A step towards the hydrogen economy by using the existing natural gas grid (the NATURALHY-project)

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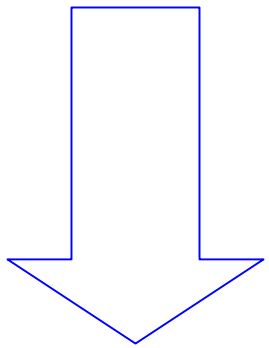
The transition to the hydrogen-economy will be lengthy, costly and will require significant R&D



PRACTICAL STRATEGY

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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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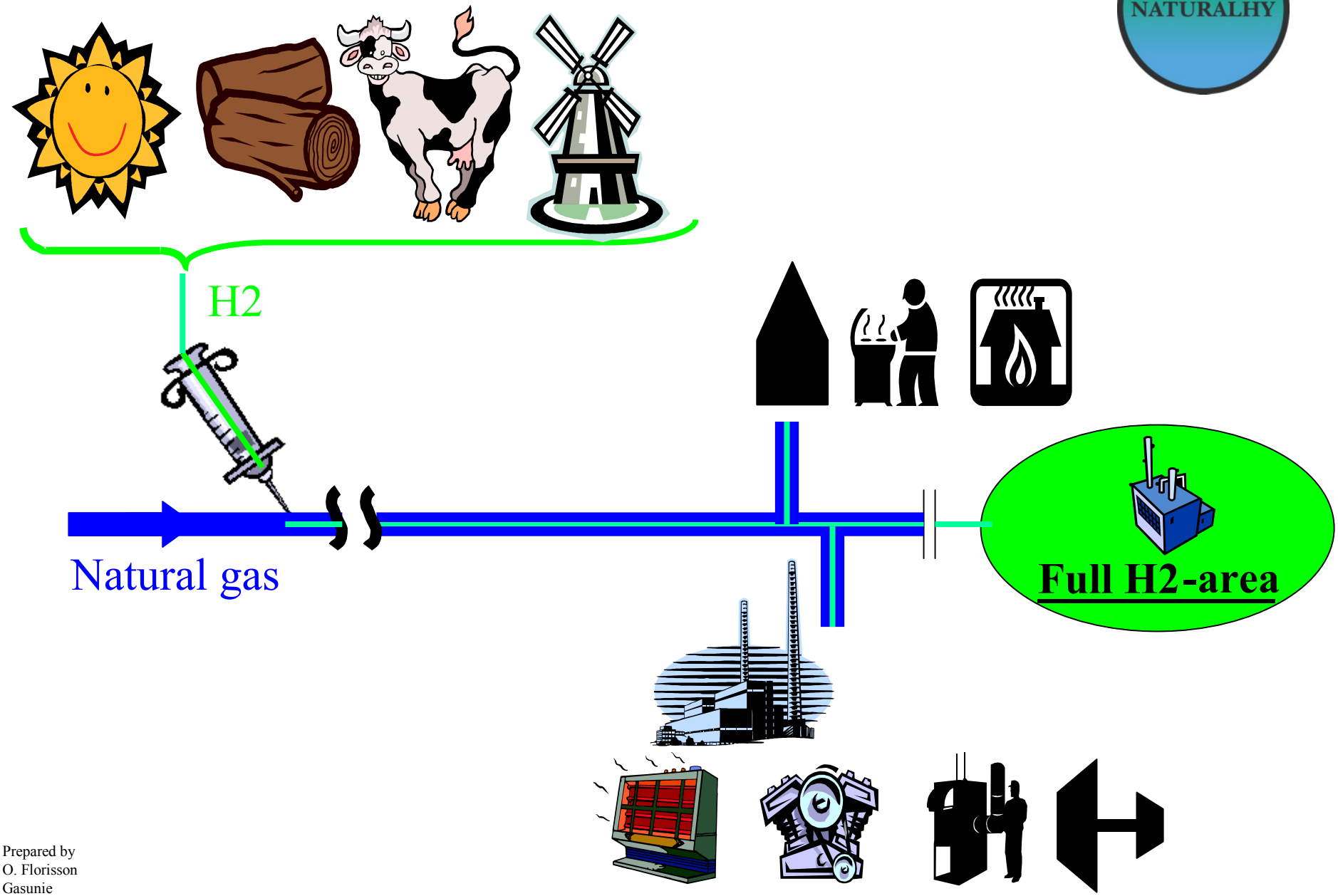
The NATURALHY approach



