Methodische Fortschritte zur techno-ökonomischen Bewertung der Kraftstofferzeugung am Beispiel Biomass-to-Liquid Prozess

Advances in the techno-economic assessment of fuel production routes based on the example biomass-to-liquid

Simon Maier, Felix Habermeyer
Techno-Economic Analysis (TEA)
German Aerospace Center (DLR)

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Agenda

- EU-Project COMSYN – An overview
- Methodology of TEPET – technical and economic analysis
- TEPET - results
- Summary & Outlook

COMSYN project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727476

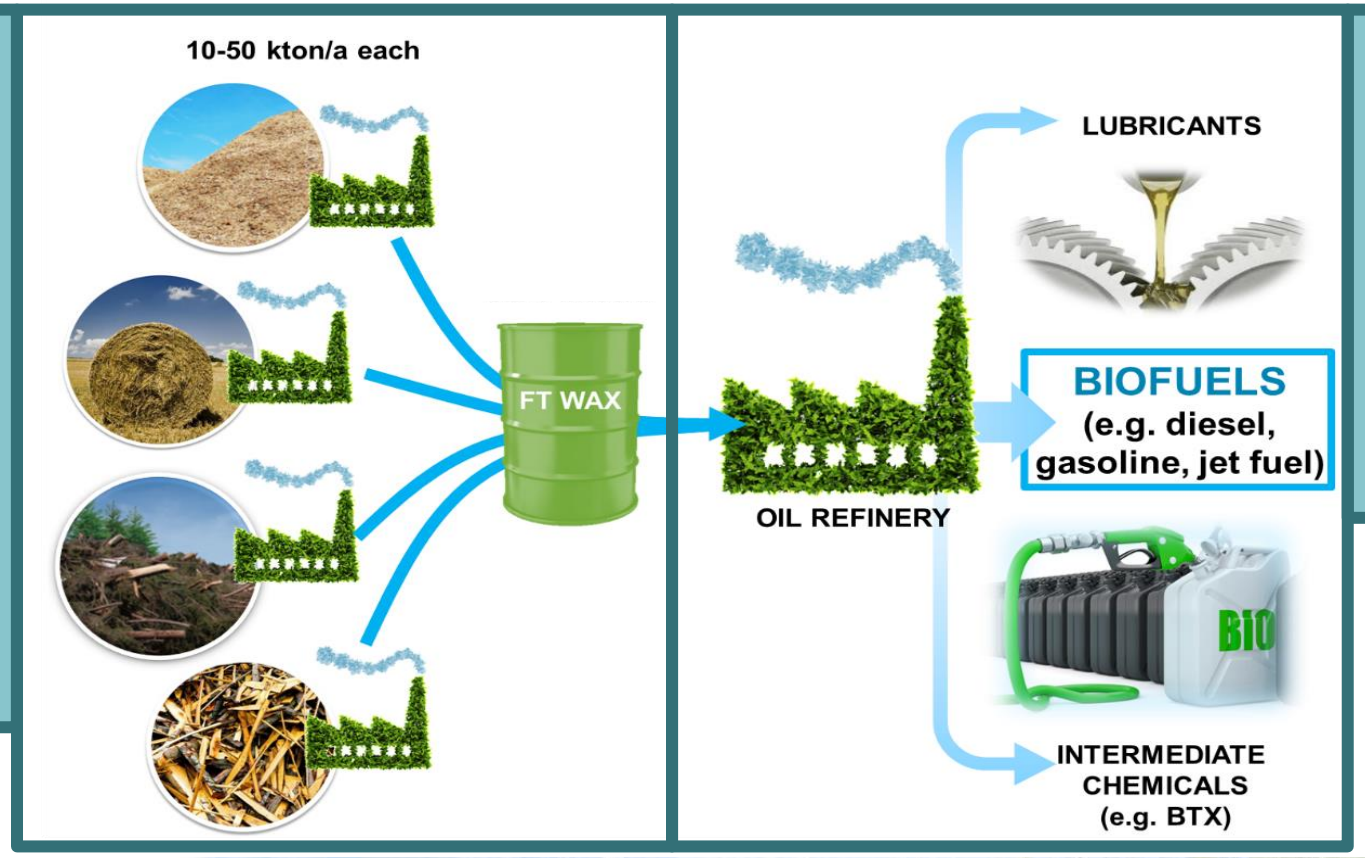
COMSYN – Compact Gasification and Synthesis process for Transport Fuels

www.comsynproject.eu – EU No. 727476

New BtL production concept with biofuel production **cost reduction** up to 35 % compared to alternative routes (Project goal: < 0.80 €/l production cost for diesel)

