



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

The NATURALHY Project: Questions and Answers

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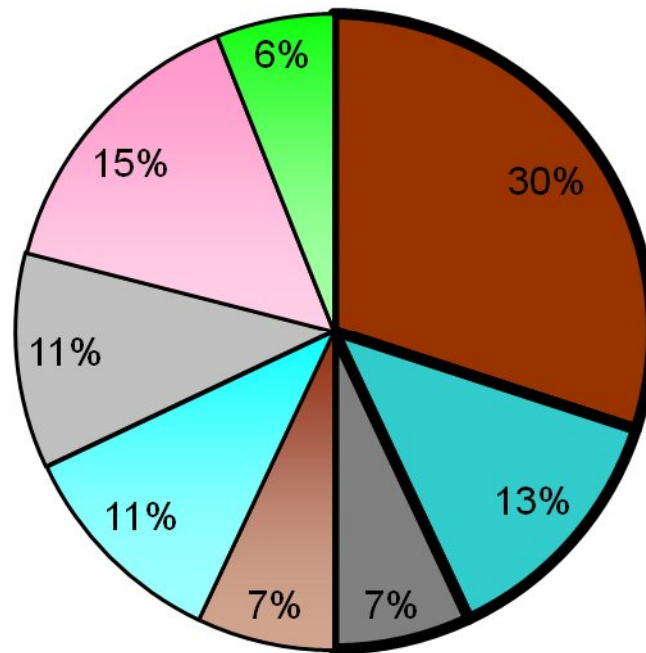
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EU Energy Supply 2004

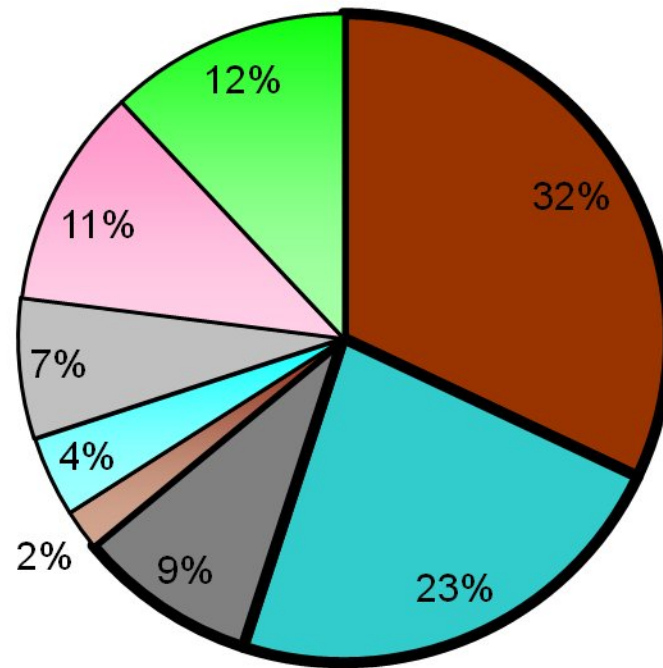


- Oil Imports
- Natural Gas Imports
- Solid Fuel Imports
- Oil Indigenous
- Natural Gas Indigenous
- Solid Fuel Indigenous
- Nuclear Power
- Renewables





