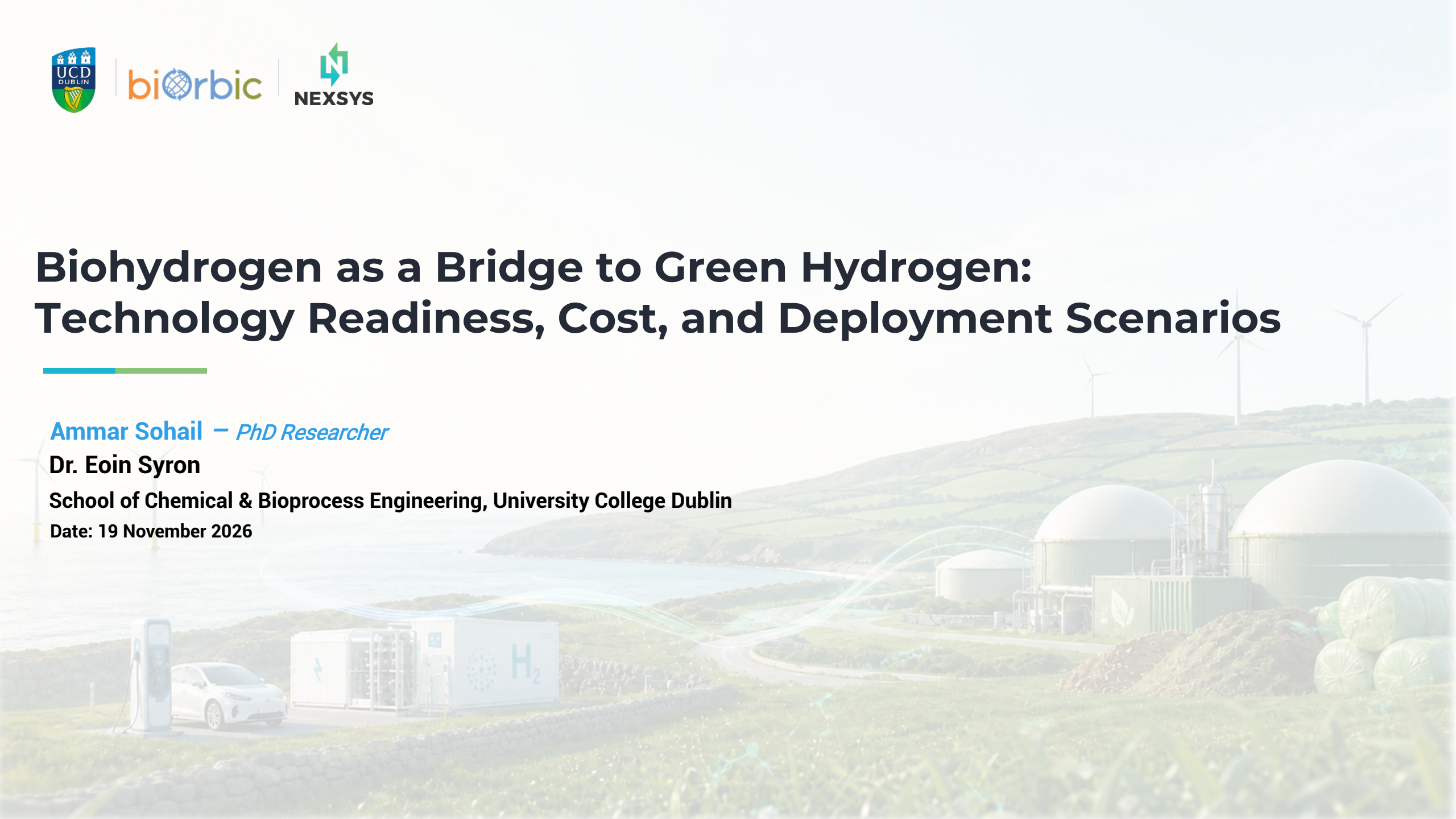
Biohydrogen as a Bridge to Green Hydrogen: Technology Readiness, Cost, and Deployment Scenarios

Ammar Sohail – *PhD Researcher*

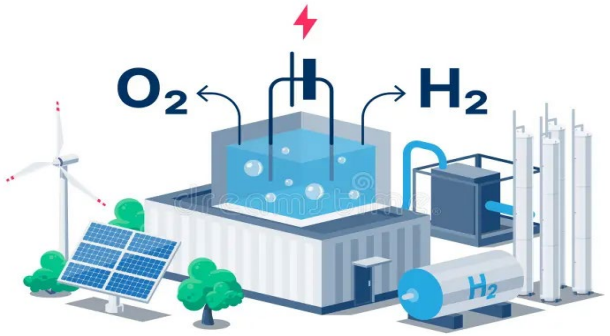
Dr. Eoin Syron

School of Chemical & Bioprocess Engineering, University College Dublin

Date: 19 November 2026



Electrolysis is Scaling Slowly, Is Biohydrogen an Alternative?