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Adding H2 to natural gas effects the physical and chemical properties and might have impact on:

- Safety aspects of transmission – distribution - end use
- Pipeline durability
- Pipeline integrity
- End user appliances' performance

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NATURALHY

The main objective:

Preparing for the hydrogen economy by identifying and removing the potential barriers regarding the introduction of hydrogen into the society, using the existing natural gas system as a catalyst

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Main Deliverables:

- Assessment tool
- Membranes for H2 separation
- Socio-Economic and LC Assessments
- Enthusiasm of the stakeholders

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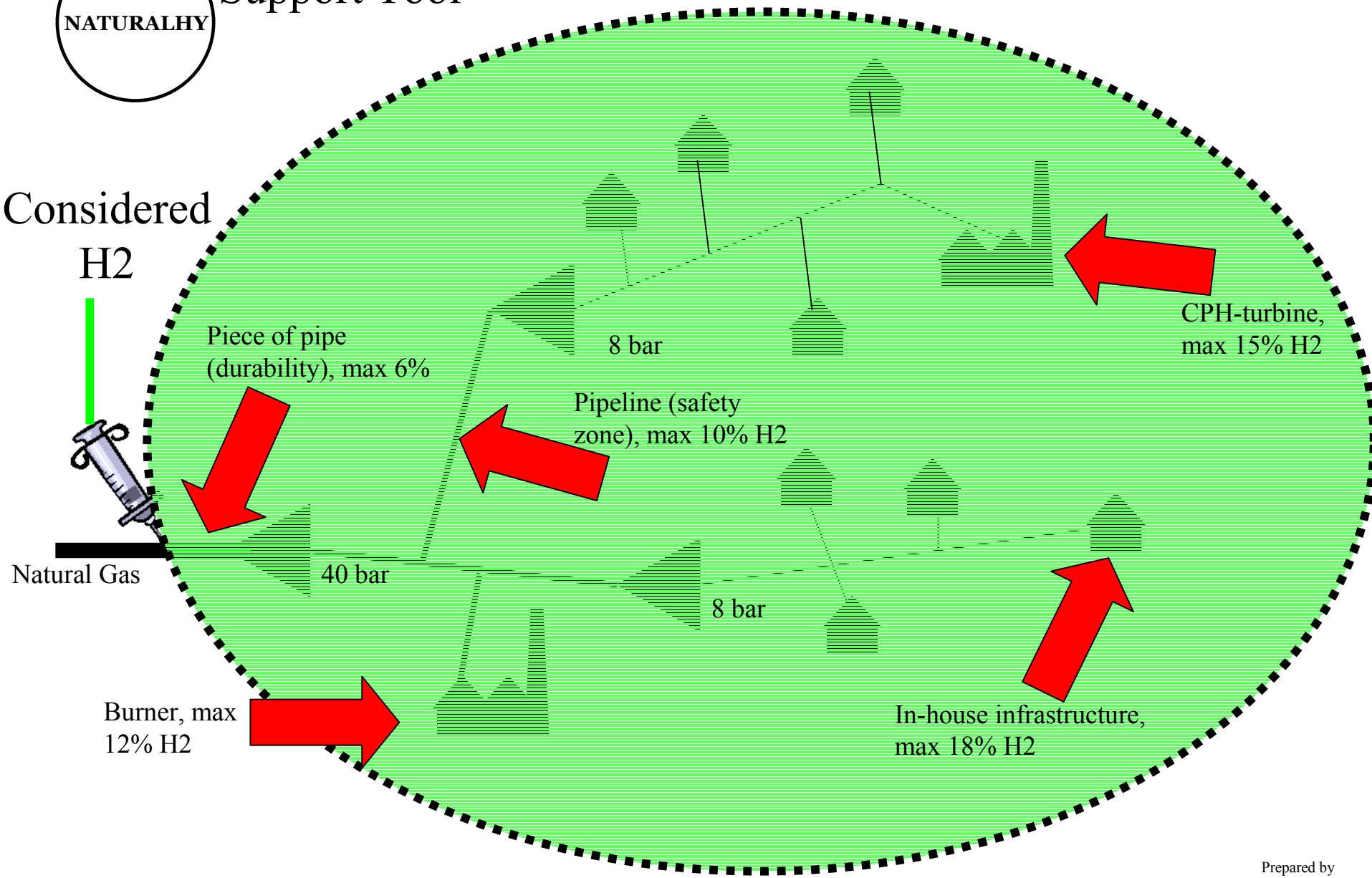
Example of the outcome of an assessment by the Decision Support Tool