PRIMARY CONVERSION

Decentralized FT wax production at **small-to-medium scale** units located close to biomass resources (50-150 MW_{th} input) + locally utilized excess heat for 80⁺ % overall efficiency



PRODUCT UPGRADING

Centralized FT product refining to high quality drop-in liquid fuels* at existing oil refineries

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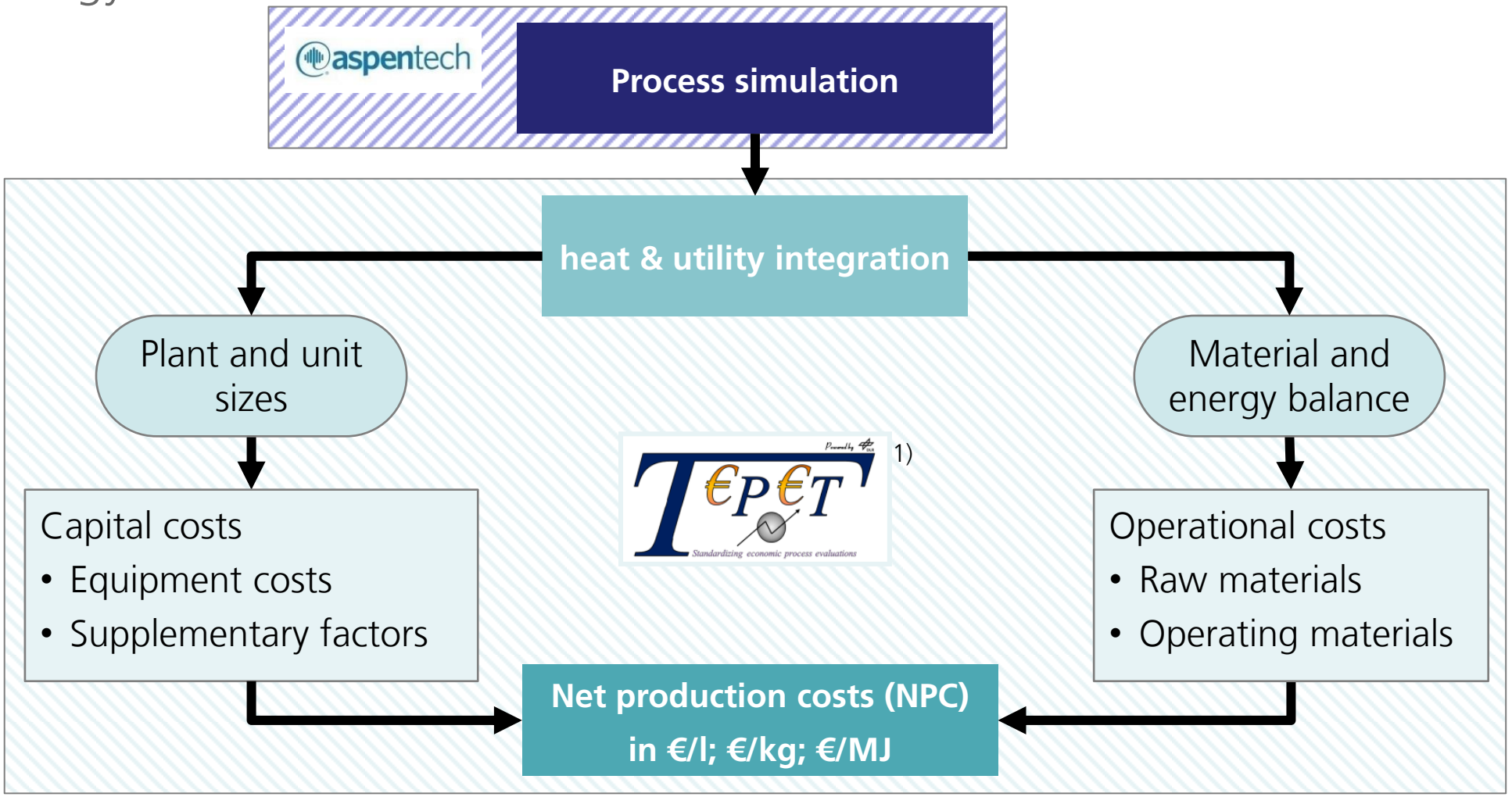
TEPET – Economic assessment

Methodology



[1] Albrecht et al. (2016), A standardized methodology for the techno-economic evaluation of alternative fuels.

