Hydrogen potential in the EU

A perspective from a German TSO

21 October 2021, Mobilizing Hydrogen from the East to the West

Johannes Stolle, Regulatory Affairs

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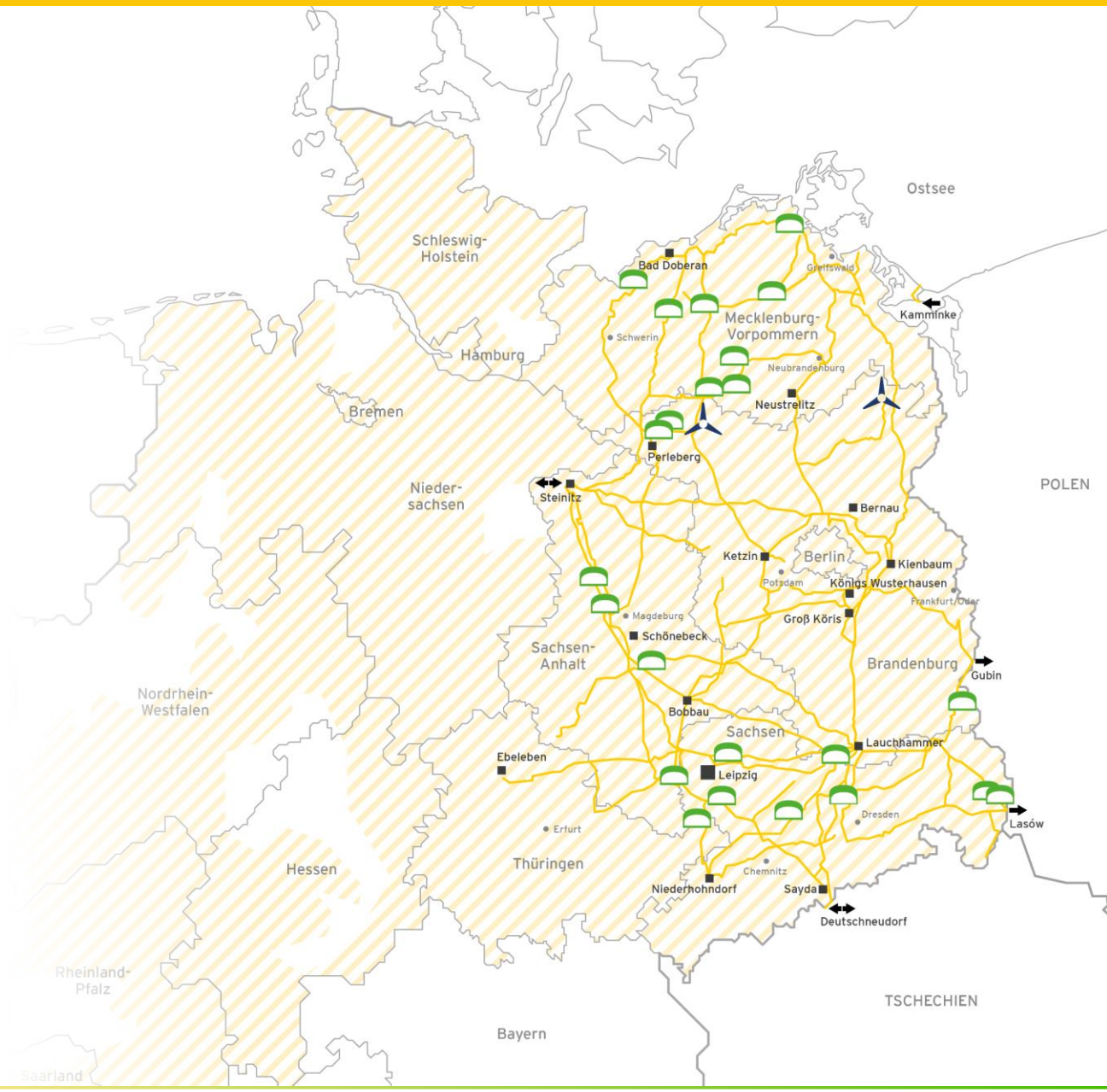
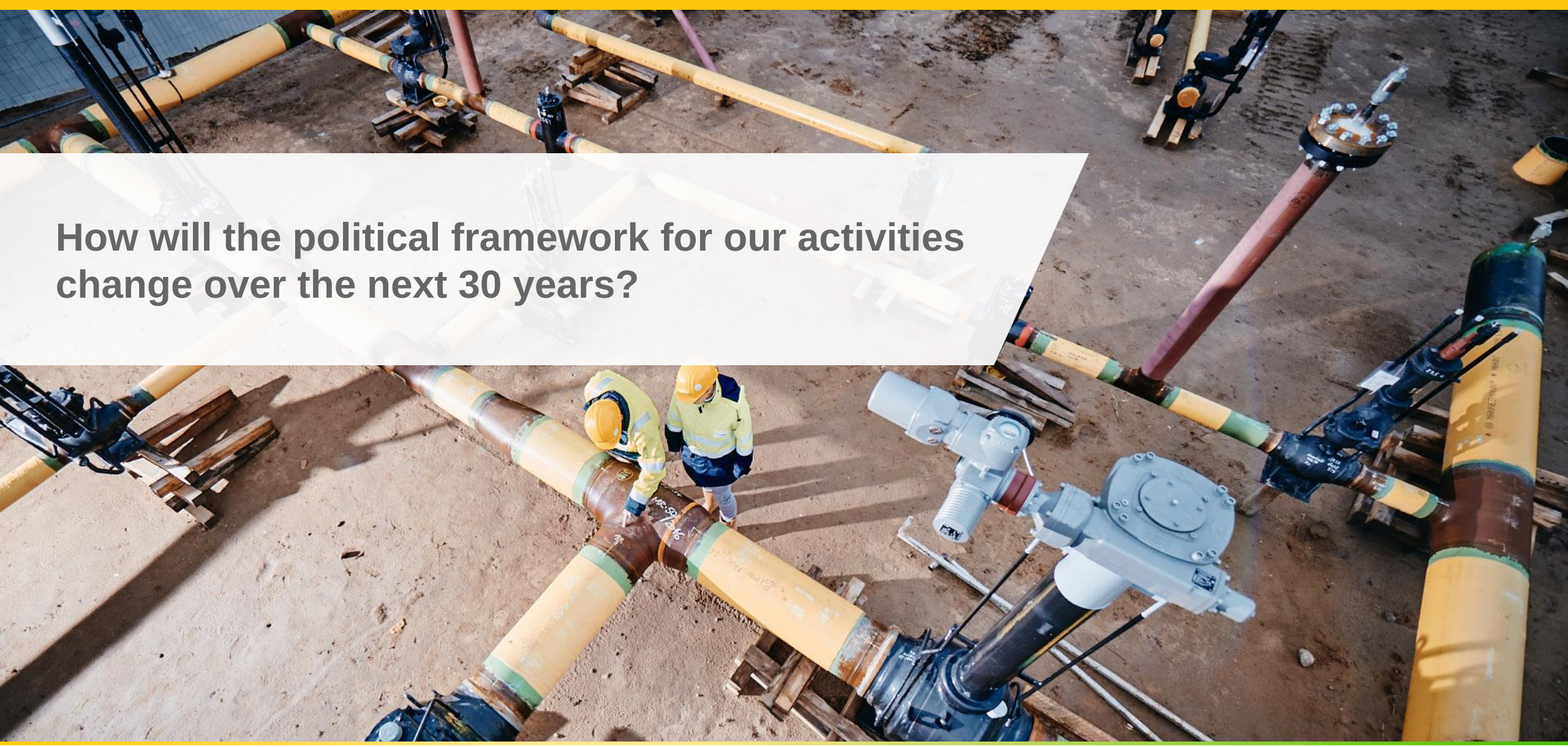
7500 km
Grid length

