

Energiepolitik in Deutschland und die Auswirkungen auf die Industrie am Beispiel

International hydrogen strategies - and what the EU has to do now

Dr. Carsten Rolle

Prof. Dr. Klaus-Dieter Barbknecht

World Energy Council – Germany (WEC)

27. April 2022

**WORLD
ENERGY
COUNCIL**

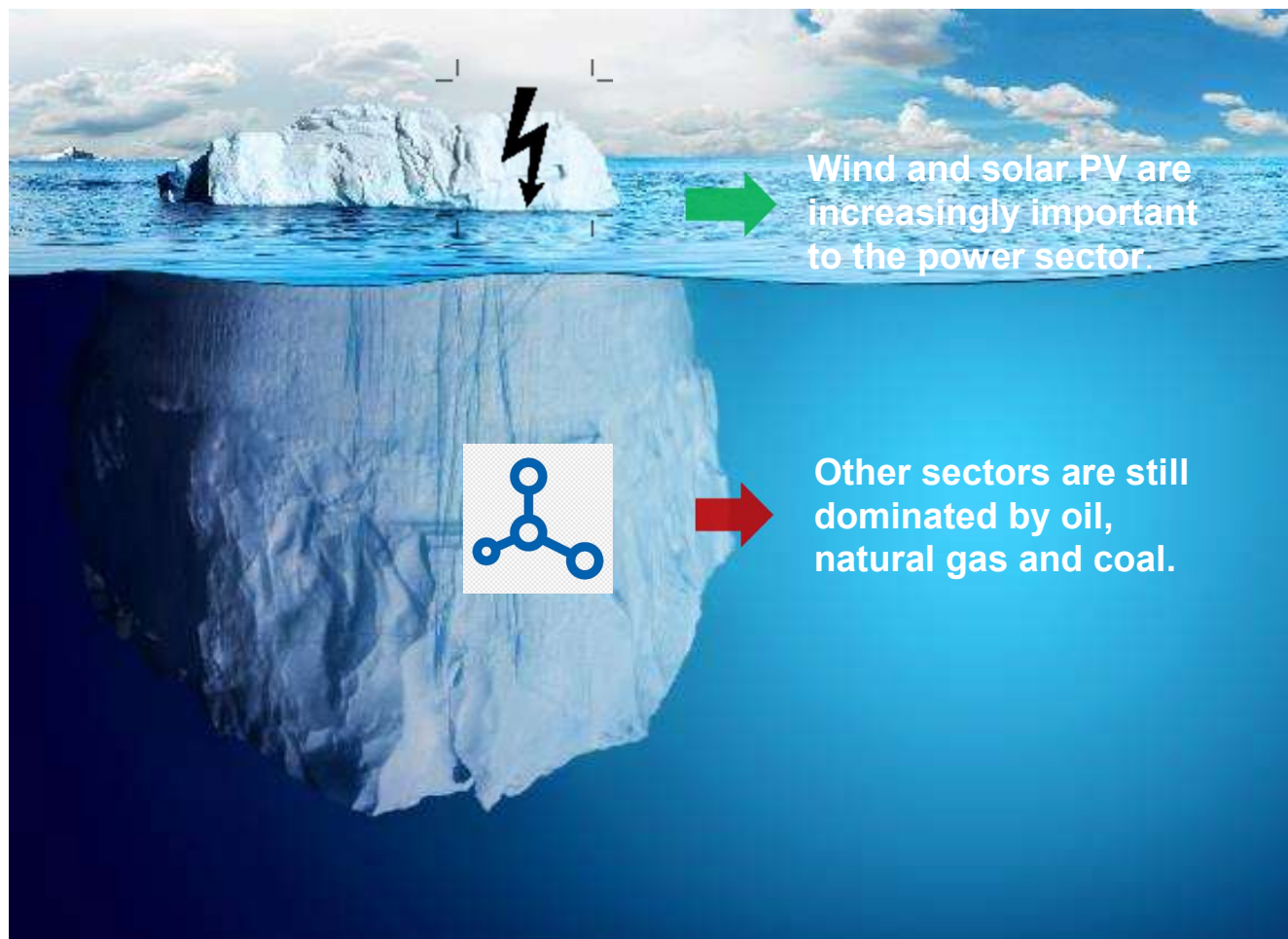
World Energy Council

- Größtes Energienetzwerk der Welt seit 1923 mit Sitz in London
- Ca. 90 Länderkomitees, die etwa 90 % der weltweiten Energieerzeugung repräsentieren
- Mitglieder: Unternehmen der Energiewirtschaft, Verbände, wissenschaftliche Institutionen, Einzelpersonen
- Repräsentiert durch seine Mitglieder alle Energieträger und Technologien
- Einzigartige Plattform für den internationalen Austausch und die Diskussion globaler Energiefragen
- Organisiert eigene Veranstaltungen und führt eigene Studien durch



Mission seit 1923: „Die nachhaltige Nutzung aller Energieformen zum Wohl aller Menschen voranzutreiben.“

Climate-neutrality is only achievable with green molecules



- Until recently global climate policy efforts have been focused on decarbonizing the **power sector**.
- According to IEA the **electricity** makes up **only 19 %** of global final energy consumption.
- Hydrogen is the key to addressing the **remaining 81 %** and bringing renewable electricity into industrial processes, transport, heating and cooling.

