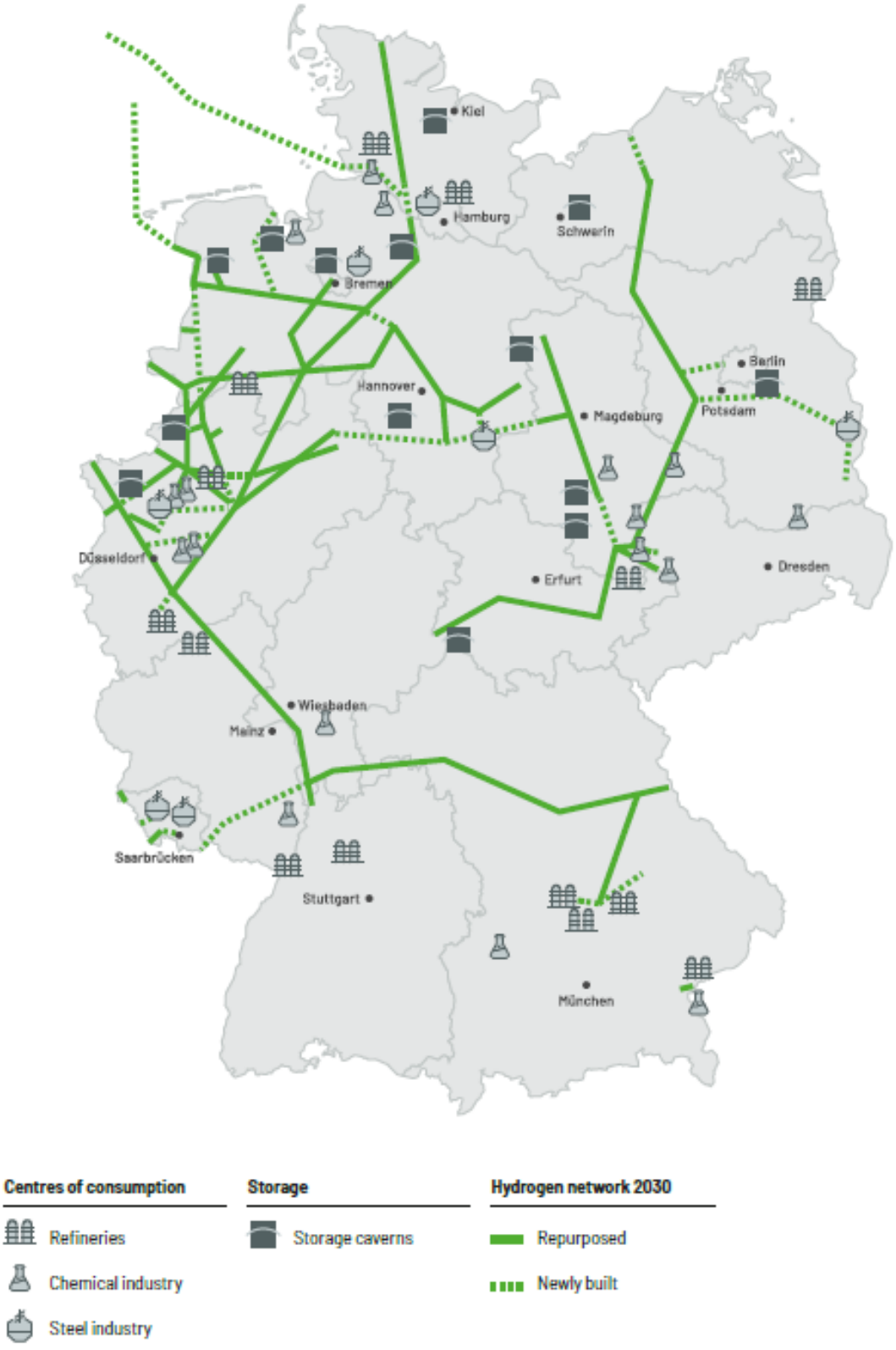
# Hydrogen network 2030: towards a climate-neutral Germany



*Germany needs a hydrogen infrastructure because hydrogen is the only viable option on the way to an efficient, safe, affordable and climate-neutral energy supply. An effective national hydrogen infrastructure is indispensable especially when it comes to integrating volatile renewables and making sure that supply meets demand at all times.*

With their hydrogen network 2030 (H2 network 2030), the German gas transmission system operators (TSOs) present solutions showing how the need for transportation capacity in a dynamic hydrogen market can be met across Germany in a timely manner.