22
Biomethane plants connected

450
Network connection points

2
Power-to-hydrogen plants connected





How will the political framework for our activities change over the next 30 years?

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Two numbers set the frame of the EU‘s climate policy…

55%

Two numbers set the frame of the EU‘s climate policy…

0

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How do we handle these challenges as a Transmission System Operator for natural gas?

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Hydrogen will be crucial to ensure the EU becomes climate-neutral by 2050

Targets of the EU H2-Strategy

- **13-14%** H2 in EU energy mix by 2050
- **Green H2:** 40 GW by 2030 (6 GW by 2024)
- **Import:** 40 GW by 2030
- Set up of a dedicated H2- infrastructure
- Regulatory framework adaptations

„H2 as the “rockstar” of the energy transition“

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Expected hydrogen demand in the EU

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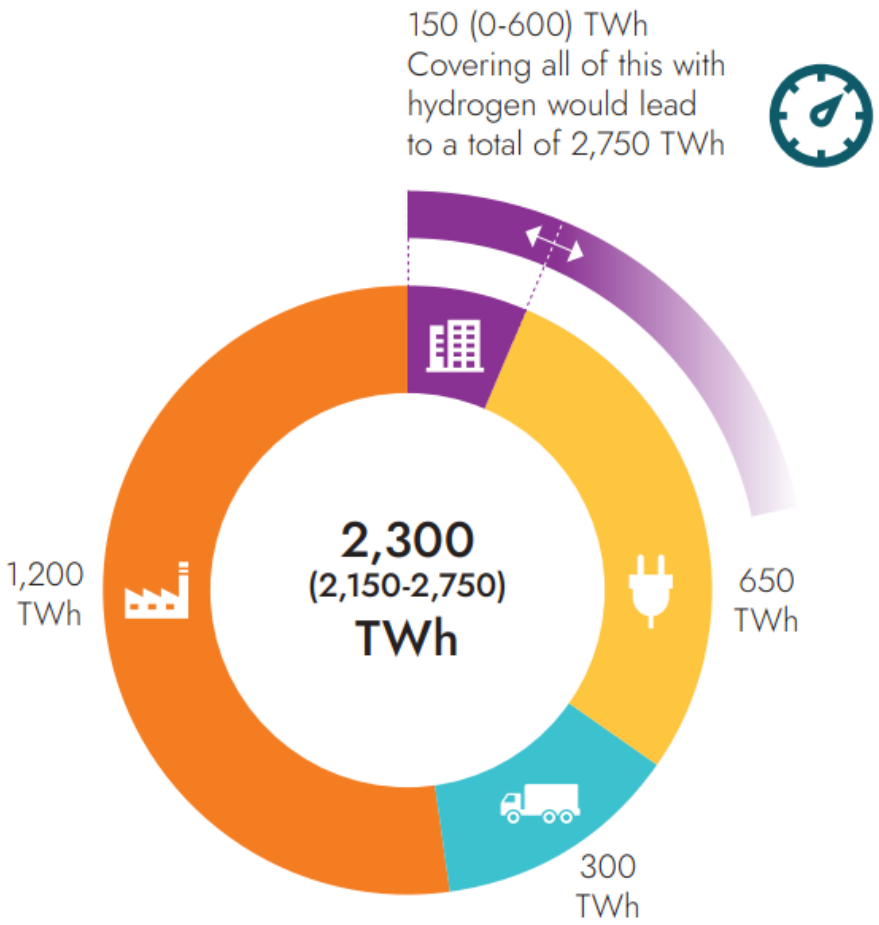
Hydrogen will be crucial to ensure the EU becomes climate-neutral by 2050



- EU+UK could see a hydrogen demand of around **2.300 TWh by 2050**
- About 1.200 TWh can be expected in industry, including 200 TWh of high temperature industrial heat
- **650 TWh** of hydrogen in dispatchable **electricity production**
- **300 TWh** in hydrogen can help to decarbonise **transport**
- **150 – 600 TWh** in the **building sector**

Source: *Analysing future demand, supply and transport of hydrogen, Guidehouse (2021)*

