

# The prospects of European green hydrogen production

Joint work with Johannes Schmidt, Marianne Zeyringer, Alexander Horsch

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Koen van Greevenbroek

April 17, 2024 — EGU — Vienna (online)

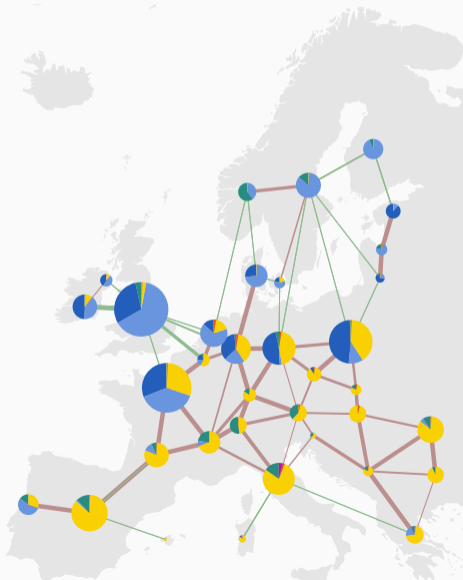
## Question:

What is the range of plausible pathways for green hydrogen production in Europe?

- How *little* green hydrogen production could Europe get away with?
- What conditions does this depend on?

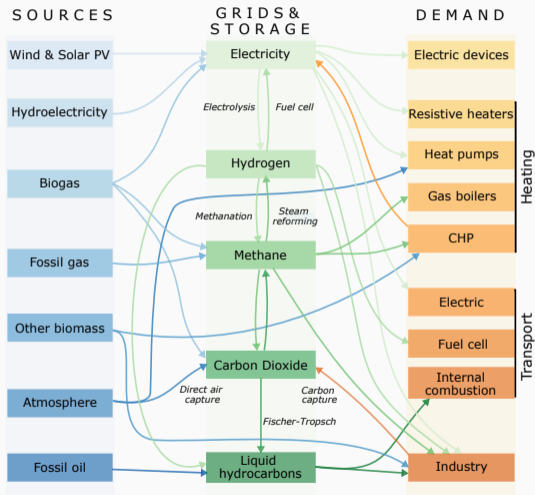
**Central to this talk:** think outside the box of cost-optimality.

# Modelling set-up



- High-resolution model for the European energy system (based on PyPSA-Eur).
- Linear program.

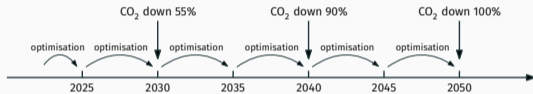
# Modelling set-up



Source: [https://github.com/PyPSA/pypsa-eur/blob/master/graphics/multisector\\_figure.pdf](https://github.com/PyPSA/pypsa-eur/blob/master/graphics/multisector_figure.pdf) (MIT license)

- High-resolution model for the European energy system (based on PyPSA-Eur).
- Linear program.
- Sector-coupled.

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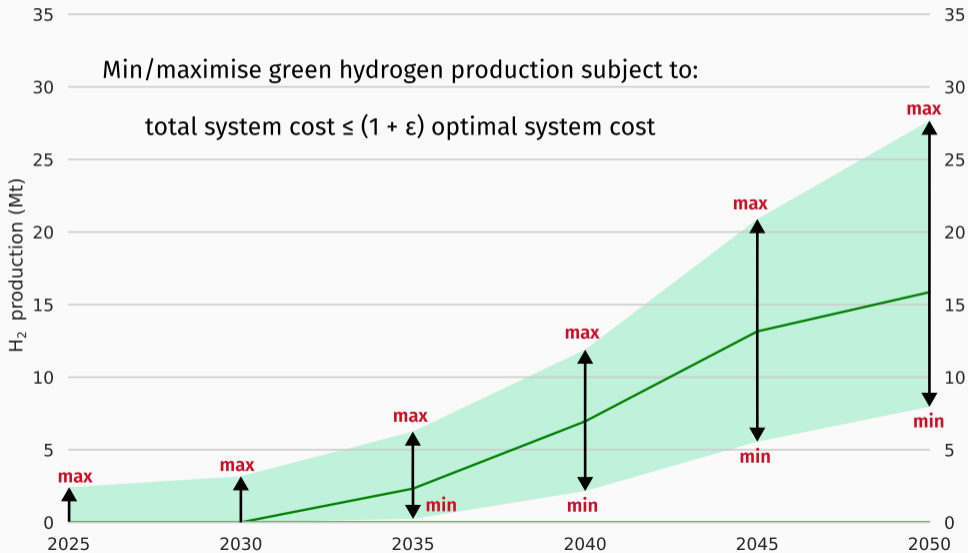
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- Linear program.
- Sector-coupled.
- Sequence of optimisations for 2025–2050 following EU targets for CO<sub>2</sub> emissions reductions.

	A	B
<b>Electrolysis</b>	costly	cheap
<b>CCS potential</b>	low/costly	high/cheap
<b>Land use</b>	constrained	liberal
<b>Green imports</b>	not allowed	unlimited
<b>Weather year</b>	1987	2020

- High-resolution model for the European energy system (based on PyPSA-Eur).
- Linear program.
- Sector-coupled.
- Sequence of optimisations for 2025–2050 following EU targets for CO<sub>2</sub> emissions reductions.
- Combinations of different socio-techno-economic scenarios.

