

Techno-economic assessment of green primary and secondary plastics production pathways

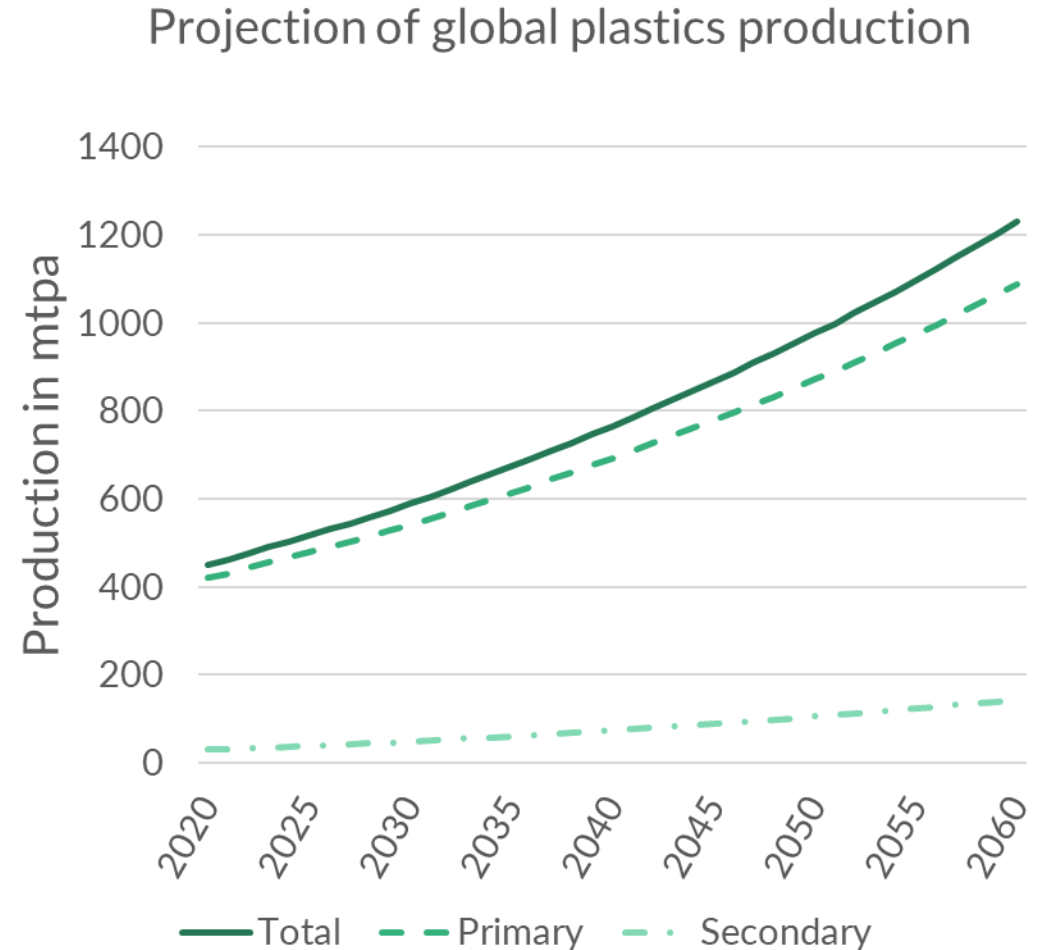
ecce Summer Study 2026

Robert Maertens



Motivation and aim

- Global plastics production is projected to rise
- Majority of plastics is produced by using fossil resources
- To become carbon neutral, primary plastics production needs to **switch to green alternatives**



OECD (2022), Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options, OECD Publishing, Paris, <https://doi.org/10.1787/de747aef-en>.

