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and Energy

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Germany's National Hydrogen Strategy

Support programs for hydrogen

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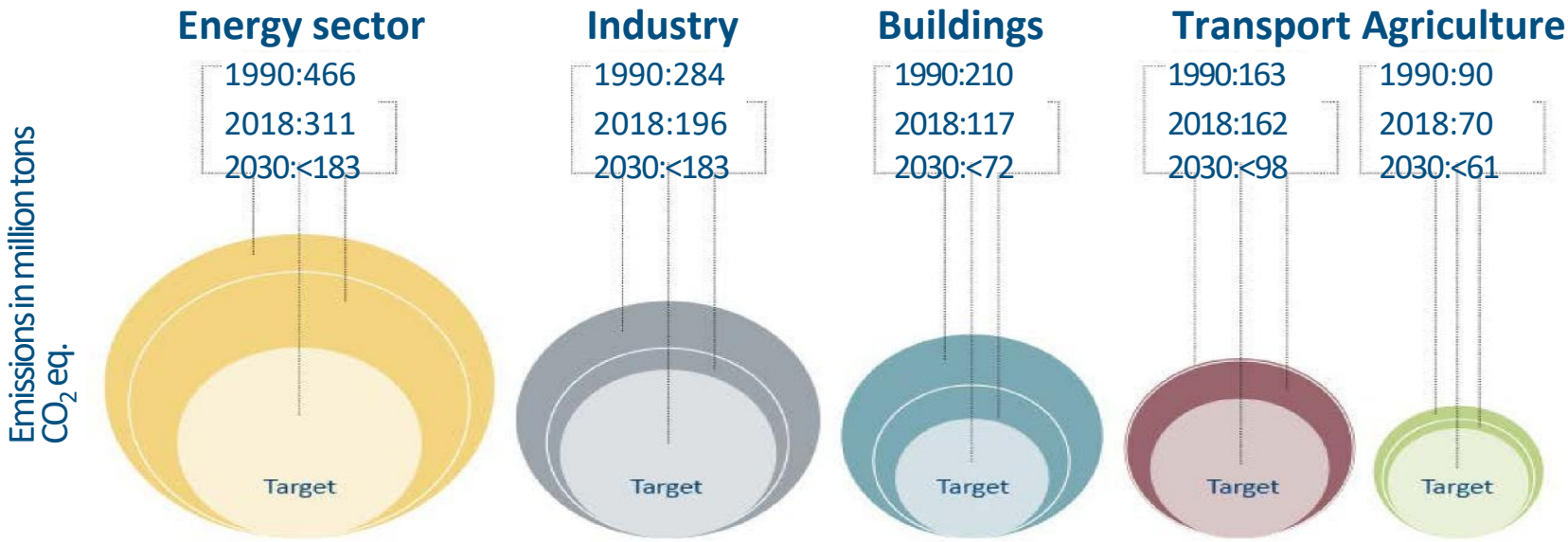
Germany‘s Climate Action Plan 2050 sectoral emission targets for 2030