EU Energy Supply 2030

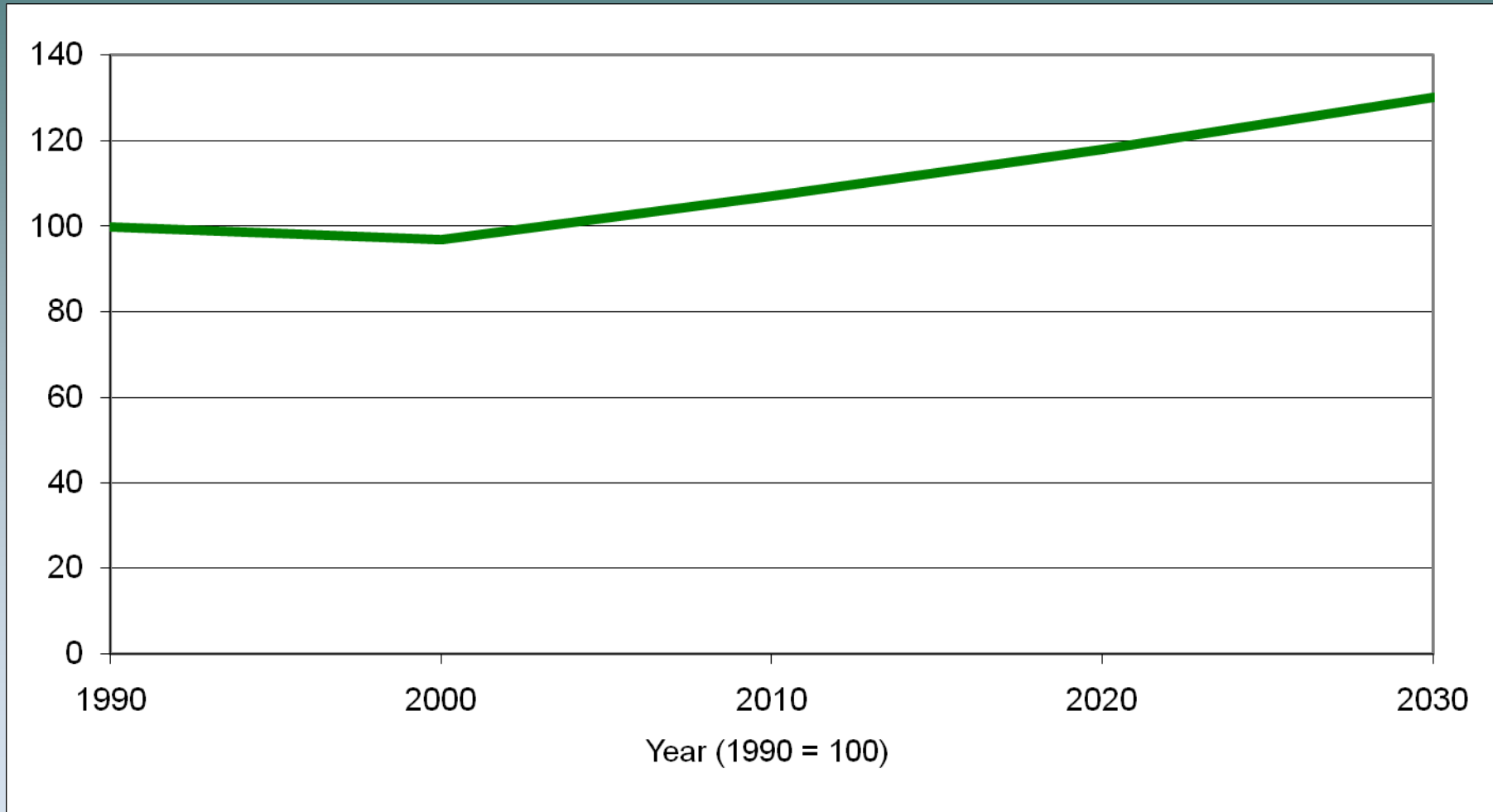


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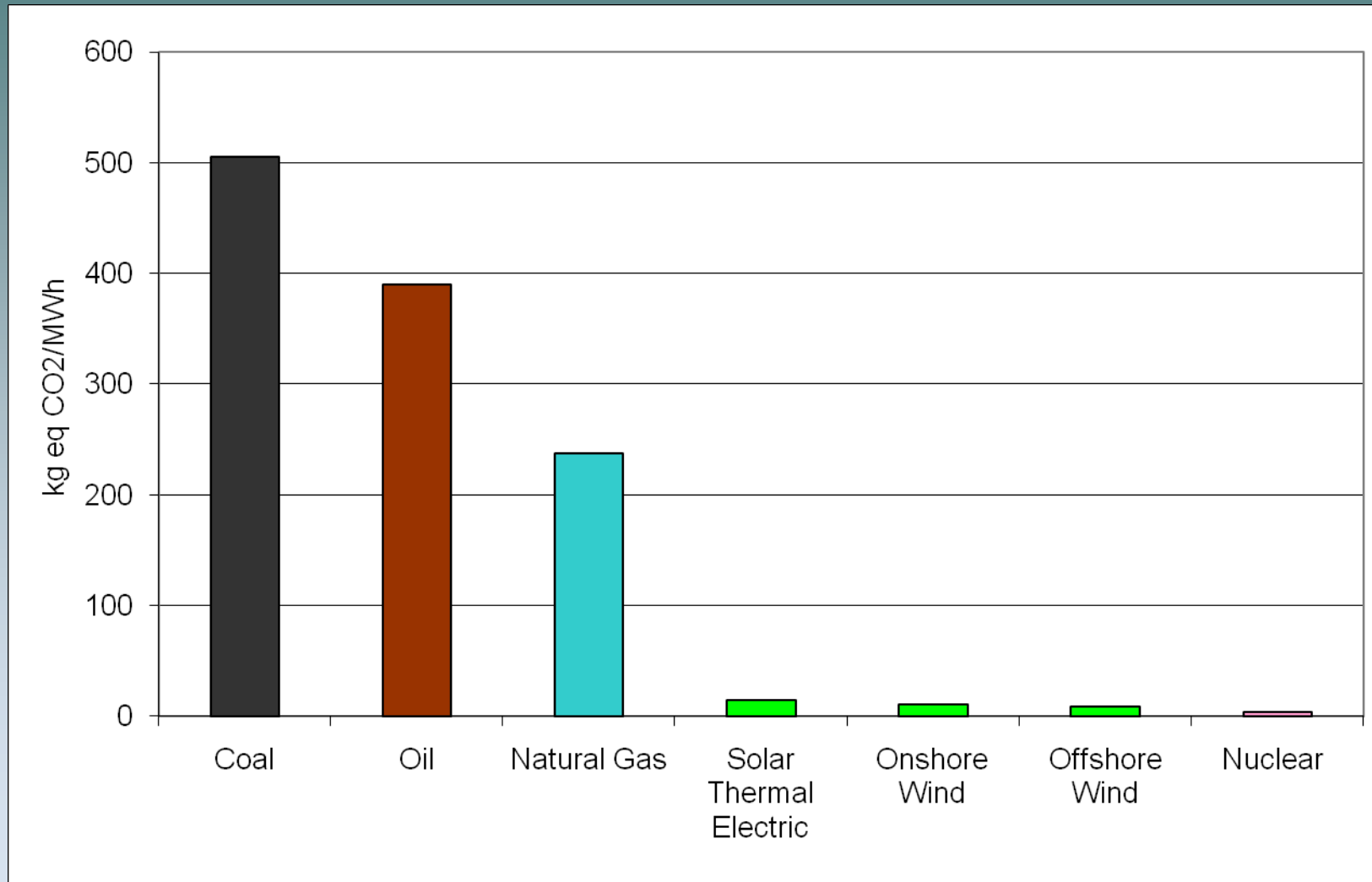


EU Energy-Related CO₂ Emissions





Total Greenhouse Gas Emissions Factors for Heat





Hydrogen as an Energy Carrier and Means to "Greener" Gas

- production from many indigenous, "low carbon" sources in the European Union
- means of storage for energy from intermittent sources
- possible mixture with natural gas
- potential use in fuel cells and transport systems