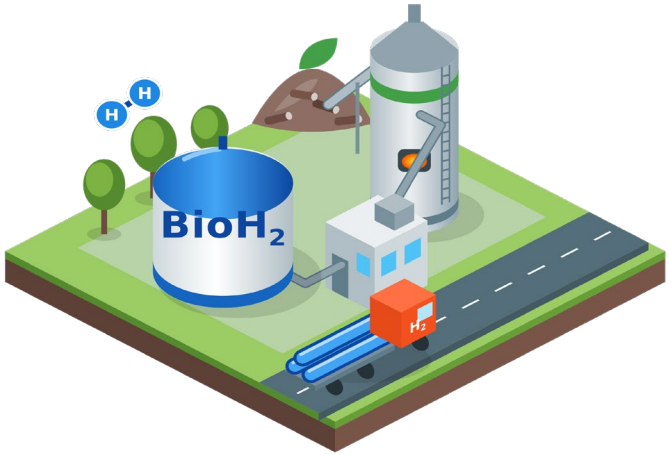


Wind Electrolysis

Commercial: over 4 GW, behind target

Plant cost: 1,717 to 2,260 €/kW

Limited by Electrolysis Capex and Renewable power price and intermittency



Biohydrogen from Biomass

Technology Readiness Level: 5-7

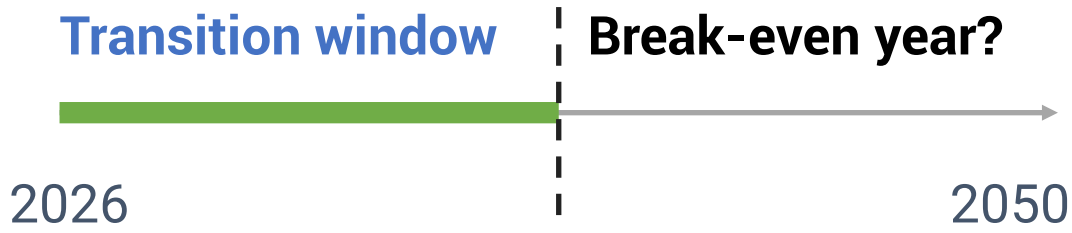
Published cost: 2.2 to 7.4 €/kg

Feedstock availability: Local biomass arisings

References:
- International Energy Agency, Global Hydrogen Review 2026
- IEA Bioenergy Task 33, 2025

