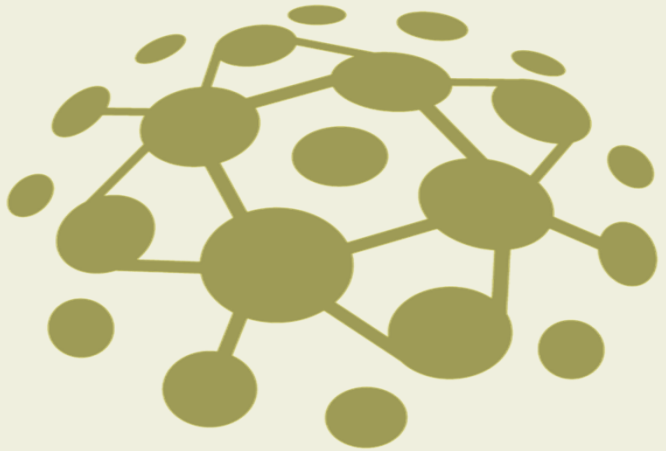

Hydrogen and SNG demand in Austrian Industry

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IETS-19 workshop on Electrification of Industry @ NEFI Conference, 14th of October 2022

Future demand - Austrian Hydrogen Strategy

Total demand for renewable gases in Austria in 2040

(Source: Austrian hydrogen strategy (data based on the study Baumann et al., 2021 "Erneuerbares Gas in Österreich 2040: Quantitative Abschätzung von Nachfrage und Angebot." where EI-JKU was a project partner)

- Hydrogen demand about 60 TWh
  - Chemical industry (about 47 %)
  - Steel industry (about 38 %)

- There is a need for 4,5 TWh SNG
  - Steel industry (about 73 %)
  - Chemical industry (about 27 %)

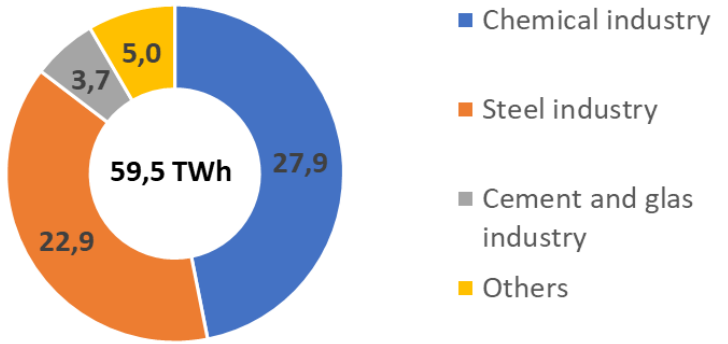

Figure: Hydrogen demand in industry 2040 (acc. to Austrian Hydrogen Strategy)

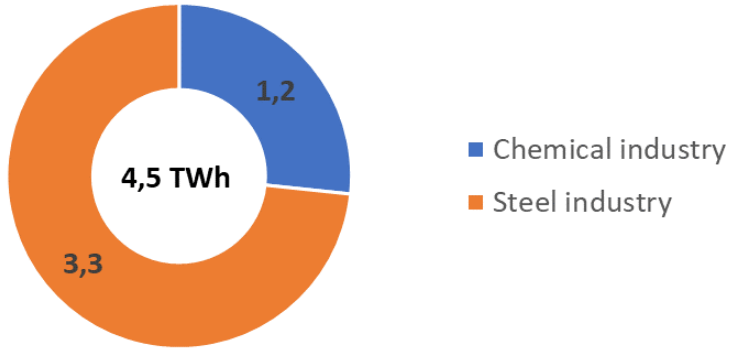

Figure: SNG demand in industry 2040 (acc. to Austrian Hydrogen Strategy)

Future demand - Austrian Hydrogen Strategy

Total demand for renewable gases in Austria in 2040

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- The demand for gaseous energy carriers in the industry sector remains the same
- There is a shift from the use of natural gas to renewable hydrogen