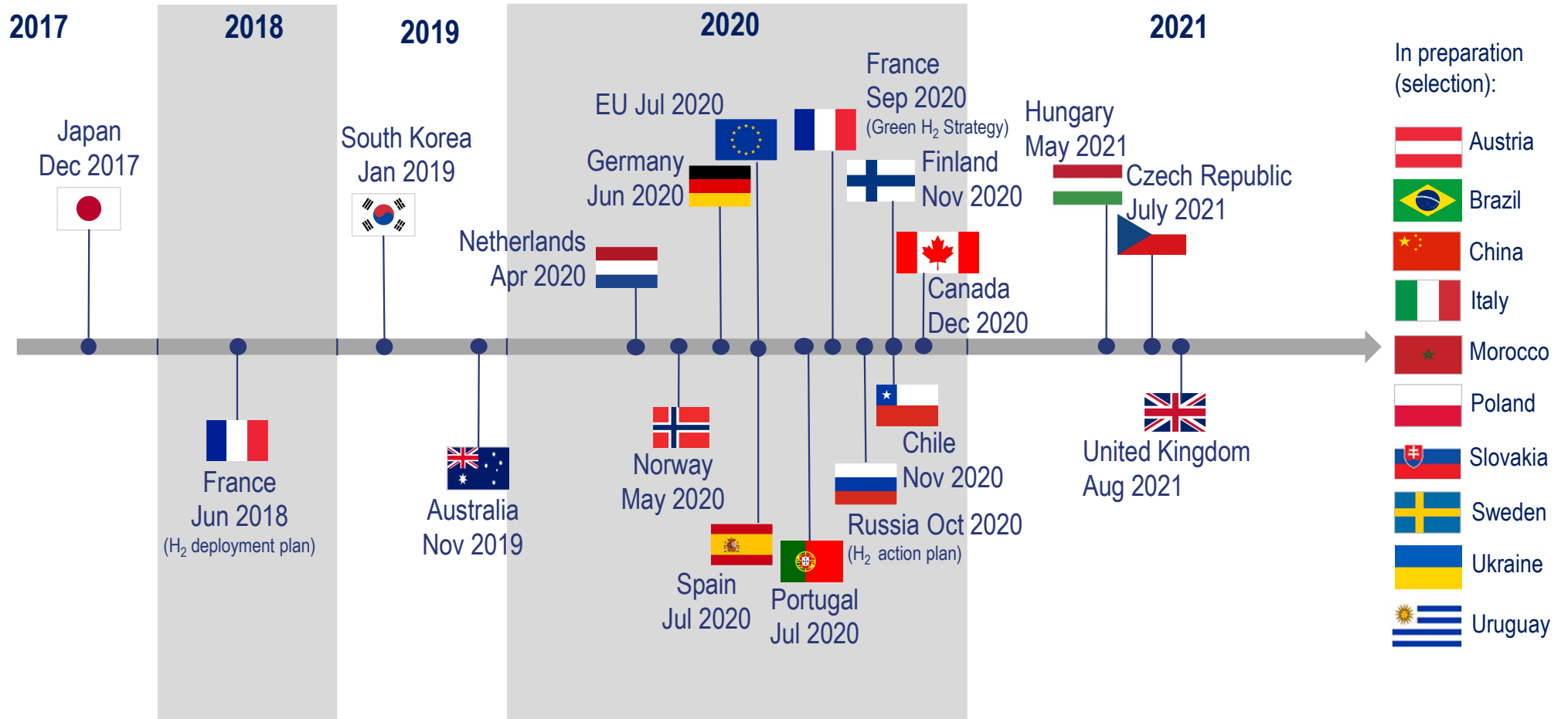
Study objective: analyse and learn from H₂ strategies

What is the national governmental support for H₂ technologies and applications?

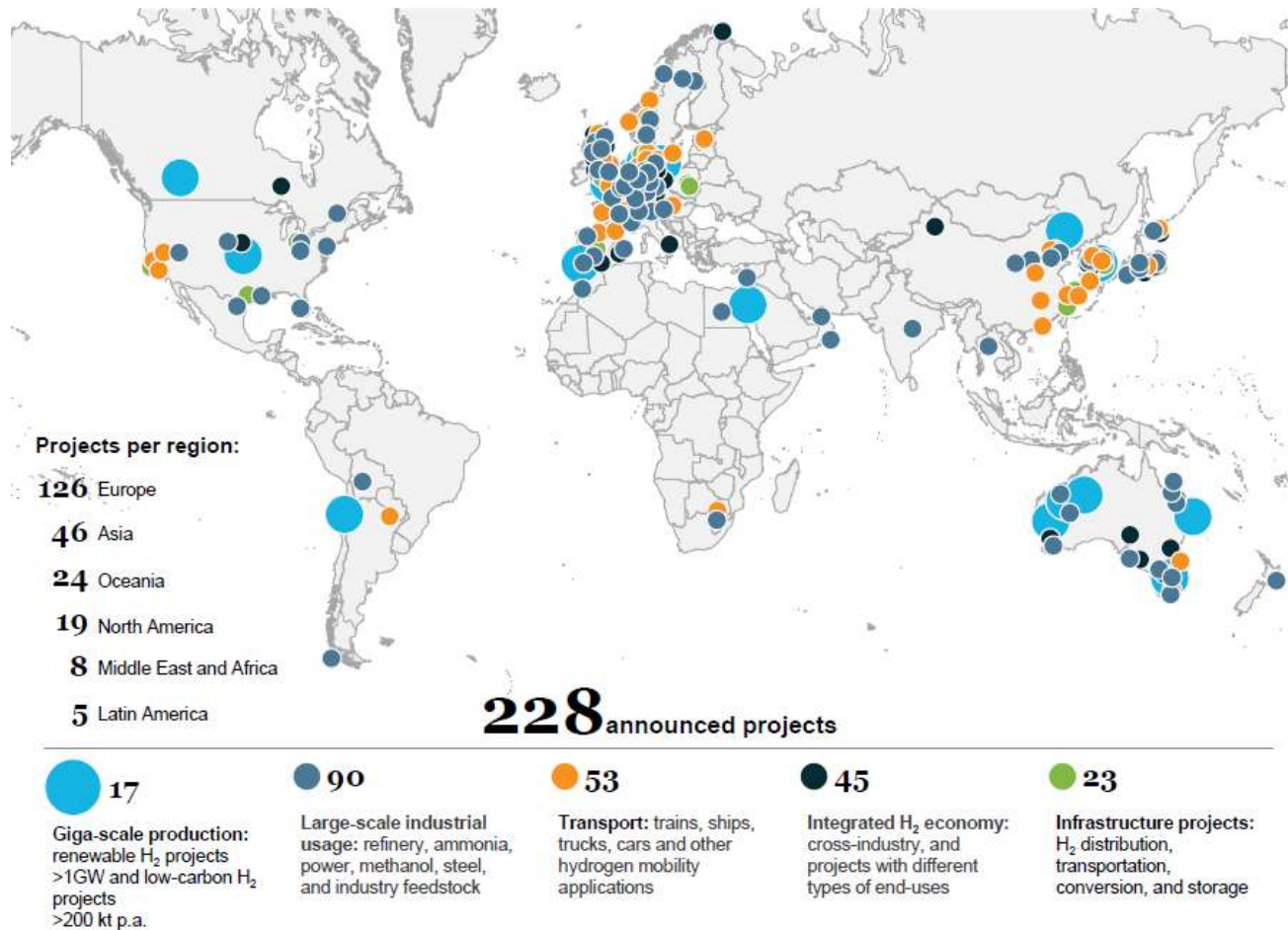
How can current experience benefit discussions of the European and German strategy?



International Hydrogen Strategies



Global H₂ projects along the value chain



Main target sectors of current H₂ strategies per country I

Hydrogen use sectors	EU	DE	NL	FR	ES	IT	UK	NO	CH	UA	RU	JP	KR	CN	AU	CA	MO
Industry	✓	✓	✓	✓	✓	(✓)	✓	✓	✗	✗	✓	(✓)	✗	✗	✓	(✓)	✓
Power	(✓)	(✓)	(✓)	✓	(✓)	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	(✓)	(✓)
Transport	✓	✓	✓	✓	✓	(✓)	✓	✓	✓	✓	(✓)	✓	✓	✓	✓	✓	(✓)
Buildings	(✓)	(✓)	(✓)	(✓)	✗	✗	(✓)	✗	✗	(✓)	(✓)	✓	✓	✗	(✓)	(✓)	(✓)
Export	✗	✗	✗ ¹⁾	✗	✓	✗	✗	✗ ²⁾	✗	✓	✓	✗	✗	✗	✓	✗	✓

✓ main sector (✓) less relevant ✗ not addressed

1) Hydrogen imports transit to other countries (e.g. Germany) considered.

