# VERBUND Green Hydrogen GmbH
# Local and global ways to supply Europe with green hydrogen

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Green Hydrogen

Verbund

# Verbund at a glance

Austria's **leading** energy utility and electricity company

Route length of around **3,400** supra-regional electricity grid kilometres


**130** VERBUND hydropower plants with over 8,300 MW of maximum electricity capacity

And approximately **900** gas transmission pipeline kilometres

**98%** of the total electricity generation stemming from renewables

Active RES positions in AT, DE, RO, ES, IT and AL with capacity expansion to

**>25%** by 2030

# **Strategy 2030** – Accelerating the energy transition - focus on the three strategic directions and the goal of further growth

## Expansion of Renewables in Europe

Significant expansion of wind & solar power in Europe

## Positioning as European Hydrogen player

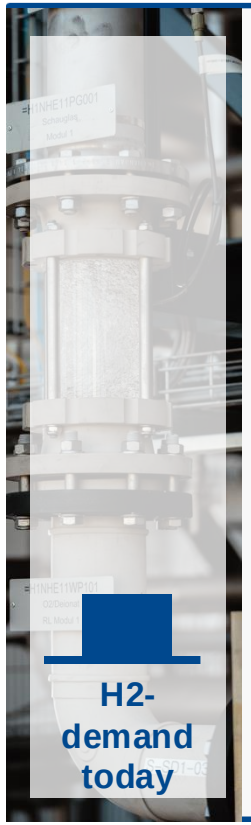
Green Hydrogen as key to the energy transition and decarbonisation

## Strengthening of integrated domestic market

Strengthening our position as an integrated provider in the domestic market and a leading hydropower producer, reliable gas and electricity grid operator, and partner in decarbonisation in Austria and Germany.

# VERBUND's holistic hydrogen strategy for positioning in the European hydrogen market

## VERBUND as a short- and long-term decarbonisation partner for industry: current and future demand forms the basis for VERBUND's H2 business development




**S H O R T  T E R M**

**Local production today**

- Initiating H2 market development
- Meeting existing demand
- Replacing grey H2 with green H2
- Building partnerships
- Ramp up from pilot to industrial scale

