SYNGERGIES BETWEEN BIO-FUEL AND E-FUEL PRODUCTION

APRIL 16, 2020

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EU POLICY

- Renewable Energy Directive II (RED II)
  - Criteria on sustainability and greenhouse gas savings
  - Target for renewable transport fuels
    - 14% in 2030, of which **3.5% advanced biofuels**

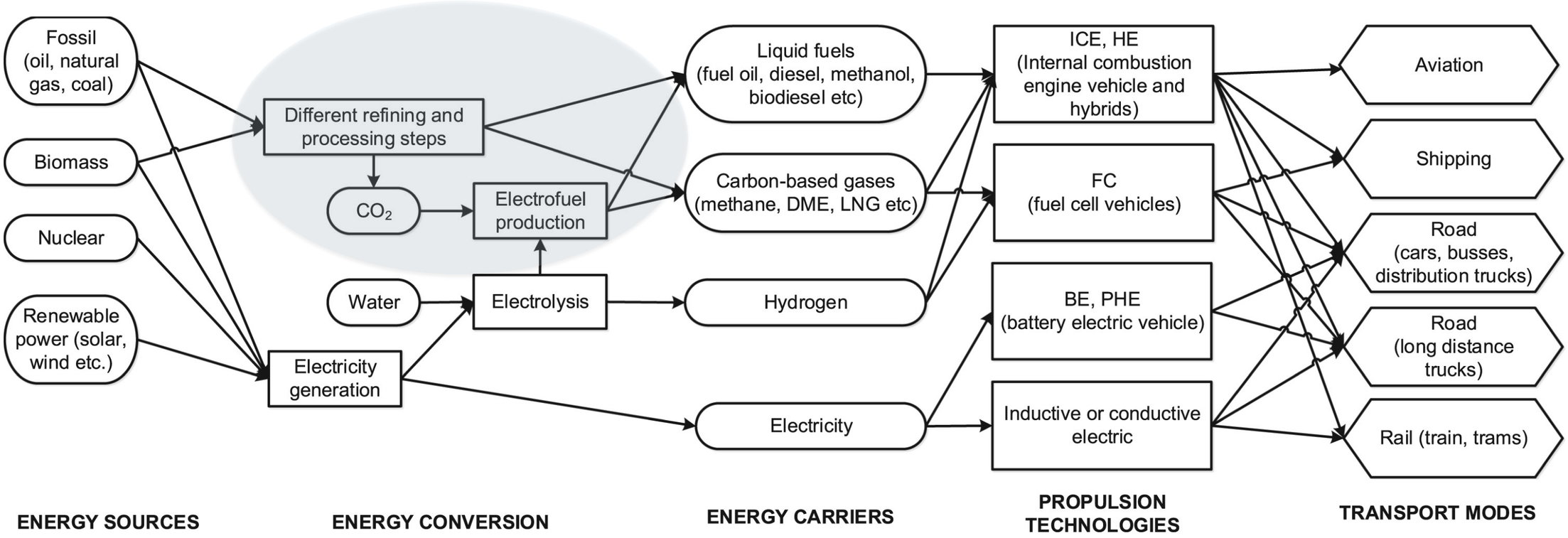
URGENCY

- This translates to 100 plants of 200 million liters capacity*
  - Or 300-400 plants at 200Mwth capacity
- We need to bring technology to the market today!
  - Accelerate the development, build demo's