2) For Norway, hydrogen is not targeted for direct export, but indirectly through the export of Natural Gas with local CCS.

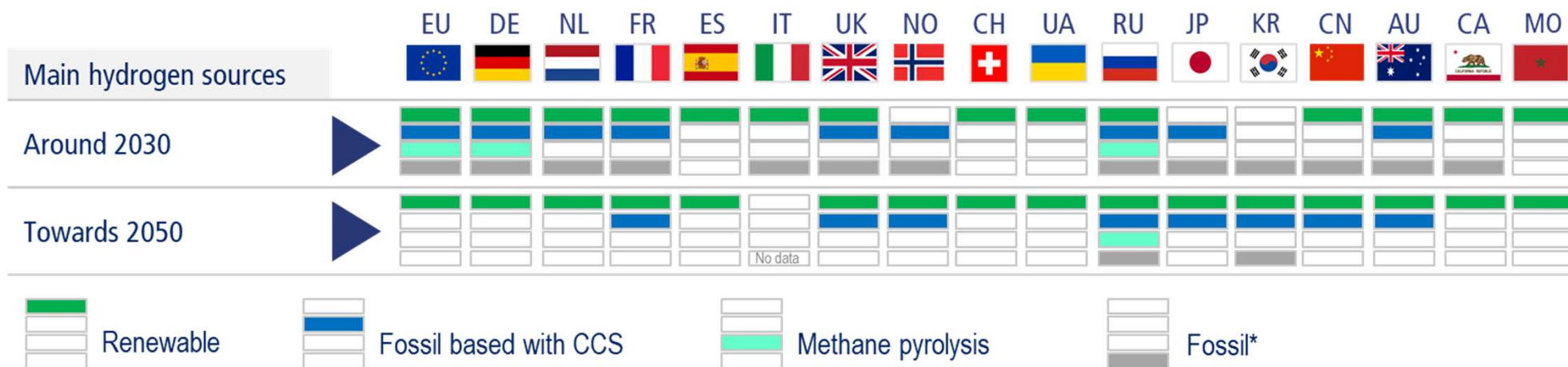
H₂-related requirements: the color of hydrogen

Around 2030

- Renewable and fossil-based hydrogen (with and without CCS) are generally considered viable medium-term sources.
- Methane pyrolysis for hydrogen production is mainly discussed as option in the German and Russian strategies.

Towards 2050

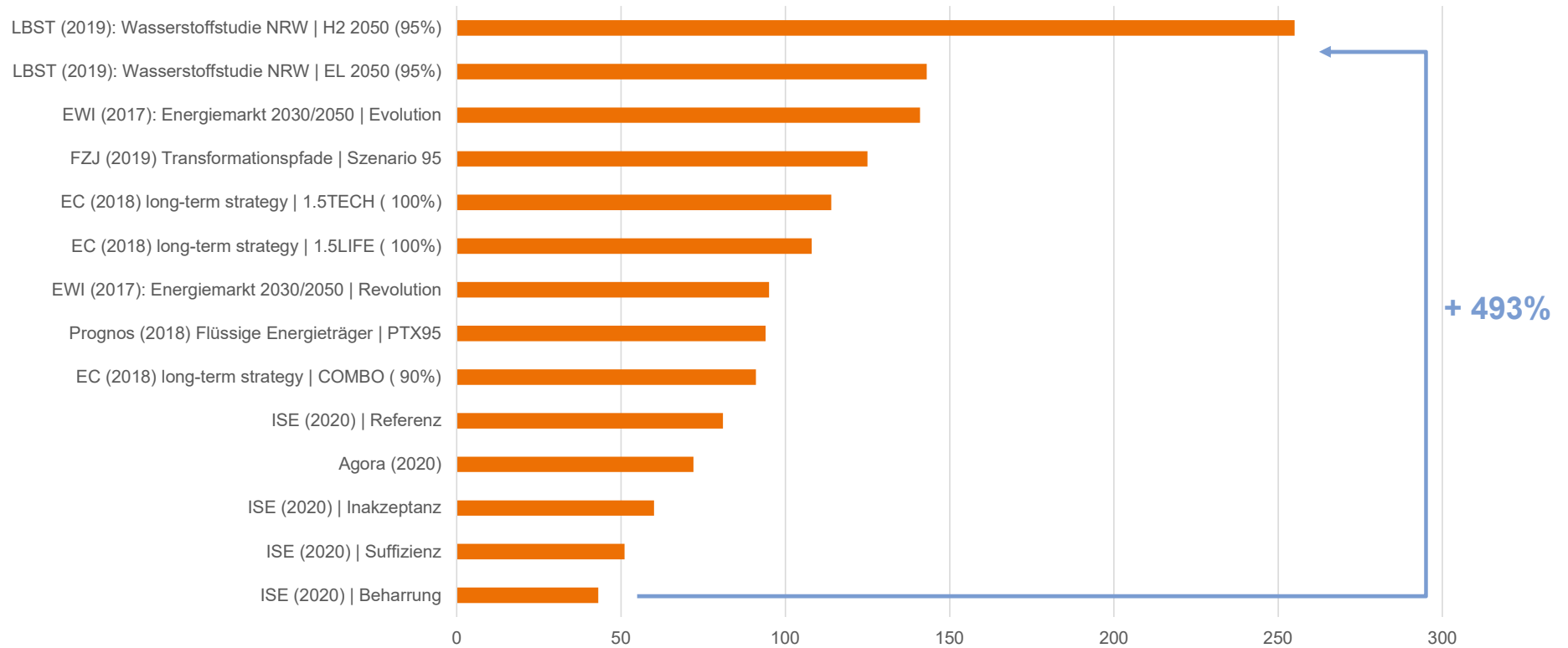
- Renewable hydrogen is the most favorable hydrogen quality in the long-term. Various countries consider it the only viable long-term option.
- Fossil based hydrogen with CCS is regarded a feasible hydrogen source in the long-term in a range of countries.