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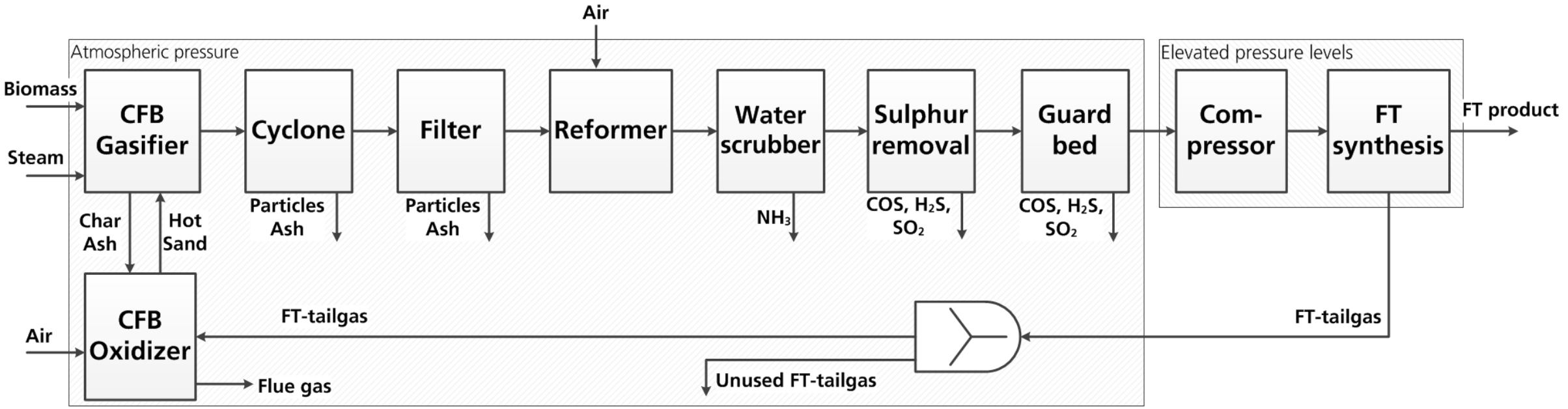
AspenPlus – Technical assessment

Basic concept

- 100 MW biomass feed
- Autothermal reforming with air
- No CO_2-absorption



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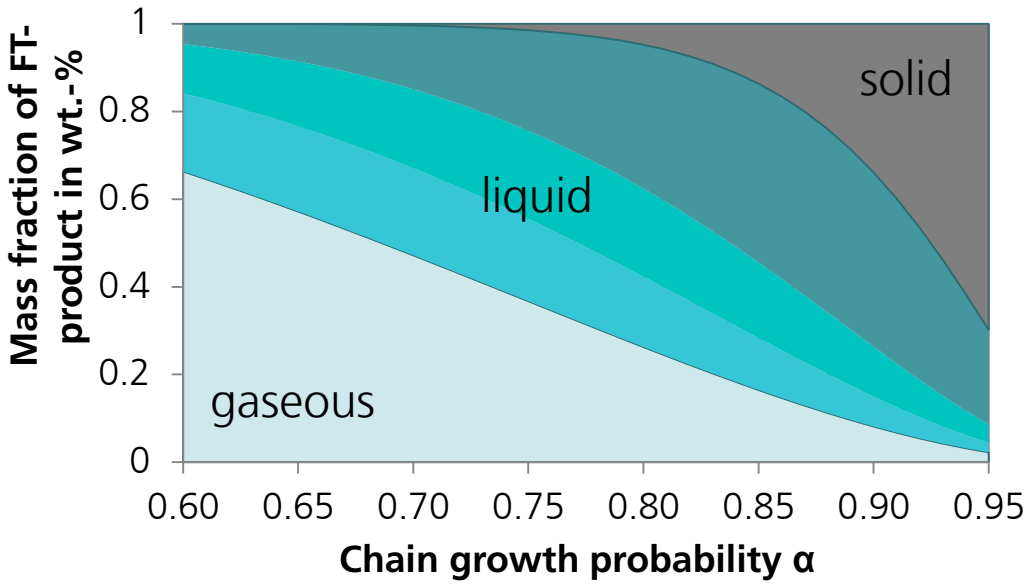
TEPET – Techno-economic assessment

