FACTSHEET
PHOTOVOLTAICS and HYDROGEN

Photovoltaic expansion enables green hydrogen

Green hydrogen offers a wide range of potential uses and will therefore play a key role in the energy transition. Photovoltaics (PV) and hydrogen (H2) complement each other synergistically: PV can provide the necessary energy for the production of hydrogen at low cost, while the storage of hydrogen compensates for the volatility of electricity production by PV. In this way, the necessary balancing of electricity production by renewable energy producers and short, medium and long-term storage for the continuous supply of consumers can be achieved.

Storing photovoltaic power

Photovoltaic electricity can be made available for all applications through storage. Hydrogen offers additional opportunities to store photovoltaic electricity in scalable, large quantities in the medium and long term. The flexible use of the stored hydrogen as a process medium or as electricity (via fuel cells) makes this form of storage particularly versatile.

Hydrogen in mobility

30% of GHG emissions in Austria are caused by transportation. Mobility accounts for the highest proportion of fossil fuels at over 90 %. Electromobility with rechargeable batteries and fuel cells is an emission-free technology. Fuel cell vehicles are also part of electromobility, in which the fuel cell is only used as an energy converter, while the energy storage is a hydrogen tank. Hydrogen is stored at high pressure in a tank, in the cell it is oxidized with oxygen from the air and supplies electricity; the only exhaust gas is water. By separating the energy storage and energy converter, significantly higher energy densities and vehicle ranges are possible even at low temperatures. While electromobility with batteries is ideal for short distances with low loads, the fuel cell as a gravity electromobility system is ideal for short refueling times and long ranges. Hydrogen plays a major role as an energy source in mobility. Particularly in the area of heavy vehicles such as buses, trains, trucks and construction machinery, the necessary amounts of energy can be quickly refueled and easily stored. Photovoltaic electricity therefore also contributes to the decarbonization of transport.

Photovoltaics enables green hydrogen

- Photovoltaics is a price-stable source of electricity
- Photovoltaics has a high expansion potential for the necessary H2 production
- Photovoltaics enables local and CO2-free production of hydrogen

Green hydrogen for decarbonization...

- Expands the storage options for photovoltaic electricity
- Enables the rapid decarbonization of heavy goods vehicles, for example

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Photovoltaic expansion and green hydrogen

The energy transition requires the strong expansion of renewable energy generation. Areas with a high potential for solar power can be developed to their full potential using green hydrogen in a grid-friendly and grid-supporting manner. In addition, green hydrogen produced locally and supported by solar power is cheaper than long-distance transportation.

Decarbonization in industrial and commercial processes

Photovoltaics enables the production of large quantities of green, CO2-free hydrogen. The use of this hydrogen and related derivatives as an energy carrier or process medium (e.g. ovens or chemicals) in industrial processes enables completely climate-neutral production. Powered by electricity, electrolysers chemically break down water into oxygen and hydrogen. The electrolytic production of hydrogen as an energy source is emission-free with efficiencies of around 50 to 80 %. The replacement of fossil fuels in industry must be considered separately depending on the process; in the steel industry, for example, hydrogen could replace carbon as a reducing agent.

Decentralized use of photovoltaic power

With hydrogen, photovoltaic electricity offers an ideal opportunity to generate large amounts of energy efficiently on site, transport it over long distances in a grid-friendly manner and directly connect existing storage capacities. Plants are successfully in operation, currently with outputs up to the MW range. Hydrogen can be stored practically indefinitely, in tanks, in underground storage facilities or fed into the gas grid. As a carbon-free energy carrier, hydrogen enables a materially closed and completely emission-free energy cycle with electrolysers and fuel cells.

Hydrogen produced with PV electricity:

- Is grid-friendly
- Enables the decarbonization of many sectors
- Reduces fossil imports and costs for energy and CO2 certificates

Fig.2 : Production of green hydrogen in Austria using the example of Mpreis. In the electrolyzer, water is broken down into hydrogen (H2) and oxygen (O2) using electrical energy. While the oxygen is released back into the atmosphere, the hydrogen is stored under pressure. This can then be used as a valuable fuel. Only green electricity, primarily PV electricity, is used for electrolysis. The electricity generated from hydrogen supplies energy for trucks and the company's bakery, among other things.

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