INP Reference

Feasibility study H2 energy park

LOCATION: Germany

SYSTEM/TECHNOLOGY: Renewable energy / H2

SERVICES: As-built status and data recording, Solution development / Feasibility studies

INDUSTRY BRANCH/TYPE OF PLANT: Green Energy

CLIENT: Energy supplier (subject to NDA)

ACTIVITY PERIOD: 2023-2024

Project description

In a number of German and European supply areas, there is a rapid expansion of renewable power generation capacities through photovoltaic and wind power plants. Due to the large number of feed-in applications and political objectives, a significant increase in renewable energies is expected. Even today, the capacity of these plants is at times more than three times higher than demand, and excess electricity from photovoltaic and wind power plants has to be fed into the higher-level grid.

The aim of this feasibility study is to investigate the technical and economic feasibility of hydrogen production in energy parks, including pipeline-based hydrogen supply to industrial customers, hydrogen admixture in the natural gas grid, hydrogen filling in trailers and the construction of a battery storage system.

The plant design was developed accordingly for two expansion stages: a first expansion stage with an electrolysis capacity of 20 MWel and a second expansion stage based on the limitation of a maximum available area corresponding to the maximum size. The electrolysis plant could be designed for up to 80 MWel. With the background of a phased expansion in the corresponding planned scale, two different construction methods (container and building) including all associated ancillary and H2 processing plants were considered, as were different electrolysis technologies (PEM and alkaline). The latter also particularly under the aspect of the planned plant operation.

In order to support the most efficient and economical operation of the plant, both in the design and in real-time operation, a specially developed digital twin was created and used in the design of the study. This also allowed energy-economic framework conditions to be mapped, such as the 37th BImSchV [Thirty-Seventh Ordinance on the Implementation of the Federal Immission Control Act of Germany] and fluctuating energy procurement costs.

INP Services

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- Comparison of electrolysis technologies with evaluation and recommendation
- Component selection
- Technical conceptual plant design and planning of an H2 plant including ancillary plants for an electrolysis output of 20 MWel expandable to 80 MWel in container and building design
- Drafting of a concept including a functional diagram and pre-dimensioning of essential plant components
- Presentation of alternative solutions
- Presentation of the required approval procedures
- Creation of a cost framework for the different versions in terms of investment and plant operation