Agenda

Overview of plastic production pathways



Techno-economic and life cycle analyses



Results

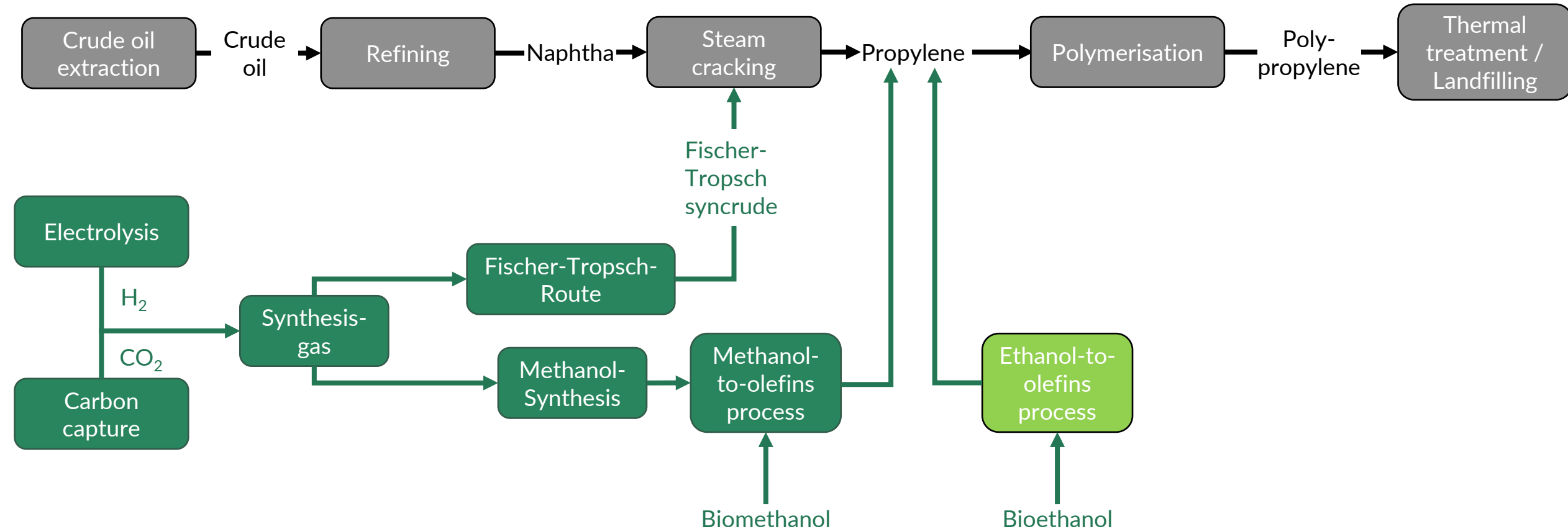


Summary and conclusion

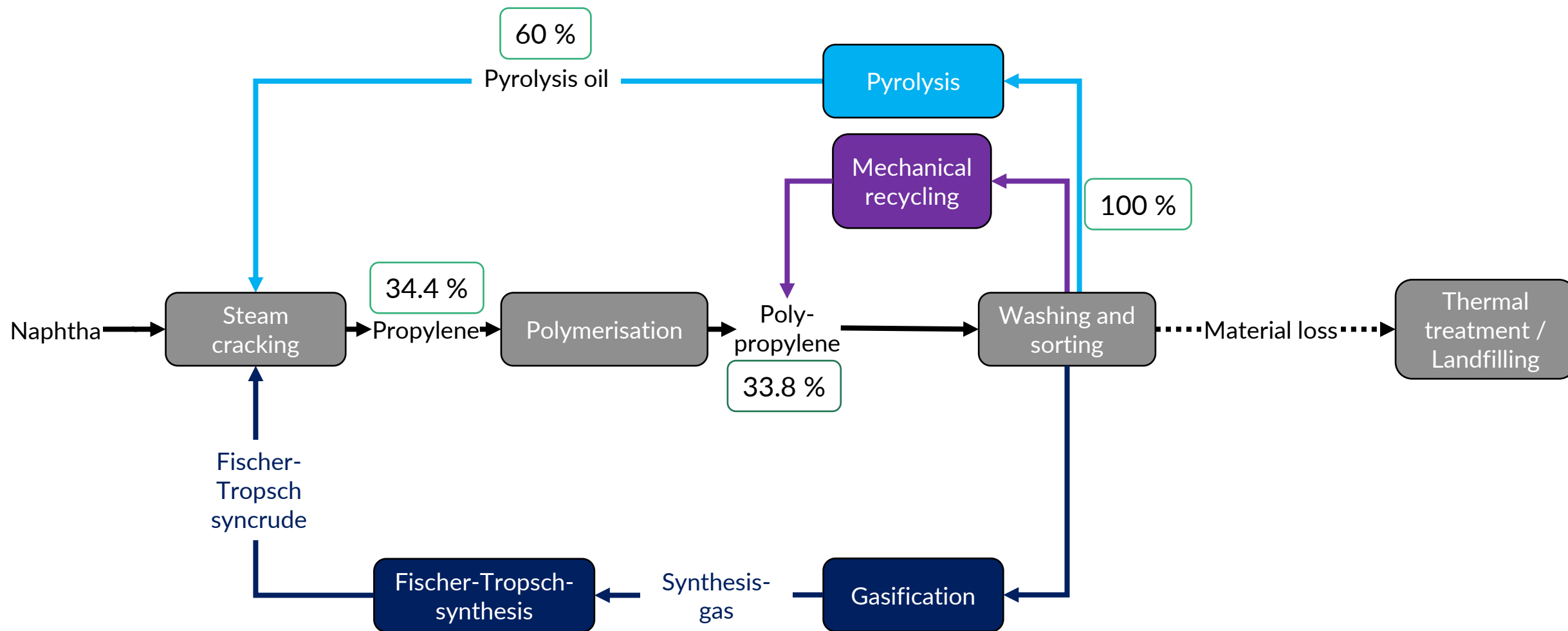


Discussion