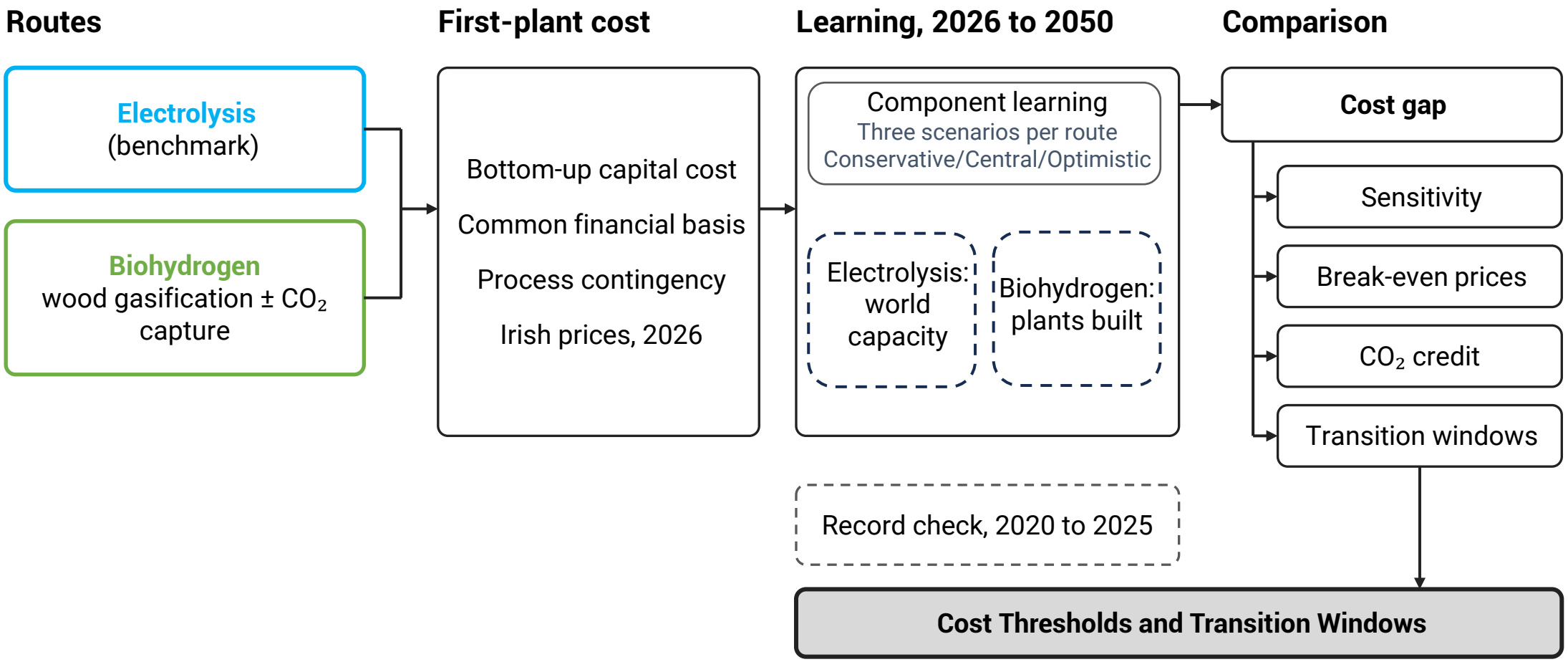
Can BioH2 Provide A Sustainable H2 Supply As Electrolysis Matures ?

1. How long does cost advantage last?
2. What drives the gap over time?
3. Under which condition would cost advantage disappear?



