

Germany National Hydrogen Strategy

H2Global make it



German Hydrogen and Fuel Cell Association



For more than 20 years now, DWV has been advocating the technological development and market introduction of hydrogen technologies.

DWV represents all European member associations of Hydrogen Europe (12 associations - March 2019) on the board of the European Hydrogen Association. Hydrogen Europe is directly involved in the design of the European funding programs of the FCH JU.

The expert commission performing energy is the key market player, which has been working intensively since 2015 to ensure that "green hydrogen" is taken into account in the many regulations on energy system transformation for use in refineries.

We have been able to successfully inspire European, federal and state politicians with our proposals and make a decisive contribution to the consideration of green hydrogen in national and European regulations.





German National Hydrogen Strategy

Federal Ministry of Economics and Energy (BMWi)

Federal Ministry of Transport and Digital Infrastructure (BMVI)

**Federal Ministry of Education and Research (BMBF) and the Federal Ministry for
Economic Cooperation and Development (BMZ)**

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



National Hydrogen Strategy

Goals and ambitions of the Federal Government

With the “National Wasserstoff Strategy” (NWS), the German Federal Government is creating a coherent framework for action for the future production, transport and further use of hydrogen and thus for corresponding innovations and investments.

The NWS defines the steps that are necessary to contribute to achieving the climate targets, to create new value chains for the German economy and to further develop international energy policy cooperation.

In order to achieve these goals, 13 concrete objectives have been defined in the NWS, which are to be achieved with 38 coordinated measures with a funding of 9 Mrd. EUR.



National Hydrogen Strategy

Selected targets of the NWS

Huge potential for International Hydrogen-Partnerships

The German government sees a hydrogen demand of about 90 to 110 TWh until 2030.

Currently 55 TWh/a of H₂ in Germany are currently consumed. The formulation of the NWS allows the conclusion that there is a theoretical potential for the import of green hydrogen of up to **41 TWh by 2030**. This would require an installation of up to 15 GW of electrolysis capacity with a total investment potential of around 30 Mrd. EUR.

Financial Support

To activate the market for green hydrogen imports, the German government's National Hydrogen Strategy provides EUR 2 billion for international partnerships.

Focus on Green Hydrogen

The German government is backing the production of hydrogen with electricity from renewable energies.

This also applies to the import of hydrogen. Here, proof of the additionality of renewable energies will also have to be provided so that hydrogen can be used in Germany to meet climate protection requirements.



Chair renewables and import of green Hydrogen to achieve the European climate targets



Example: Security of energy supply in Germany needs imports of renewable energy

Necessary import of renewable energies for a complete renewable energy supply in Germany

Total demand	national production	Full load hours/a ³	Annual energy production	Need for imports	Percentage of total demand	Percentage of national production
1.000 TWh/a	300 GW	2.330 h/a	699 TWh/a	301 TWh/a	30.1%	100%
1.500 TWh/a	300 GW	2.330 h/a	699 TWh/a	801 TWh/a	53.4%	100%
2.000 TWh/a	300 GW	2.330 h/a	699 TWh/a	1.301 TWh/a	65.0%	100%
2.500 TWh/a	300 GW	2.330 h/a	699 TWh/a	1.801 TWh/a	72.0%	100%

Without green hydrogen and eFuels the import of the required amount of renewable energies is not possible.

+400 billion investment opportunity in hybrid electrolysis, wind and PV power plants.

The demand for electrolysis is in the best case and 680 GW in the worst case. In combination with electricity imports, the demand for electrolysis is 400 GW in 2050.



Climate neutrality until 2050 means 100 % CO₂ reduction

Challenge

Revolutionary technological change:

- Power Industry
- Automotive Industry
- Steel Industry
- Chemistry
- Heating and cooling sector

Geopolitical changes:

- energy supply
- Raw material requirements

or

Opportunity

New Industries:

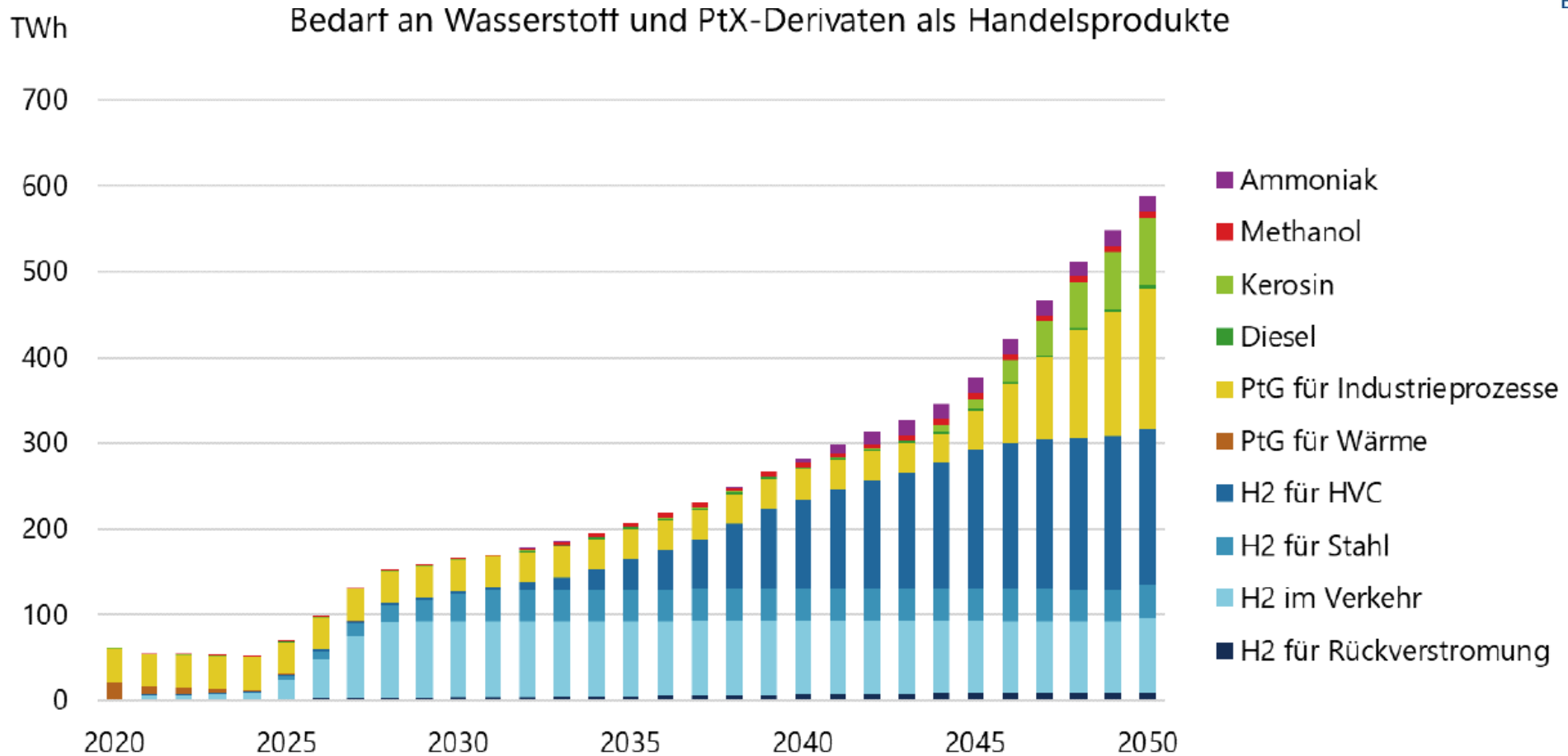
- 200 GW electrolysis (EUR 200 billion)
- 350 GW Wind & PV (EUR 350 billion)
- 300,000 MW fuel cells per year (7.5 billion EUR/a)
- Value added FCEV vs. BEV 50% higher
- Steel industry – Direct-Reduction (EUR 8 billion)
- Chemistry
- Fuel-Cells in Heating

Geopolitical changes:

- Diversification of Energy supply
- Reduction of imports / added value



Green Hydrogen demand of Germany



Kick off for a green hydrogen economy

H₂Global



**Best practice
model for a
European market
incentive
programme!**



Hydrogen Energy Partnership

Pre-competitive hydrogen energy partnerships to build a global renewable energy economy and hydrogen industry.

As part of the National Hydrogen Strategy, the Ministry of Economics intends to provide 2 billion EUR for the development of H2Global by 2023.

The first projects are to be initiated as early as 2021.

In accordance with the European competition and trading regulations.
And copyable for all member states.

H2Global

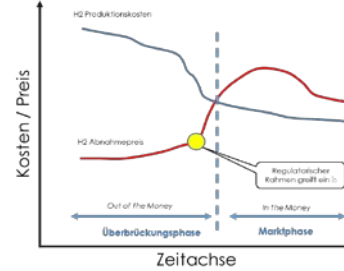


Cornerstones and core elements



Bridging

Immediate creation of instruments for market ramp-up until regulatory framework takes effect



Defined system

- Creation of a system limited to at least 1 GW
- Clear time limit of 10 years



Contracts for Difference

- Compensation payments in the form of CfDs
- Setting up an H2 intermediary: the HYDROGEN INTERMEDIARY NETWORK COMPANY, HINT.CO



Competition

- Auctions (or comparable mechanism) on H2 buy and sell side
- Setting competition-based prices on both sides



Win-win for Everybody

ADD ON

Only additional expansion of renewable energies in the partner countries comes into play with H2Global

Locale value

Share of H2/PtX can be used in partner countries. Production and export of H2/PtX creates local jobs

Pathfinder and technology transfer

H2Global as a basis and opportunity for partner countries to integrate green H2 and PtX into their own energy transition.

International trade

Establishment of H2 and PtX as a new "raw material" for own use and diversification of export structures

Climate targets

The import of green hydrogen and its derivatives contributes to the achievement of European climate targets.

Industry

European hydrogen and RE industry benefits from the construction of plants in partner countries.



**Green hydrogen has the potential to
revitalize the European community**

**Share financial strength with
renewable energy richness**



- H₂** Global: The McKinsey study "Hydrogen, Scaling Up" has identified a market potential of more than \$2,500 billion for 2050 with over 30 million jobs.