Overview of primary plastic production pathways

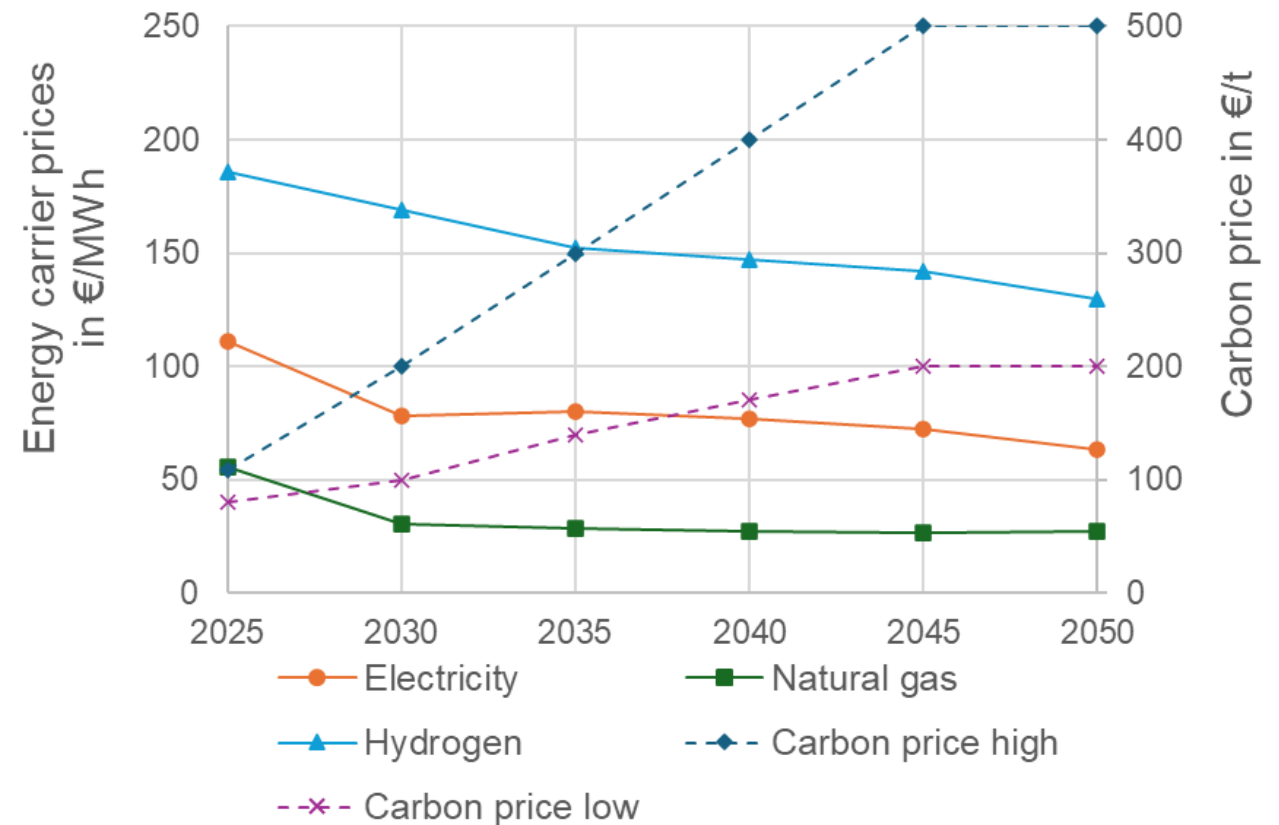


Overview of secondary plastic production pathways



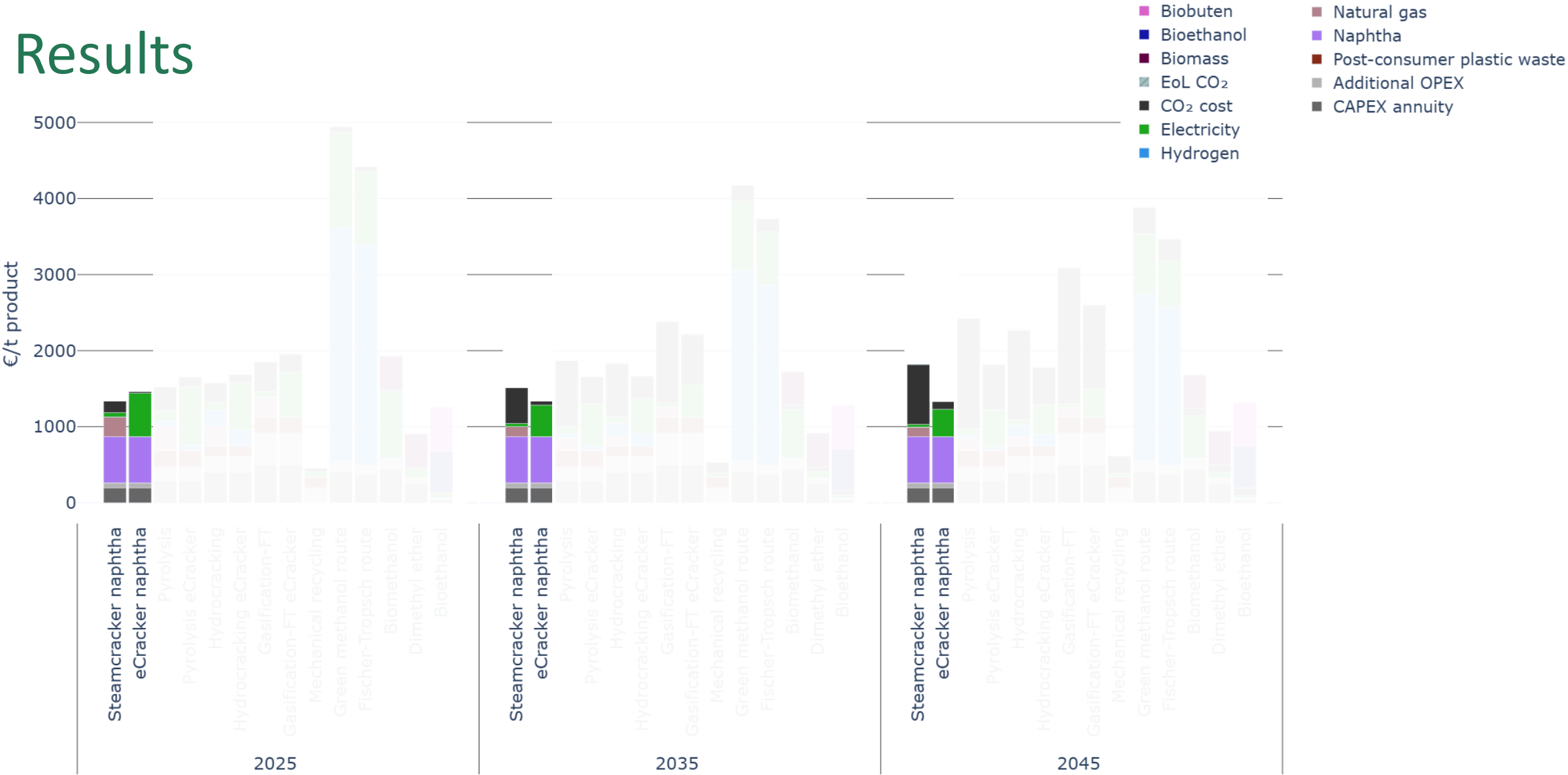
Techno-economic and life cycle analyses

- Literature-based aggregation of CAPEX, OPEX, energy demand and emissions
- Consideration of process yields and allocation in multi-step pathways
- Calculation using a modified version of the CaCoCa modelling framework