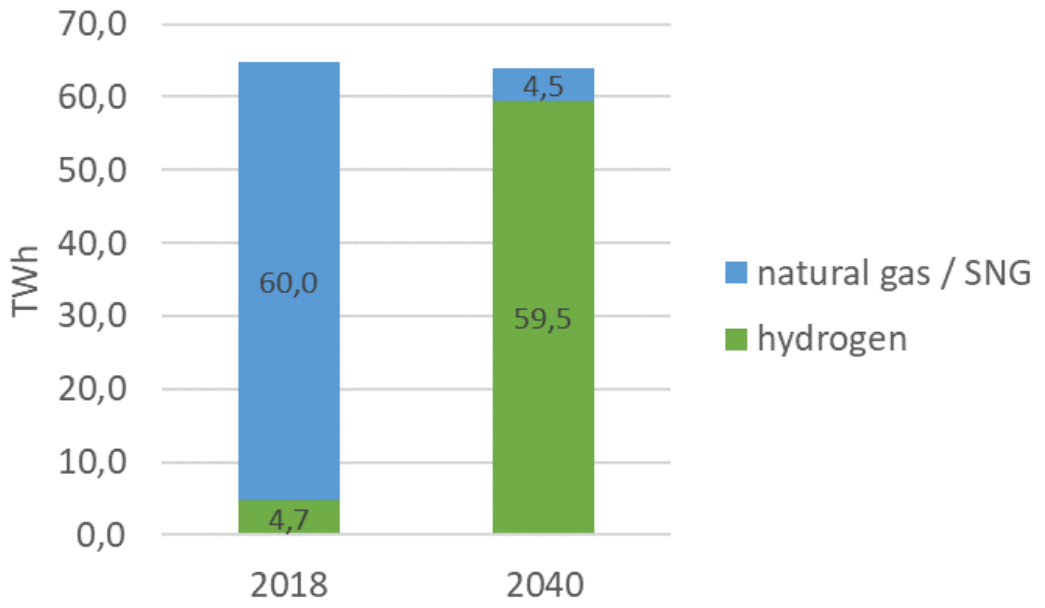

Figure: Current and future demand in industry 2040

Future demand – different scenarios for industry

- In general, scenarios have a wide range - from 20 to 60 TWh
- Different time horizons until climate neutrality (2040 / 2050) - Austria has set itself the goal of being climate neutral by 2040
- The Austrian Hydrogen Strategy has the most ambitious scenario with the highest use of hydrogen in the industry
- In (AGGM, 2021) hydrogen is mainly used in the steel industry – the other sectors are decarbonized by electrification or by the use of biomethane

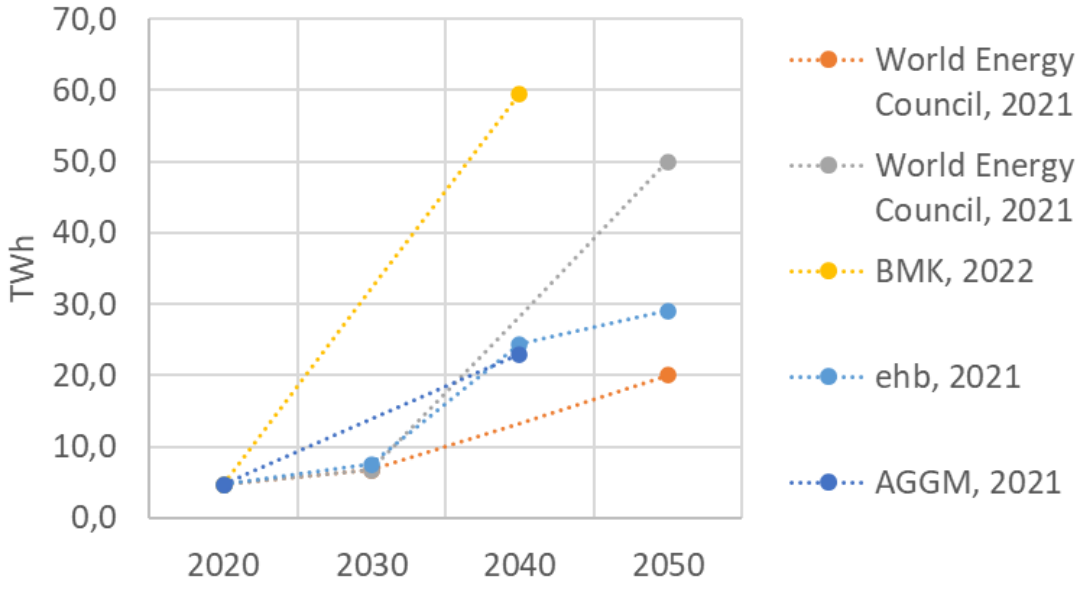

Figure: Different scenarios for the future development of the hydrogen demand in the Austrian industry sector – a literature analysis

Future demand – steel industry

Hydrogen demand steel industry in Austria – climate neutrality by 2040/2050

- Studies conducted in Austria estimate the demand to be significantly higher than studies conducted in Europe for Austria.