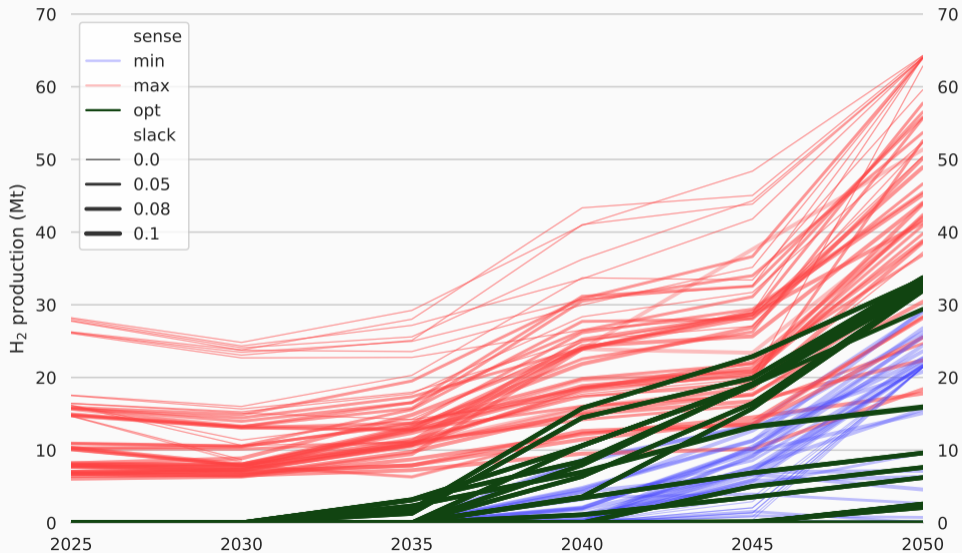


# MGA on green hydrogen production

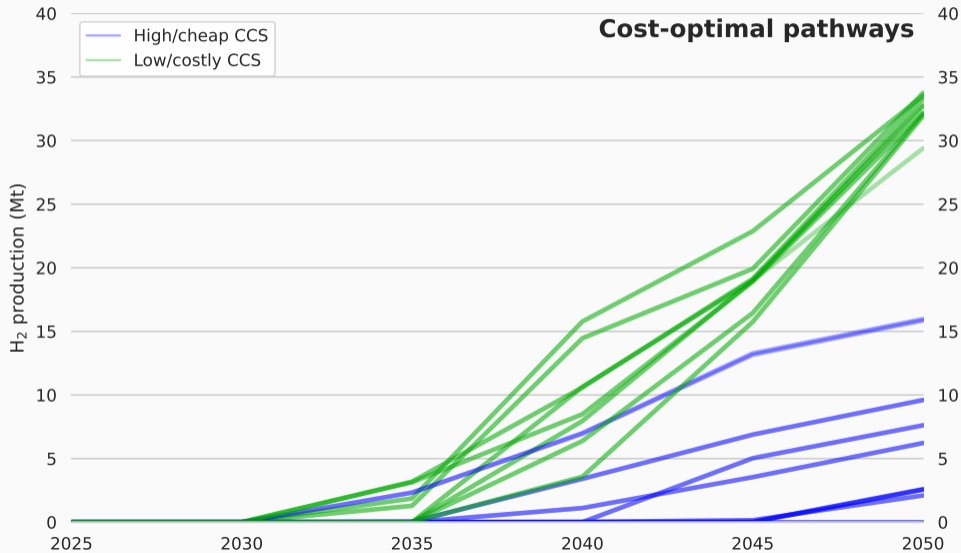




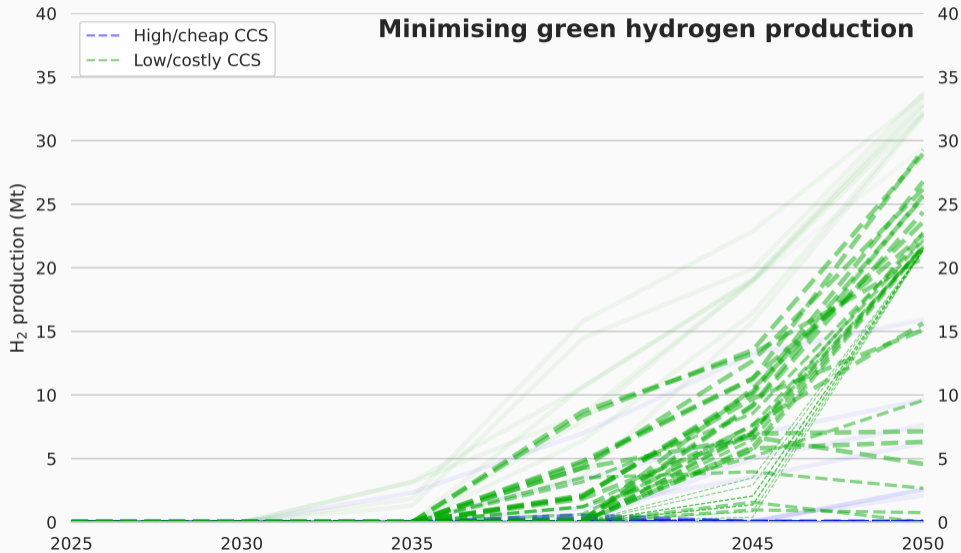
# MGA on green hydrogen production



# The crucial role of CCS



# The crucial role of CCS



- European green hydrogen production is surprisingly easy to eliminate (at low/moderate cost) **IF** liberal use of CCS (especially CO<sub>2</sub> sequestration) is allowed.
- Fierce competition between fossil fuels + CCS and green hydrogen.
- At least one of these two is needed for decarbonisation — modelling shows that they are almost tied from a cost perspective.

**Thank you! Questions?**