



By: *Gordon Feller*

Hamburg and Hydrogen's Next Stage



While calling for an urgent energy transition, Germany's Federal Ministry for Economics and Climate Protection has set a new national target to reduce annual emissions three times faster than previously planned.

Advocates pushing green hydrogen are citing numerous advantages:

- It does not emit polluting gases either during combustion or (if done correctly) during the production process.

- It is easy to store, allowing it to be used for other purposes and at other times than when it was produced.

- It is versatile, insofar as it can be transformed into electricity or synthetic fuels and used for commercial, industrial, and mobility purposes.

- It is transportable, since it can be mixed with natural gas up to 20% and travel through the same channels and infrastructures as gas.

However, green hydrogen must face up to some real challenges. Much of the core equipment, and the enabling technologies, are all still expensive.

At the current time these must be custom-made, since production is not fully developed. With barely any operating network of hydrogen plants, the hydrogen itself cannot yet be produced at a cost which is close to parity with diesel.

Secondly, the high cost of vehicles: vans, lorries. Despite the obvious benefits -- from an environmental, social and image point of view -- only a few operators are actively purchasing them.

Hamburg boasts a dense network of hydrogen projects across various sectors, including industry, mobility, and maritime.

Frontrunner in the European hydrogen market

Many projects are currently in the planning or implementation phase, showcasing the city's commitment to hydrogen development. EU funding and ongoing efforts position Hamburg as a frontrunner in the European hydrogen market.

The hydrogen project landscape in Hamburg is undergoing significant development, with the Hamburg Green Hydrogen Hub (HGHH) project being a major focus.

This project aims to convert a former coal-fired power plant into a facility producing green hydrogen

This project aims to convert a former coal-fired power plant into a facility producing green hydrogen (generated from renewable energy) by 2026.

A 100-megawatt electrolysis plant is central to this project, and it has received €250 million in funding from the European Union (EU) as part of the "Important Projects of Common European Interest (IPCEI) Hydrogen" initiative.

If permits are granted on schedule, the project is expected to contribute to Hamburg's energy transition goals and provide green hydrogen to industries in the city.

Four substantial companies -- Shell, Mitsubishi Heavy Industries, Vattenfall, and Hamburg GmbH -- have formed HGHH. They are working to jointly produce hydrogen from wind and solar power at the site of the Hamburg-Moorburg power plant in northern Germany.

They are designing their project in such a way that it will be ready to utilize hydrogen supplied from the immediate vicinity.

Green energy hub

Their initial focus is on the construction of a

scalable electrolyzer with an initial output of 100MW. They are aiming to further develop the site, in keep with an ambitious goal: turning it into a “Green Energy Hub”.

This includes transforming the existing infrastructure at Moorburg such that it can be used to the produce energy only from renewable sources. This involves organizing logistics chains and storage options for the hydrogen. Once the site has been cleared, the production of green hydrogen is anticipated to begin in 2025 - making this particular electrolyzer one of the largest in Europe.

In order to link local production, cross-regional infrastructure and users, Gasnetz Hamburg is planning to set up an industrial hydrogen network.

Furthermore Gasnetz Hamburg joined forces with HGHH and a few others -- Airbus, ArcelorMittal, Greenplug, Hamburger Hafen und Logistik AG, Hamburg Port Authority, HADAG Seetouristik and Fährdienst – in order to form the Hamburg Hydrogen Network.

Their focus is jointly the producing, transport and utilizing green hydrogen in the Hamburg port area. Additional related projects involve Aurubis, Stadtreinigung Hamburg and Hamburger Energiewerke, each of which are also pursuing specific projects to establish a strong hydrogen economy in the region.

The companies recognized that hydrogen has the potential to do much more than efficient power storage

Meanwhile, ADM, Cargill, GP Joule, Greenplug, H&R-Group, Hobum, Nynas, Sasol, Speira und Trimet also have announced their own related plans.