**L O N G  T E R M**

**$H_2$-Import**

Securing long-term volumes at competitive costs

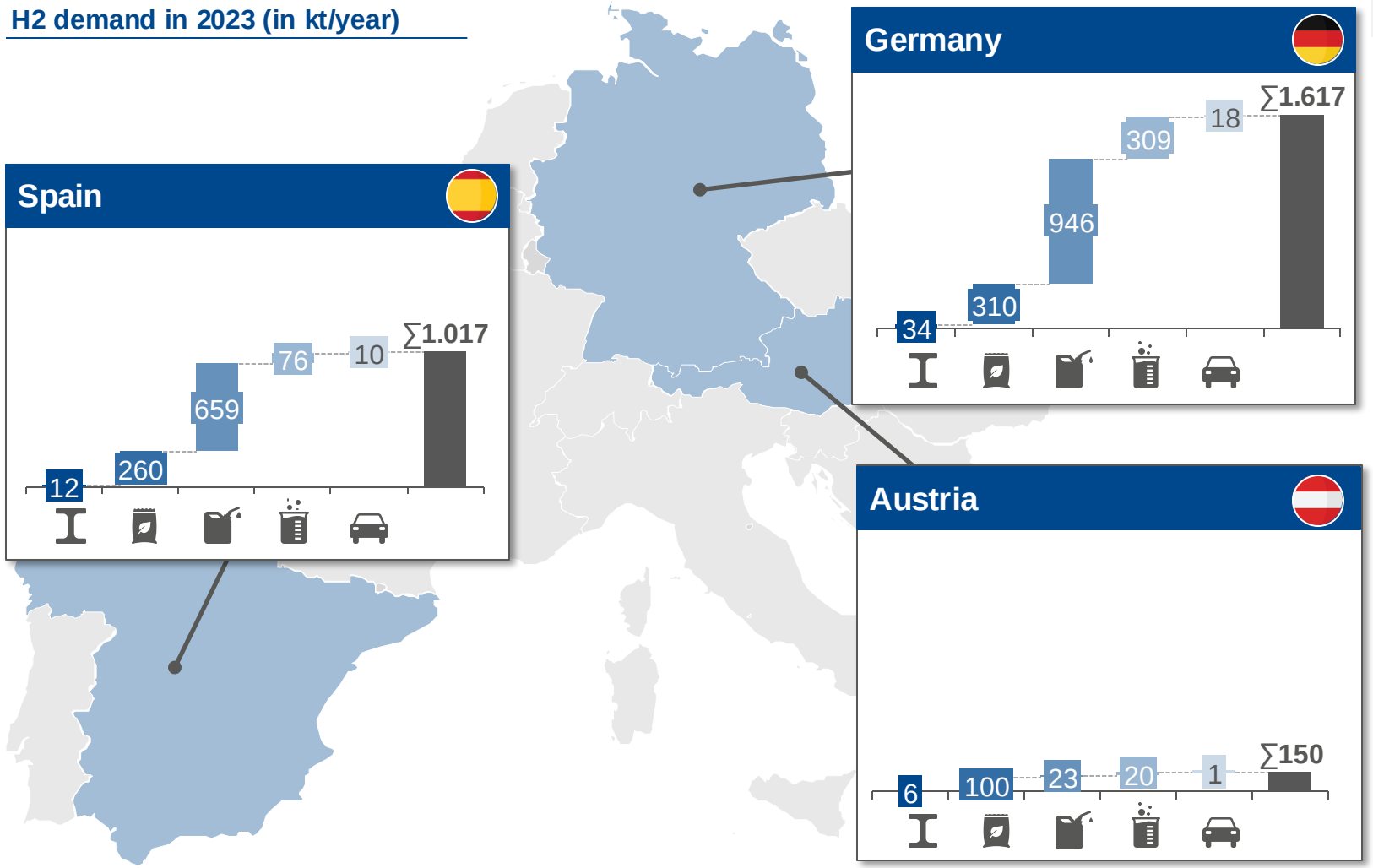
Develop diversified import flows

Enable deep decarbonisation at scale

Develop infrastructure

# The current demand for hydrogen in VERBUND's core markets

**H2 demand in 2023 (in kt/year)**




Source: Rystad Hydrogen Solutions, VGH Market analysis 2024

## Key messages

- Demand is currently driven by oil refining and fertilizer production (~83%)
- In Germany, methanol-based chemicals already play a greater role
- Steel currently still plays a subordinate role (~ 2%)

- Currently hydrogen-based transport, plays a minor role in VERBUND markets
- In the future, hydrogen will play a key role in heavy-duty and long-haul transport

# Setting the scene – Climate policy as a driver for the H2 economy

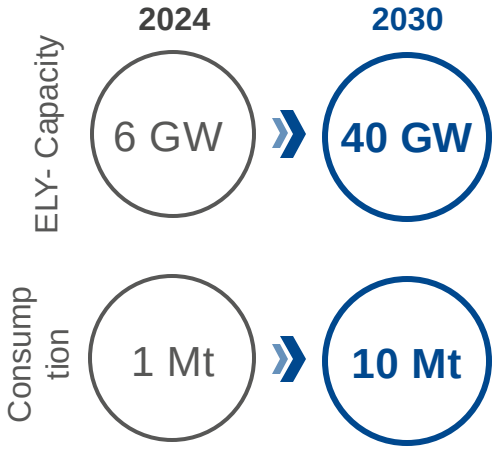
## European Union

### European $H_2$ Strategy (06/2020)

**Phase I (2020-2024):** ELY near refineries, chemicals, steel, gas stations. Decarbonization of existing $H_2$ applications + introduction of new applications

**Phase II (2025-2030):** Additional applications

**Phase III (2031-2050):** 1/4 of electricity production for ELY, market maturity of $H_2$ technologies in all sectors




### REpowerEU (05/2022)

**Goals:**

Achieving a 42% share of green hydrogen in industrial end-use by 2030 (RED III)

**$H_2$ demand by 2030**

**10 Mt** + **10 Mt**

**Production in the EU** | **Importing into the EU**

## Austria

### AT $H_2$ Strategy

**ELY-Capacity 2030**

**1 GW**

**Substitution** of fossil fuels with climate-neutral $H_2$
(ie. Energy intensive industry)

- Creation of **support framework for production**
- **Infrastructure**
- Establishment of **international partnerships** for climate-neutral hydrogen

## Germany

### DE $H_2$ Strategy

**ELY-Capacity 2030**

**10 GW**

- Increasing domestic ELY Capacity to **10 GW by 2030** (previously 5 GW, 2020)
- **Total $H_2$ demand by 2030:** 95 to 130 TWh (2.4 to 3.3 Mt)
- **Covering 50–70%** of demand through imports
- **1,800 km** hydrogen start-up network by 2027/28 (IPCEI subsidies). **Expansion by 2032.**

## Spain

### ESP $H_2$ Strategy[1]

**ELY-Capacity 2030[2]**

**11 GW**

- **Climate neutrality by 2050**
- Reduction of GHG emissions **by 4.6 Mt $CO_2$ equivalents**
- **25% renewable $H_2$** in industry
- **150 $H_2$ filling stations, 200 fuel cell buses** and **7,500 fuel cell vehicles**

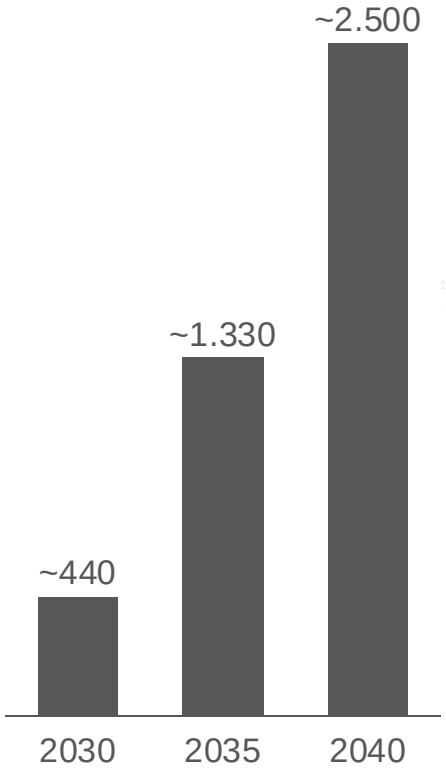
**Regulations, especially the national implementation of political goals, are the most critical levers for H2 demand.**