Production costs for different operating conditions of the FT-synthesis

- Main reaction in FT-synthesis:

$$n \cdot CO + 2n \cdot H_2 \rightarrow (CH_2)_n + n \cdot H_2O$$

Effects of FT operating cond.	α/C_{5+}-yield	CO conversion	Production costs
Main target:	↑	↑	↓
Temperature ↑	↓	↑	-
Pressure ↑	↑	↑	-
Space time ↑	-	↑	↑



- The implemented Fischer-Tropsch kinetics are based on Almeida et al.[1)]

[2)] Almeida et al. (2013), Kinetic analysis and microstructured reactors modeling for the Fischer–Tropsch synthesis over a Co–Re/Al2O3 catalyst

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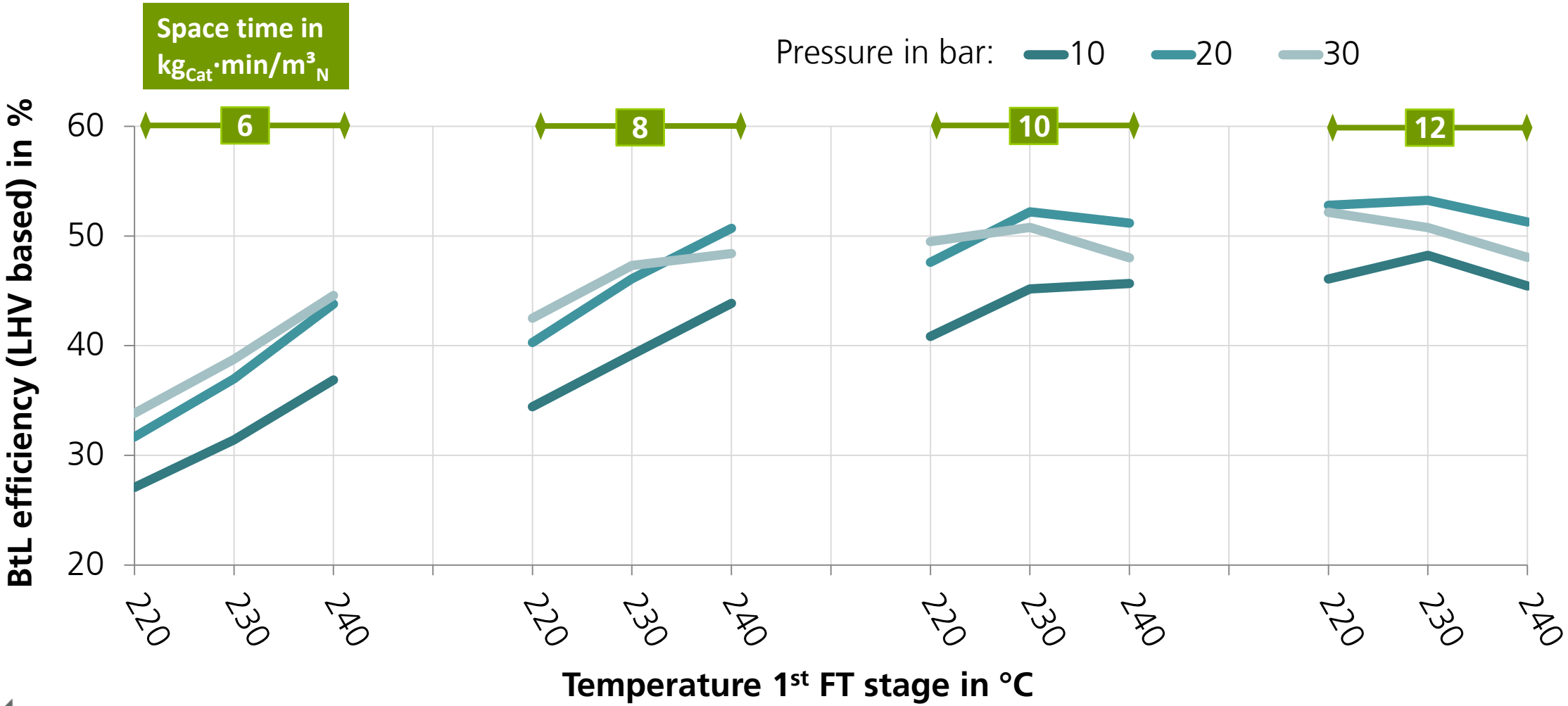
TEPET – Techno-economic assessment

