

Perspectives on Germany's hydrogen strategy

*Surfing the Hydrogen Wave in Southeast
Asia – Insights from Europe & Germany*

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There is a limited set of applications in all sectors that urgently need renewable hydrogen to become climate-neutral.

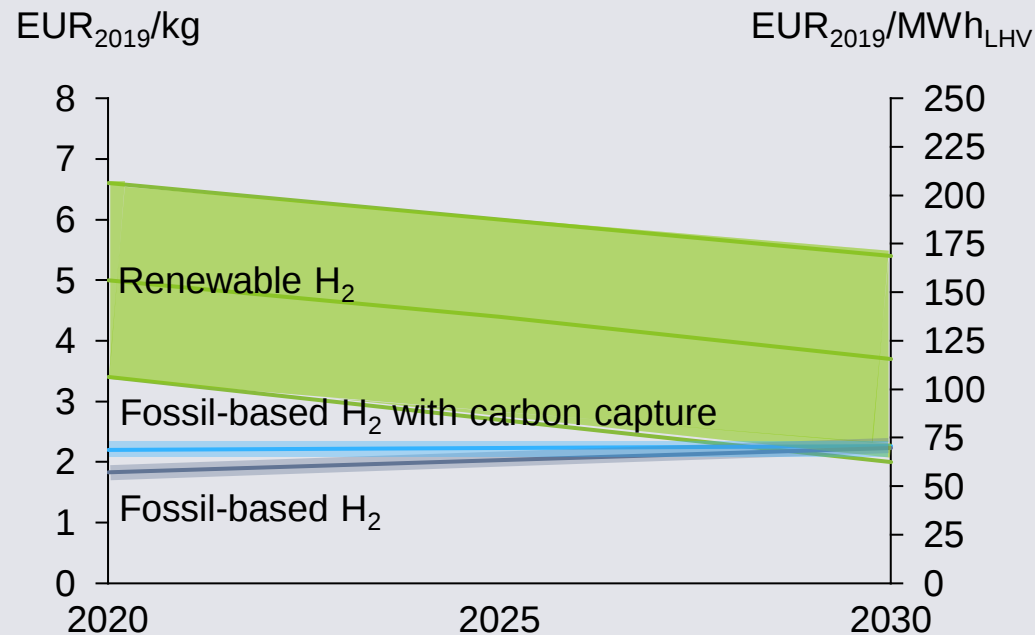
Green molecules needed?	Industry 	Transport 	Power sector 	Buildings 
No regret	· Reaction agents (DRI steel) · Feedstock (ammonia, chemicals)	· Long-haul aviation · Maritime shipping	· Long-term storage for variable renewable energy back-up	· District heating (residual heat load *)
Controversial	· High-temperature heat	· Trucks and buses ** · Short-haul aviation and shipping	· Absolute size of need given other flexibility and storage options	
Bad idea	· Low-temperature heat	· Cars · Light-duty vehicles		Individual buildings

* After using renewable energy, ambient and waste heat as much as possible. Especially relevant for large existing district heating systems with high flow temperatures. Note that according to the UNFCCC Common Reporting Format, district heating is classified as being part of the power sector.

** Series production currently more advanced on electric than on hydrogen for heavy duty vehicles and busses. Hydrogen heavy duty to be deployed at this point in time only in locations with synergies (ports, industry clusters).

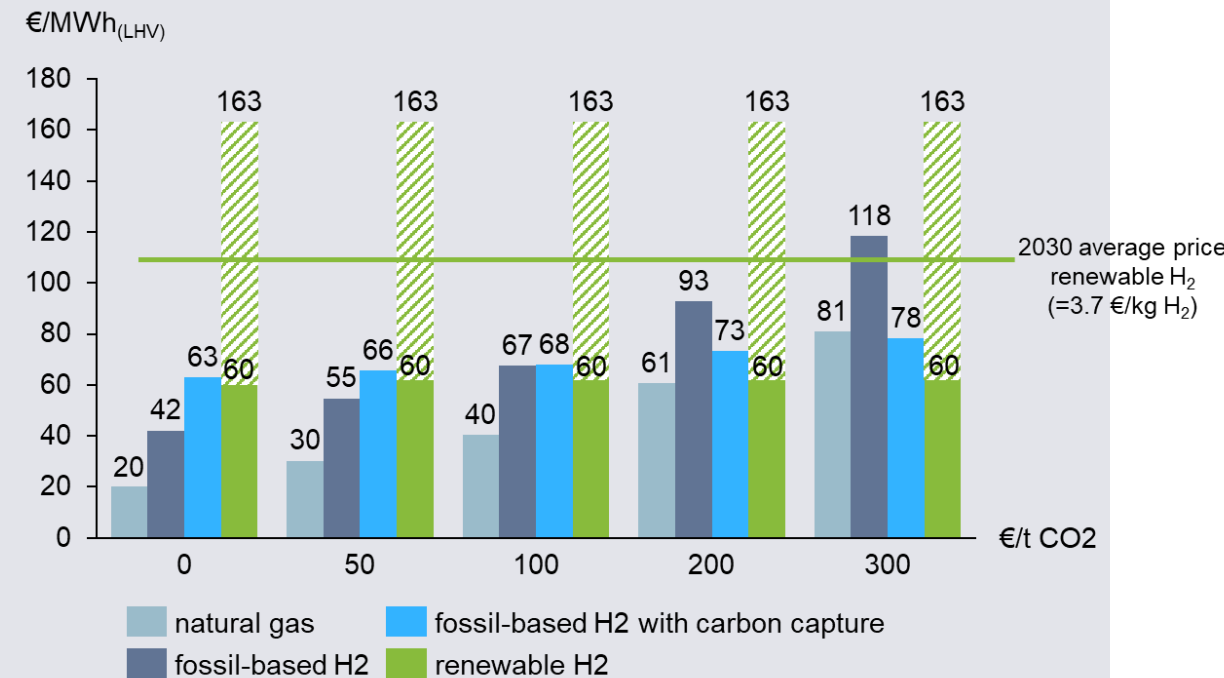
Renewable H₂ is more expensive than fossil-based H₂ and needs policy support. Even at a price of 100-200 €/t CO₂, the EU ETS alone will not incentivize renewable H₂ production sufficiently.