* In Russia in 2050 mainly based on nuclear power

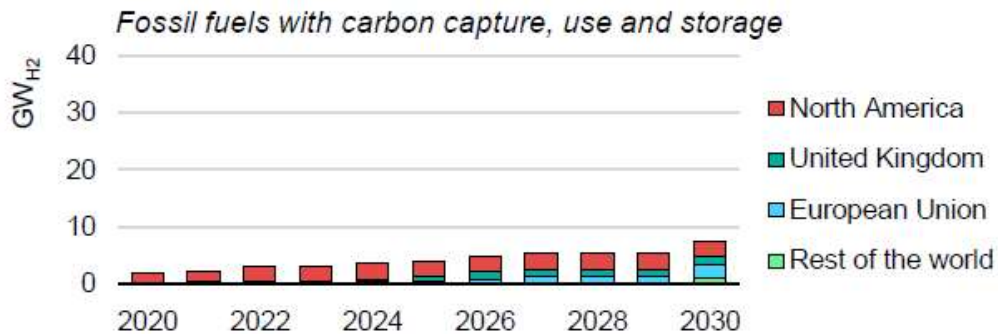
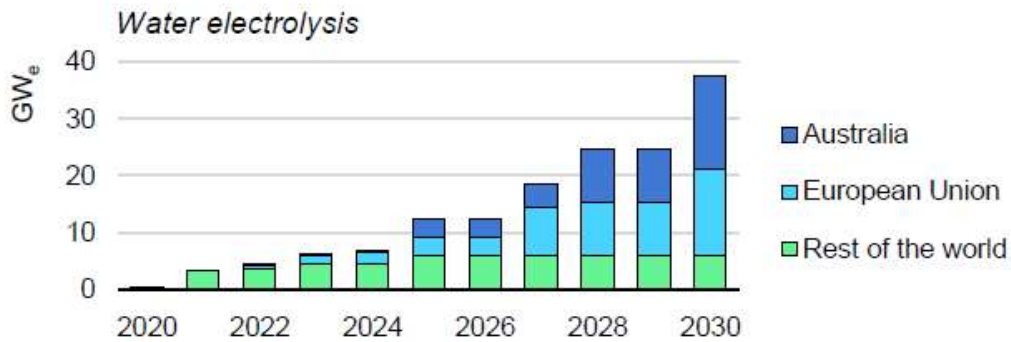
However, current studies show a wide range for the demand of hydrogen in industry

Comparison of hydrogen demand in industry for the year 2050 [in TWh]

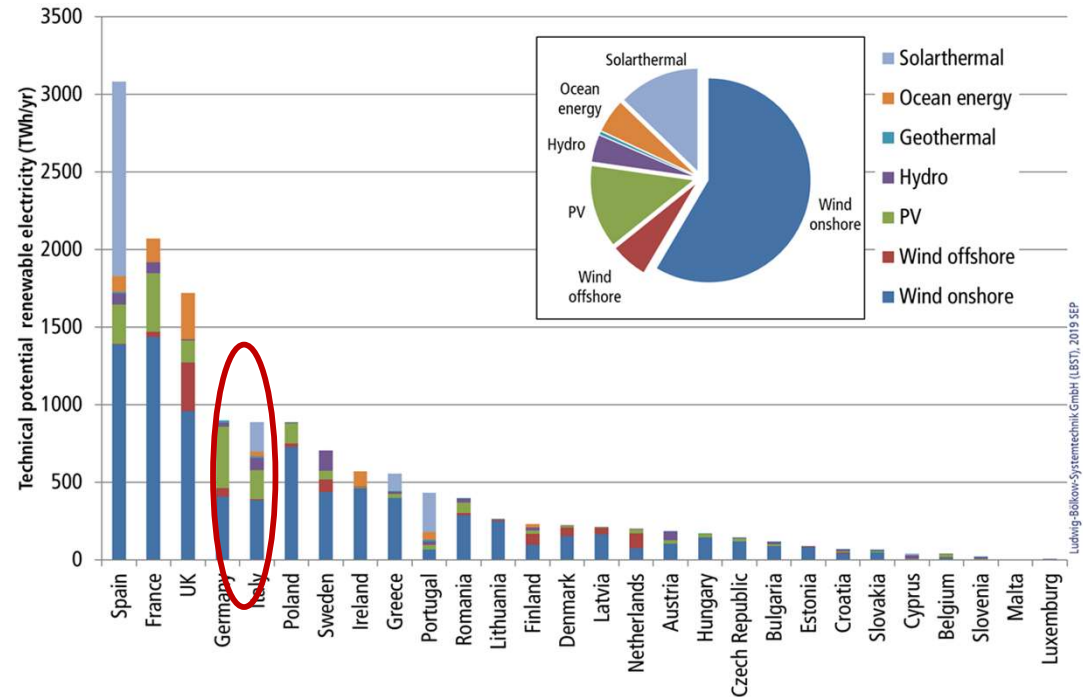


RE potential exceeds power and H₂ demand in EU

Projects for the production of low-carbon H₂



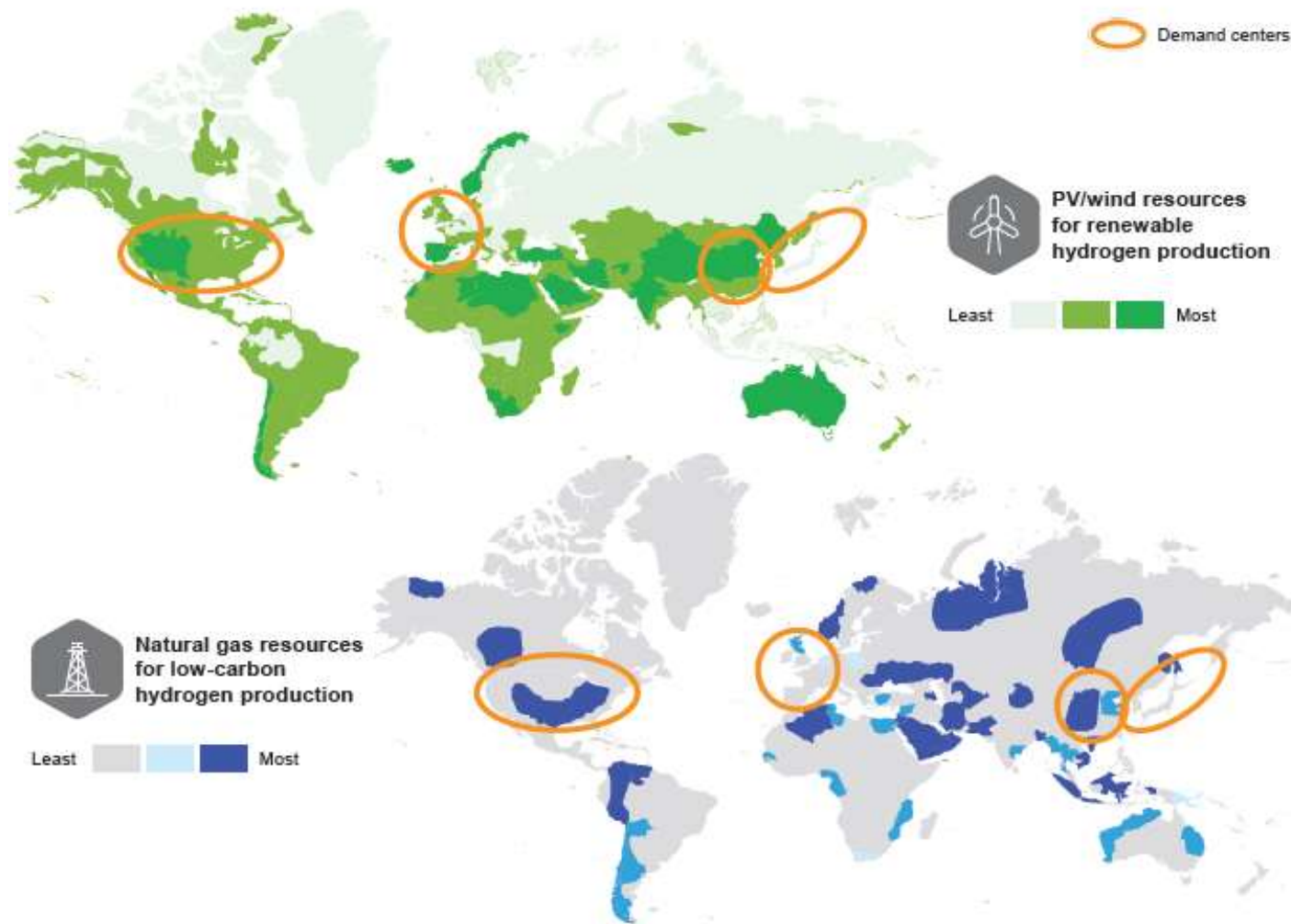
Source: International Energy Agency (IEA)