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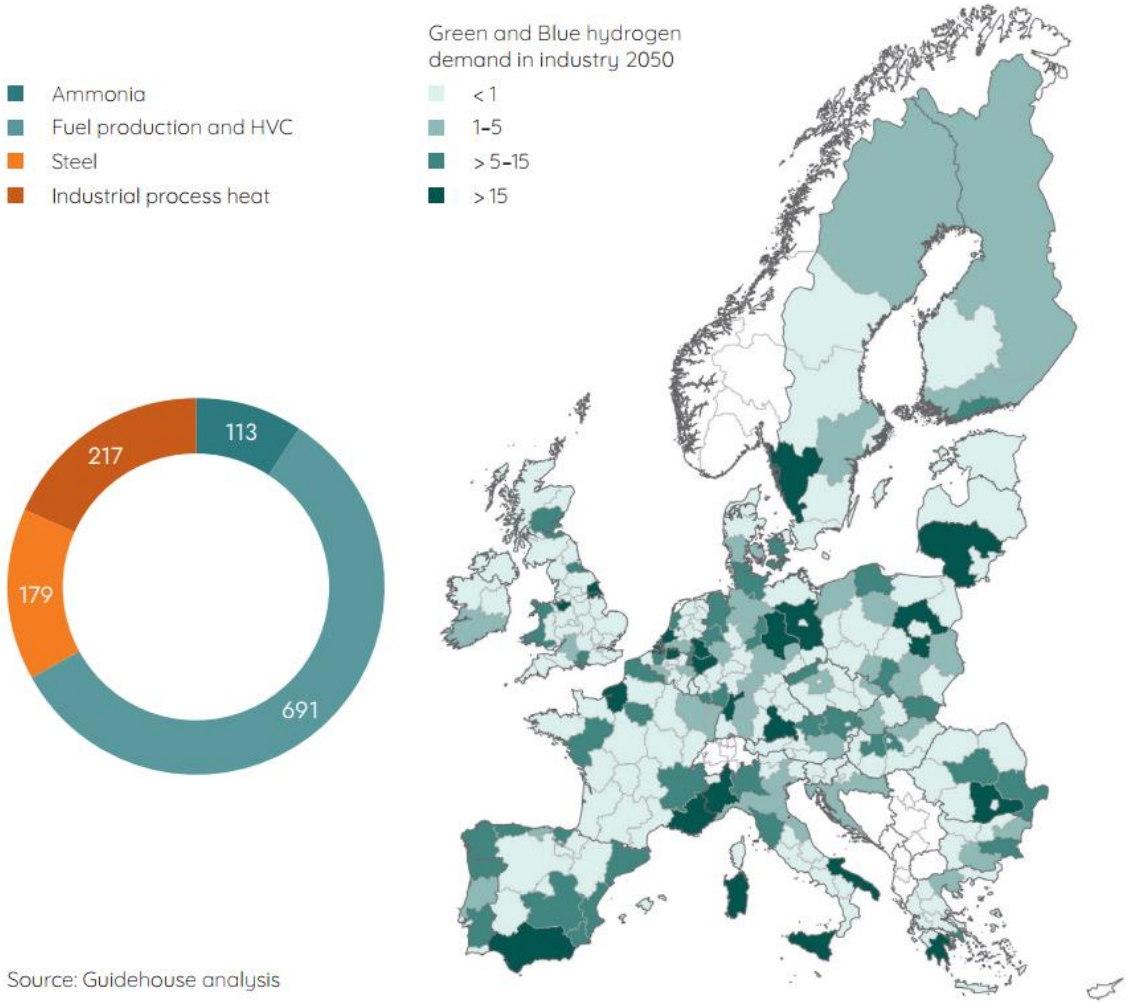
Expected industrial hydrogen demand in the EU in 2050

Based on industry decarbonisation roadmaps of existing installations (in TWh/year)



- Focus on ammonia, fuel production and high-value chemicals, iron & steel production and industrial process heat
- Industrial sector accounts for 20% of GHG emissions in the EU (877 Mt of CO2 in 2017)
- Steel sector today largest emitter of CO2 in Europe, emitting 22% of industrial GHG emissions and 4 % of Europe's total emissions
- Today industry is the largest consumer of hydrogen

Source: *Analysing future demand, supply and transport of hydrogen, Guidehouse (2021)*