- H₂** Europe: Hydrogen Roadmap Europe

Ambitious scenario
2050 hydrogen vision



~24%
of final energy demand¹



~560 Mt
annual CO₂ abatement²



~EUR 820 bn
annual revenue
(hydrogen and
equipment)



~15%
reduction of local
emissions (NO_x)
relative to road transport



~5.4 m
jobs (hydrogen,
equipment, supplier
industries)³

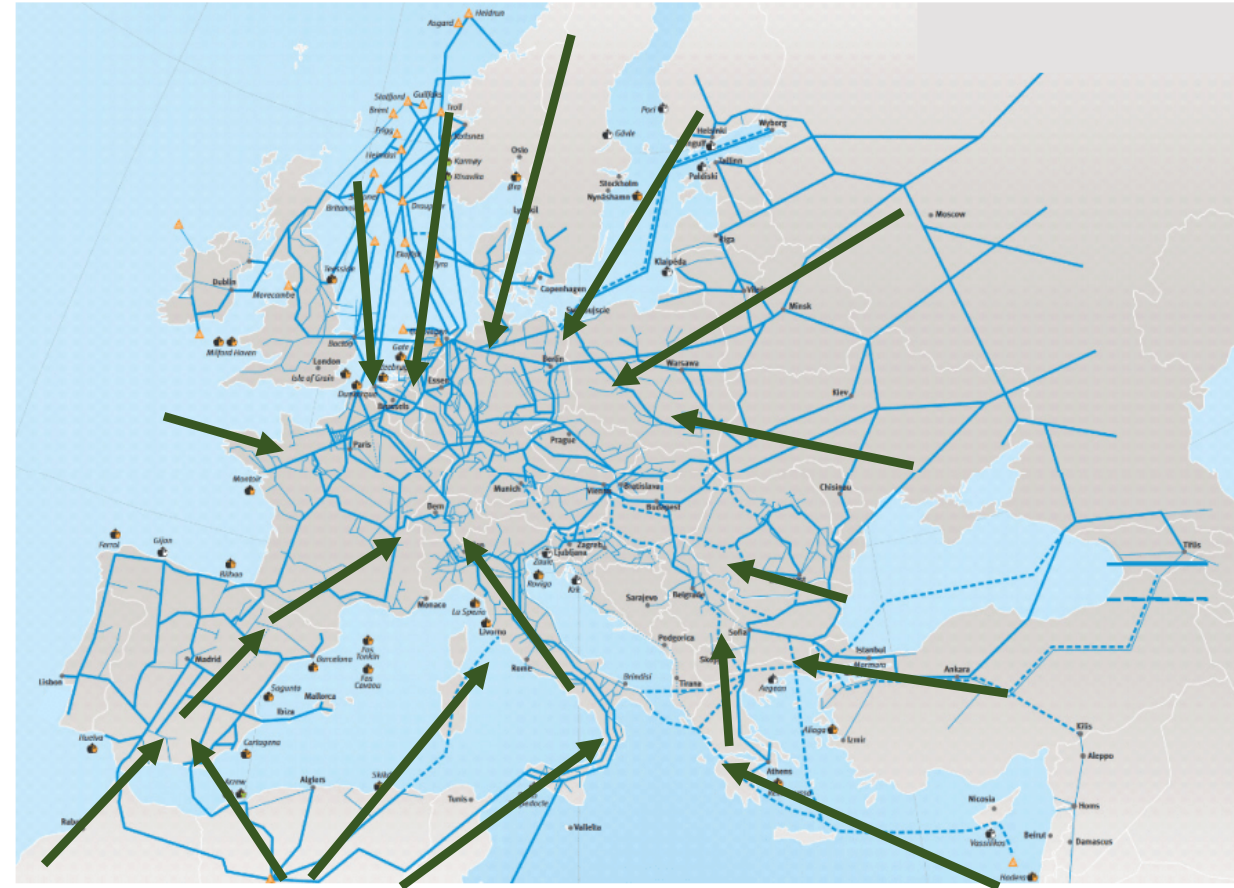
1 Incl. feedstock
2 Compared to the Reference Technology Scenario
3 Excl. indirect effects



Deutscher Wasserstoff- und Brennstoffzellen-Verband

The switch to green hydrogen allows for maximum diversification of supply options.

- West Africa
- North Africa
- Southeast Europe
- Scandinavia
- North Sea
-



European Hydrogen Strategy

Next economic miracle? Next opportunity for EU?

Green hydrogen is the crude oil of tomorrow (statement of the policy)!

The share of crude oil in the total world trade is more than 2.000 billion US-Dollars, which is more than 12 %!

In 2050 this market potential will have to be almost completely converted to renewable energy sources - especially to hydrogen and its derivatives.

This is where it is necessary to make great efforts and not to lose any time if you want to be a global leader.

**Hydrogen
market
2030**

We must act ambitiously now!

Clear economic strategy

Hydrogen Market Demand 2050





Deutscher Wasserstoff- und
Brennstoffzellen-Verband



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