**Fuels Europe Statistical report 2018 and*

GAIN Report Number:NL1902 - EU Biofuels Annual 2019

RENEWABLE FUELS FOR TRANSPORT

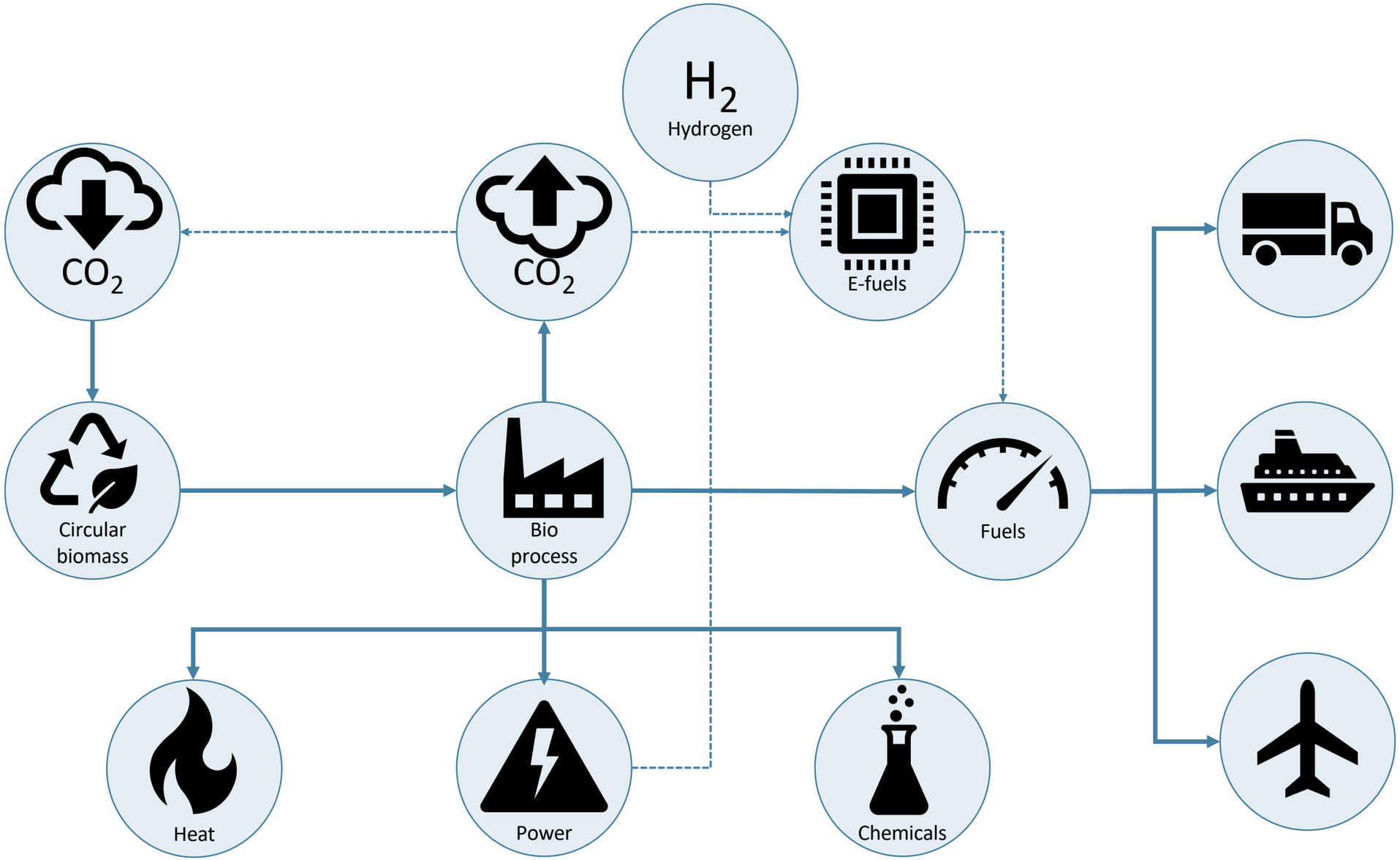


Electrofuels for the transport sector: A review of production costs