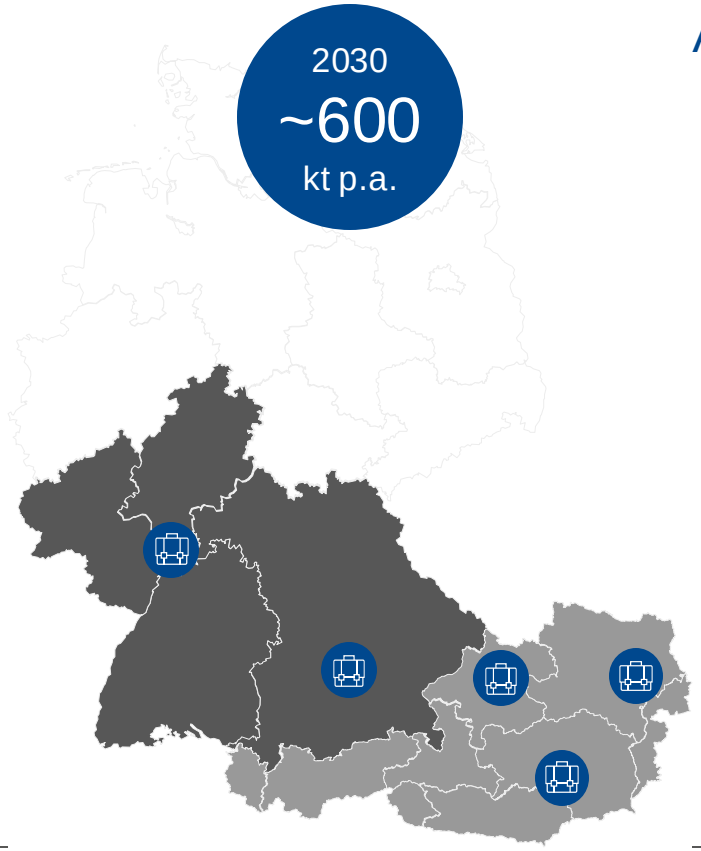
1. Hydrogen Roadmap Spain | 2. National Energy and Climate Plan (NECP), Update July 2023