NATURALHY



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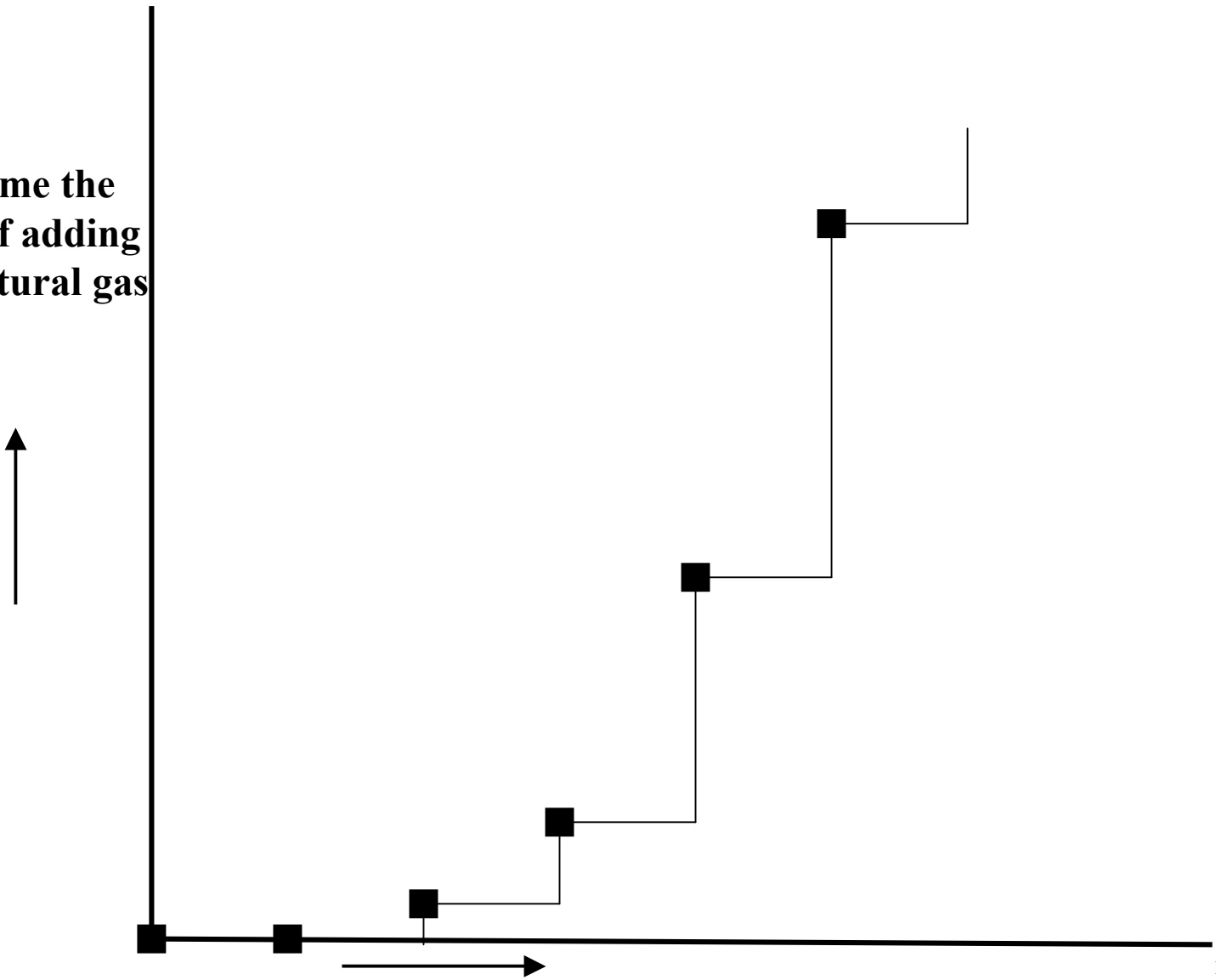
Costs to overcome the consequences of adding hydrogen to natural gas



% of hydrogen added to the natural gas

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Characteristics

- 39 European partners, including 15 from the gas-business
- Integrated Project within FP6
- Project budget 17.3 M€, EC-grant 11 M€
- Start 01-05-2004, duration 5 years