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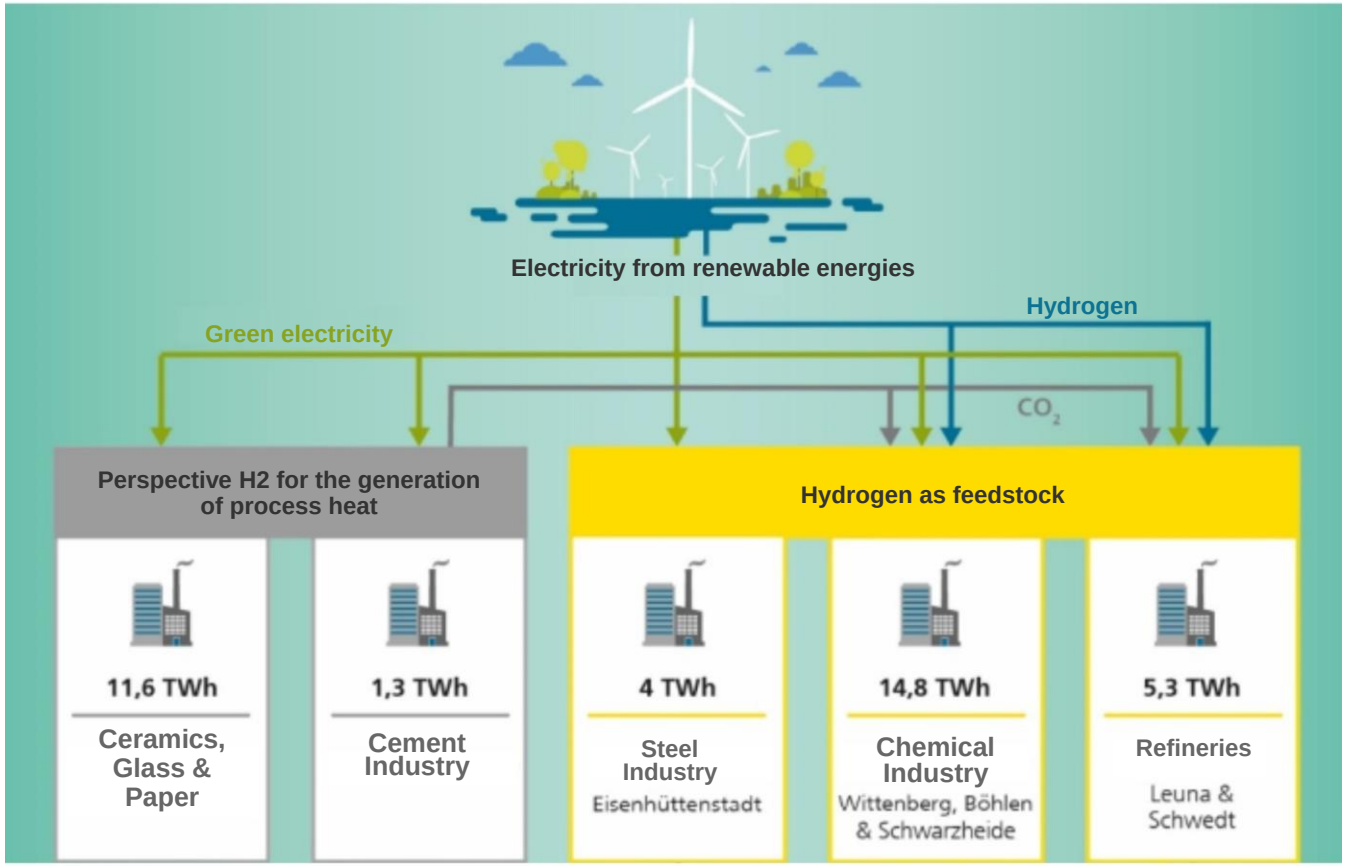
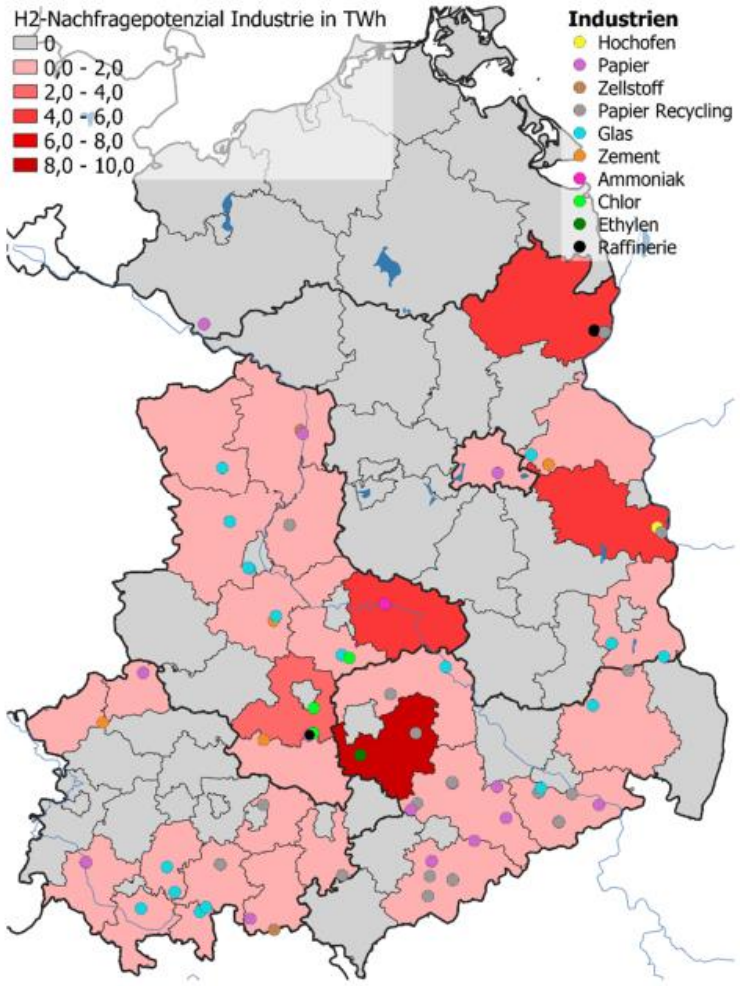
Expected industrial hydrogen demand in our network area by 2030





Source: H2 Masterplan für Ostdeutschland, Frauenhofer IKTS, Frauenhofer IEG, Frauenhofer ISI *(2021)*

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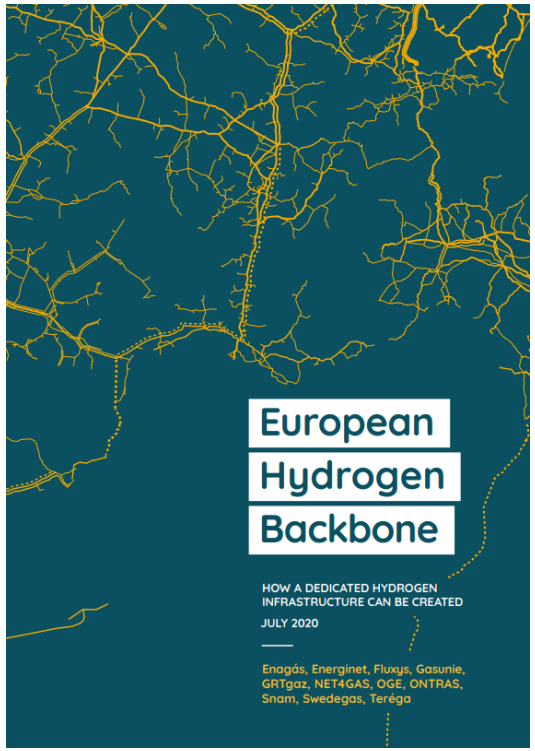
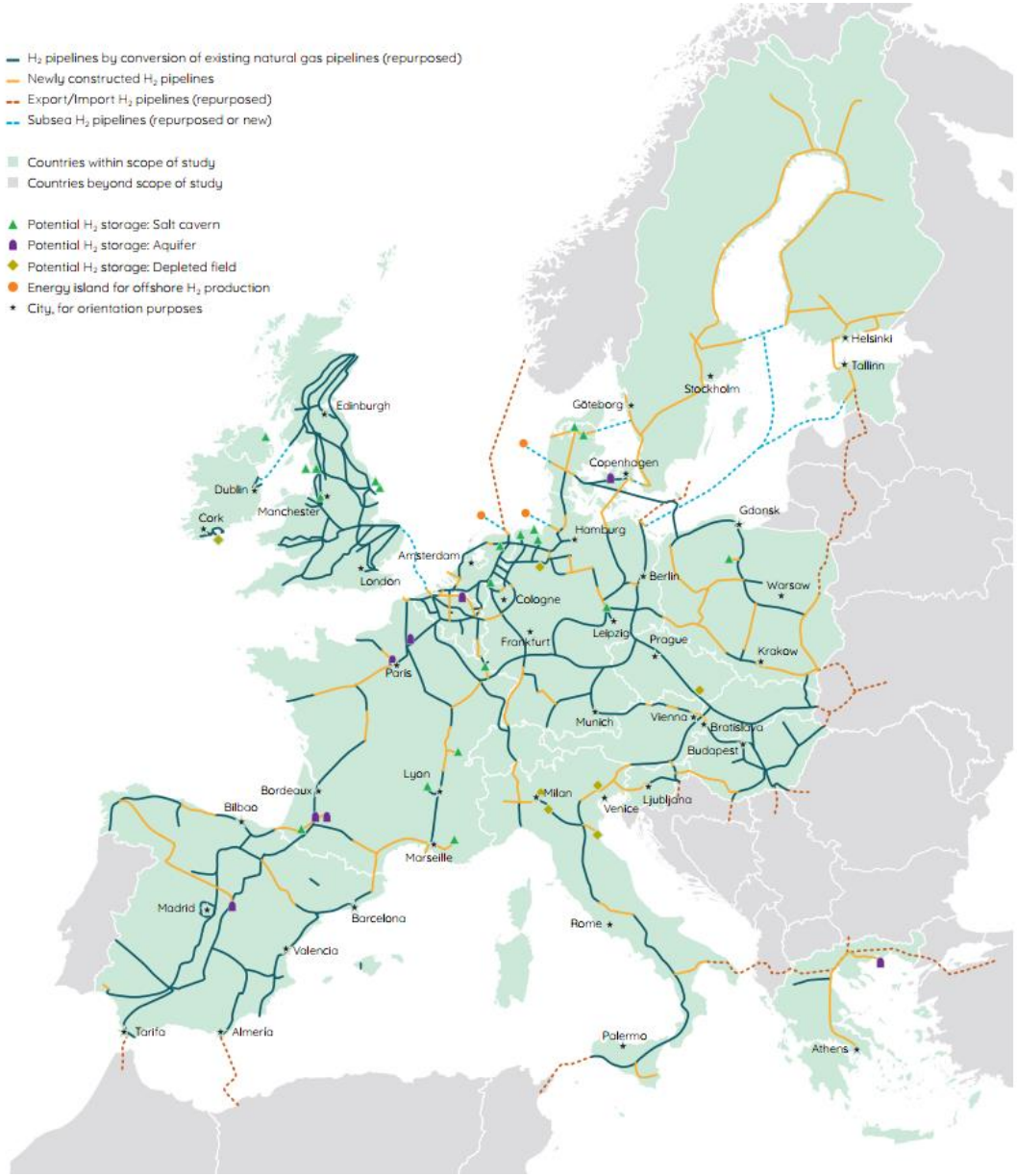
The European Hydrogen Backbone – A Vision for a future hydrogen infrastructure for the EU