Case study: Ireland, 2026 to 2050

Model Framework

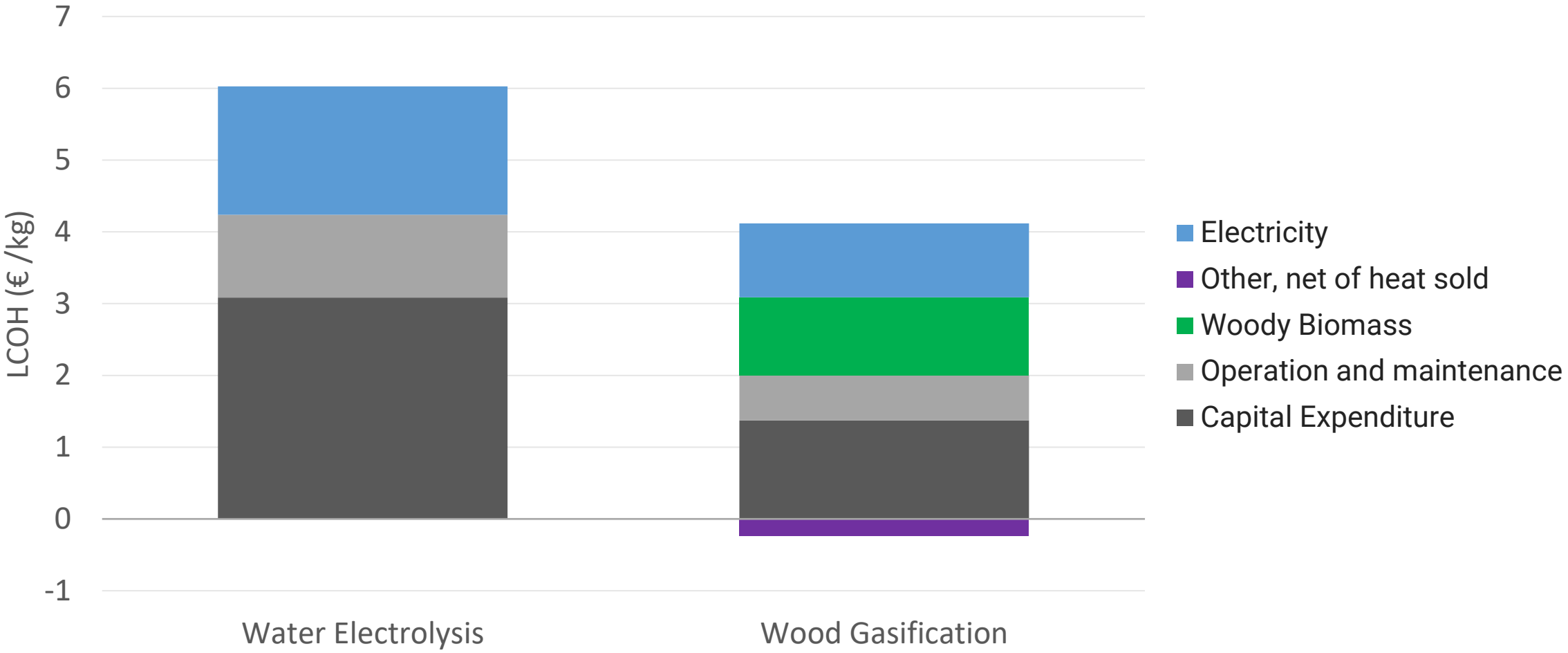


Model Inputs–2026 Central Scenario

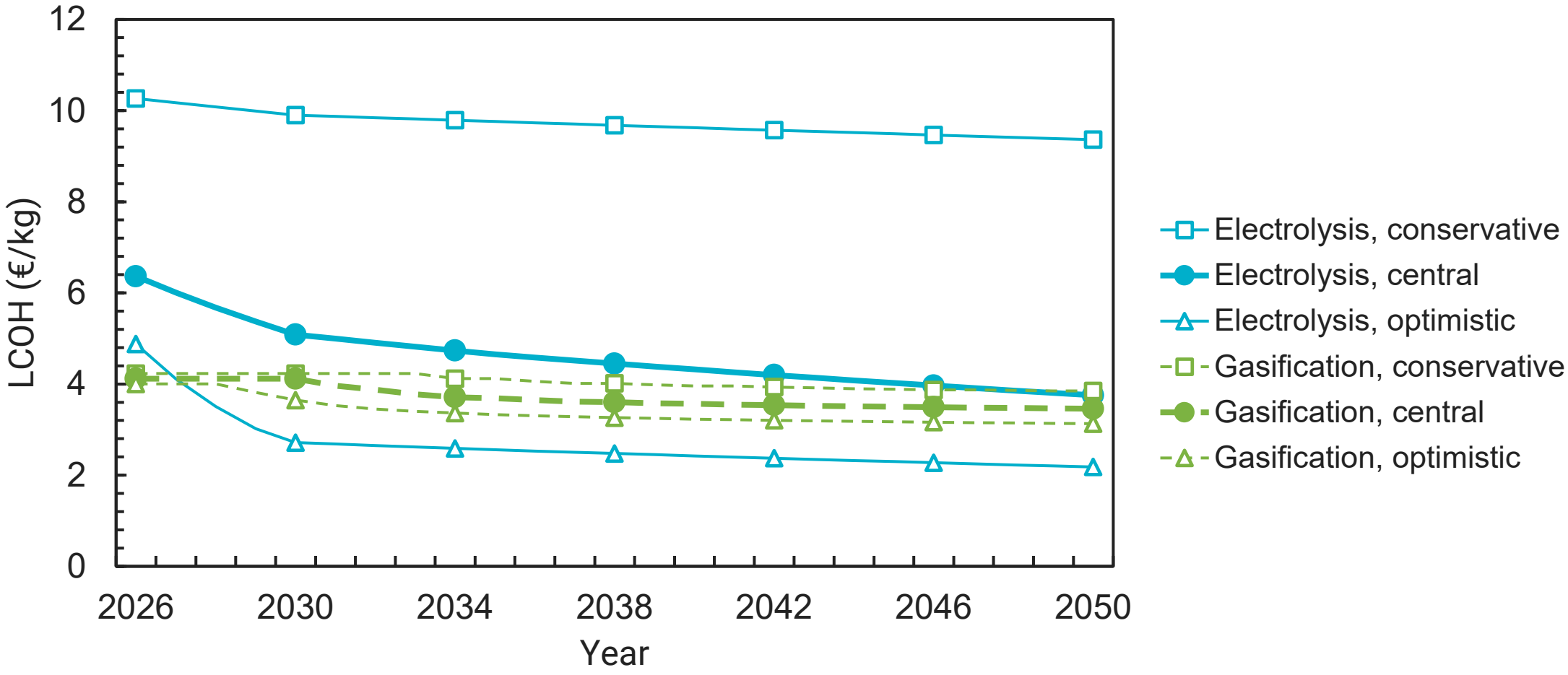
Central Case	Wind Powered Electrolysis	Biohydrogen
Plant	100 MW, 2,243 €/kW	60 MW gasifier (Wood Gasification)
Running hours	3,035 h a year	7,500 h a year
Feedstock price	Wind, 34.33 €/MWh	Wood, 20 €/MWh
Learning rate	Stack 13 %, balance of plant 3.5 %, construction 5 %	7.9 % per doubling of plants
Deployment	World: 50 GW in 2030, 2,200 GW in 2050	First plant 2030, 31 plants by 2050
Both	5 % discount rate, 20 years	2026 Euro, Irish prices