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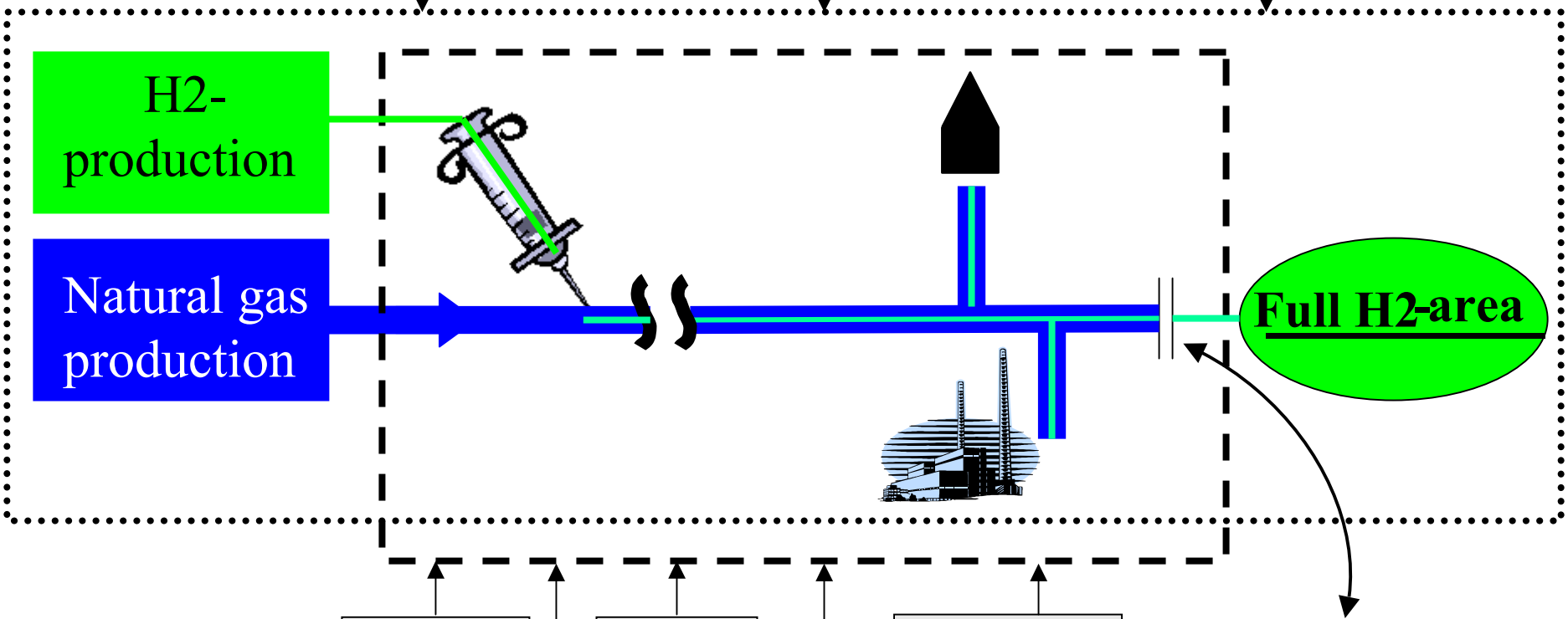
Socio-economic & LCA

Dissemination (in cooperation with HYSAFE)

Collaboration with HYWAYS (roadmap development)



Durability

Integrity

Safety

Standards and norms

Performance

H2-Membranes

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Parties

Gas companies and gas research institutes

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

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Parties (continued)

Manufacturers and consultants

CSM CMI TOG GE/PII CETH SAVIKO Exergia SQS

Universities and Institutes

Technical University Berlin

National Technical University of Athens

Leeds University

Loughborough University

Högskolan i Borås

TUBITAK

University of Warwick

Ecole Nationale d'ingenieur de Metz

Norwegian University of Science and Technology

NEN COGEN ECN HSE TNO CEA PLANET

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Project organisation:

3 Committees to manage the execution

Strategic Advisory Committee

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List of members of the Strategic Advisory Group (under development):

Safety: Health Safety Executive, HYSAFE

Energy/natural gas: IGU, IEA, Ruhrgas, ENItecnology, DVGW, IAHE

Policymaking: HYWAYS, EU-Commission, NL Min. of Economics and Environment, EU-Platform for hydrogen and fuel cells, Wuppertal Institute, US Department of Energy, EU-Parliament

Regulations: CEN

Environment: WWF, Bellona

End use: ENGVA

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THANK YOU FOR YOUR ATTENTION

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Comparison of the main risk aspects of hydrogen versus natural gas

Physical aspect	**Impact on risk (H2-n.g.)**
Energy content /m^3	-
Ignition energy	+
Combustible gas/air ratios	+
Combustion velocity	+
Radiation of flames	-
Small leaks	+
Density and diffusivity	-
Total	?