- **23 gas TSOs from 19 EU Members States**, including the UK and Switzerland launched the initiative
- A **concrete solution** for the **transportation of large quantities** of **hydrogen over long distances** within and from outside Europe
- First concrete **cost assumptions**
- Show the **potential of gas infrastructure** for a rapid scale-up of a hydrogen economy through **repurposing**

2040 – Hydrogen Backbone

- **Pan-European network with a total length of 39.000 km possible by 2040**
- Connections to the potentially most **important hydrogen corridors** (UK, Norway, Ukraine, Russia, North Africa)
- Based approx. **70% on repurposed pipelines, 30% newly-built**
- The European Hydrogen Backbone can be **created at an affordable cost:**
  - estimated **investment cost of € 43-81 billion**
  - Transporting hydrogen **over 1000 km** over an average stretch of the backbone cost **€0.11-0.21 per kg**.
  - **cost-effective option for long-distance transport of hydrogen**, taking into account estimated future production cost of €1.0-2.0 per kg of H2.
- EHB as **dialog tool** with partners from across the entire value-chain and beyond Europe



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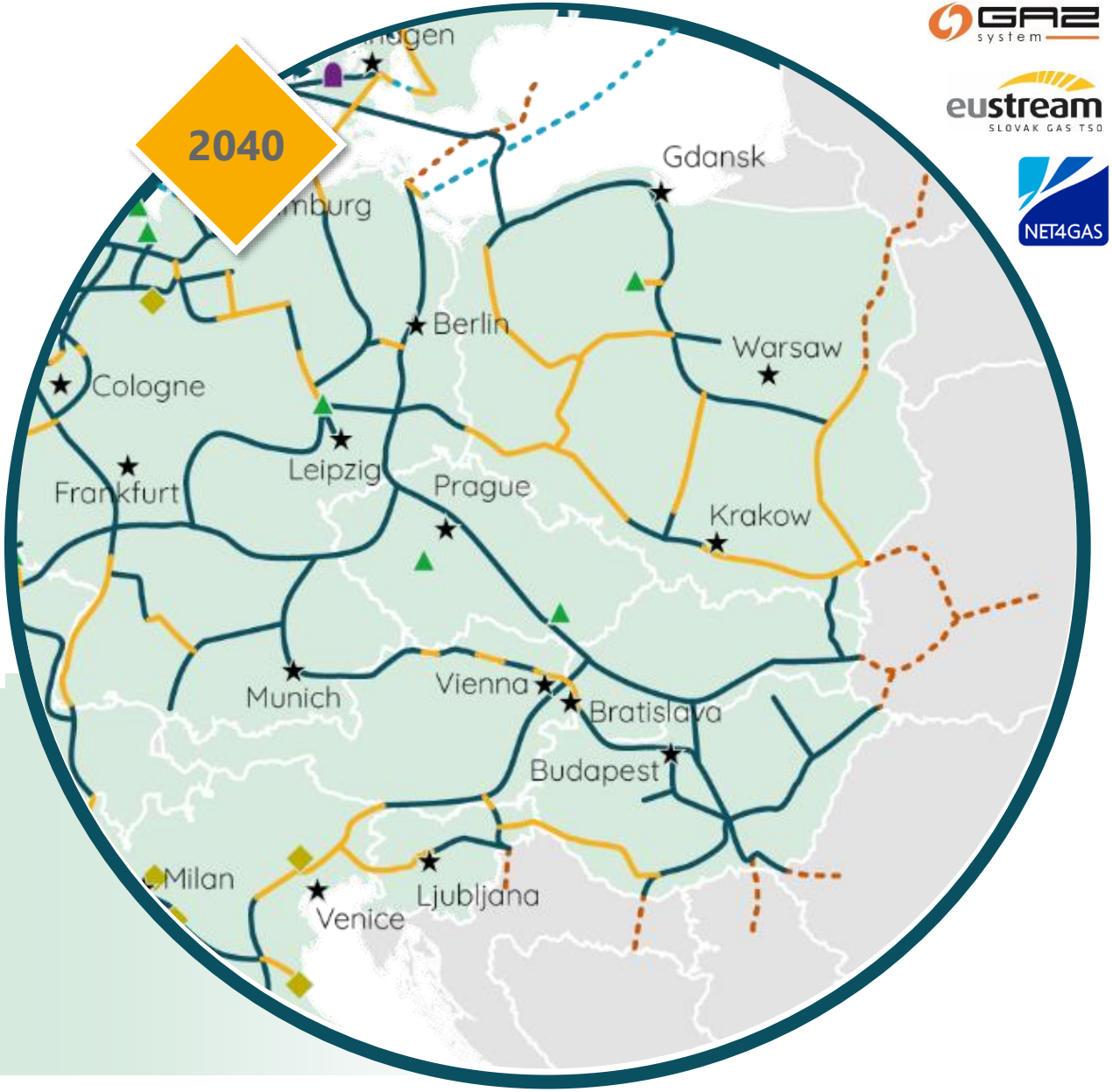
Focus on the Czech Republic, Slovakia and Poland