Selma Brynolf, Maria Taljegard, Maria Grahn, Julia Hansson

https://doi.org/10.1016/j.rser.2017.05.288

BIOPROCESSES



THERMOCHEMICAL CONVERSION

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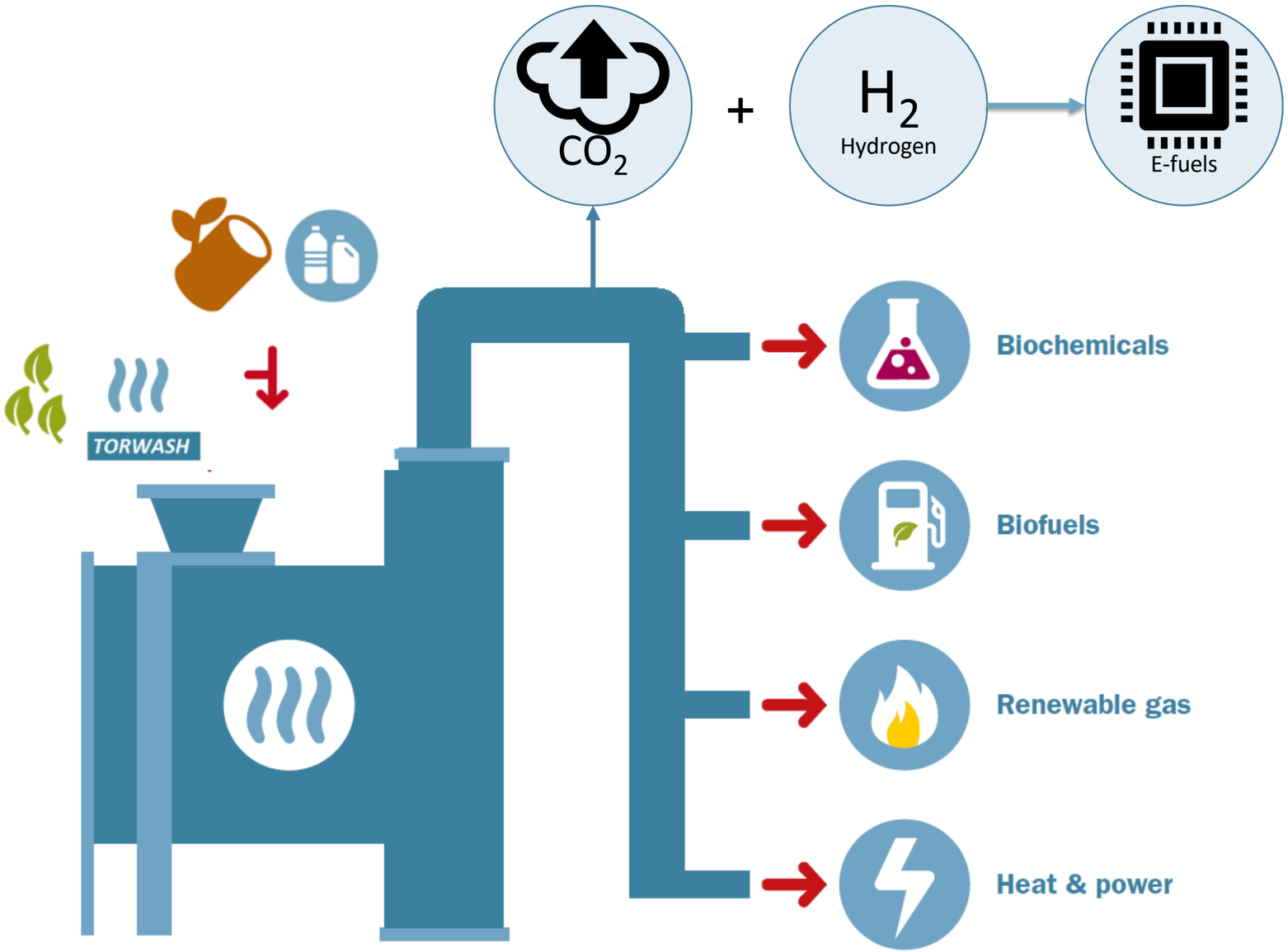
TNO developed a unique gasification technology