Germany’s sectoral GHG emission targets for 2030



Total emission target 2030: < 563 million tonnes of CO_2 equivalent

Source: Navigant 2019 based on BMU 2019

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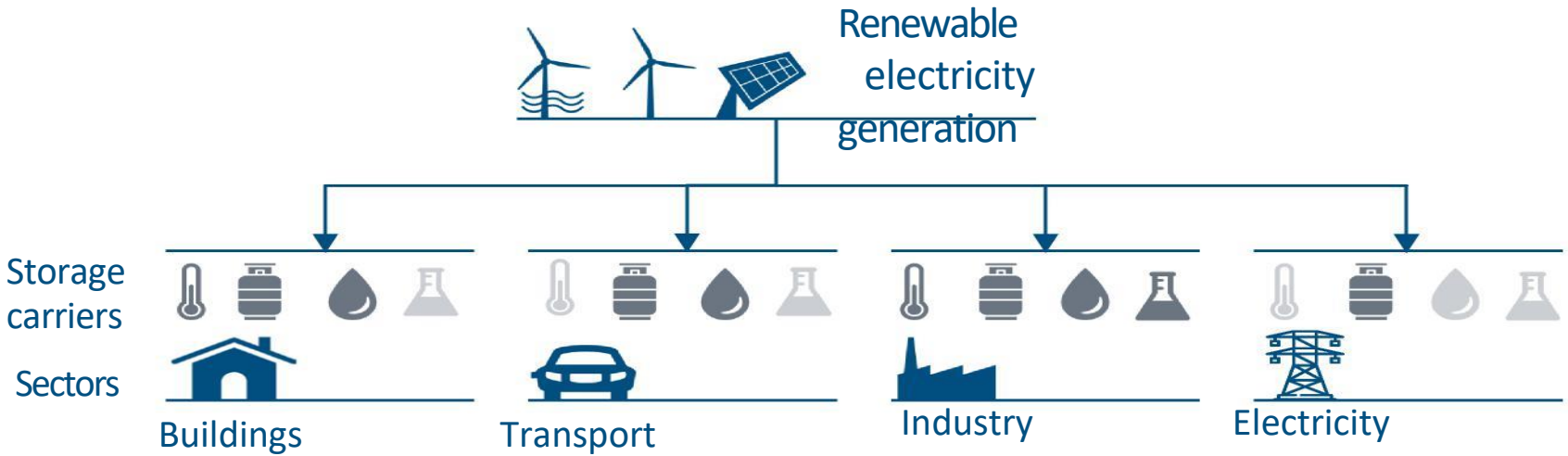
Power-to-X supply



Source: Navigant and Edelman 2019

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A concrete action plan lays out the necessary steps to bring Germany' hydrogen strategy to success

Hydrogen production

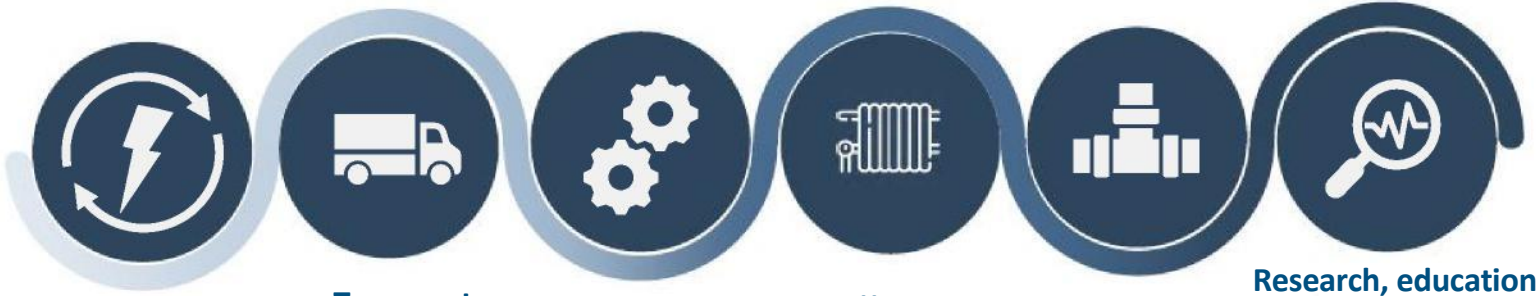
- 5 GW electrolyzer capacity including renewable energy generation
- Additional 5 GW by 2040 considered

Industry

- Pilot program for Carbon Contracts for Difference (CfD)
- Sector-specific dialogue formats

Infrastructure and supply

- Stakeholder process to identify actions needed to establish hydrogen infrastructure
- Improve link between electricity, heat and gas sectors



Transport

- Implementation of the EU Renewable Energy Directive (RED II)
- 2% e-kerosene quota by 2030

Heat

- Incentivize ‚hydrogen-readiness' for CHP plants
- Funding of funding fuel-cell heating systems

Research, education and innovation

- National and international demonstration projects on green hydrogen
- Research offensive named ‚Hydrogen Technologies 2030'

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Source: Guidehouse 2020 based on BMWi 2020