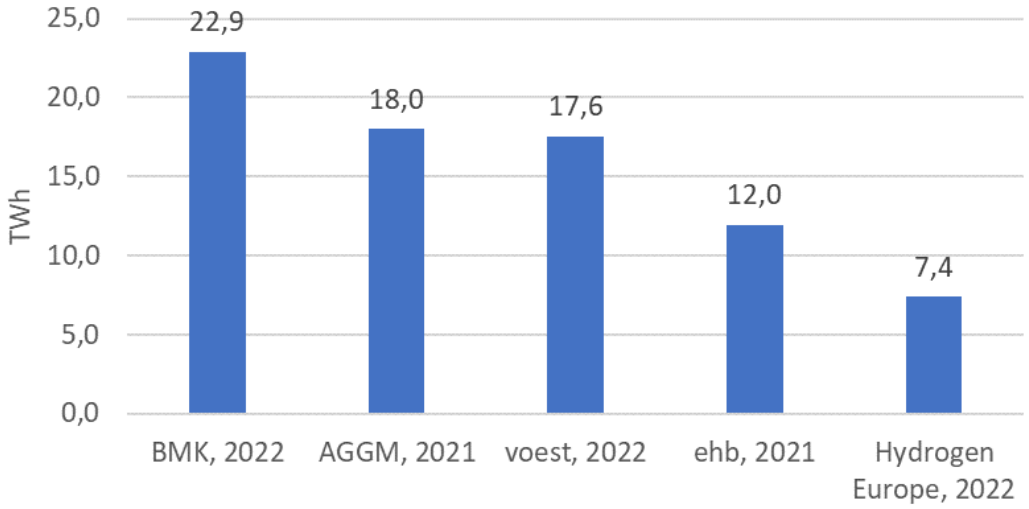

Figure: Future hydrogen demand in the Austrian steel industry according to different literature sources.

Future demand – steel industry

What does a hydrogen demand in the steel industry of about 20 TWh mean?

- … would require a nominal electrolysis power of about 4.4 GW
- … there is an annual need for app. 35 TWh of renewable electricity to operate the electrolysis plant.

Challenges …

- Size of the electrolyzer: For comparison, electrolysis plants currently planned for the year 2030 have a nominal electric power in the range of about 100 MW
- Required space at the site in Linz is limited
- Renewable electricity demand: For comparison, in 2020, in total, about 56 TWh of renewable electricity was generated in Austria. Even the expansion targets of an additional 27 TWh by 2030, will not be sufficient.
- Electricity grid

→ build up an infrastructure for **hydrogen imports** to support domestic production and provide a cost-effective mix of renewable hydrogen for the local players.

Future demand – chemical industry

Hydrogen demand chemical industry in Austria – climate neutrality by 2040/2050

- About 28 TWh (acc. to the Austrian hydrogen strategy)
  - 3.1 TWh for ammonia production, and 24.8 TWh for methanol production
- (AGGM, 2021) about 4.1 TWh (in total 9 TWh, the rest is covered by liquid fuel imports)
- For comparison (ehb, 2021) for ammonia production: much lower, about 1.5 TWh

→ Still quite different forecasts for the hydrogen demand in the chemical industry in Austria. Depends very much on the selected framework conditions - technologies used, development of the chemical industry in general, ...

→ However, the chemical industry faces the same challenges with hydrogen supply as the steel industry - collectively, the challenges are even greater.

Uncertainties and challenges

- Influence of new manufacturing processes - industrial stack production
- Large-scale plants - from when are they built on a large scale and are available? Long delivery times, setting up production structures
- Development of (Current and) future electricity prices?
  - Spot market prices, Power purchase agreements, politics, incentives, funding
- Development of fossil benchmarks (natural gas, …)
  - Spot market prices, new partnerships, new structures, politics, … changes in hydrogen import share
- Change in the value-added shares in the transformation to a climate-neutral industrial sector (new investments done in Austria, …)
- Expansion of the infrastructure, e.g. European hydrogen backbone, …

Thank you!

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