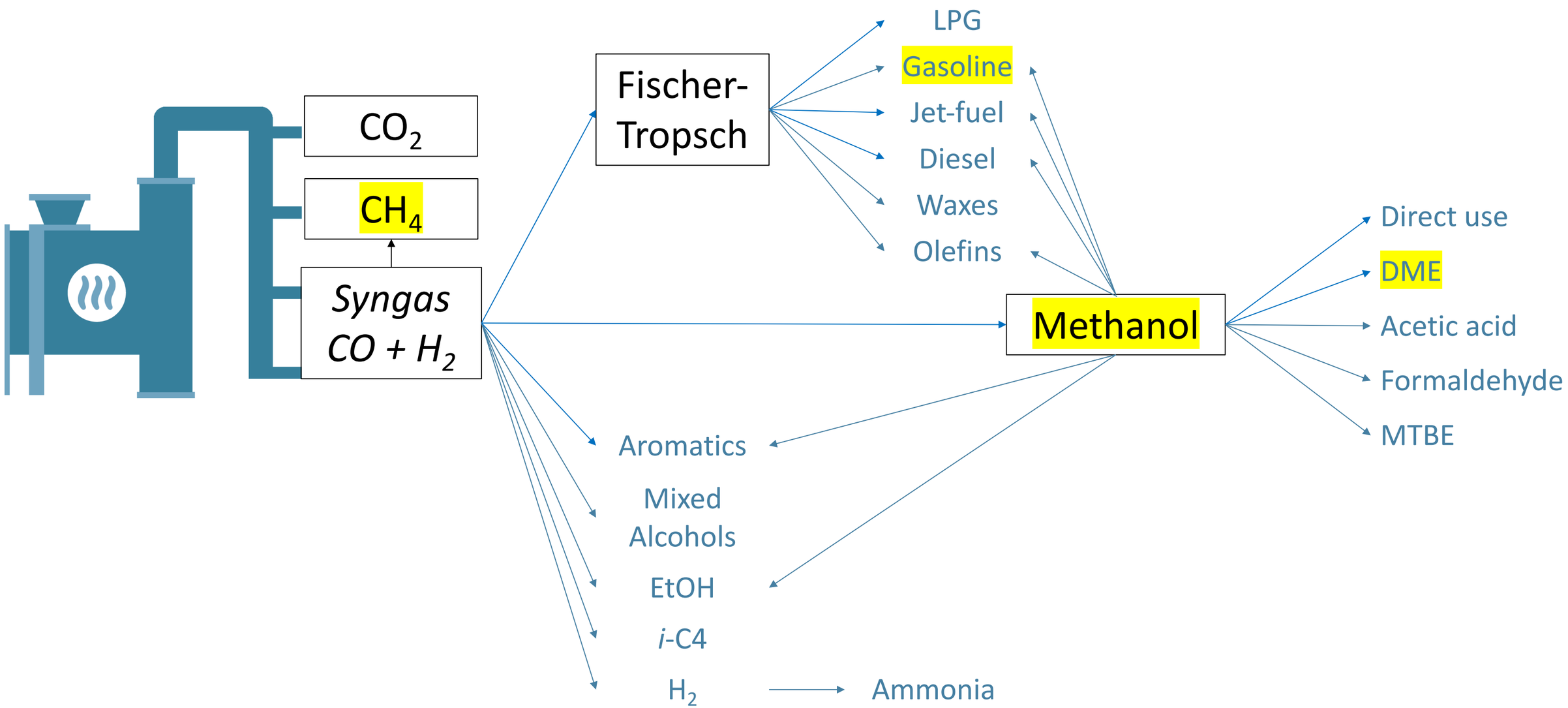
- Highly flexible - cater for different feedstock types;
  - agricultural-, selected municipal- and / or plastic waste streams;
- Product gas can be used to:
  - Generate electricity;
  - Generate heat;
  - Produce chemicals;
  - Produce green gas and / or bio-fuels;
- Can be scaled, high efficiency, weather independent;