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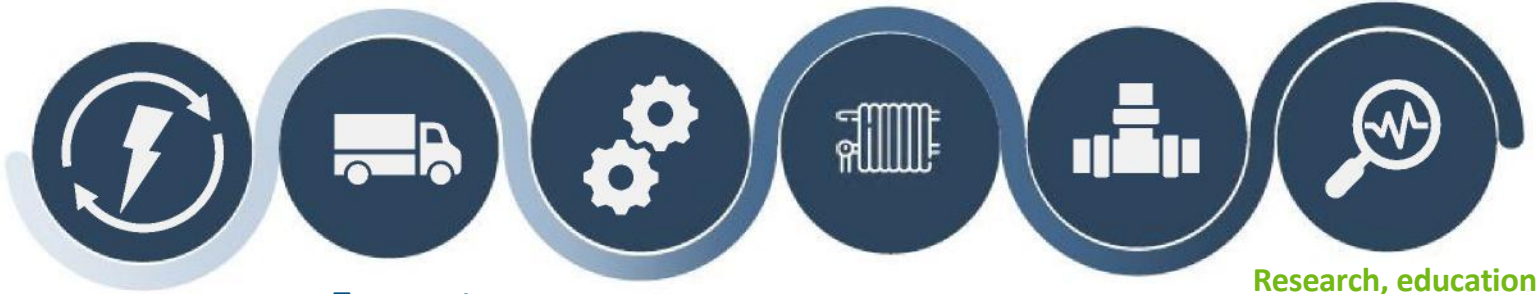

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Source: Guidehouse 2020 based on BMWi 2020

Hydrogen production

H_2

Vision:

Only green H_2 considered sustainable in the **long term**, but given Germany's close integration in the European energy supply infrastructure, carbon-free H_2 will be temporarily used

By 2030, a demand of **90 to 110 TWh H_2** is expected

Now is the time for **scale-up to reduce the cost** of H_2 production considerably

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Measures (not exhaustive):

By 2030, 5 GW H_2 production capacities (equivalent to 14 TWh H_2 p.a.) are planned, with additional 5 GW added by 2035-2040

Exploration whether electricity for green H_2 production could be largely **exempt from taxes**, levies, and surcharges

Promotion of **offshore wind** for H_2 production

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Source: Guidehouse 2020 based on BMWi 2020

Research, education, innovation

Vision:

Research funding for key enabling technologies and new approaches that cover the entire hydrogen value chain

Integrating forward-looking basic research with targeted application-based research; strengthening the cooperation between **science & business**

Measures (not exhaustive):

National and international **demonstration projects** on green hydrogen

New **cross-ministry research campaign** entitled 'H_2 technologies 2030'

Developing a **roadmap for the German hydrogen industry**

Foster education and **vocational training** nationally and internationally

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Source: Guidehouse 2020 based on BMWi 2020

Funds have been dedicated to research on hydrogen since 2006

*Hydrogen technologies are supported through public **research funding.***

National Innovation Program Hydrogen & Fuel Cell Technologies 2006-2025

Strategic Priority of 7th **Energy Research Program**

National Hydrogen Agency (NOW)

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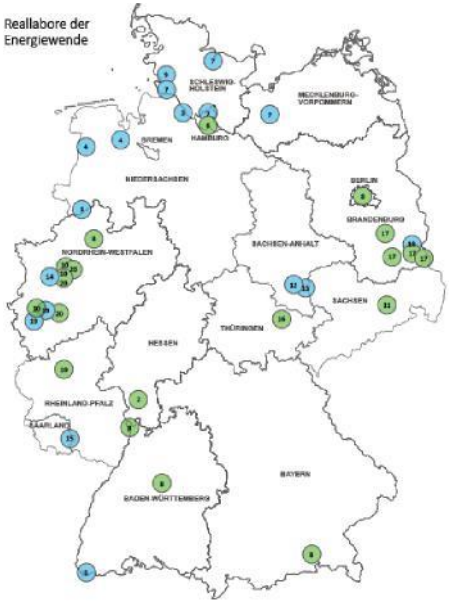
Real-life laboratories develop and test new solutions including hydrogen

Real-life laboratories (Reallabore) allow for implementation of pilot projects.