Regional perspective:

- H2 with great potential for the decarbonisation of coal-regions
- All countries have published or are about to publish H2 strategies
- Slovakia and the Czech Republic serve a transit role for hydrogen from Ukraine and further East from Kazakhstan, while the Czech Republic also enhances north south transport route in the EU and Germany

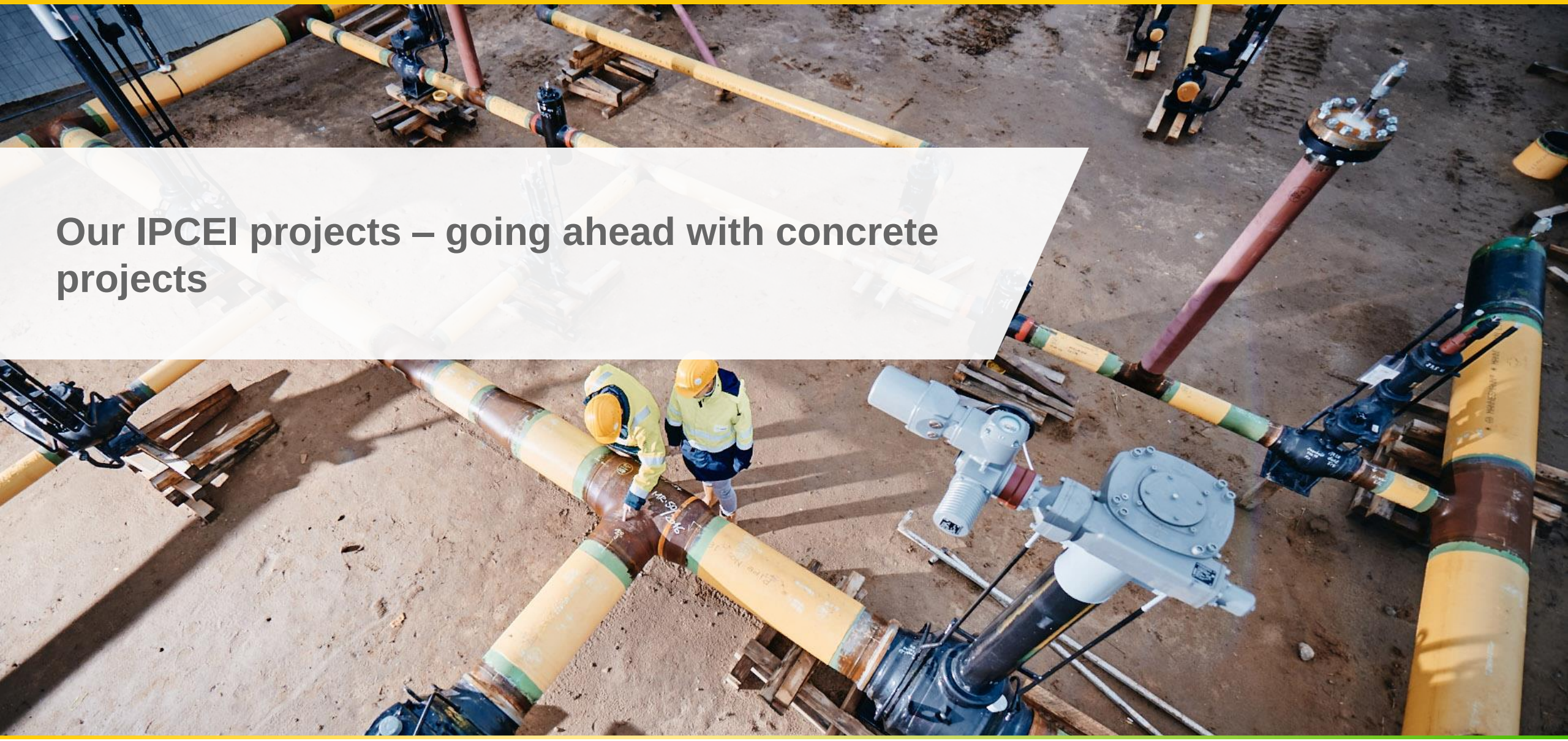


2040

Poland: Matured network, north-south highway, storage and interconnections to Ukraine, Denmark via Baltic Pipe and possibly to Baltic states via Lithuania.