Results – BtL efficiency for different operating conditions of the FT-synthesis



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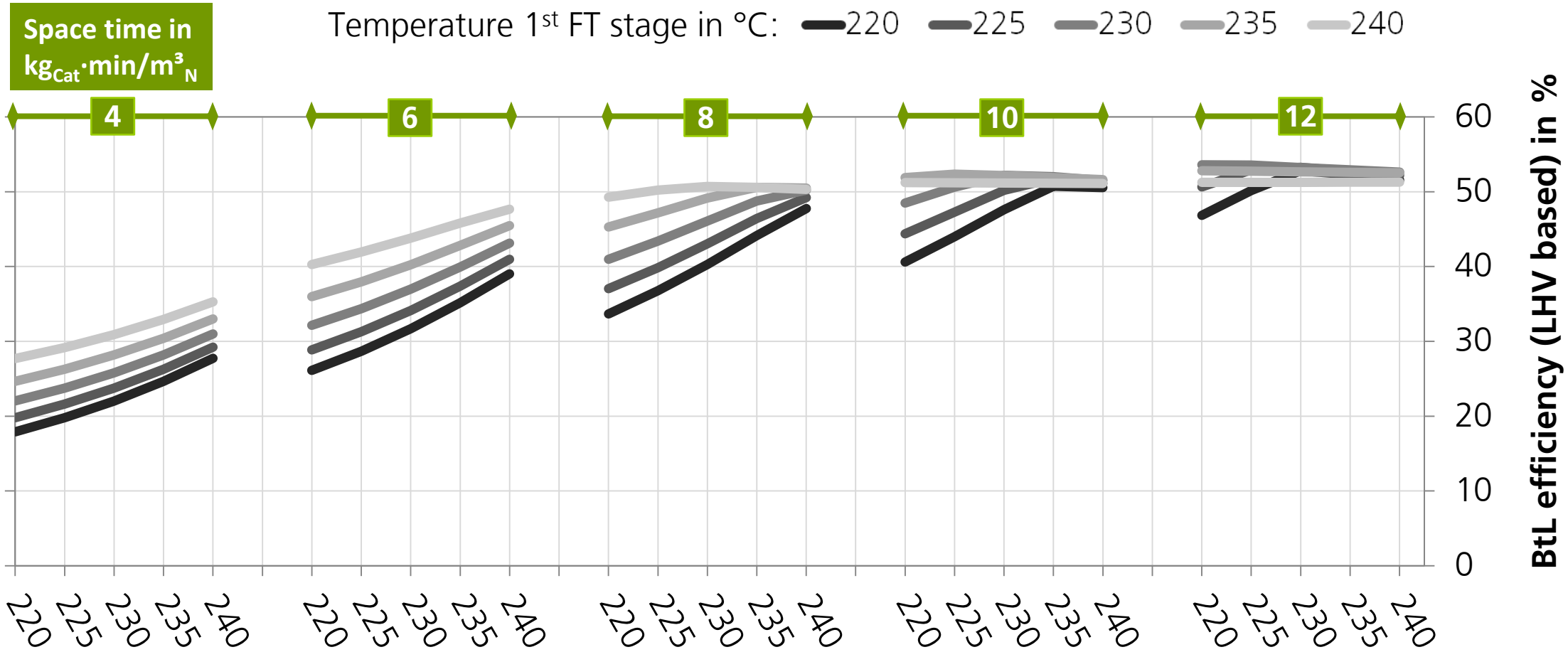
TEPET – Techno-economic assessment