Compared to the "starter network" announced by the gas TSOs as part of their Gas Network Development Plan 2020-2030 (Gas NDP) last year, the H2 network 2030 is much larger and is also accommodates the new volume target that comes with a significantly higher national hydrogen demand of about 90 to 110 TWh, as defined in the National Hydrogen Strategy.

Linking hydrogen production and consumption will allow a pipeline-based hydrogen transmission infrastructure to be developed in the near future.

## Underlying assumptions for H2 network 2030

The gas TSOs began their scenario analyses and planning work for the future hydrogen transmission network in spring 2020. The work is based on a scenario for the production and use of hydrogen in Germany **developed together with the consulting firm 4Management on the basis of the recognised dena pilot study I (TM95)**.[1]

In addition to the forecast for 2050, the scenario also includes energy consumption rates for 2030, which were used by the gas TSOs for network planning for 2030 and 2050. For the period up until 2030, it has been assumed that pipeline capacities will be determined mainly by the demand for hydrogen in the steel, chemical and refinery industries.

## H2 network 2030 parameters

The total length of the H2 network 2030 is about **5,100 km**, some **3,700 km** of which are repurposed natural gas pipelines.

The underlying scenario for the H2 network 2030 assumes that there is a **71 TWh demand for hydrogen** (net calorific value) as an energy source and feedstock. Quantities that will probably also be used in 2030 as part of various process chains involving methane are not included in this figure.

In the simulation, the H2 network 2030 met a **peak demand of around 10 GWh/h** of hydrogen. Quantities required by the transport and heating sectors will presumably not (yet) be shipped via the hydrogen network for the most part until then, but will predominantly be generated locally.

**Capital spending until 2030** is expected to amount to about **6 billion euros**. This estimate includes investments for transmission pipelines including compressors, which are required for Germany-wide hydrogen transportation.

[1] FNB Gas (2021): Scenario Framework of the Gas NDP 2022-2032, p. 39

## H2 network planning details

The H2 network 2030 is based on a simulation of the fluid mechanics. For this purpose, the TSOs defined specific capacities at all entry and exit points of the future network, which meant regionalising the capacities assumed in the scenario for the industrial sector. For the chemical industry and the refineries, these capacities were based on the production volumes currently available at sites that can be reached by pipeline by 2030. For the steel industry, the simulation relied e.g. on the demands reported by the companies in the market survey for the green gas variant as part of the Gas NDP 2020-2030, as these demands were already above those of the study used.

In the simulations, future hydrogen demand is primarily met by imports. The capacities at the cross-border IPs are based on the assumed hydrogen production potential in the different regions. Given the power-to-gas expansion targets defined in the National Hydrogen Strategy, the TSOs included 5 GW of electrolyser capacity for 2030, most of which is located in northern Germany.

For the design of the network, the TSOs considered various load scenarios depending on the availability of renewables and cavern storage capacity connected to the pipeline network.

## Outlook

In their current Gas Network Development Plan 2022-2032, the gas TSOs are working on a hydrogen network for 2032, which, unlike the scenario-based H2 network 2030, will be modelled according to demand and will be based on the results of the Hydrogen Generation and Demand Market Survey. Given the different approach (demand-based vs. scenario-based), the two networks will show some differences which can only be harmonised as part of the Gas NDP.

The planning work for the 2030 network will help prepare the ground for the Gas NDP 2022-2032. With their detailed scenario-based analysis involving network simulations, the TSOs are also charting the political course for an efficient national hydrogen transmission infrastructure and for capturing early decarbonisation opportunities through the use of hydrogen.