- Large wind and solar technical potentials in EU: ca. 14,000 TWh/a
- German renewables potential : ca. 1,000 TWh/a

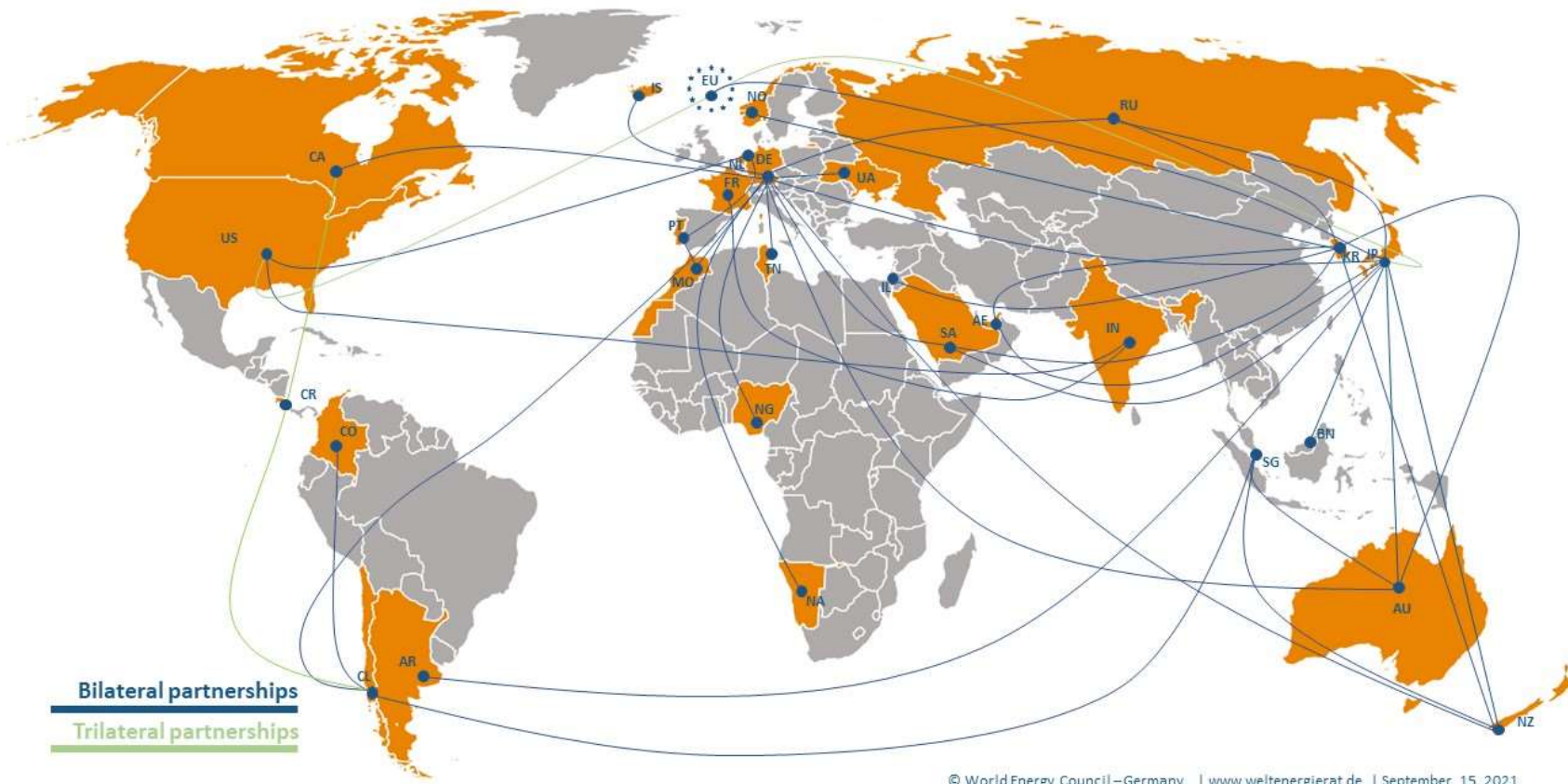
Source: Trinomics/LBST/E3-Modelling, 2019

Global H₂ resources and demand centers



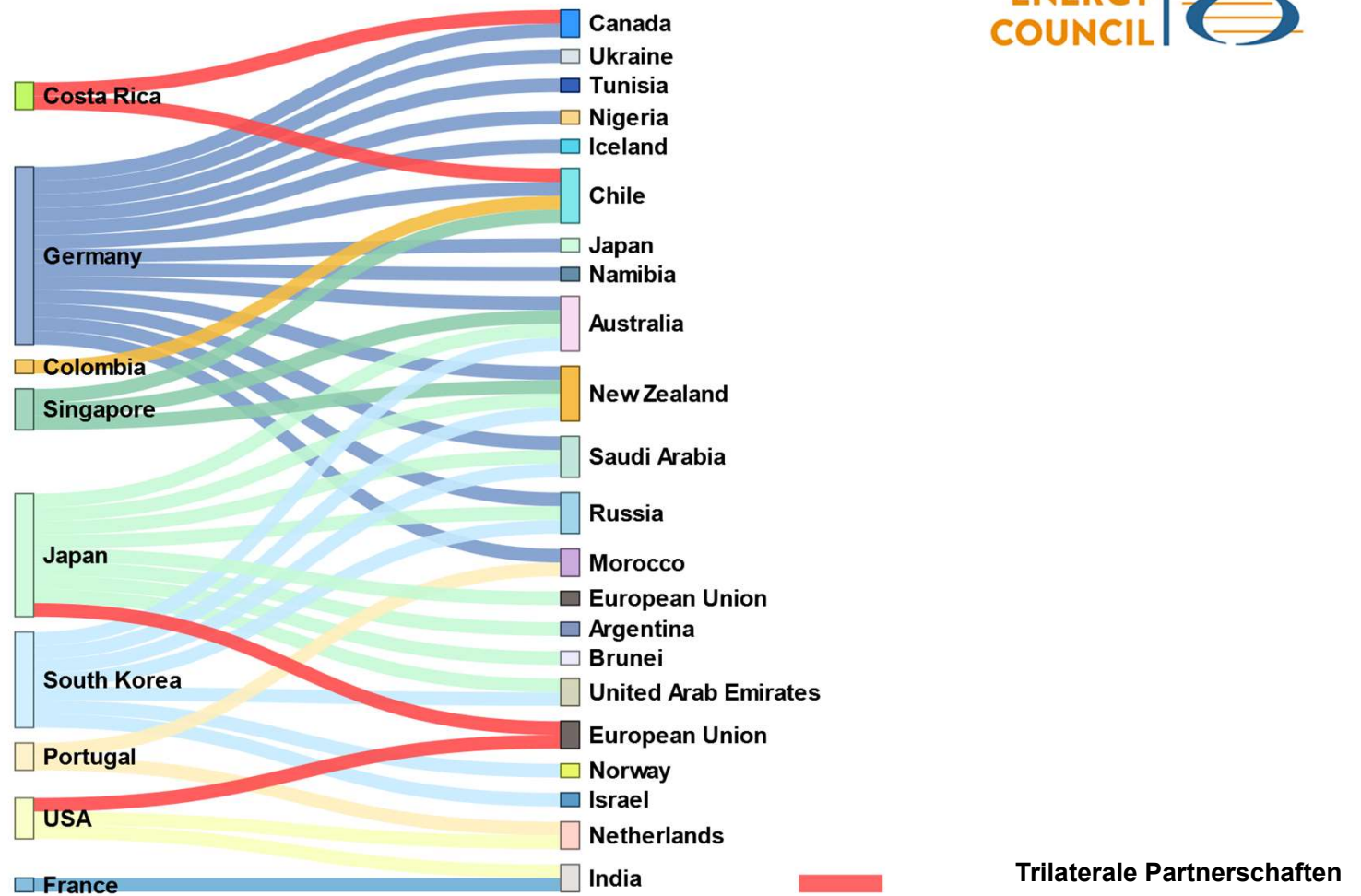
Source: Hydrogen Council/McKinsey & Company