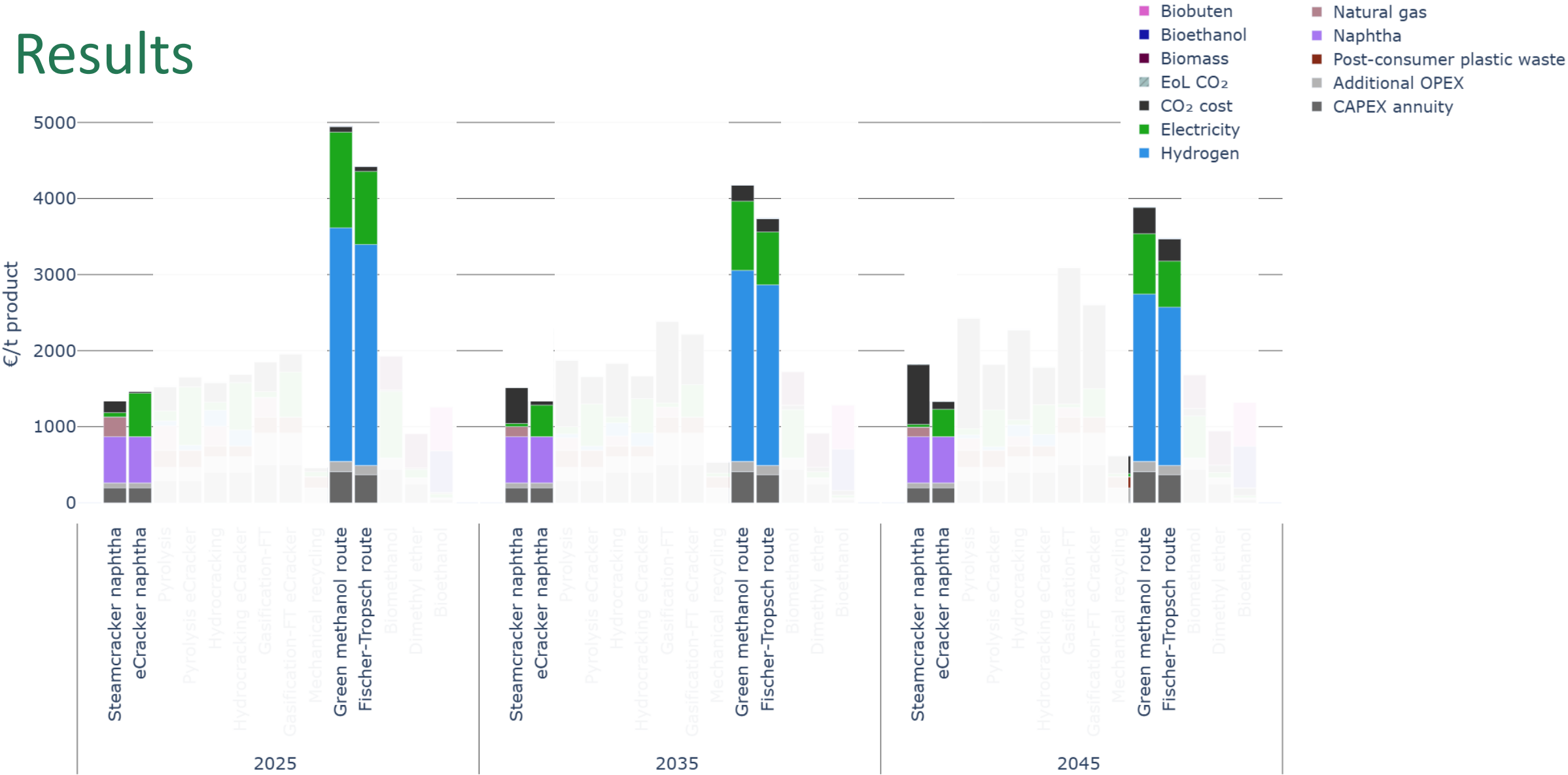


[1] J. Dürrwächter, R. Blömer, P. Verpoort, B. Weiss, P. Effing, J. Eckstein, F. Ueckerdt (2023). *CaCoCa: The Carbon Contracts Calculator*. Version 2.0.0