All of these companies have come to recognize that hydrogen has the potential to do much more than efficient power storage.

For instance, Wärme Hamburg has pledged to make available all sources of waste heat and to

utilize this climate neutral heat.

Funding under EU’s program

According to Christian Heine, CEO of Wärme GmbH and Gasnetz Hamburg, “this is the reason why Wärme Hamburg decided, to take part in the electrolyzer project. In addition, we want to evaluate if we can use the existing infrastructure at the Moorburg site, also to use other, additional forms of renewable energy. Moorburg has the potential to become an innovative urban hub for renewable energies.”

The four HGHH partners applied for funding under the EU’s large-scale program known as “Important Projects of Common European Interest” (IPCEI).

This funding was committed in the first quarter of 2021. The EU and the partners determined that Moorburg is the ideal location because it can be connected there to the national 380,000 volt transmission network, and to the City of Hamburg’s own 110,000 volt network.

In addition, overseas ships can call at the location directly, using the quay and port facilities as a dedicated import terminal.

"We have direct access to the supply of green electricity from wind power - and thus the possibility of actually producing green hydrogen in relevant quantities" - Michael Westhagemann

Affirming this choice of location has been the Minister for Economy and Innovation of the Free and Hanseatic City of Hamburg. In that capacity Michael Westhagemann said that “there is no better location in Hamburg for a scalable electrolyzer of this size. Via the 380 kV connection and the connection to Brunsbüttel, we have direct access to the supply of green electricity from wind power - and thus the possibility of actually producing

green hydrogen in relevant quantities.”

Furthermore, he’s indicated in numerous speeches and media interviews that he and his government are firmly committed to a long-term decarbonization of the port.

The municipal gas network company intends to expand a hydrogen network in the port during the next ten years, and is already working on building out the distribution infrastructure.

Major lever for reaching climate goals

Numerous potential customers for green hydrogen are located near the site. This will enable the project to cover the entire hydrogen value chain: from generation to storage, transport and utilization in various industrial sectors.

With these prerequisites, the Moorburg location is deemed to be optimal by the German government, since it is the designated starting point for developing a nation-wide hydrogen economy.

The CEO for Energy Systems at Mitsubishi Heavy Industries, Kentaro Hosomi, said “the establishment of a green hydrogen hub that is fully integrated into Hamburg’s industrial infrastructure would show Europe and the world that the hydrogen economy is real and can make a significant contribution to the decarbonization of the energy system and heavy industry.”

For many years, Moorburg was the site of a gas-fired power plant operated by Hamburgische Electricitäts-Werke Co. Vattenfall had been operating a coal-fired power plant here since 2015.



Moorburg power plant won a bid in the auction for the nationwide coal phase-out in 2020

Its commercial operation was terminated after the power plant won a bid in the auction for the nationwide coal phase-out in 2020. A decision to go forward was made by the transmission system operator in 2021. The City of Hamburg and Vattenfall are working towards clearing some areas at the site, as soon as possible.

Among the key advocates for the HGHH is Jens Kerstan, Chairman of the Supervisory Boards of Wärme Hamburg GmbH and Gasnetz Hamburg GmbH. He serves as the Free and Hanseatic City of Hamburg’s Minister for the Environment and Energy.

Kerstan announced that, “for Hamburg as a city that embraces the energy transition, this agreement is a vital step.”

“At the Moorburg site, we will be producing green hydrogen on a large scale in collaboration with experienced partners from industry, while at the same time establishing a Green Energy hub for climate-friendly energy. This project will be a major lever for reaching our climate goals,” said Mr Kerstan.

According to Andreas Regnell, Vattenfall’s Head of Strategic Development, “production of fossil free hydrogen is one key to the decarbonisation of the industry and the transport sectors.”

“Vattenfall wants to enable fossil free living within one generation and we have high ambitions to grow within renewable energy production in the markets where we operate,”

said Andreas Regnell.