International H₂-partnerships I



© WorldEnergy Council – Germany | www.weltenergierrat.de | September 15, 2021

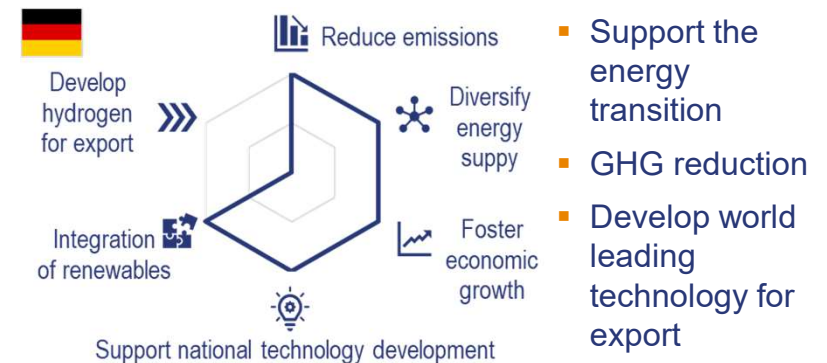
International H₂-partnerships II



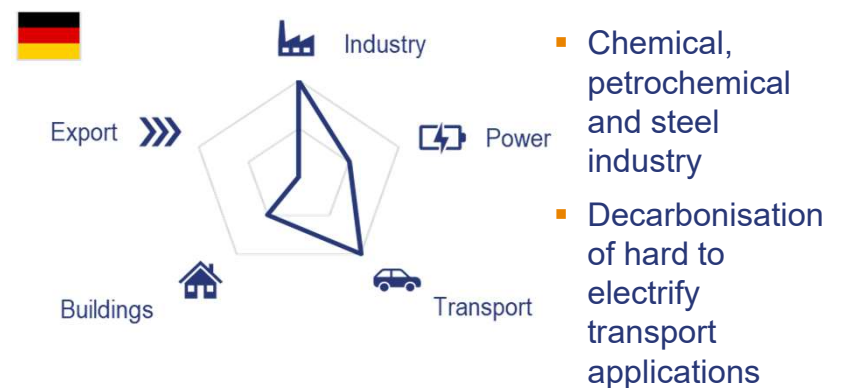
National H₂ strategy Germany

- **Two phases to activate hydrogen market in Germany:**
 - Phase 1 (<2023): Start market ramp-up, harness opportunities
 - Phase 2 (<2030): Strengthen market ramp-up nationally & internationally
- **Long-term focus:** renewable hydrogen in different sectors
- **38 concrete measures along the whole value chain**
- **Expected funding: 7 B€ (national) + 2 B€ (international)** + up to 12 B€ from other funds (together with other technologies)
- **National targets for Germany:**
 - **Electrolysis:** 5 GW & 14 TWh/a (2030) | 10 GW & 28 TWh/a (2035-2040)
 - **H₂ consumption:** 90-110 TWh/a (2030) | 110-380 TWh/a (2050)

National goals



Target sectors and infrastructures



Selection of measures from the German H₂ strategy

Hydrogen production

- Revision of EEG charge for the use of electrolyzers (charges, levies, taxes on renewable electricity)
- New business models for cooperations in between electricity and gas network operators
- Support schemes for electrolyzers
- Support schemes for offshore wind production

Hydrogen use

- Mobility
- Industry
- Heat

- Ambitious national implementation of RED II (Accountability of synthetic fuels towards EE-targets and CO₂ thresholds)
- Examination of quota for synthetic fuels in aviation sector
- Support scheme for the production of synthetic fuels
- Implementation of Clean Vehicle Directive
- Examination of „CO₂ Vignette“
- Examination of quota for end consumers, such as green steel

Infrastructure and supply

- Coordinated approach for building H₂ charging infrastructure
- Required regulatory framework for the establishment of a functioning infrastructure

Research, education and innovation

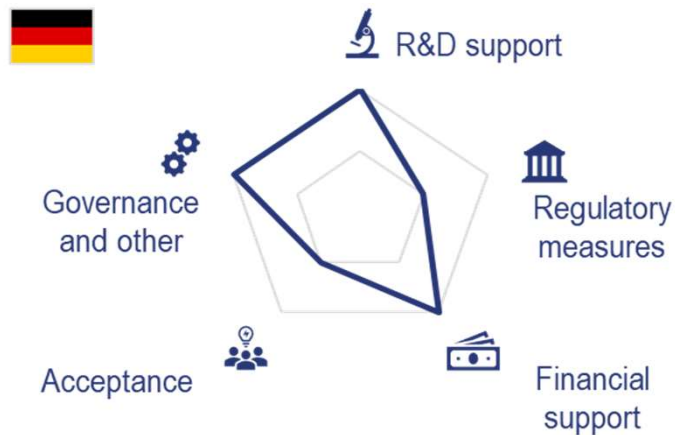
- Creation of a hydrogen roadmap
- Launch of hydrogen demonstration projects
- F&E support in all sectors, also: fuel cell development

European activities & international H₂ economy (additional 2 bn euros)