Slovakia and Czech Republic: By 2035 an import route from Ukraine / Kazakhstan to the EU could emerge, passing through large diameter fully repurposed pipelines in **Slovakia** and the **Czech Republic** into Germany. → substantial savings in compression capacity

Our IPCEI projects – going ahead with concrete projects



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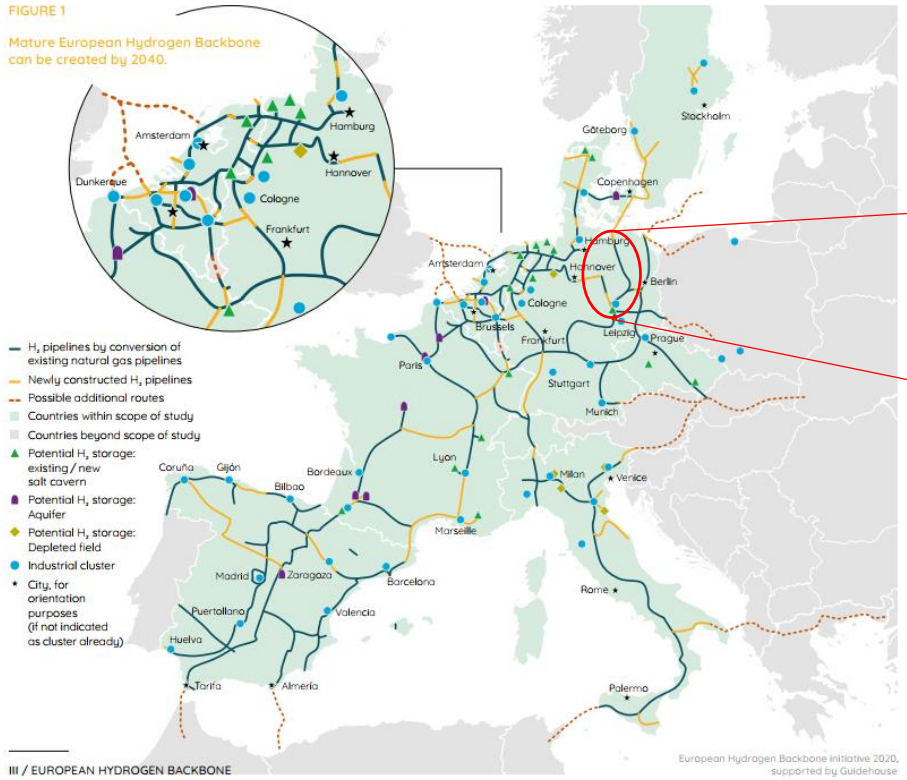
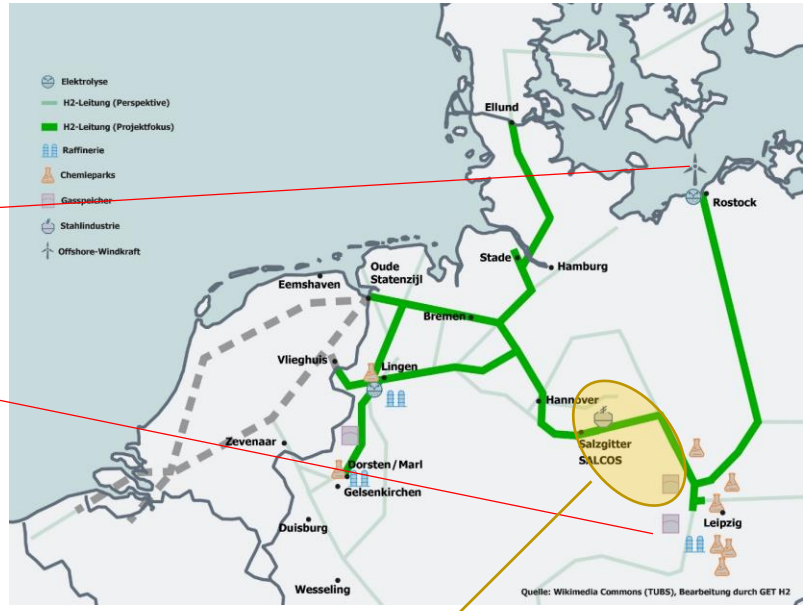


Quelle: Gas for Climate – European Hydrogen Backbone (EHB) 2020



IPCEI

Green Octopus Mitteldeutschland
ONTRAS
Hydrogen Pipeline Salzgitter / Leipzig

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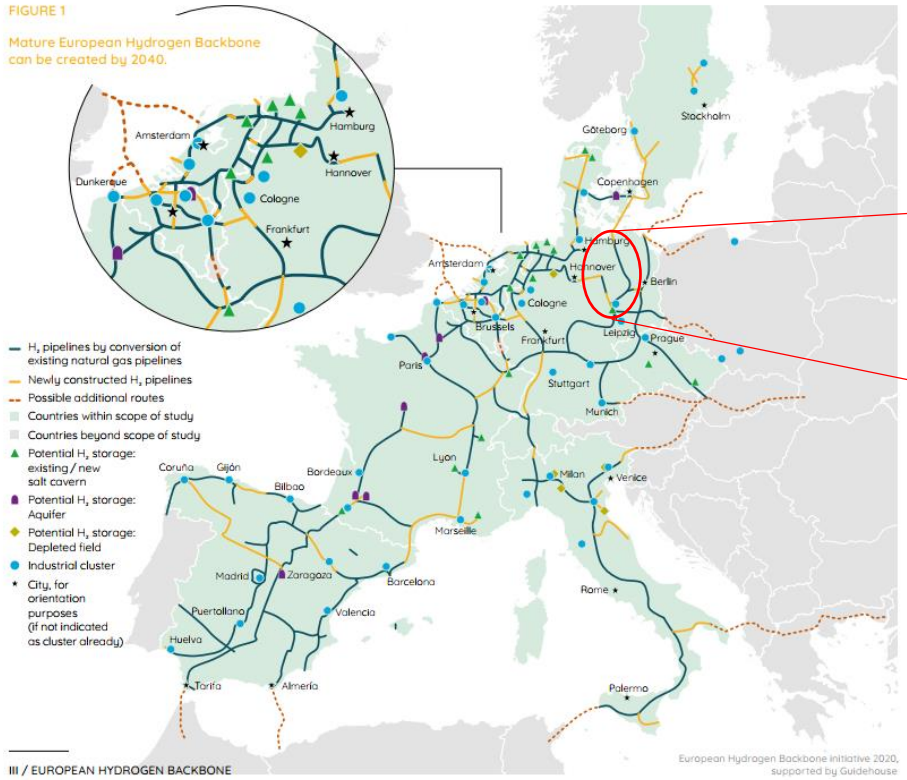