# Sharply increasing demand until 2030 in South Germany & Austria

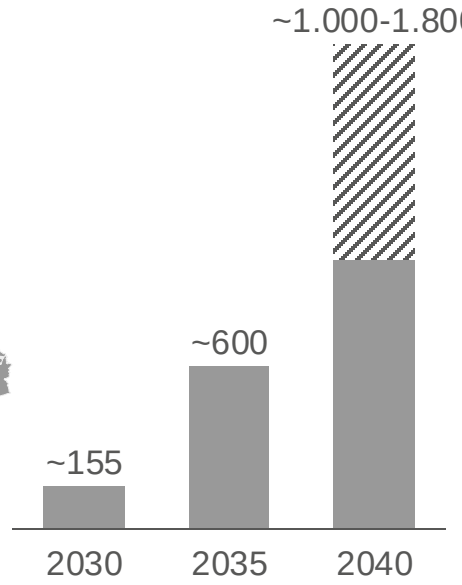
## GREEN HYDROGEN ON COURSE FOR GROWTH

### Green $H_2$ demand South-DE / kt p.a.



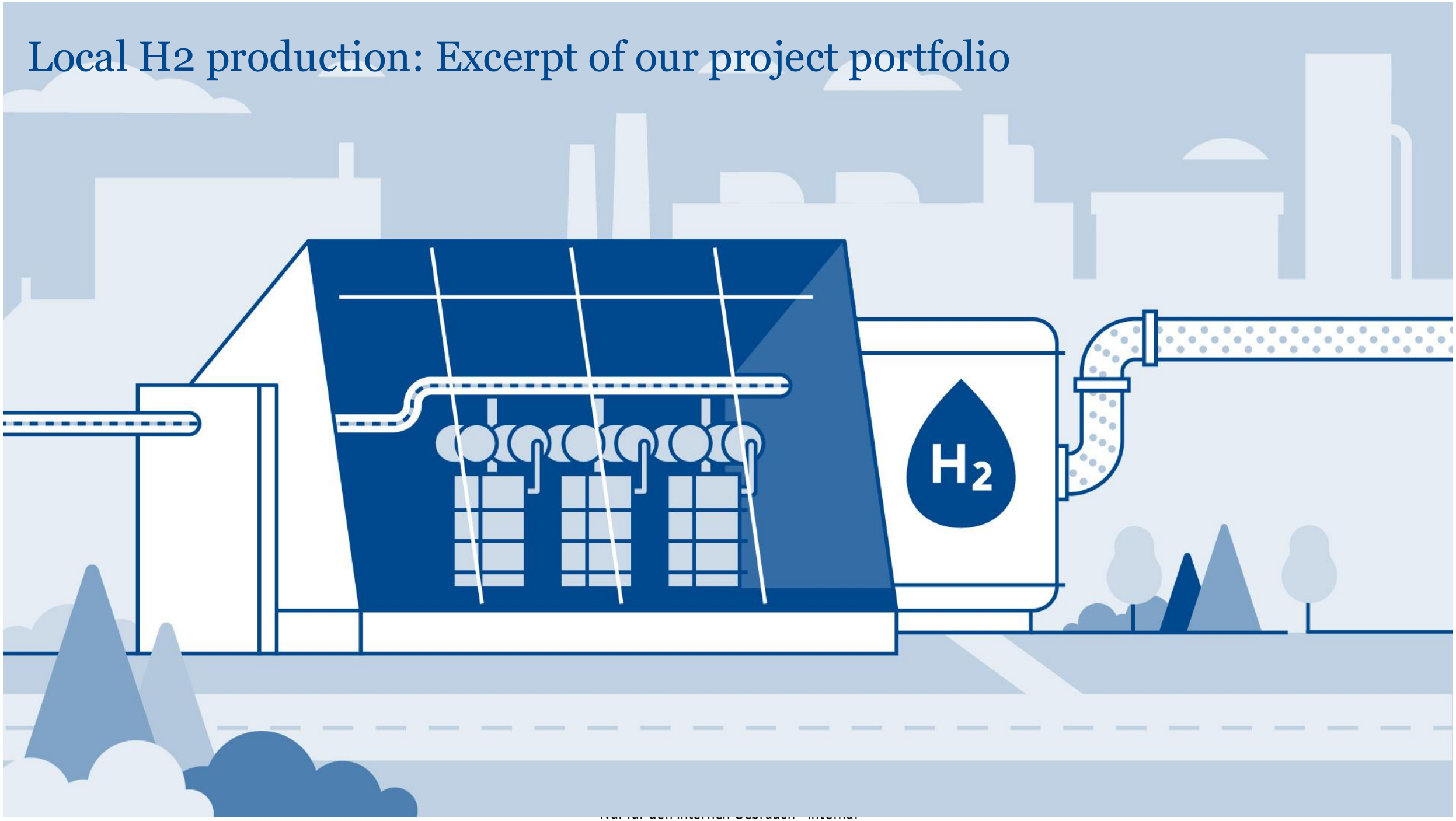




### Green $H_2$ demand AT / kt p.a.




- Expected energy deficits driven by increasing demand from decarbonization and electrification strategies
- Hydrogen imports necessary for long-term security of supply of increasing demand due to limited, local expansion potential for electricity generation from renewable energies
- Dedicated development for the expansion of renewables (especially wind & PV) required for the production of green hydrogen – within and outside Central Europe