Results – Production costs for different operating conditions of the FT-synthesis



FT-pressure: 20 bar

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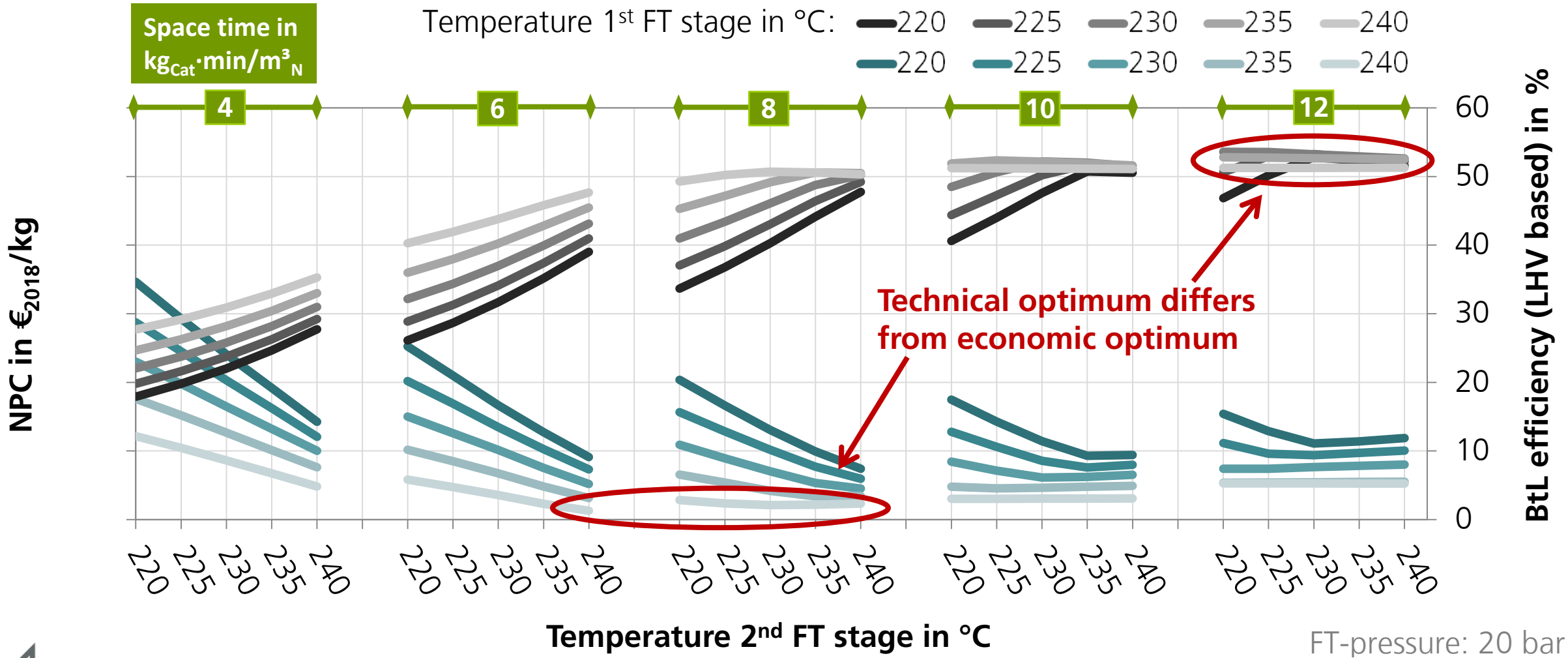
TEPET – Techno-economic assessment

Results – Production costs for different operating conditions of the FT-synthesis



FT-pressure: 20 bar

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Summary & Outlook

Summary:

- Control of simulation through TEPET
- Automated technical and economic parameter variation
- Automated integration of utilities

- The techno-economic assessment allows a transparent comparison of different process configurations

Outlook:

- Adjusting the FT-model with experimental data and future development curves
- Integration of more utilities and sub-processes
- Business cases for different countries

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COMSYN

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Project partners

UniCRE · wood. · VTT · GKN SINTER METALS · INERATEC

Thank you for your attention!

Simon Maier

German Aerospace Center (DLR)
Institute of Engineering Thermodynamics

simon.maier@dlr.de
www.dlr.de/TT

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