References:
- European Hydrogen Observatory 2025
- IEA 2026
- Gubin et al. 2024
- Irish wind records 2015 to 2024

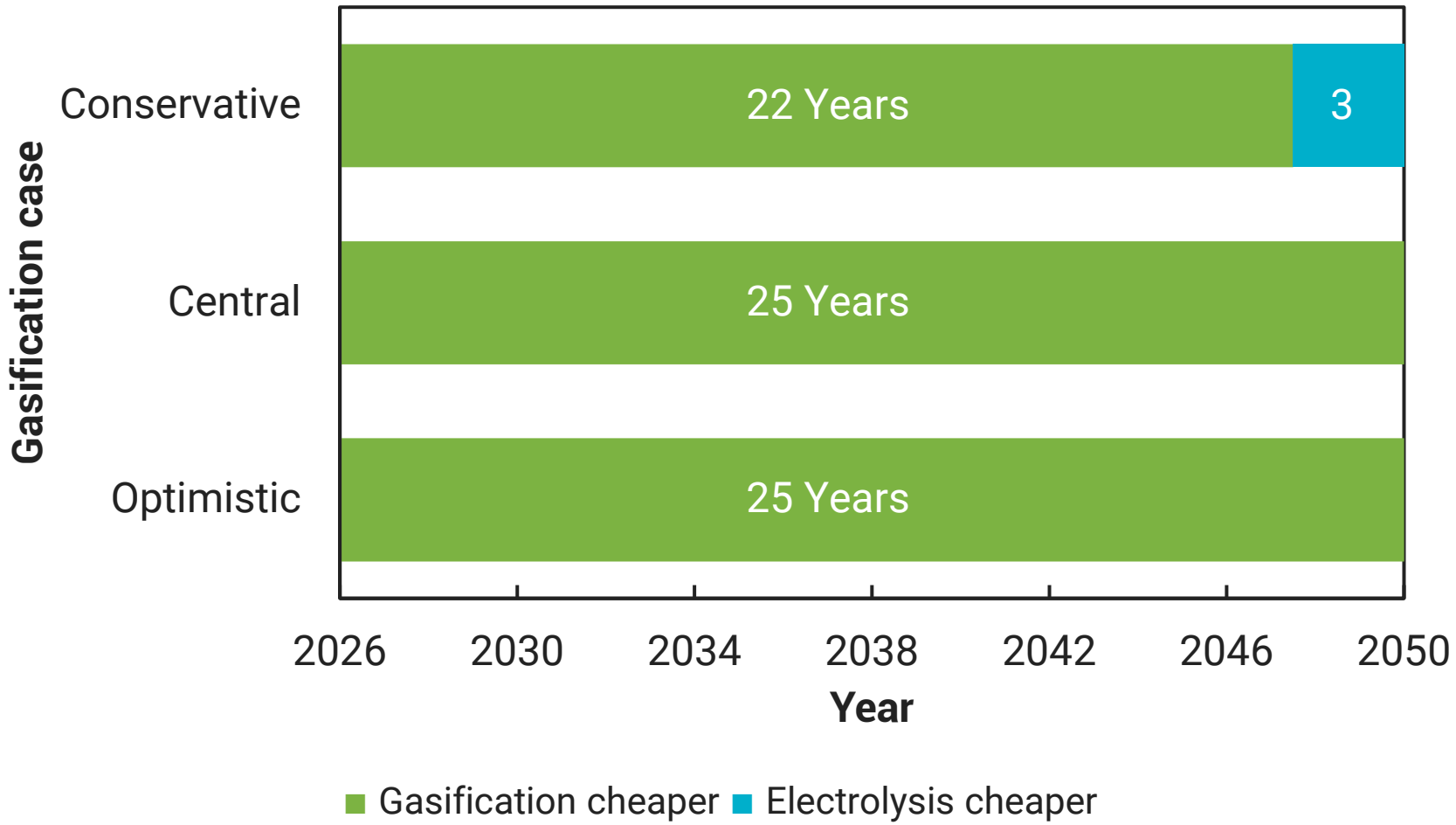
Biohydrogen Costs 4.12 €/kg, Electrolysis 6.36 €/kg (2026-Central)