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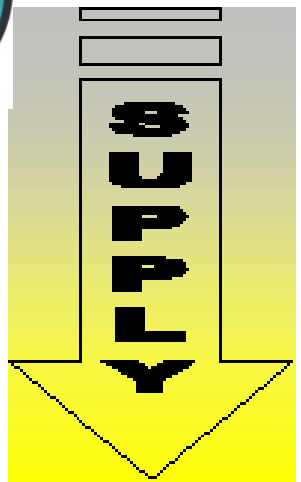

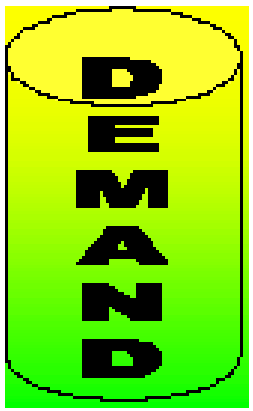

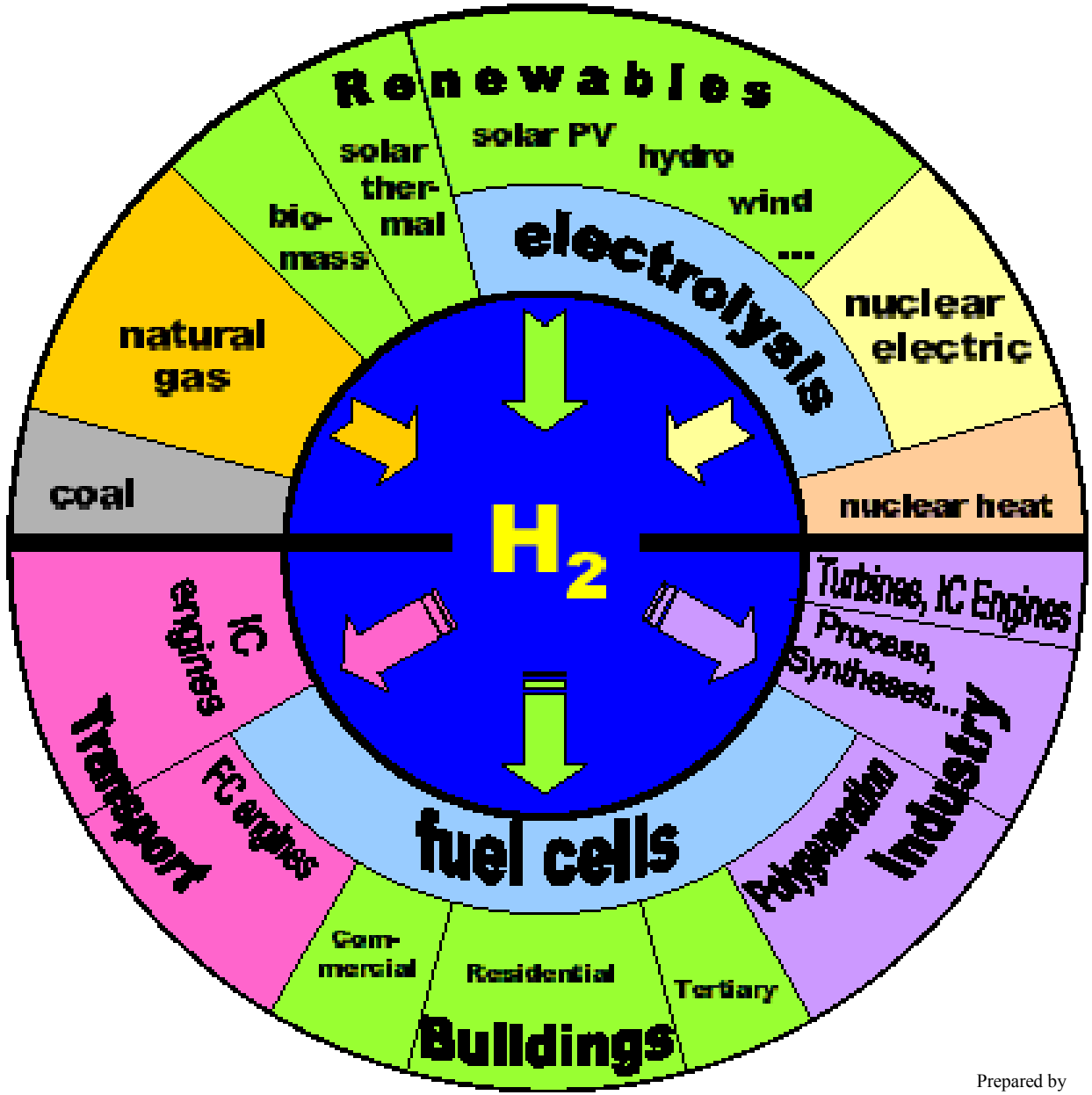