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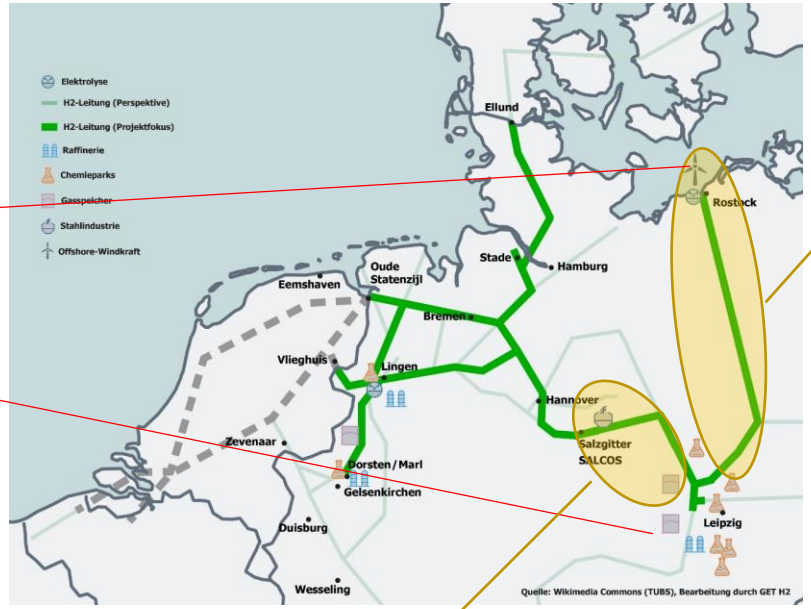

IPCEI

„doing hydrogen“
A hydrogen hub for East Germany

ONTRAS / GASCADE hydrogen pipeline Rostock / Berlin region / Leipzig

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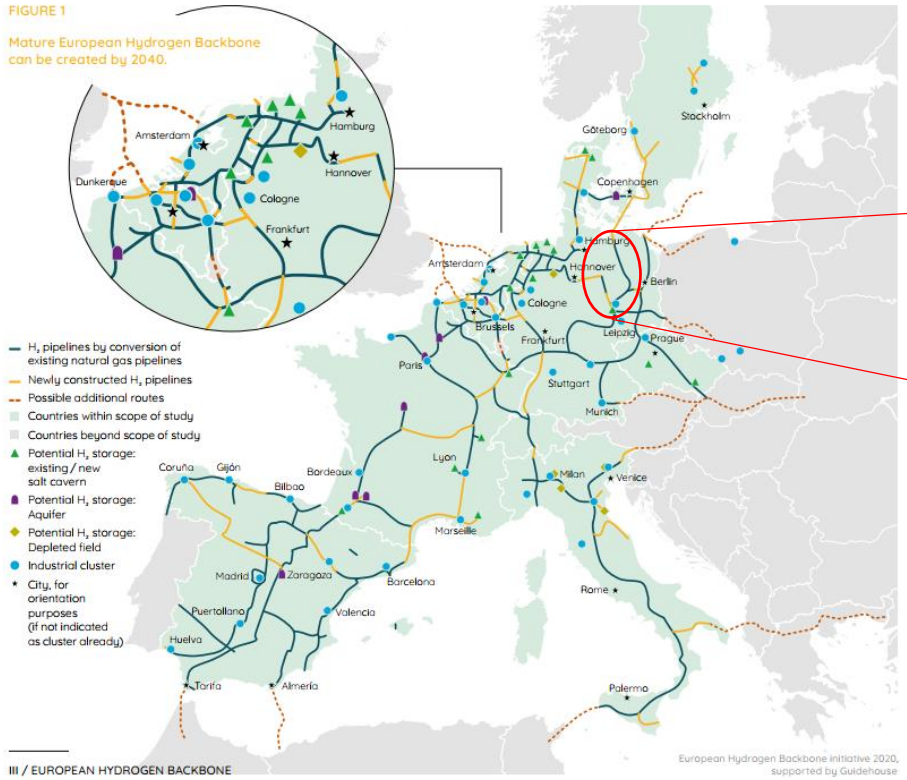

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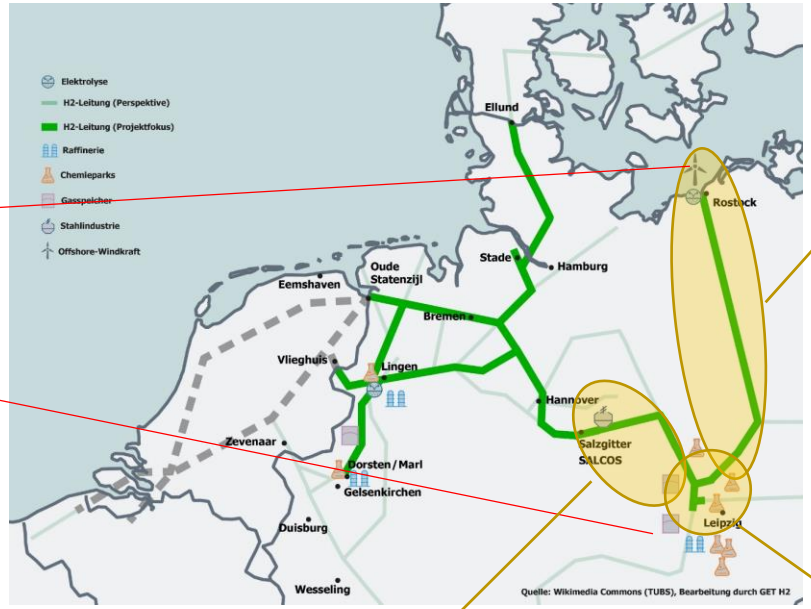

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LHyVE - *Leipzig Hydrogen Value Chain for Europe*
Green Hydrogen Circle Leipzig

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Questions that need to be addressed when repurposing natural gas pipelines for the transportation of hydrogen

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Technical feasibility of conversion from gas to hydrogen transport

Technical requirements for the conversion of a natural gas pipeline to hydrogen transport

What adaptation measures are necessary for a conversion?

What are the assessment criteria for a hydrogen pipeline?

Which changed operating parameters must be taken into account?

YES, taking into account the necessary adaptation measures,
the assessment criteria and the changed operating parameters,
a conversion of the TSO-Pipelines is technically possible!

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Why are we choosing this path?

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Concrete cost savings through repurposing

- Providing renewable hydrogen
  - via an H2 storage site
  - to an industrial customer (central German chemical triangle)
  - via repurposed natural gas pipeline
- Total length: 20 km
- DN 500 / DP 63 bar
- Planned DP for hydrogen transportation: 30 bar
- Capacity: 100.000 m³/h

- Estimated costs: **7.5 Mio EUR**
- A comparable newly-built system would cost: **33 Mio EUR**

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-80%

The repurposing of this existing natural gas pipeline for the transportation of hydrogen is **80% less** than the construction of a newly-built system.

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