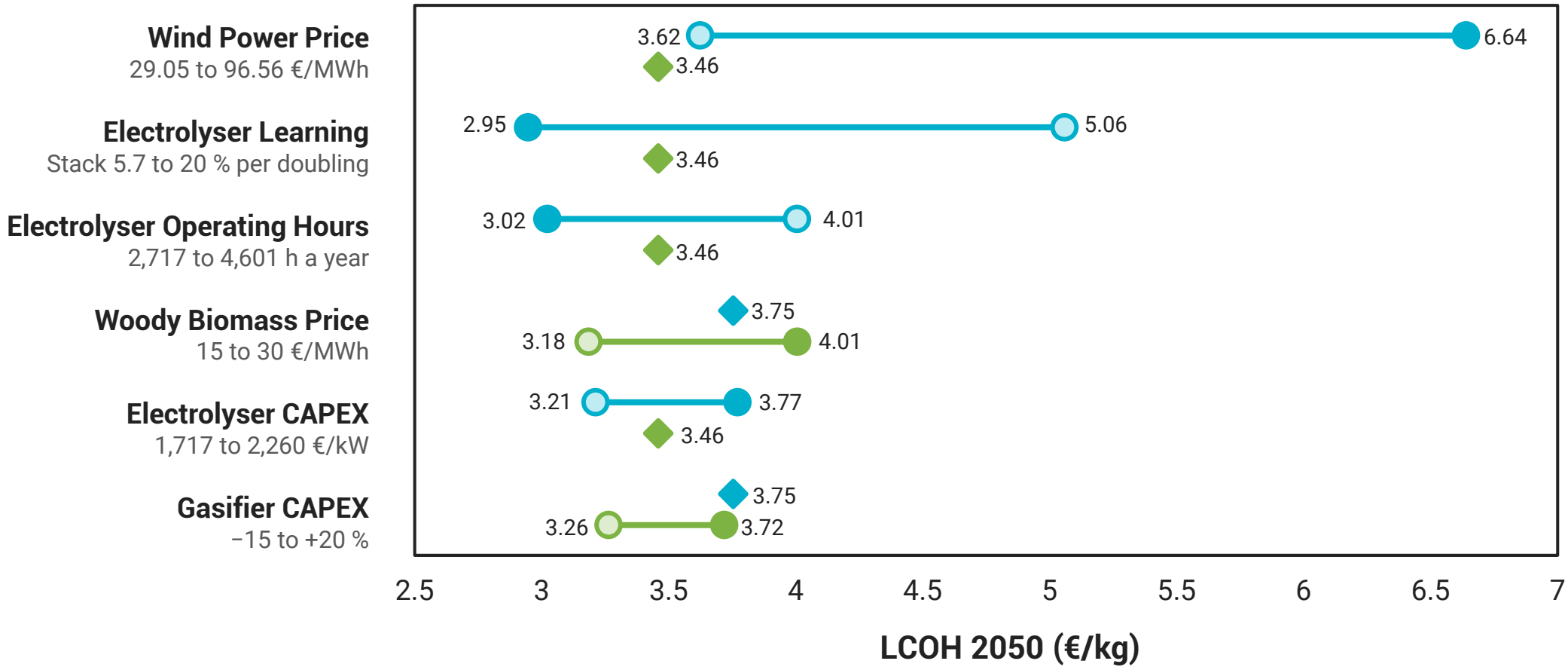
Cost Projections, 2026 to 2050



Gasification Remains Competitive Against Electrolysis Until.....