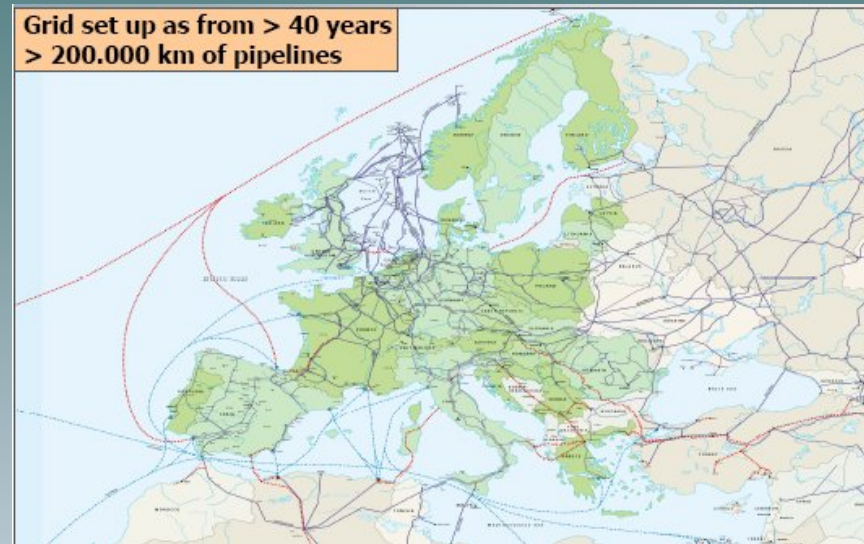
General Question

How can hydrogen be delivered from these diverse sources to many users in a cost-effective manner on a significant scale in the near future?





European Union Natural Gas Network



- Customers = 93,614,775
- Transmission network length = 214,652 km
- Distribution network length = 1,444,400 km
 - Service line length = 51,739,401 km





Specific Question for the NATURALHY Concept

Can hydrogen be added to (and, possibly, removed from) the existing natural gas system;

- whilst maintaining acceptable levels of safety?
- whilst delivering net energy, environmental, employment and economic benefits?





Key Technical Questions for the NATURALHY Project

- Can hydrogen be added to the existing natural gas system;
- without unacceptably reducing safety?
- without unacceptably increasing costs?
- without major changes to the infrastructure (pipelines and end-use appliances)?





Maintaining Safety: WP 2

- current high level of safety
- safety; risk = likelihood x severity
- adding up to 20% hydrogen will probably not increase overall risk significantly
- adding 20% to 30% hydrogen does not significantly increase explosion or fire severity





Ensuring Integrity: WP 4

- safety related to crack detection as critical defect
- modified in-pipe inspection tools can detect such cracks in the presence of hydrogen
- existing methods can repair such cracks in the presence of hydrogen
- higher maintenance costs might occur with higher concentrations of hydrogen





Maximum Percentage of Hydrogen without Mitigation: WP 3 and 5

- fatigue crack resistance of older steel pipes not affected by hydrogen up to 50%
- lifetime of plastic pipes not affected by hydrogen
- domestic meters not affected by presence of hydrogen
- modern boilers can be operated with up to 50% hydrogen





Gas Quality and Combustion: WP 5

- older appliances can accommodate up to 20% of hydrogen
- precise hydrogen content acceptable varies from country to country





Hydrogen Separation: WP 5

- can hydrogen be extracted from mixture for subsequent use (fuels cells) in a practical and cost effective manner?
- innovative two-stage carbon/palladium membranes can deliver high purity hydrogen (better than 99.99%) for fuel cells
- cost comparison being conducted with conventional separation technologies





Assistance for Natural Gas Companies

- Probability of Failure Tool (WP 4)
- Integrity Management Specification (WP 3 and 4),
- Transmission Risk Assessment Package (WP 2)
- Life Cycle and Socio-Economic Assessment Workbooks (WP 1)
- Decision Support Tool (WP 6)





Dissemination from the NATURALHY Project: WP 7 and 8

- six monthly newsletters
- posters and flyers
- conferences and papers
- workshops
- Strategic Advisory Committee
- Website: www.naturalhy.net
- project co-ordinator:
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Thank you for your attention

www.naturalhy.net



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