Cost of hydrogen over time



Guidehouse (2021),
assuming CO₂ prices of 50 €/t (2020) and 100 €/t (2030),

Cost of hydrogen over price of CO₂

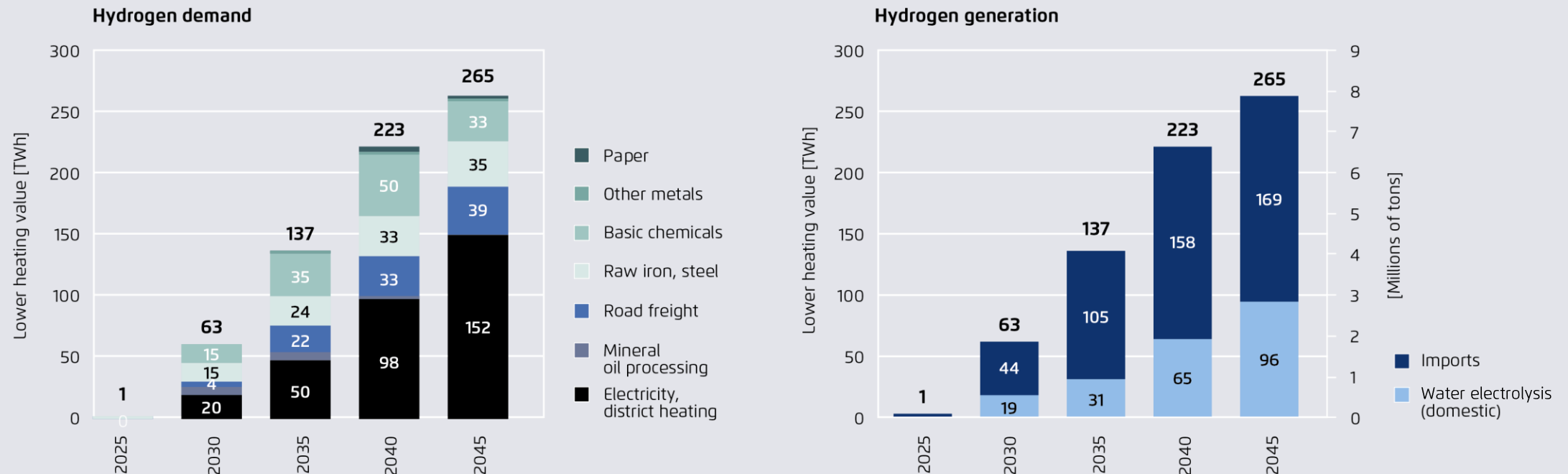


Guidehouse (2021)

a capture rate of around 75% and a natural gas price of €20/MWh.
Note that current natural gas prices are considerably higher.

Germany's demand for H₂ amounts to 63 TWh (2030) in the „Climate-Neutral DE 2045“ scenario – for safeguarding security of supply in the energy system and to create a climate neutral industry.