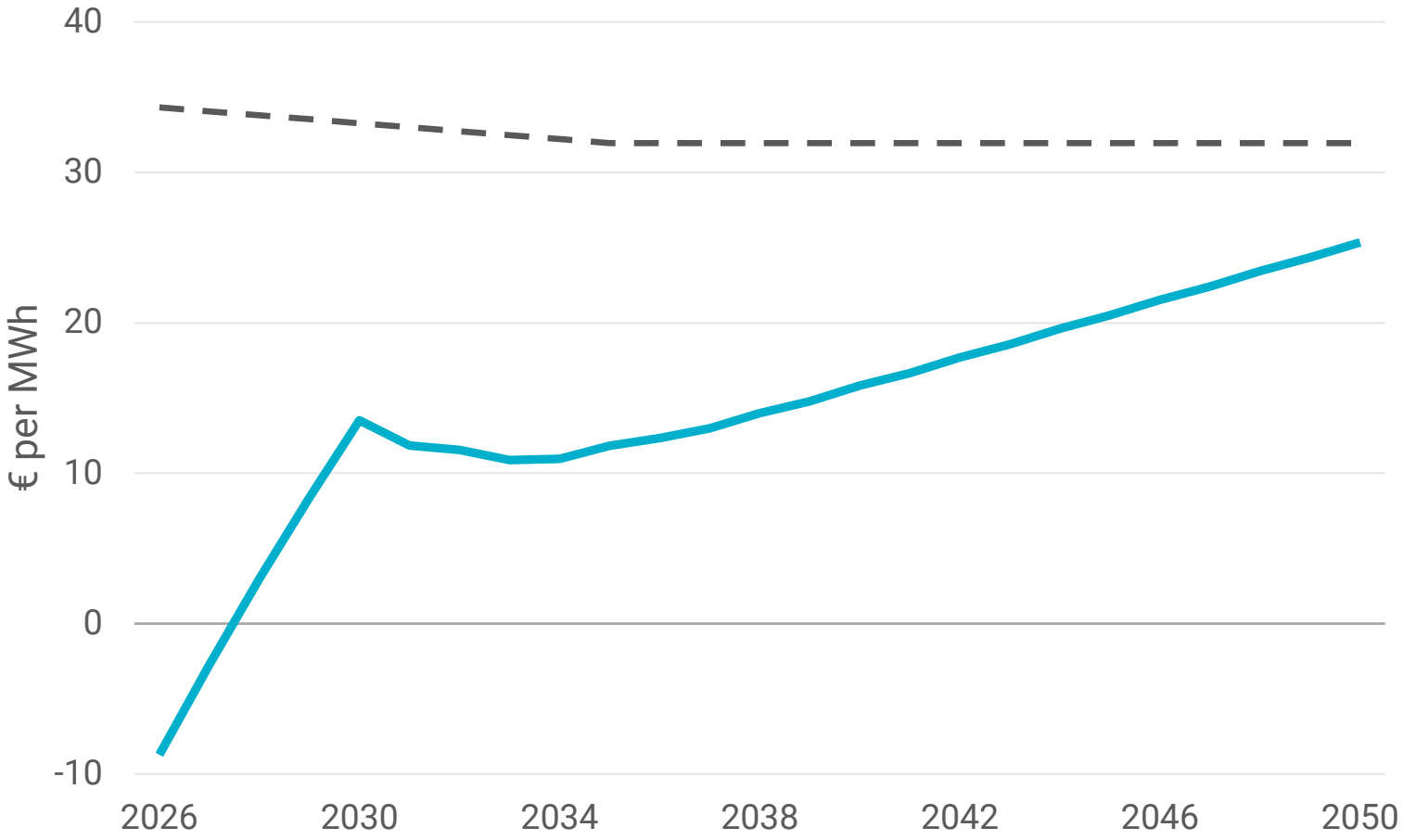


2050 Sensitivity Analysis



● Electrolysis ● Gasification ○Lower Input Value ● Higher Input Value ◆Not Affected

Cost of Electricity to be Cheaper than Gasification



Break-even price in 2050
25.35 €/MWh

----Central Wind price
31.95 €/MWh in 2050

Electricity cost to be cost competitive.

Key Takeaways

- Gasification is 2.25 €/kg cheaper today
- Lead falls to 0.29 €/kg by 2050
- By 2050, electrolysis is cheaper if:
  - wind power costs below 25 €/MWh
  - full-load hours reach about 4,600
  - wood costs above 25 €/MWh
- Power price and load hours outweigh deployment

Thank you

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