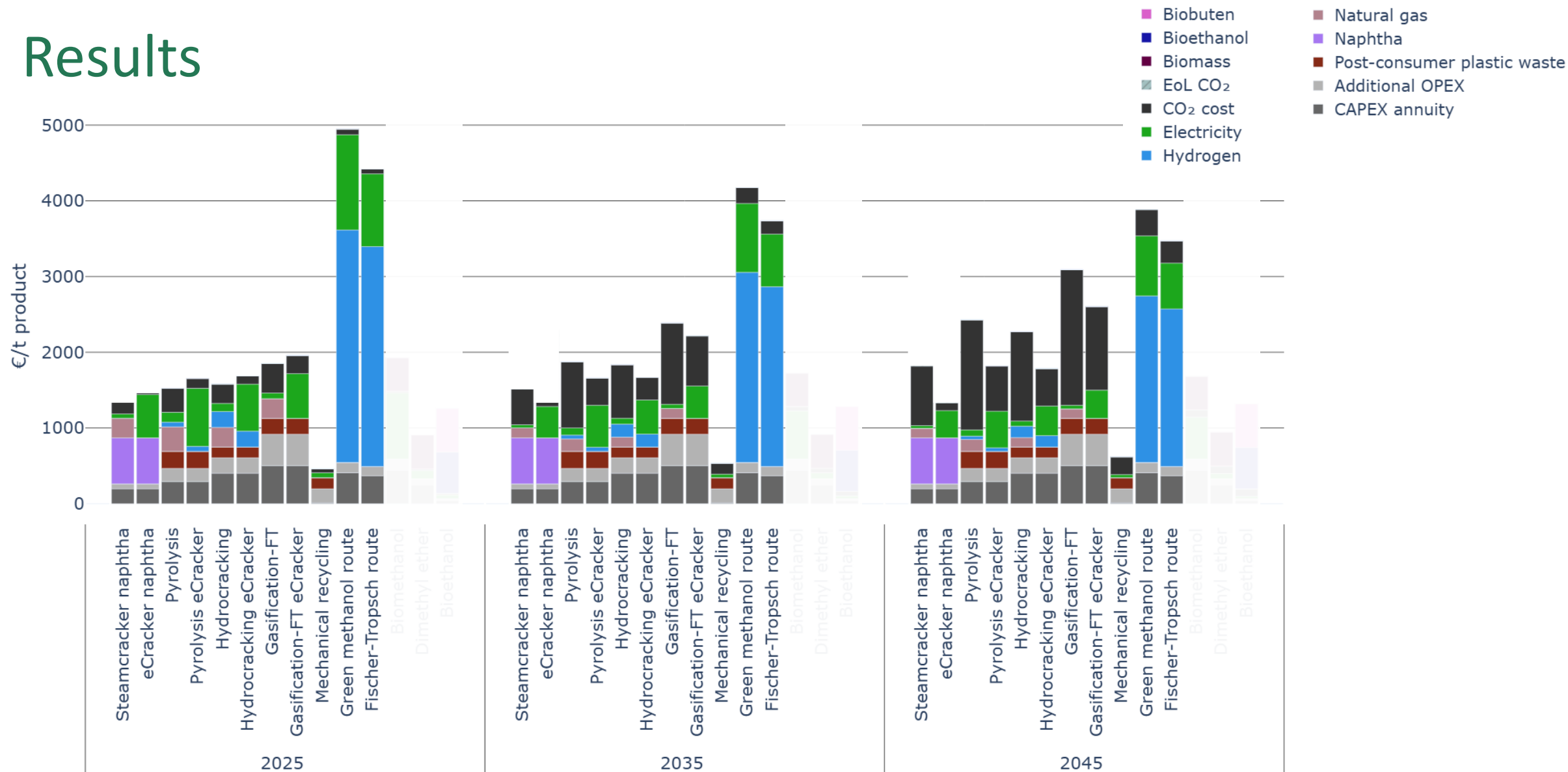
Results



Results



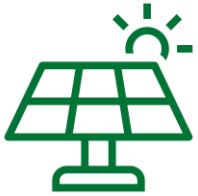
Results



Summary and conclusion



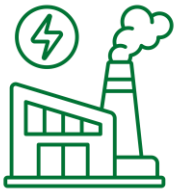
Recycling is always **cheaper** than synthesis from H_2 and CO_2



Cheap renewable power is needed for PtX primary production



Growing demand for plastics and **low yield of recycling pathways** create the need for **continued primary production**

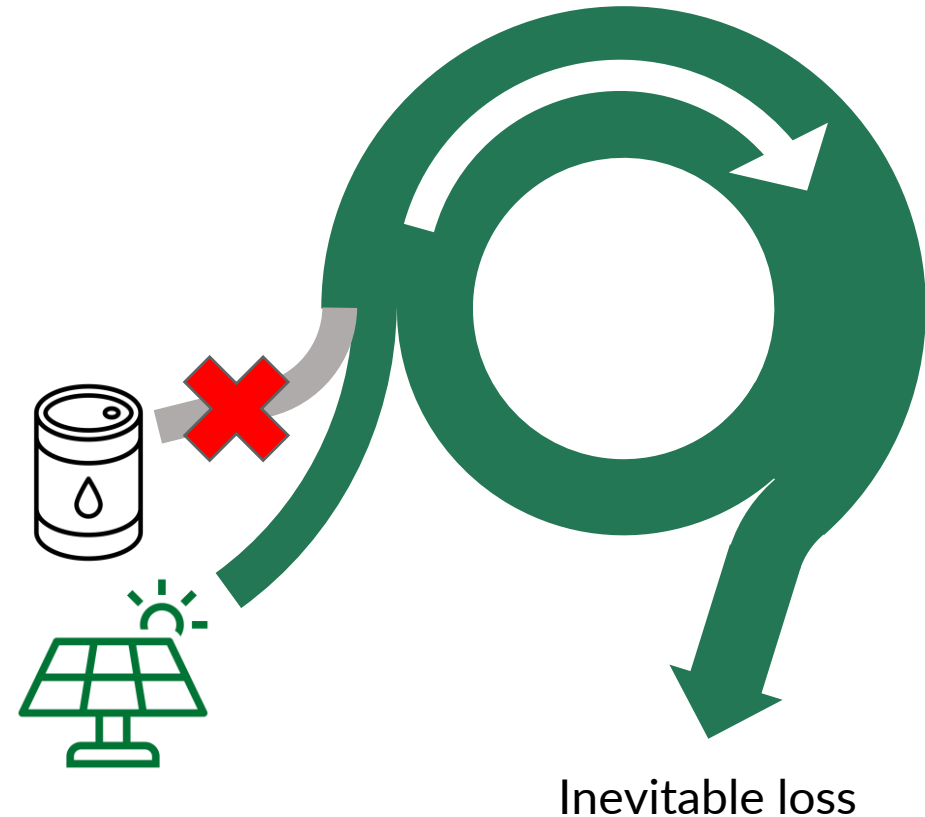


eCracker creates an **economically attractive fossil lock-in** if the fossil carbon content is not assigned to the final product

Key takeaway and central point of discussion

Primary production will always be necessary, and green primary production will remain more expensive than fossil production for the foreseeable future.

How do we design policy frameworks that prevent the market from defaulting to cheap fossil primary material to fill the recycling yield gap?



Thank you for your attention.

Supported by:



on the basis of a decision
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Dr. Robert Maertens

Tel.: + 49 721 9152636-25
E-Mail: r.maertens@irees.de

IREES GmbH

Durlacher Allee 77,
76131 Karlsruhe,
Deutschland

www.irees.de