- Establishment of international partnership programs
- Creation of „atlanti of potential“
- Pilot projects in partnering countries / international hydrogen value chains
- Establishment of a European certification scheme

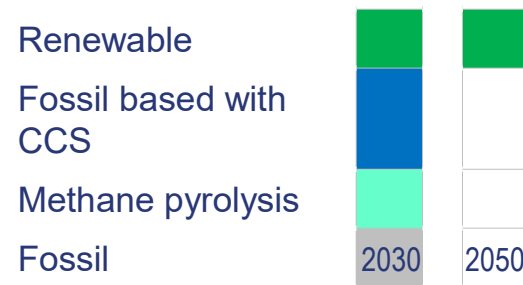
Germany country summary: Measures, requirements, and achievements

Major support measures



- Comprehensive R&D programmes (NIP)
- Funding for large scale projects
- Aggressive transposition of European directives (RED II, AFID)

Considered main hydrogen sources



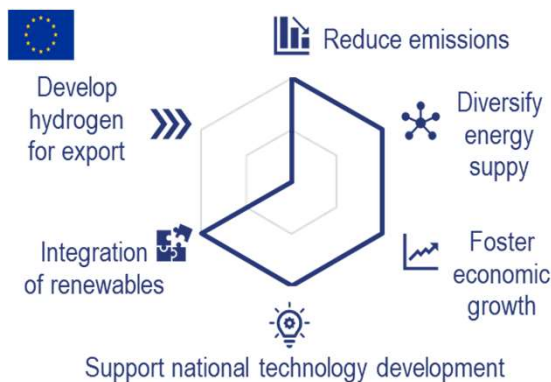
Achievements

- Many research and pilot projects launched in the past years
- Successful launch of comprehensive value chain demonstration projects
- National network of H₂ refuelling stations
- Fuel cell trains in regular service

H₂ strategy European Union

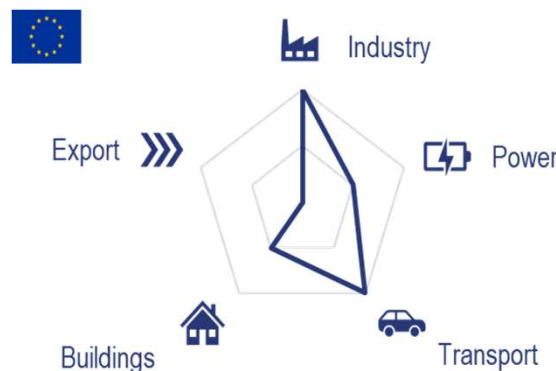
- European Commission’s “A hydrogen strategy for a climate-neutral Europe” published in July 2020.
- Hydrogen production targets:
 - Electrolysis: 6 GW (2024); 40 GW (2030)

National goals



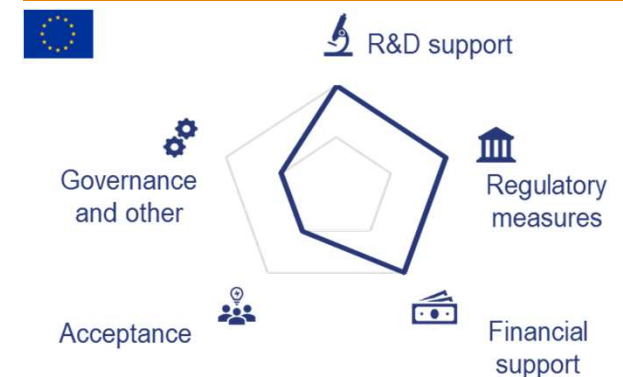
- 1 million jobs directly and indirectly in the long-term; cumulative investment of up to about 500 B€ for renewable and low-carbon hydrogen until 2050
- Hydrogen considered key to achieve GHG targets

Target sectors and infrastructures



- In the transport sector, heavy-duty vehicles (trucks, buses, aviation, ships) in focus.
- Focus in industry sector on refineries, ammonia, and methanol production.

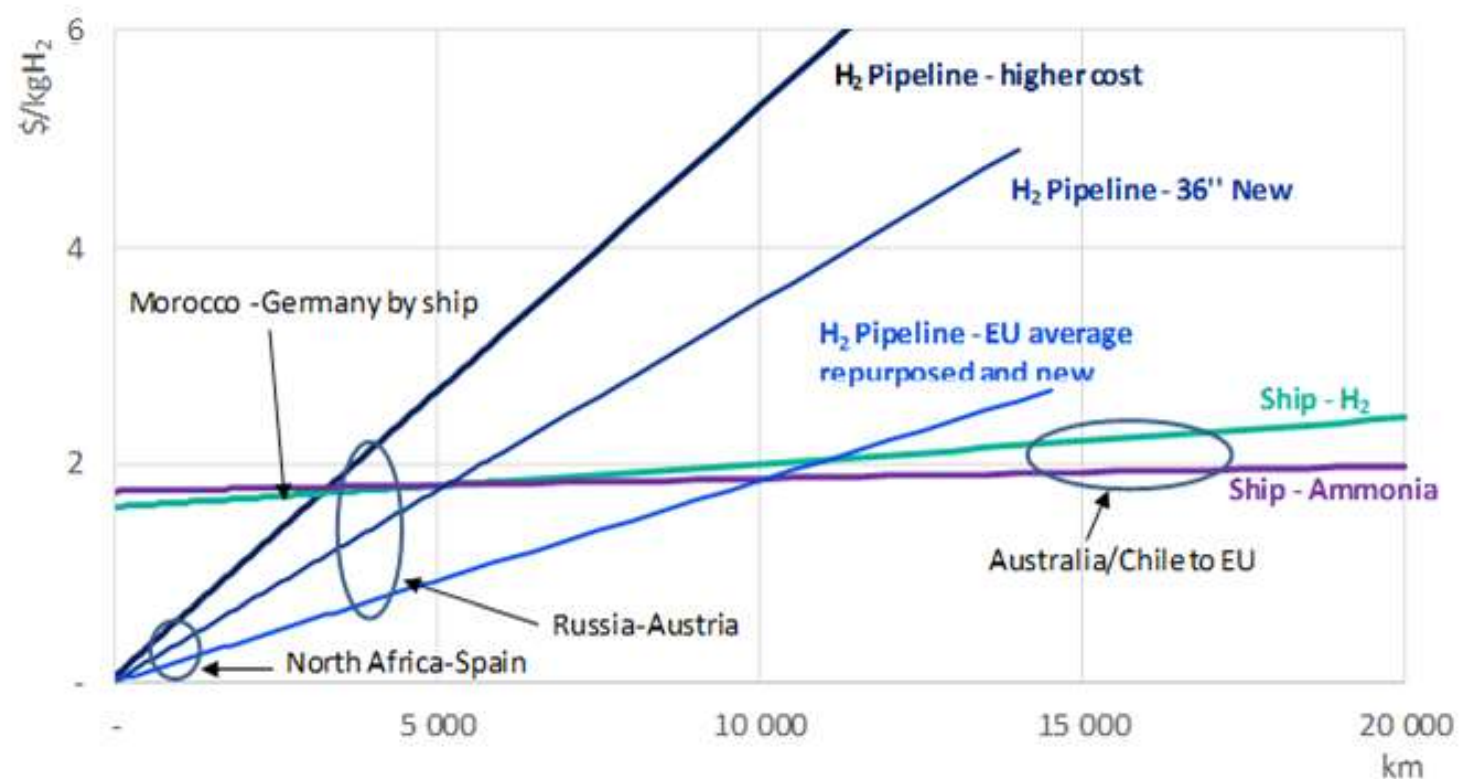
Major support measures



- Possible quota in end-use sectors
- European certification system for renewable and all low-carbon fuels planned.
- Revision of EU Directives
- Further support via the Horizon Europe programme

