The role of low carbon hydrogen

in the transition towards a climate-neutral Europe

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Hydrogen demand:
# Which applications really need green molecules to become climate-neutral?

Need for green molecules, in addition to green electrons (hyperlinks lead to additional material)

Green molecules needed?	Uncontroversial	Controversial
Industry	- Reaction agents (DRI steel) - Feedstock (ammonia, chemicals)	- High-temperature industrial heat
Transport	- Long-haul aviation - Maritime shipping	- Ground-based transportation (cars, trucks) - Short-haul aviation and shipping

Power sector	- Long-term storage
	  for variable renewable energy back-up
		- Absolute size of need given other flexibility
		  and storage options

Buildings	- District heating
	  (residual heat load in large existing
	  systems with high flow temperature)*
		- Heat systems for individual buildings

* According to the UNFCCC Common Reporting Format, district heating is classified as being part of the power sector

Hydrogen infrastructure: Where to start?
We derived early, no-regret investment opportunities for hydrogen pipelines, based on industrial demand.

No-regret corridors with industrial hydrogen demand in TWh per year in 2050

Best LCOH 2050
- Hybrid
- Solar
- Wind
- Industrial hydrogen demand 2050 in TWh per year

AFRY (2021)

Only those hydrogen pipelines that are resilient to the future levels of hydrogen demand and the technology assumptions used here have been considered to be "no-regret".
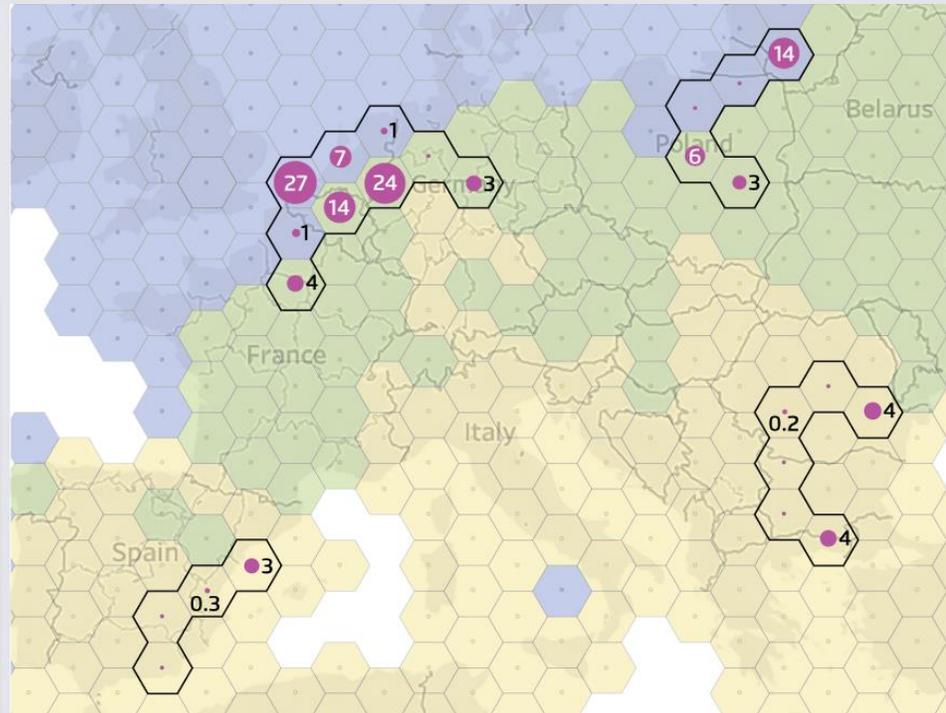
→ Adding potential hydrogen demand from power, aviation and shipping sectors is likely to **strengthen the case** for a more expansive network of H_2 pipelines.

→ Even under the most optimistic scenarios any future **H_2 network will be smaller** than the current natural gas network.

→ A no-regret vision for H_2 infrastructure **reduces the risk of oversizing** by focussing on inescapable demand, robust green hydrogen corridors and storage.

Hydrogen supply – covering the clean hydrogen cost gap: Agora is currently analysing a range of potential policy support instruments for renewable hydrogen.