Ten hydrogen projects selected (total: 20 projects) for €100 Mio./a funding volume in the first call

Total funding volume: € 600 Mio from 2020 to 2023

Aim to support German **technology leadership** in H_2



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Industry sector

Vision:

Wherever possible, **upcoming investments** in industrial-scale production facilities should be channeled into climate-friendly technologies

H_2 is set to play an important long-term role in safeguarding the **attractiveness of Germany's industrial sector**

Measures (not exhaustive):

Supporting use of electrolysers through '**Carbon Contracts for Difference**'

Exploring how **markets for climate-neutral products** can be boosted, e.g. demand quota for green steel

Developing sector-specific, hydrogen-based long-term decarbonization **strategies with stakeholders** for i.a. chemicals, steel, logistics, aviation

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Source: Guidehouse 2020 based on BMWi 2020

International Hydrogen Markets

Vision:

Importing renewable energy from beyond the European internal market will become a medium and long-term necessity

Global **scale-up** of H_2 production in cooperation with international partners

Measures (not exhaustive)**:**

€ 2 bn. funding for international projects in partner countries for selected lighthouse projects

Integration of H_2 into existing **energy partnerships** and the establishment of new partnerships with strategic exporting and importing countries

Cooperation with partner countries in the context of a **hydrogen alliance**

Potential atlases for selected countries of development cooperation

Source: Guidehouse 2020 based on BMWi 2020

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Hydrogen is a focus area of Germany's Presidency of the Council of the EU

Priorities of the German Presidency of the Council of the EU in the field of hydrogen

- Develop common understanding of hydrogen as an element of **climate and industrial policy**
- Promote development of an **international market for hydrogen**
- **Exchange experience** on how green hydrogen can be produced sustainably and marketed competitively
- Support **hydrogen technologies** by establishing Important Projects of Common European Interest (IPCEI)

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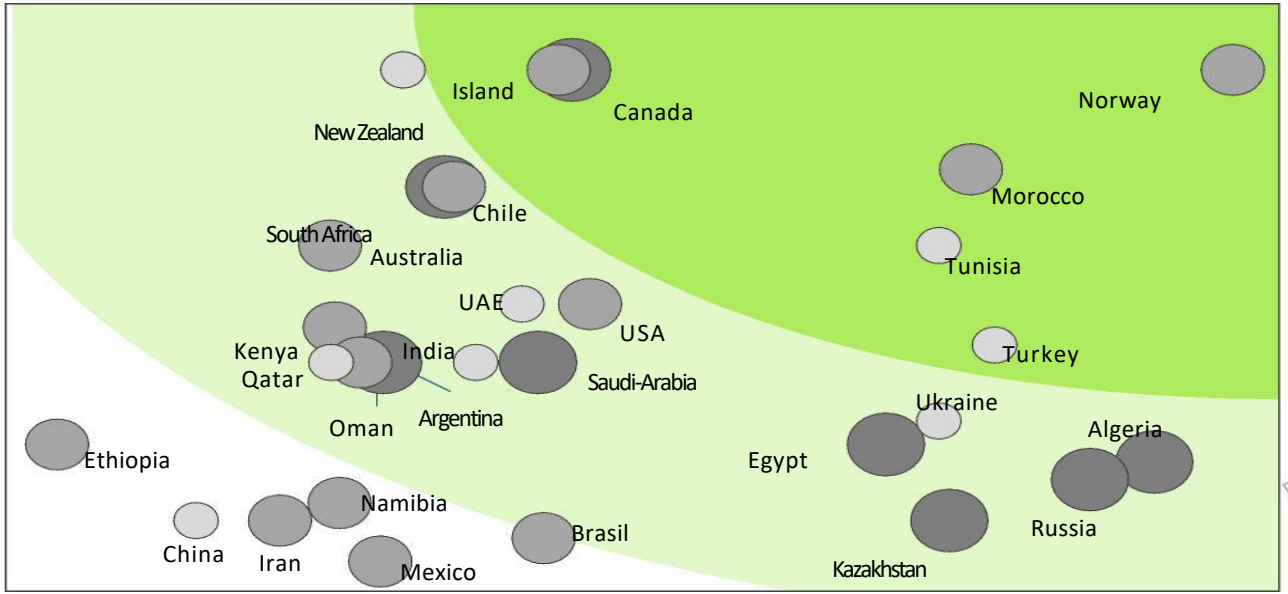
Germany is looking at international partners for hydrogen imports

favorable

Political-economic framework 2030

less favorable



more expensive cheaper

Potential

green hydrogen import costs 2030

Green hydrogen Export potential 2050

large small

Based on assumptions about long-term developments and therefore subject to uncertainties.

Source: Adelphi, Navigant, giz, dena 2019

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Thank you
for your attention!

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