# Local H2 production: Excerpt of our project portfolio

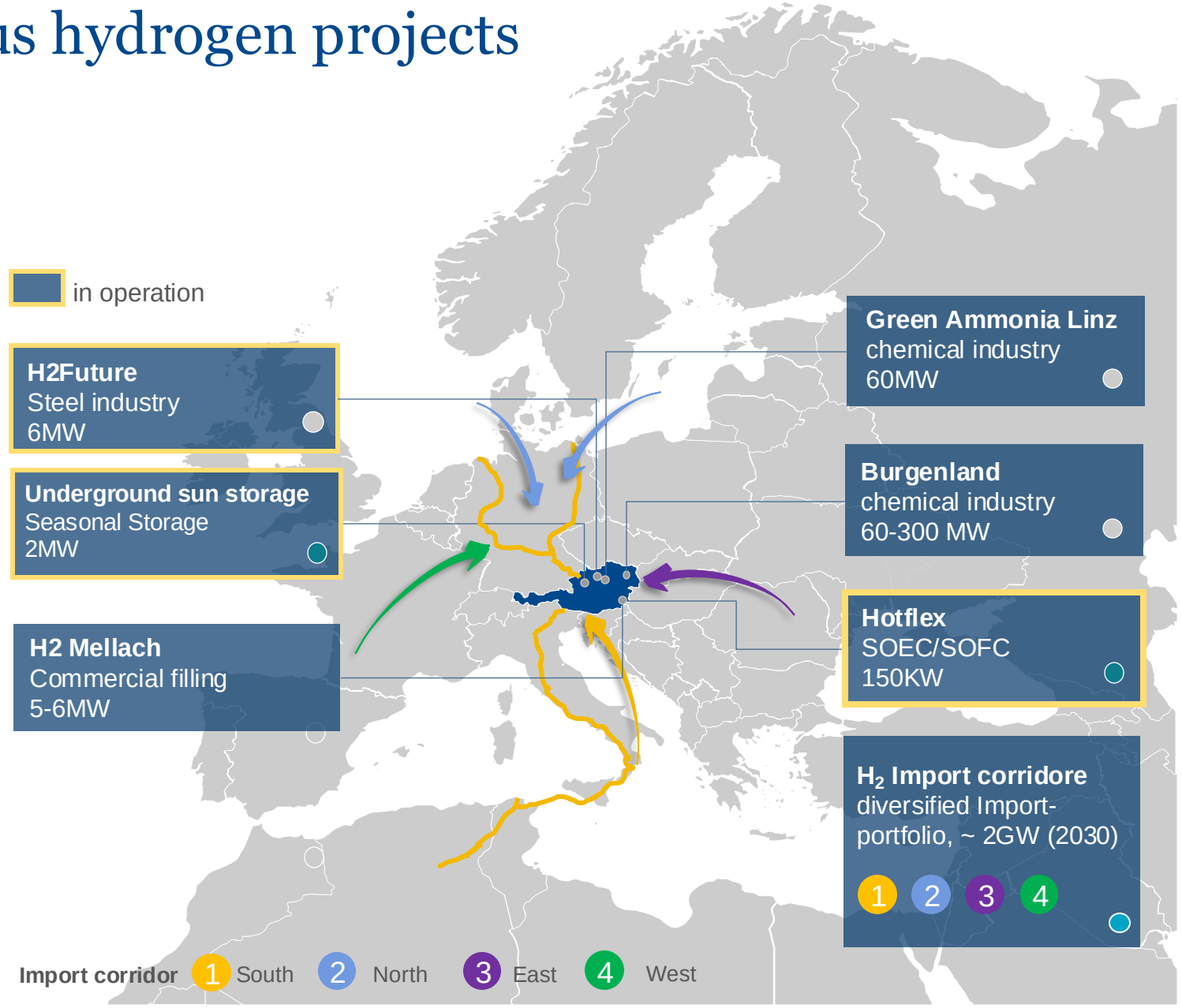


# VERBUND is active in various hydrogen projects along the value chain

- **Feedstock for industry and mobility**
  H2 as a contribution to decarbonization of hard-to-abate sectors, especially steel industry, fertilizer production and petrochemicals

- **Energy carrier for electricity system**
  $H_2$ as enabler flexibilities and seasonal storage to stabilize electricity system with increasing share of volatile renewables (wind and PV)

- **Global commodity**
  $H_2$ easily transportable for imports to Central Europe to secure long-term demand



# Excerpt from VERBUND's hydrogen project portfolio for local hydrogen production and storage


This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 735503. This Joint Undertaking receives support from the European Union's Horizon2020 research and innovation programme and Hydrogen Europe and N.ERGHY

## H2FUTURE: GREEN HYDROGEN FOR THE STEEL INDUSTRY

- 6 MW electrolyser - up to 1,000 tonnes/year
- Commissioning in 2019
- Industrial integration of H2 production into the steel making process
- Further development into a filling plant and commercial distribution by 2025
- High pressure trailer filling up to 500 bar
- 5.0 quality (suitable for fuel cells)

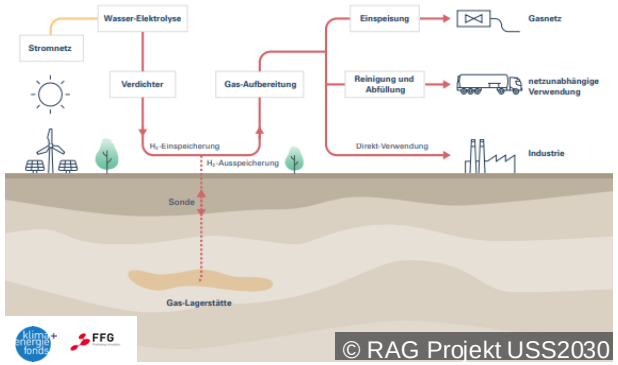

## LARGE-VOLUME ELECTROLYSIS PLANT WITH BURGENLAND ENERGIE

- 60-300 MW electrolyser
- Production of green hydrogen from wind and solar energy for industrial customers in eastern Austria
- 2-stage expansion: from 9,000 to 40,000 tonnes of green hydrogen per year


Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

## JOINT PROJECT ON AN INDUSTRIAL SCALE WITH LAT NITROGEN LINZ

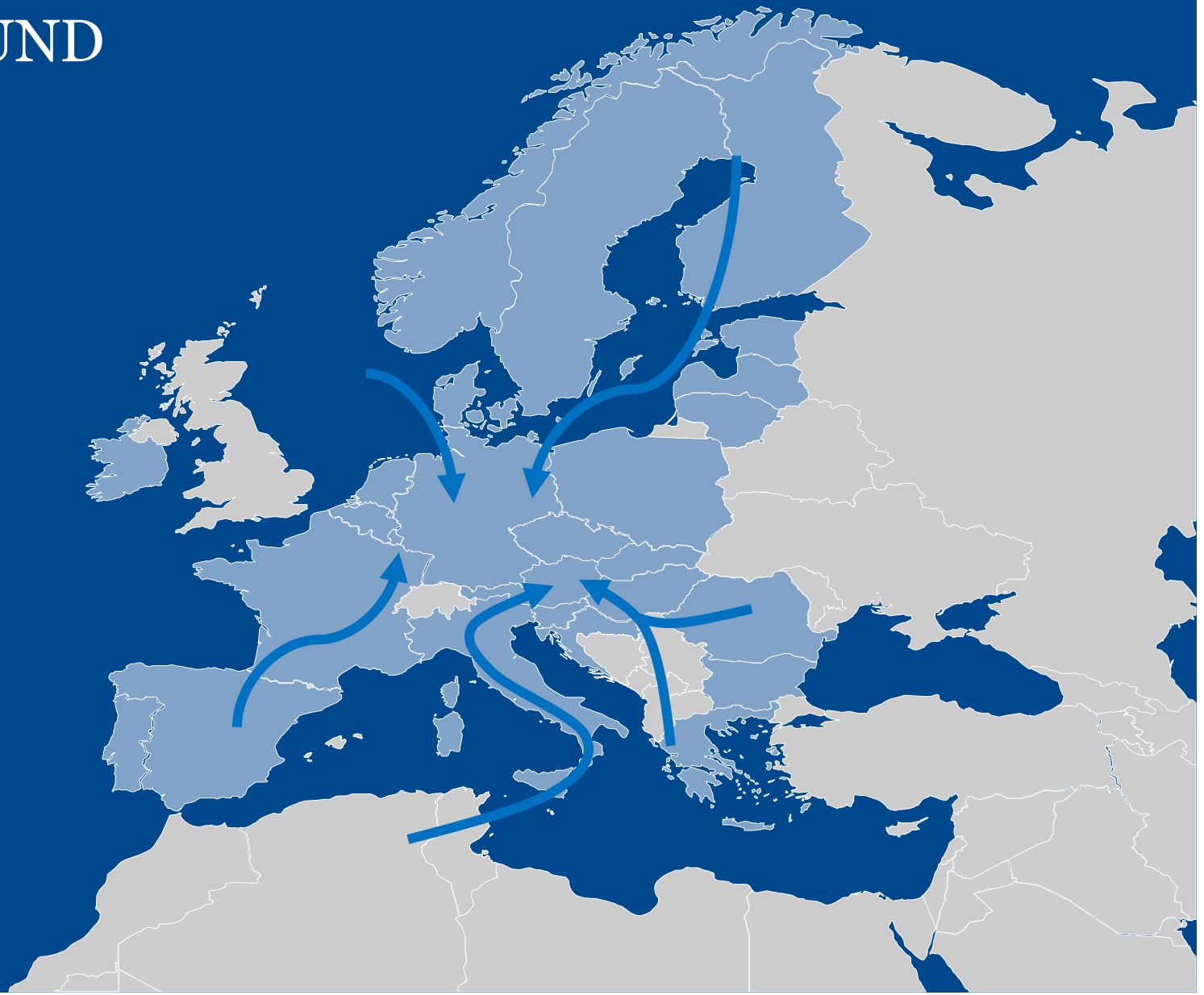
- 60MW electrolyser at LAT Nitrogen Linz
- Production of up to 7,000 tonnes of hydrogen per year
- IPCEI (Important Projects of Common European Interest) Hy2Use and Innovation Fund funding approved
- Use of green hydrogen in the production of fertilisers, melamine and technical nitrogen products




