

The hydrogen economy

In the public opinion hydrogen as an energy carrier has a consistently positive image. The main aspects of the energetic utilisation of hydrogen can be summarised as follows:

- The production of hydrogen from renewable energy is a contribution to the conservation of fossil energy sources. Once the utilisation of renewable energy has reached a level that requires significant (seasonal) storage, the advantages of hydrogen as an energy source (for example efficient storage, little environmental impacts at the point of use) will become fully noticeable.
- For certain applications, even hydrogen produced from conventional energy sources can offer energetic advantages. This applies, for example, to fuel cell systems that may substitute conventional systems (e.g. in cars or industrial combined heat and power systems).
- Decentralised reforming of fossil or synthetic hydrocarbons could contribute to the reduction of costs required for establishing a large-scale hydrogen infrastructure and the gradual development according to demand.

For its market introduction hydrogen will be mostly produced from fossil fuels for the time being. The long-term aim, however, has to be the production of hydrogen from renewable energies. It is difficult to predict which options will ultimately prevail. Any decision still requires a lot of research and development work, particularly realistic tests in practice.



MCFC (hotmodule)
Figure: MTU CFC
Solutions GmbH

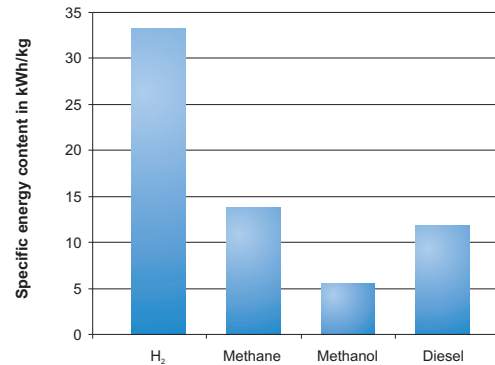
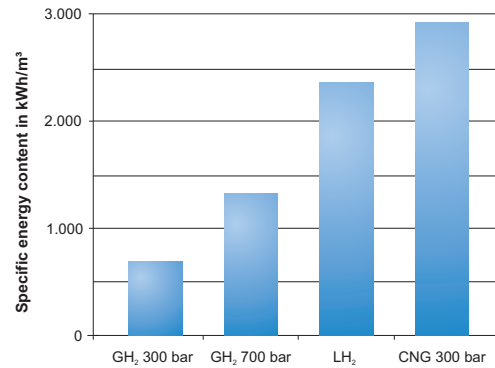
H₂-Glossary

Material characteristics ¹⁾	GH ₂ (gas.)	Methane	Methanol	Petrol
Density ratio based on air	0,09	0,55	1,4	3,2 - 4
Ignition temperature (°C)	585	595	455	220 - 280
Ignition limits (Vol.%)	4 - 75	5 - 16	6 - 36,5	0,6 - 8
Min. ignition energy (mJ)	0,02	0,30	0,14	0,24
Laminar combustion velocity (m/sec)	2,7	0,43	0,48	0,4

¹⁾ Source: TÜV Süd

Specific gravity ²⁾	g / l
GH ₂ (gaseous)	0,0899
LH ₂ (liquid)	70,8
Methanol	793
Methane	0,668
Petrol	700 - 740
Diesel	820 - 855

²⁾ at standard conditions (T=293,15 K, p=1,013*10⁵ Pa) except LH₂



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The Bavarian Hydrogen Initiative - Policies, Projects, Partners -



The Bavarian Hydrogen Initiative

Bavarian Hydrogen Initiative (Wasserstoff-Initiative Bayern wiba) was established in 1996 by the Bavarian Ministry of State for Economy, Transport and Technology with the intention of promoting innovative hydrogen energy technology in Bavaria.

The wiba coordination center was established at the Research Institute for Energy Economy (Forschungsstelle für Energiewirtschaft) in Munich and has the following tasks:

- Public relations on the subject of hydrogen energy technology in the form of brochures, meetings, trade fairs, media work etc.
- Energy economic analyses on the subjects of hydrogen production, logistics and application, as well as fuel cells
- Formulation of a long-term strategy for the promotion of hydrogen energy technology. Thereby the cooperation with other initiatives, within the national strategy group (HYBERT), at the European Hydrogen and Fuel Cell Technology Platform and International Partnership for the Hydrogen Economy gain more and more in importance.

