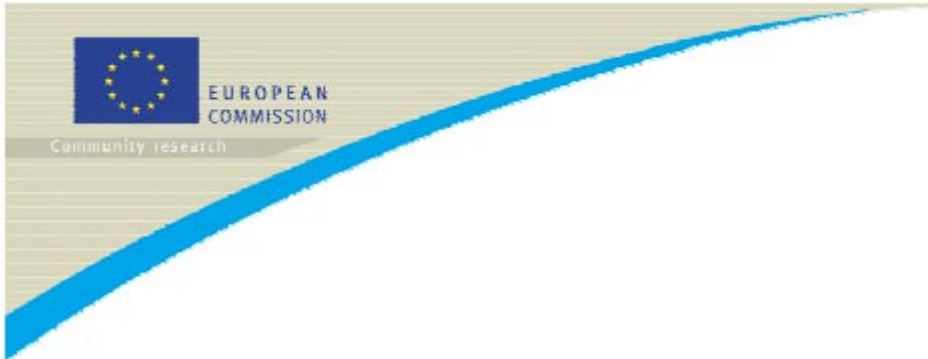
To increase the acceptance of hydrogen by the end users and other stakeholders:

- **The excellent safety record of the natural gas industry**
- **The possibility of a smooth introduction of hydrogen into the society**



To prepare stakeholders for the introduction of hydrogen:

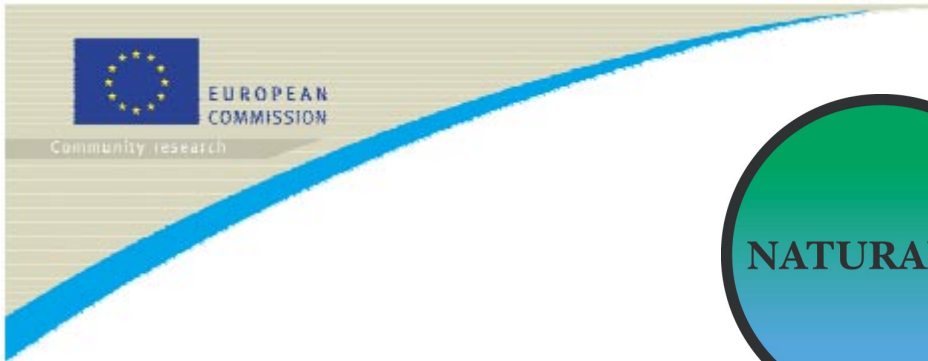
- **Gas companies involved in the project execution**
- **Strategic Advisory Committee: leading organisations in the fields of safety, policymaking, energy/natural gas, regulations, environment, end users**
- **Dissemination activities, including NATURALHY-workshops, newsletters, website, publications etc.**



Cooperations:

- **Strategic Advisory Committee**
- **Enhanced collaboration with HYSAFE, HYWAYS and US DOE**
- **Recognised as IPHE project, SSA-proposal under preparation**
- **Contacts with Australia, Japan**
- **In general: NATURALHY is interested in further collaborations aiming at win-win**





Thank you for your attention

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