## UNDERGROUND SUN STORAGE 2030: HYDROGEN AS SEASONAL STORAGE

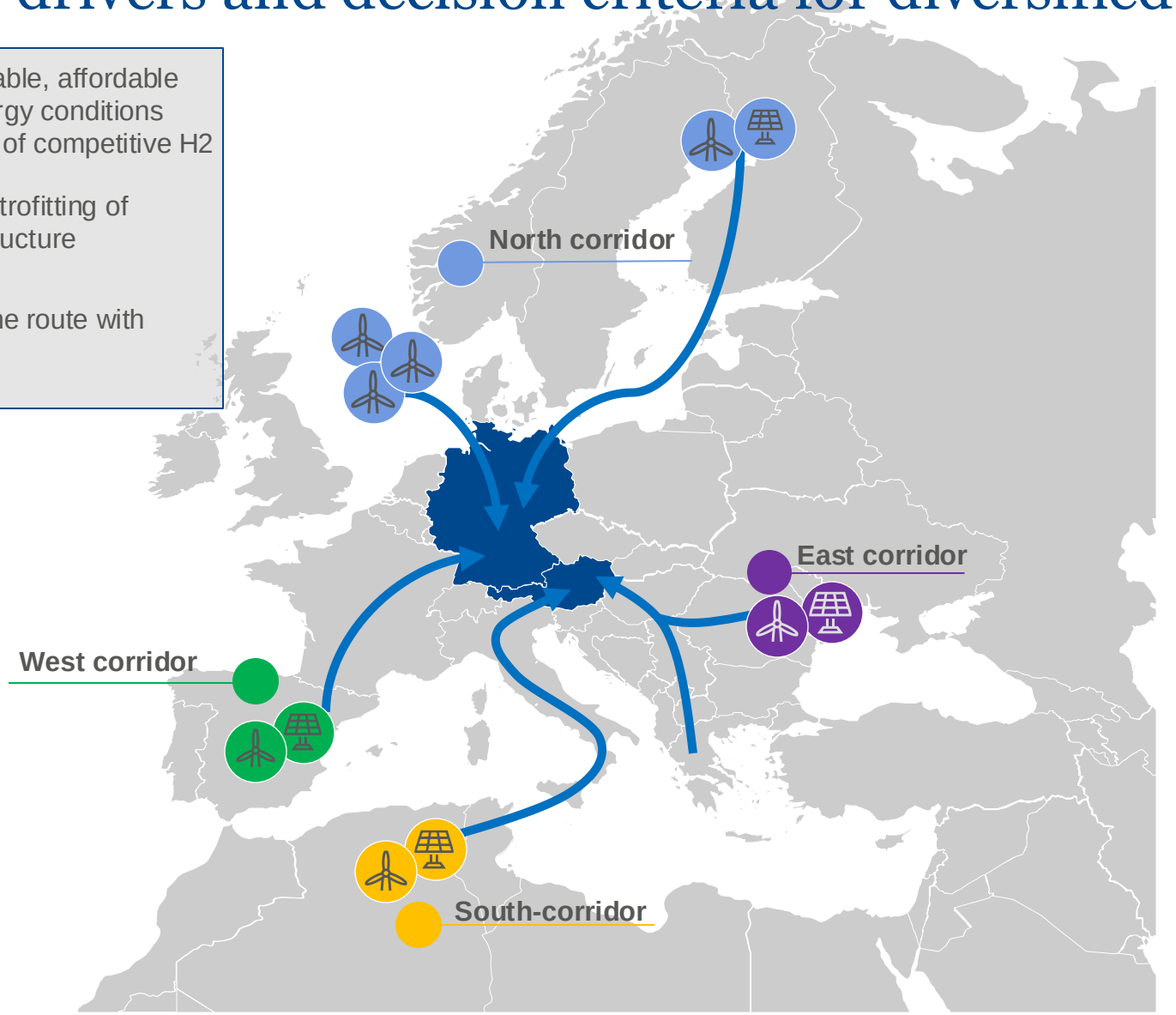
- Development and demonstration of a large-volume seasonal storage facility for green hydrogen in underground gas reservoirs
- Processing and utilisation of hydrogen with high purity based on a novel purification technology

# H2 Import:
# Role and activities of VERBUND



# H2 import: drivers and decision criteria for diversified corridors

- Access to scalable, affordable renewable energy conditions and availability of competitive H2
- Possibility of retrofitting of existing infrastructure
- Feasibility of the route with local support




**Long-term coverage** of the significantly **increasing H2 demand** in Austria and Southern Germany through imported green H2 at **competitive prices** from 2030 onwards, leading to the decarbonization and securing the industrial sites.

Limited **regional renewables expansion** potential, indicating that the hydrogen demands of Austria and Southern Germany cannot be met in the long term through local production alone.

**Identification and development** of the four most promising import corridors to **Austria** and **Southern Germany** by VERBUND.

# Green hydrogen via pipeline – H2 NOTOS

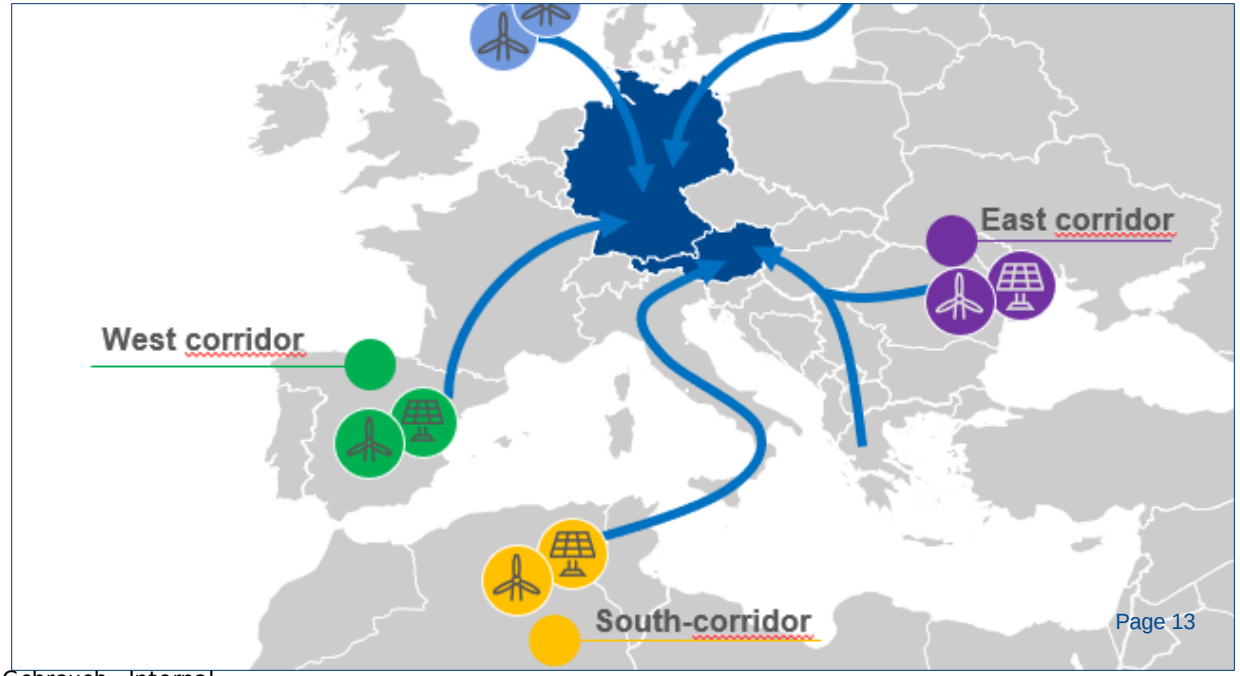
Together with TEH2, a joint venture between TotalEnergies and the EREN Groupe, VERBUND is developing a large-scale project to produce green hydrogen in Tunisia and export it to Central Europe. The country offers excellent wind and PV potential and therefore ideal conditions to produce green hydrogen. The connection to Europe is via the planned 'SoutH2 Corridor' pipeline, which connects North Africa with Italy, Austria and Germany. The project is an important building block in the development of VERBUND's diversified import portfolio for the long-term and sustainable supply of green hydrogen to our European customers and partners.