- Source of CO_2
- Can be integrated with e-fuels

GASIFICATION OPTION



INTEGRATION OPTIONS



SORPTION ENHANCED DME SYNTHESIS

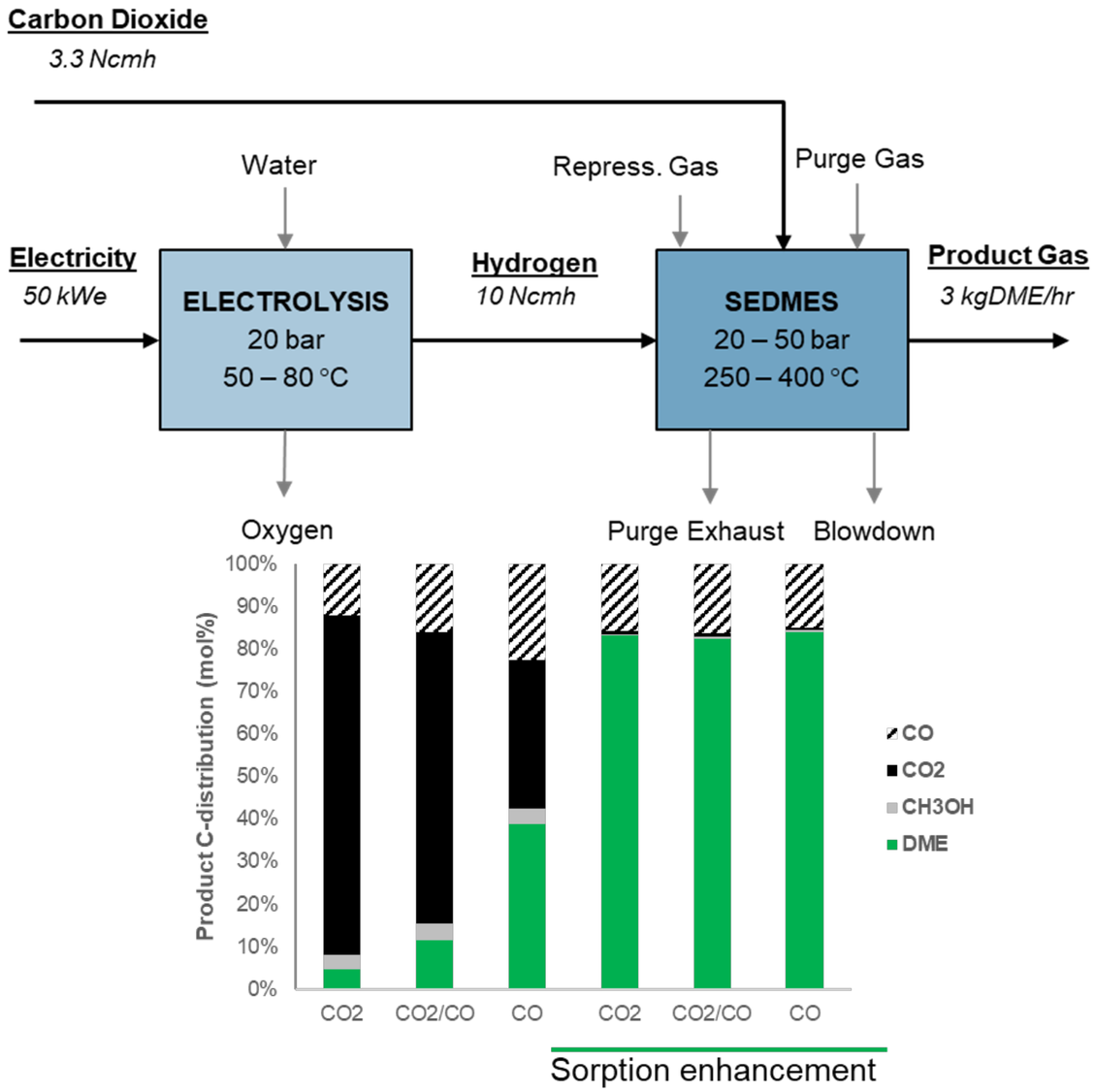
USP: In-situ removal of Steam by adsorption, increased conversion efficiency

Driver:

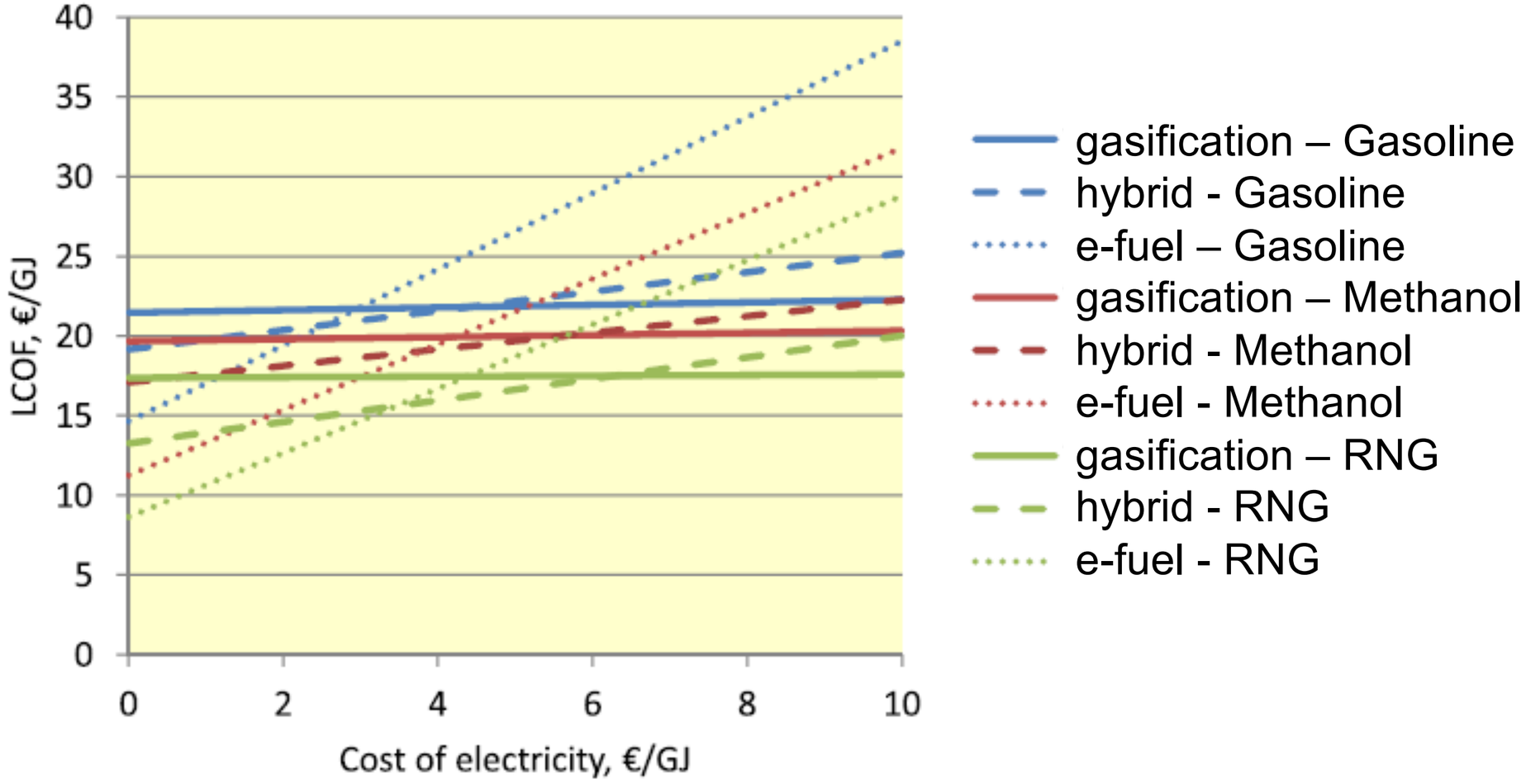
- Increase DME production and efficiency in one pass

Current project:

- SEDMES: Sorption-enhanced DME synthesis (in situ removal of steam by adsorption)
- Interreg E2C: pilot demonstrator at TRL6 of coupled 50 MW electrolyser sorption enhanced DME synthesis to 3 kg/hr DME

