



Press release
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"Green iron" - the underestimated source of hydrogen

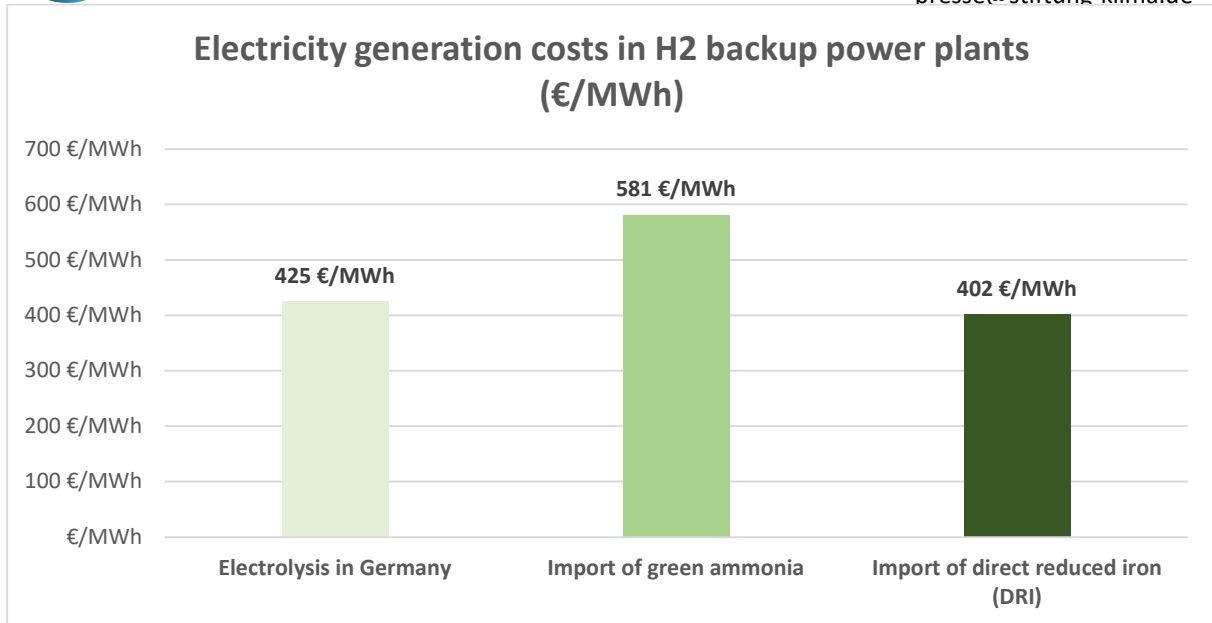
Hydrogen is seen as the key to a climate-neutral energy industry and the decarbonization of the steel industry. The cost of hydrogen production and storage remains a major challenge on this path. However, there are more and more cost-effective technological solutions than previously known. The Climate Neutrality Foundation (CNF) points this out in a new study. CNF Director Rainer Baake: "The production of hydrogen from iron is extremely promising. Green iron is an energy storage medium that can be stored relatively easily and cost-effectively and can be used to produce large quantities of climate-neutral hydrogen at the power plant site as required." In the "Iron to Hydrogen" (I2H) technology, iron ore is reduced directly to pure iron at non-European sites using low-cost renewable energies with the help of hydrogen and then re-oxidized with water in Germany, releasing hydrogen in the process.

On behalf of the Climate Neutrality Foundation, the renowned Norwegian consultancy and assurance firm DNV has carried out a cost comparison between different ways of producing and storing green hydrogen. The results show that backup power plants that produce electricity with hydrogen based on imported green iron (I2H - Iron to Hydrogen) are likely to be more cost-effective than power plants that use green hydrogen from a German or European pipeline network. Generating electricity from hydrogen from cracked green ammonia would be much more expensive than the first two options.

A first plant for the direct reduction of iron ore using hydrogen produced with very cheap electricity from photovoltaic systems is currently being built in Namibia and will start production at the end of this year (2024). Imported green iron can be used not only for steel production, but also for electricity generation. Baake: "We therefore recommend taking the use of green iron into account when drafting the Power Plant Safety Act."

In the opinion of the CNF, it also seems advisable to consider the iron-to-hydrogen process for supplying backup power plants with green hydrogen in terms of expansion speed and security of supply. The methods currently envisaged as part of the power plant strategy for the storage and supply of hydrogen are likely to have physical expansion limits, such as the availability of natural caverns for intermediate storage. In the provision via the ammonia cracking process, for example, the number of crackers required, and secure transport infrastructure represent a growth limit.

The key components "generation, transportation and storage" of the three variants examined for the provision of backup capacities each have different degrees of technological maturity. Only actual operation will show which technologies will prevail and to what extent. In addition to costs, the actual availability of pipeline hydrogen and green iron will also play a role; criteria such as resilience must also be taken into account.



The hydrogen for the power plant can be supplied as follows:

- **Electrolysis in Germany:** this generates costs of €425/MWh
- **Import of green ammonia:** At 581€/MWh, this value chain has the highest costs of the three methods compared, mainly due to the very high costs of ammonia cracking and the higher costs of ammonia storage
- **Import of directly reduced iron:** With electricity generation costs of €402/MWh, this method of H2 provision has the potential to generate the lowest costs of the three value chains examined. In addition, DRI is also suitable for long-term storage and enables the decentralized supply of hydrogen, even at locations without a connection to the H2 backbone.

The costs include all elements of the value chain (including generation, transportation, storage, reconversion to electricity).

Further information:

The new study by the Climate Neutrality Foundation is entitled "Securing Green Hydrogen for the German Power Sector" and is available to download free of charge: <https://www.stiftung-klima.de/de/studie/>

About the Climate Neutrality Foundation

The Climate Neutrality Foundation began its work in Berlin in July 2020. Its aim is to identify ways to achieve climate neutrality. It develops cross-sector strategies for a climate-friendly Germany in close cooperation with other think tanks. Based on good research, the foundation aims to provide information and advice - beyond individual interests. www.stiftung-klima.de

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