Instrument	Target sector	Description	Mentioning in H_2 strategies
Carbon Contract-for-Difference	Industry	Compensates for difference cost between current CO_2 price and higher costs of climate mitigation technologies	EU, DE
PtX quota	Aviation	Challenge: Current EU discussion on Sustainable Aviation Fuels (largely bio)	(EU), DE
General gas quota	All sectors	Main problem: Does not allow for focussing on those sectors that really need H_2.	
H_2 for CHP plants	Power	Incentive for installing and using „H_2-ready" CHP plants	
H_2 Supply Contracts	TBD	Double auction for procuring H2 from different regions (DE, EU, world).	
Labelling	TBD	Transparency and standards for green products that use green H_2	

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Questions or Comments? Feel free to contact me:

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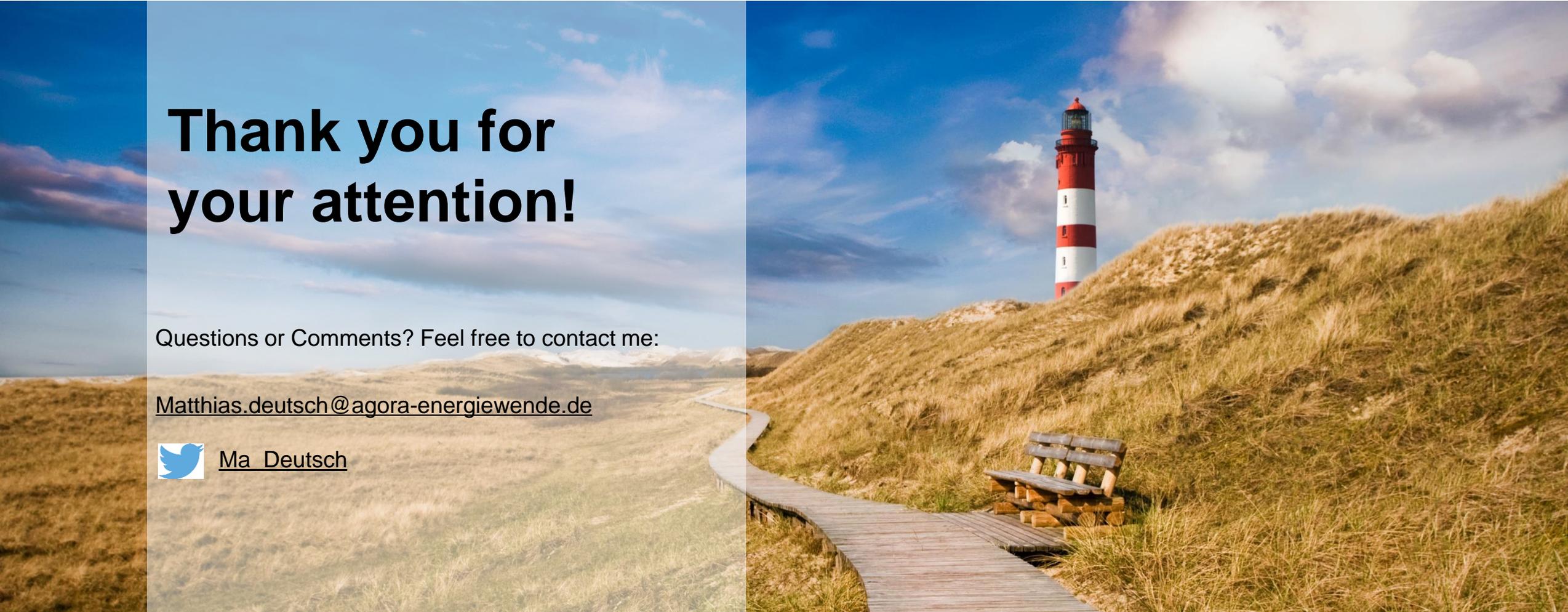
Agora publications on climate-neutrality and hydrogen
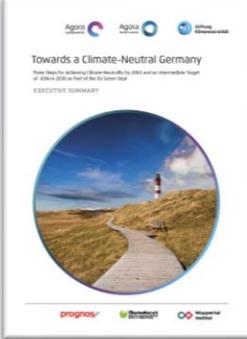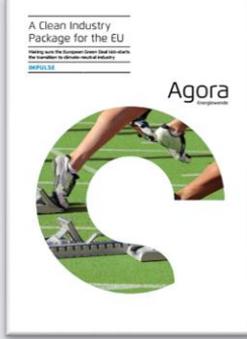
No-regret hydrogen: Charting early steps for H_2 infrastructure in Europe	Towards a climate-neutral Germany	Breakthrough Strategies for Climate-Neutral Industry in Europe	A Clean Industry Package for the EU	The Future Cost of Electricity-Based Synthetic Fuels
> full study	> summary (EN) > full study (DE)	> summary	> full study	> full study > PtG/PtL calculator
> data appendix > webinar	> data appendix (DE)		> slide deck > webinar	> slide deck > webinar