CO₂ free hydrogen production and consumption in Germany

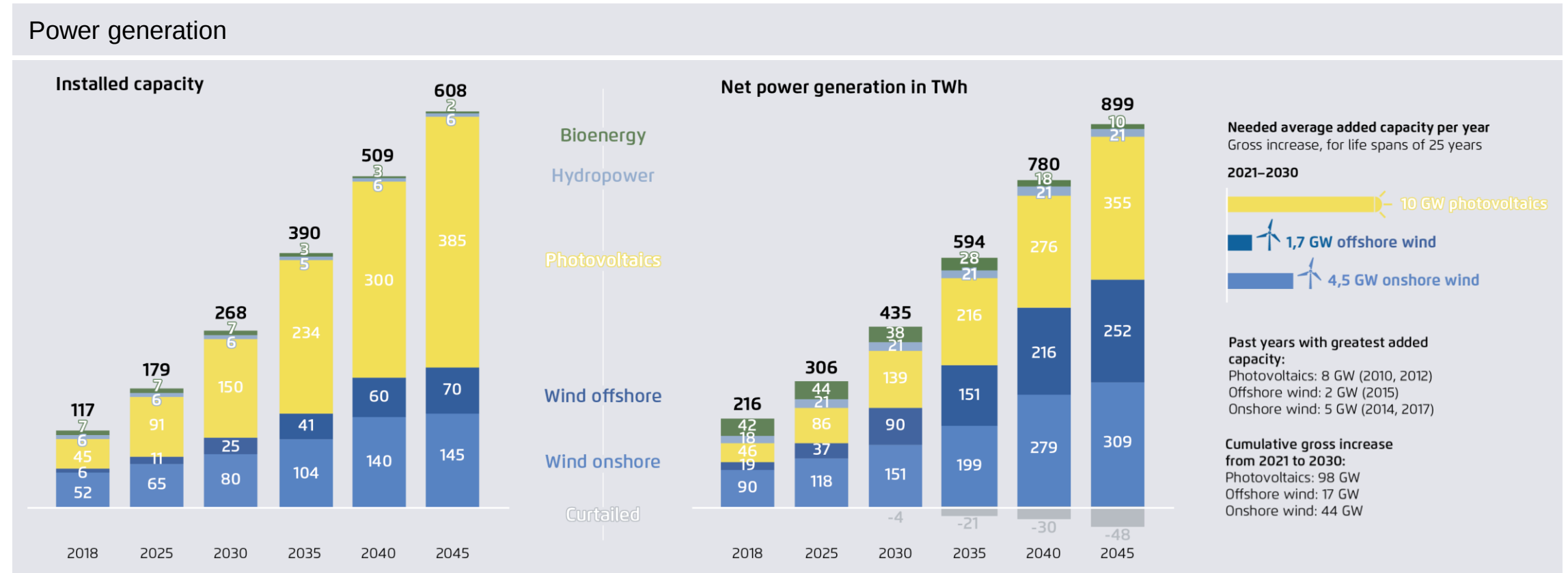


Prognos, Öko-Institut, Wuppertal-Institut (2021). Note: Hydrogen only. In addition, Germany will need 158 TWh of Power-to-Liquid by 2045.

German Hydrogen Strategy

- **Size:** Targets 5 GW for 2030 (vs. 10 GW in scenario „Climate-Neutral Germany 2045“)
- **Policy support** for
 - domestic projects (Carbon Contracts for Difference for industry, Important Projects of Common European Interest, „real laboratories“) – Combined Heat and Power missing so far
 - projects abroad (H2Global).
- **Infrastructure** development:
Regulatory risk for TSOs may need more focussed support to develop H2 pipelines
- **Renewable energy deployment** needs to increase considerably to also cover the demand of electrolyzers: ~25 TWh for 19 TWh domestic hydrogen production in the scenario „Climate-Neutral Germany 2045“.

The pace of renewable energy deployment in Germany needs to double to quadruple to reach a 70% share of electricity by 2030, to 100% by 2045 at the latest...



Prognos, Öko-Institut, Wuppertal-Institut (2021)

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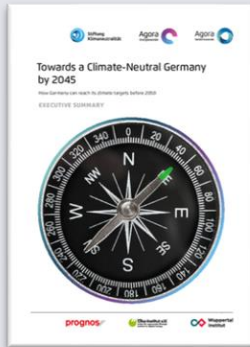
Questions or comments? Feel free to contact me:

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Publications on climate-neutrality, hydrogen and industry

Making renewable hydrogen cost-competitive	No-regret hydrogen: Charting early steps for H ₂ infrastructure in Europe	Towards a climate-neutral Germany by 2045	Breakthrough Strategies for Climate-Neutral Industry in Europe	The Future Cost of Electricity-Based Synthetic Fuels
				
> <u>main study</u> > <u>legal analysis</u>	> <u>full study</u>	> <u>summary (EN)</u> > <u>full study (DE)</u>	> <u>summary</u> > <u>full study</u>	> <u>full study</u> > <u>PtG/PtL calculator</u>
> <u>slide deck</u> > <u>webinar</u>	> <u>data appendix</u> > <u>webinar</u>	> <u>data appendix (DE)</u>	> <u>webinars</u>	> <u>slide deck</u> > <u>webinar</u>