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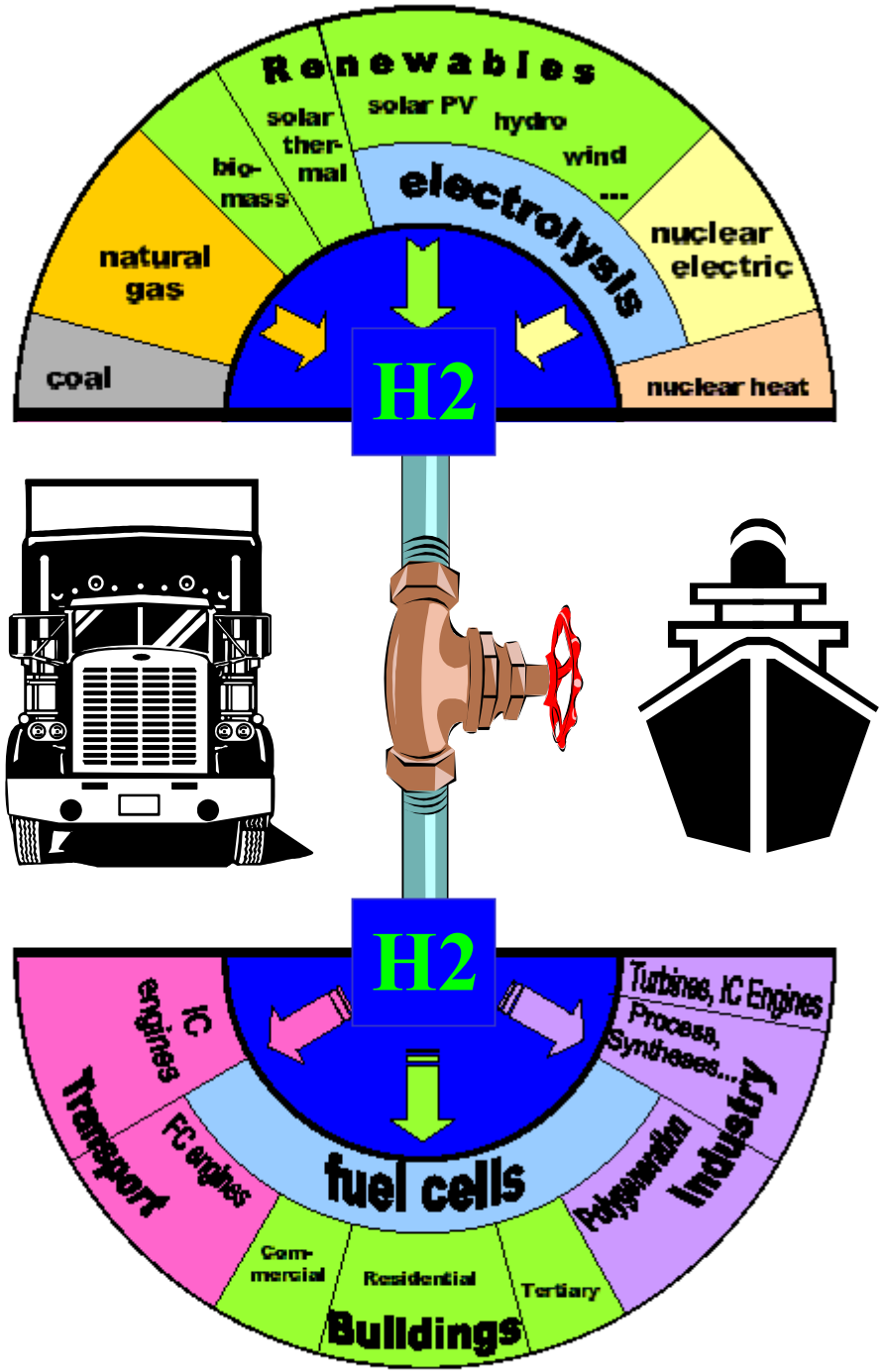

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