- Initiation of hydrogen and fuel cell projects in Bavaria
- Support of Bavarian companies during project conception

The wiba projects

Since 1997, around 45 projects with a financial amount of approximately 100 million euro received part-funding within the framework of the Bavarian Hydrogen Initiative. These projects cover a wide range of topics, e.g. hydrogen generation, hydrogen logistics and storage, as well as the development and application of fuel cells, including all required system components. Examples :

- Hydrogen project at Munich airport: 13 companies realise the electrolytic production, storage and refuelling of gaseous hydrogen, together with the first public robot-operated refuelling station for liquid hydrogen worldwide.
- Stationary fuel cells (PAFC and MCFC) are in development and tested by manufacturers and utilities. Especially applications with high efficient combined heat and power or tri-generation are a matter of particular interest.

Contacts

The coordination center of the Bavarian Hydrogen Initiative is located at the Research Institute for Energy Economy (Forschungsstelle für Energiewirtschaft e.V.) and is managed by Prof. Dr.-Ing. Ulrich Wagner.

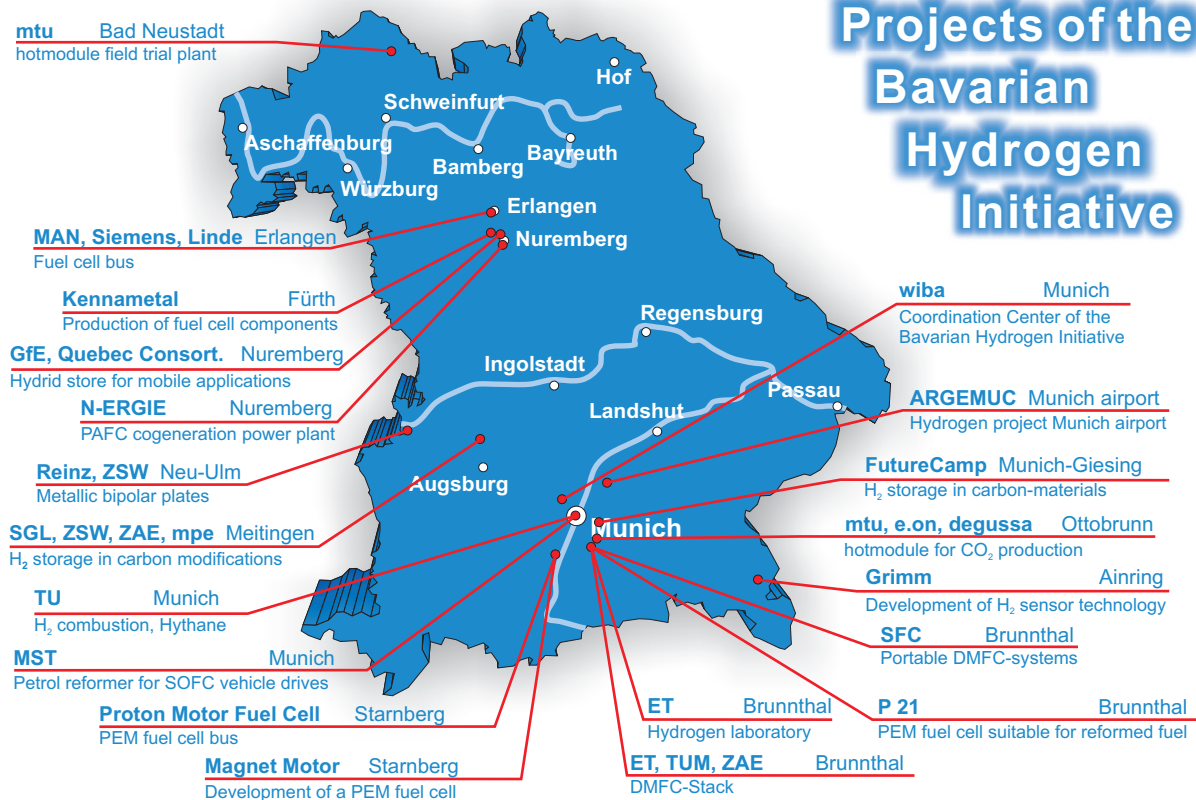
c/o Research Institute for Energy Economy
Am Blütenanger 71, 80995 Munich
Phone: 089 / 15 81 21-0
Fax: 089 / 15 81 21-10
email: wiba@ffe.de
Internet: www.wiba.de

Further contacts:

Dipl.-Ing. M. Beer, Dipl.-Phys. R. Corradini

wiba prospective studies:

- Technologies and systems for hydrogen provision
- Fuel cells for domestic energy supply
- The virtual fuel cell power station
- System comparison of alternative drive technologies
- Energy economic assessment of decentralised CHP-systems for energy supply in homes



Hydrogen production plant
Figure: Linde AG



hydrogen-bus at Munich airport Figure: MAN AG