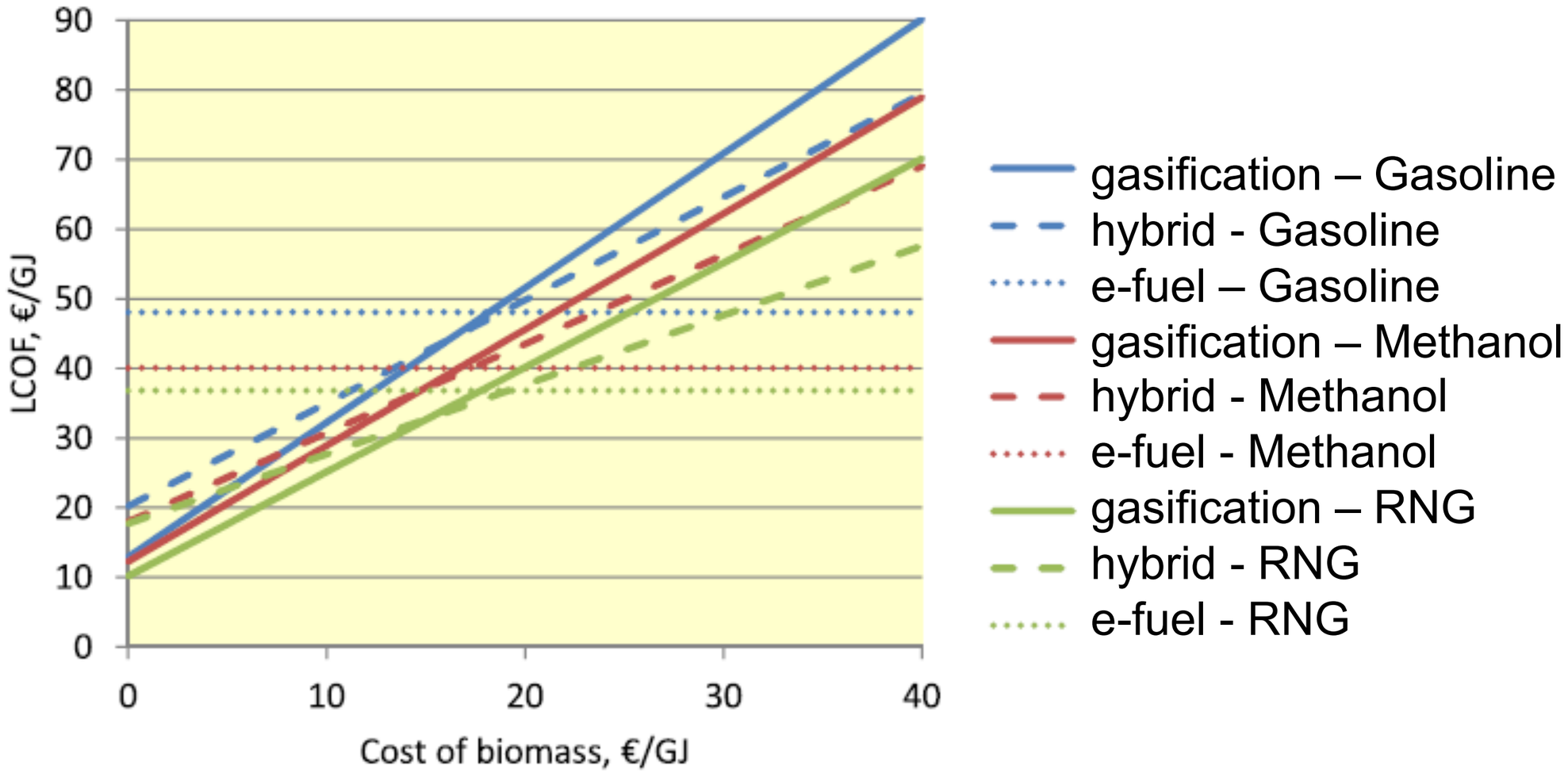


EFFECT OF ELECTRICITY PRICE



Hannula I. Co-production of synthetic fuels and district heat from biomass residues, carbon dioxide and electricity: performance and cost analysis. Biomass Bioenergy 2015;74:26–46.

EFFECT OF BIOMASS PRICES



Hannula I. Co-production of synthetic fuels and district heat from biomass residues, carbon dioxide and electricity: performance and cost analysis. Biomass Bioenergy 2015;74:26–46.

CONCLUSIONS

- It is a huge challenge to bring substantial amounts of renewable fuels to the market
- There is an urgency to start building demo's and plants as soon as possible
- Different high TRL technologies exist

- One option is to use gasification for green gas production
  - High TRL
  - has future BECCS / BECCU options
  - Source of "pure" CO2 that can be integrated with green hydrogen

- Cost price of e-fuels are very dependent on cost of electricity
- Biofuels are very dependent on cost of biomass

THANK YOU FOR YOUR ATTENTION

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