## Key Facts

TotalEnergies $H_2$ a company owned by TotalEnergies and eren

Verbund

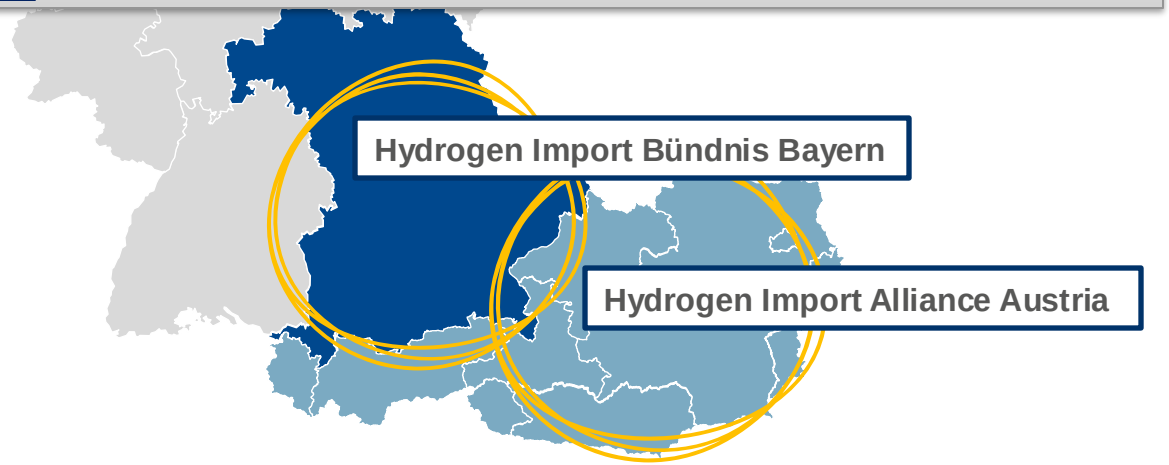
- **H2 NOTOS** produces green hydrogen using electrolysers powered by wind and solar energy
- Initial production: 200,000 tonnes per year
- Expansion to up to 1 million tonnes possible
- Water supply via desalination plants
- Access to the European market via the 'SoutH2 Corridor' pipeline (planned commissioning ~2030)
- TE H2 and VERBUND lead development, financing, construction and operation
- VERBUND coordinates transport of hydrogen to Central Europe



# Partnerships - an important building block for a successful hydrogen economy

IMPORT

- **Bundling** of hydrogen offtake
- **Development** of a clear and feasible roadmap for hydrogen imports to Austria and Southern Germany (Bavaria)
- Development of corridors for **low-cost hydrogen imports**




The partner companies work together on:

- Accelerating the $H_2$ economy
- Coordinating $H_2$ production, transport and demand
- Solving the "chicken and egg" problem
- Sharing expertise and resources

## International partnerships for H2 production

Development of large-scale projects for the production of H2 in Europe and in neighbouring regions

Beispiele für Partnerschaften sind: Masdar, TotalEnergies $H_2$ a company owned by TotalEnergies and eren, ACWA POWER

## Supporting PCI Corridor Development Projects

Working together for a supply of green hydrogen from a diversified range of import routes.

Beispiele für Partnerschaften sind: SouthH2Corridor, Flow making hydrogen happen, H2ercules

## National and international memberships

We contribute to the development of the European hydrogen economy through our membership of associations and consortia.

Beispiele für Partnerschaften sind: AquaVentus, H2 Nationaler Wasserstoffrat, Wasserstoff Bündnis Bayern, H2Global Stiftung, HyPA Hydrogen Partnership Austria, Dii, HyCentA, bdew Energie. Wasser. Leben., WIVA P&G Energy Model Region