Transportation cost overview

- Shipping costs include conversion and reconversion costs
- Pipeline costs refer to pipelines on land
- Subsea pipelines assumed to cost 25-30% more and are no longer than 1,500-2,000 km



Source: World Energy Council – Europe

The vision for a European Hydrogen backbone: a strategic extension to the East?

- First vision endorsed by the European gas transmission operators
- Presented by 11 TSOs from 9 member states
- Poland would be a further strategic supplement

The companies foresee a network gradually emerging from the mid-2020s onwards to an initial 6,800 km pipeline network by 2030, connecting 'hydrogen valleys'. By 2040, a hydrogen network of 23,000 km is foreseen, 75% of which will consist of converted natural gas pipelines, connected by new pipeline stretches (25%).

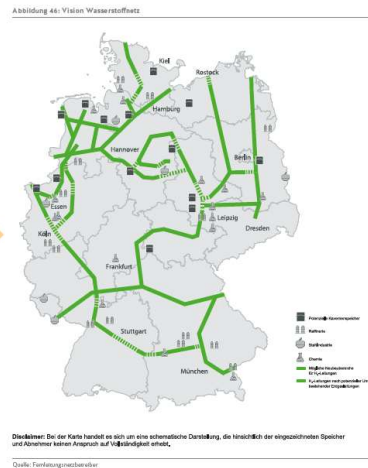
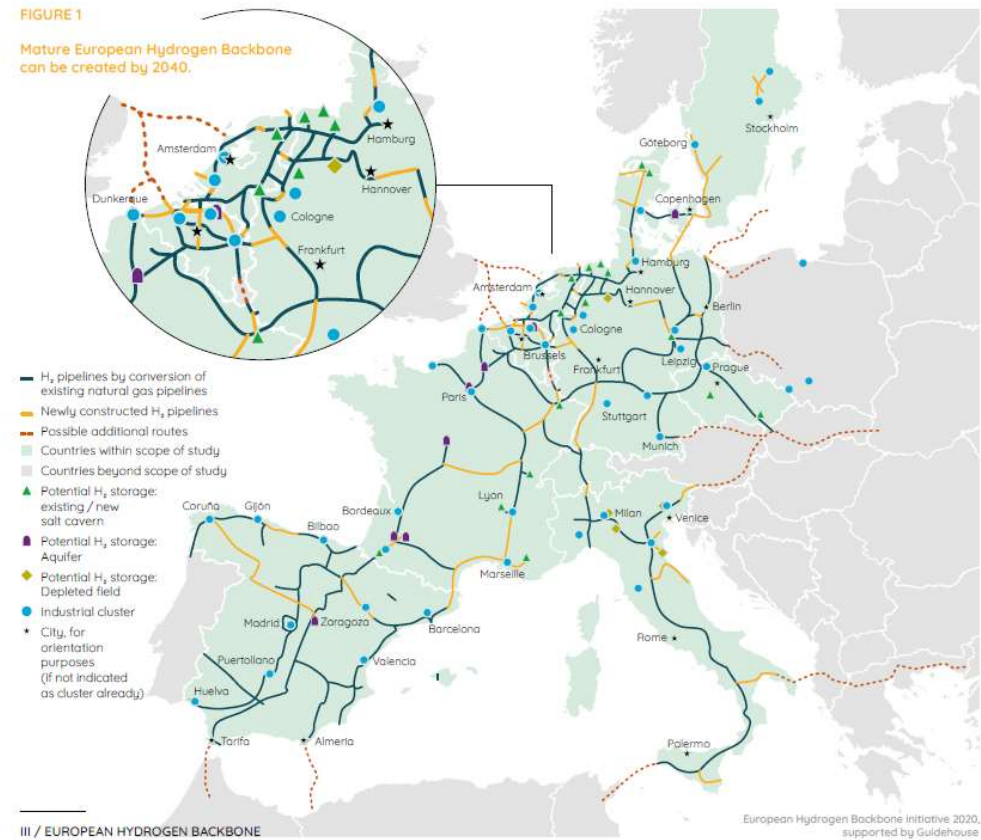


FIGURE 1

Mature European Hydrogen Backbone can be created by 2040.



Fit-for-55 on hydrogen



ETS

- Production of H2 with electrolyzers to be included in the EU ETS



Alternative Fuel Infrastructure Regulation

- Deployment of refuelling points for H2 (mobility)



Energy Taxation Directive

- Preferential tax rates for the use of renewable and low-carbon H2 for end-consumers
- Tax exemption or reduction possible for RFNBOs

Revision RED II

- Legal basis for creating certification schemes for renewable and low-carbon hydrogen -> not mandatory for Member States
- Scaling up the ambition for renewable energies in the EU
- Proposal of sector quotas (industry (50% renewable H2 of overall H2 share) and mobility (2.6% renewable of RNBOs share in use))
- Delegated Act: Criteria for production of green hydrogen still pending! ❌





Many aspects remain open and need to be addressed in the revision **European Gas package**:

- Infrastructure regulation** needs to be addressed as soon as possible
- Classification of climate-neutral gases** according to CO2-footprint required, criteria for production of **green H2** pending
- European-wide **certification scheme** for climate-neutral gases should be established, being accountable for end-consumers and should be operationalized according to a **book-and-claim system** to help ramping up a European tradable market for hydrogen

Important steps for scaling up a European market for hydrogen



Provide harmonized standards

..to ensure level playing field for climate-neutral Hydrogen

-  Establish European classification and **certification scheme** based on CO₂-footprint
-  Establish **harmonized regulation and interoperability for hydrogen infrastructure and cross-border transport**
-  Develop a **power-to-X import strategy**
-  Adopt **State Aid Guidelines in view of promoting hydrogen projects**



Create a demand for hydrogen:

-  Enable the use of synthetic fuels to fulfill sector targets (e.g. mobility sector, industry sector)
-  Foster European research and innovation programs (H2020, regulatory sandboxes) as well as support mechanisms (IPCEI)



Vielen Dank!

Contacts

Dr. Carsten Rolle
Executive Director
Prof. Dr. Klaus-Dieter Barbknecht
Schatzmeister

T: +49 (0)30-2061 6750
E: rolle@weltenergierat.de

World Energy Council – Germany
Gertraudenstraße 20
10178 Berlin
www.weltenergierat.de