Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg



From mega- to gigawatt Approaches to hydrogen production with electrolysis on a large scale

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G:motion Global digital event of the company Gemue, Juni 8th, 2021



- I. Hydrogen strategies Germany, Europe
- II. Electrolysis plant (alkaline water electrolysis) and examples of implementation
- III. Short introduction to ZSW (Center for Solar Energy and Hydrogen Research)
- IV. Opportunities for industrial developments in the electrolysis technology
- V. Conclusions



The new model of the EU Europe as the first climate-neutral continent

"A European Green Deal I want Europe to achieve even more by becoming the first climate neutral continent.

This includes the first European climate law, with which the goal of climate neutrality by 2050 is to be anchored in law. "

Where does hydrogen have its place?

Without green hydrogen and its synthetic derivatives, neither the climate goals in the transportation sector nor the goal of climate-neutral production in industry can be achieved!







Selected key points:

- Increase of the minimum share of renewable energy in the final energy consumption of the transport sector in 2030 significantly at least 14% above the EU requirements.
- To exempt electricity for green hydrogen from the EEG surcharge is the aim is.
- Funding of plants for the production of electricity-based fuels with € 1.1 billion by 2023, in particular for the production of electricity-based kerosene.
- In addition, a further 7 billion euros for the market ramp-up of H₂ technologies in Germany and a further 2 billion euros for international partnerships.
- Cooperation with partner countries around the world along the entire value chain.
- **Supplementary introduction of fuel cell vehicles,** among other things, in public transport (buses, trains), in parts of heavy-duty road traffic (trucks), in commercial vehicles and in certain areas in cars.
- Check of mixing quota for synthetic fuels with aviation fuel and for green steel.





Why electrolysis applications in Europe? → European hydrogen strategy since July 2020

Hydrogen strategy of the EU: One million tons until 2024

08. Juli 2020 , aktualisiert 08. Juli 2020, 14:19 Uhr

erneuerbaren Energien wachsen.

Bild: dpa



European hydrogen strategy from Juli 8th, 2020

 ".. the first phase (2020-24) ... relies on the installation of at least 6 Gigawatt of renewable hydrogen electrolysers in the EU... leine Agenda für Europa

 In the second phase (2024-30) ... to install at least 40 Gigawatt of renewable hydrogen electrolysers..."

Source: Wirtschaftswoche, 8. Juli 2020

"The hydrogen strategy is intended to advance investments and to mobilize public and private funds for them. According to the commission, between €24 and €42 billion will be needed to build electrolysis plants by 2030. To set up 80 - 120 GW solar and wind power plants for energy supply, an additional 220 - 340 billion euros would be required.

The public support could come from several EU pots, including the Corona reconstruction plan that the EU states are currently negotiating. "

Principles of water electrolysis

In water electrolysis, hydrogen and oxygen gas are generated from water using electrical energy.







Polymere electrolyte membrane electrol. Solid oxide high temperature electrolysis





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ZSW Locations



Stuttgart: Photovoltaics (with Solab), Energy Policy & Energy Carriers, Central Division



Widderstall: Solar Test Facility

Foundation purpose: Industry-related research and technology transfer on renewable energies.





UIm: Electrochemical Energy Technologies with ZSW Laboratory Battery Technologies (eLaB)





ResearchTopics





Use of electrolysis technology **Energy supply for modern city districts**

Energy center of the new west town of Esslingen, a BMWi-project of the initiative "building energy transition"



Electrolysis facility in the energy center

- Hydrogen supply for district supply and mobility.
- 50% heat requirement of the new west town Esslingen quarter from electrolysis waste heat.
- Balance sheet reduction of the CO_2 footprint below 1 to. CO_2 per year & person for mobility and living.







Use of electrolysis technology Energy supply for modern city districts

Energy center of the new west town of Esslingen





1.3 MW PtG-plant at the Grenzach-Wyhlen hydropower plant PtG-lighthouse project Baden-Wuerttemberg

Green hydrogen generation for the chemical industry and mobility purposes





1.3 MW PtG-plant of the PtG-lighthouse project Baden-Wuerttemberg

Installation overview of the hydrogen systems





Electrolysis market ramp-up

Industrialization of a successful development







Hydrogen production plant with alkaline electrolysis (AEL)

From the container system to the modular system





"Electrolysis made in Baden-Wuerttemberg, BW-Electrolysis" (04.2020 – 12.2022)

Initiation of electrolysis and component production in the country



→ Value creation potential, recommendations for action

Industry dialogue: qualification & activation of industry



→ Initiation of electroyIsis production & strengthening of supplier industry



Technology & Innovation



→ Efficient and marketable technology modules

MW-class electrolysis "made in Baden-Wuerttemberg"



→ System demonstrator with high added value in BW

Electrolysis: structure and added value shares

Main components of an AEL-plant





Gas processing



Cooling system







Electrolysis stack



Closed lye loop





Power electronics





- I. Hydrogen (H₂) is the key to the energy transition it can be used in all energy sectors
- II. The market ramp-up for electrolysis systems is now beginning
- III. Despite the new technology, many components / subsystems are available or can be adapted
- → Position yourself get into hydrogen technology!





THANK YOU FOR YOUR ATTENTION! ANY QUESTIONS?

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