The Road to Sustainable Transport

By introducing hydrogen in road transport, total CO_2 emissions can be reduced over 50 % in a cost-effective way

The need for hydrogen!

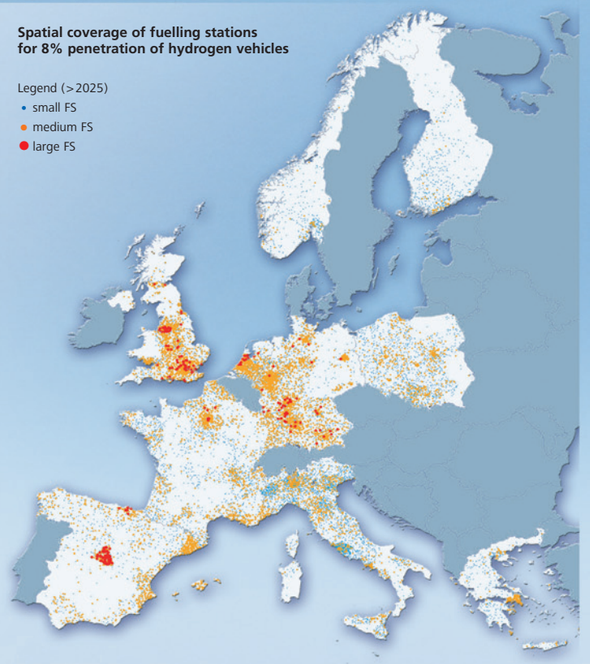
Hydrogen is an energy carrier with zero carbon content. Just like electricity, hydrogen can be produced from all energy resources, such as biomass, wind and solar energy, clean fossil fuels and nuclear energy. It can be converted to power and heat with high efficiency and zero emissions, especially when used in fuel cells. It improves security of supply due to the decoupling of demand and resources, allowing each European member state to choose its own energy sources.

Within the context of the HyWays project, a Roadmap and an Action Plan for the introduction of hydrogen into the European energy system have been developed in a joint cooperation between leading industry partners, institutes and energy agencies. The Roadmap was recently published by the European Commission, see http://ec.europa.eu/ research/energy/nn/nn_pu/hyways/article_0001_en.htm

HyWays

Spatial coverage of fuelling stations for 8% penetration of hydrogen vehicles

Legend (>2025)
- small FS
- medium FS
- large FS



Main conclusions

Emission reduction: Hydrogen is a cost effective option for the reduction of CO_2 emissions. The costs to reduce CO_2 emissions decrease by 4% in 2030 and 15% in 2050 compared to a baseline scenario without hydrogen. By starting to act now, emissions from road transport can be reduced by over 50% in 2050. Furthermore, the introduction of hydrogen in road transport contributes to a noticeable improvement of air quality in the short to medium term. This holds specifically for the most polluted areas such as city centres where the sense of urgency is greatest.

Impact on economic growth and employment: The transition to hydrogen offers an economic opportunity to strengthen Europe's position in car and energy equipment manufacturing. The major benefit for economic growth is a strong decrease in vulnerability of the economy to shocks and structural high oil prices. The net impact on employment, assuming import/ export shares do not change, amounts to 200,000 – 400,000 labour years by 2030.

Security of supply, energy savings and contribution to targets for renewable energy: Like electricity, hydrogen decouples energy demand from resources. In terms of energy savings, for example, hydrogen produced from biomass or other renewable sources when used in fuel cell vehicles allows for substantial efficiency gains over conventional and biofuels used in conventional and hybrid vehicles. The introduction of hydrogen in the energy system offers the opportunity to increase the share of renewable energy. The efficiency improvement and diversification potential lead to a substantial improvement in security of supply.

Competitiveness of hydrogen vehicles: Hydrogen vehicles can be produced and operated cost effectively once initial barriers such as the cost reduction of drive trains and infrastructure build-up have been overcome. In particular in combination with fuel cells, hydrogen can compete with conventional fuels if oil prices remain above 50 – 60 $ per barrel. Nevertheless, hydrogen specific policy incentives are needed to facilitate cost reduction of the drive train through economy of scale and R&D, ensuring a fast ramp up of production of hydrogen vehicles. When policy support is modest, implying that budgets are too low and the timing of policy incentives is inadequate, deployment of hydrogen vehicles is slowed down. As a result, no business case for industry exists (infrastructure build-up as well as vehicle development).

Main recommendations

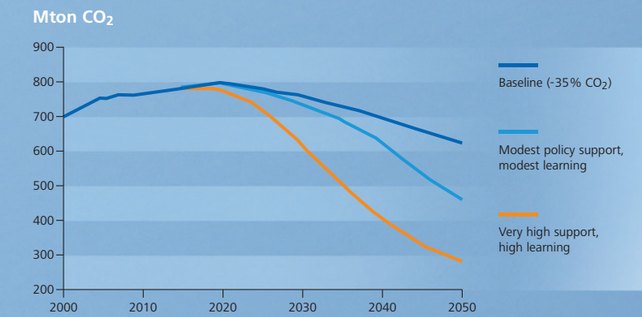
We have to act now for a sustainable future! Immediate action is needed to overcome initial barriers, enabling a substantial and cost effective contribution to both reduction of greenhouse gas emissions and import dependency while creating economic stability.

A European hydrogen-specific support framework is needed: This should address the following issues:

- *Support innovation at EU and member state level;* At a European level, the R&D budgets for hydrogen production and its end-use applications need to increase to 80 M€ per year.
- *Market support;* To overcome initial barriers, a hydrogen-specific deployment support framework needs to be implemented at the member state level. The total costs of a deployment support scheme are of the order of 180 M€ per year. A starting point is to equalise the total costs (€ct/km) for road transport through financial measures such as tax incentives.
- *Creation of early markets;* Early markets for e.g. hydrogen vehicles need to be created utilising the advantages offered by hydrogen applications. Examples are city centre access regulations or procurement of zero emission vehicles within governmental services.

Establish a public-private partnership: In the early commercialization phase, technology-specific deployment support and R&D must go hand-in-hand. A European public-private partnership between industry and the EC, such as a Joint Technology Initiative (JTI), is the most suitable framework to meet these conditions.

The hydrogen Roadmap and Action Plan are available for download at www.HyWays.de
further information coordinator@HyWays.de



Development of total CO_2 emissions for road transport for the 10 member states analysed in HyWays. In the baseline, a general -35% emission reduction target (all sectors) is assumed for 2050. In case of well timed and adequate financial incentives, total emissions can be reduced over 50% compared to the baseline.