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Advanced biofuels by gasification – Status of R&D work in Güssing

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Team of R&D

Institute of Chemical Engineering
Working Group Future Energy Technology

- Scientific partners



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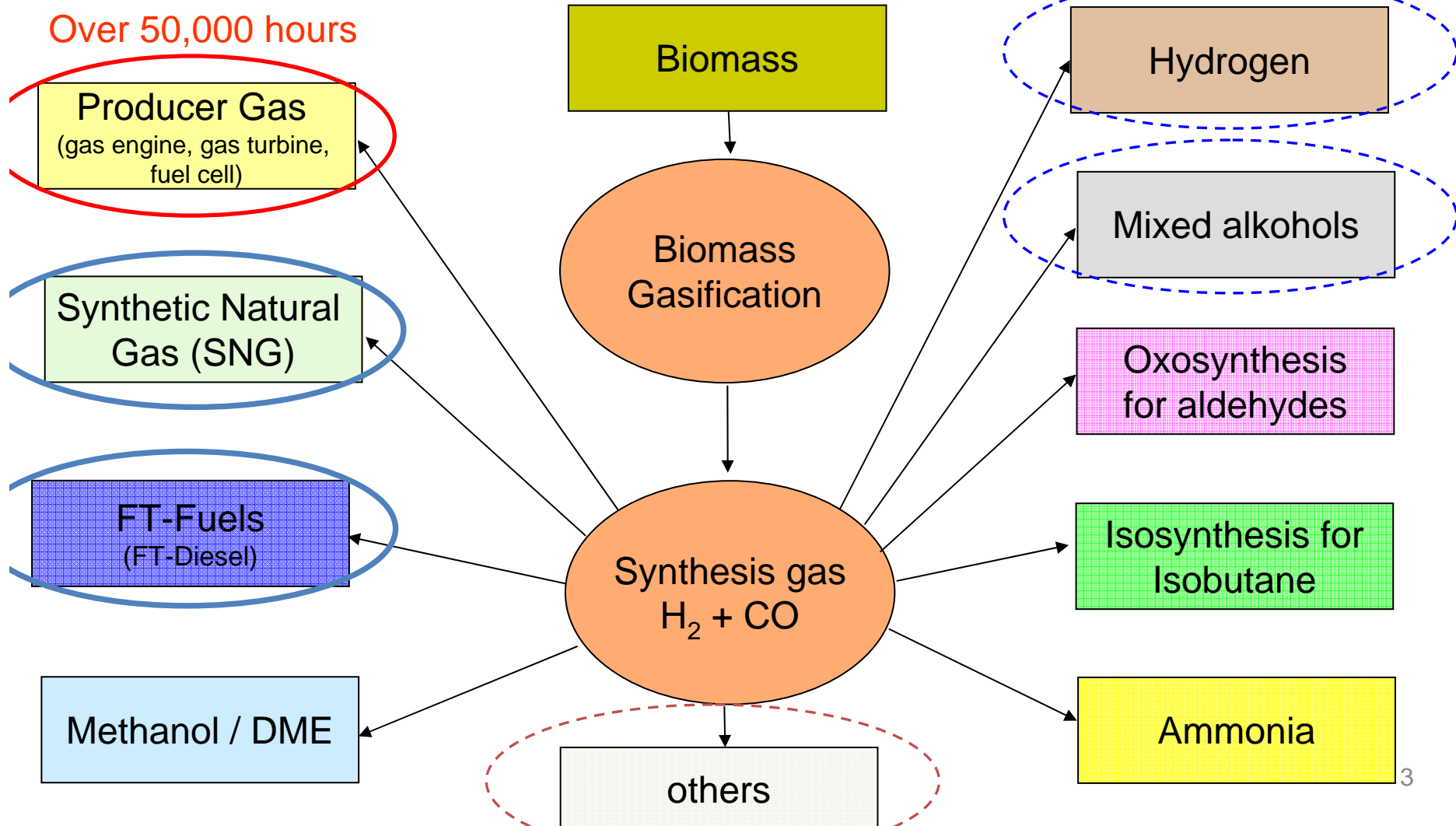
- Engineering (as example)

repotec
renewable power technologies

- Operators (as example)



The basic concept – “Green Chemistry”



BioSNG demonstration plant



Gasifier

BioSNG PDU

Technikum

Fuelling Station

Commercial FICFB gasifiers

Location	Electricity production	Fuel / electr. MW, MWeI	Start up	Status
Güssing, AT	Gas engine	8.0 / 2.0	2002	Operational
Oberwart, AT	Gas engine / ORC	8.5 / 2.8	2008	Operational
Villach, AT	Gas engine	15 / 3.7	2010	Commissioning
Klagenfurt, AT	Gas engine	25 / 5.5	2011	planing
Ulm, DE	Gas engine / ORC	14 / 5	2011	Under construction
Göteborg, Sweden	BioSNG	32/20 (BioSNG)	2012	planing

Gas Composition (after gas cleaning)

Main Components		
H ₂	%	35-45
CO	%	22-25
CH ₄	%	~10
CO ₂	%	20-25

Minor Components		
C ₂ H ₄	%	2-3
C ₂ H ₆	%	~0.5
C ₃ H ₄	%	~0,4
O ₂	%	< 0,1
N ₂	%	1-3
C ₆ H ₆	g/m ³	~8
C ₇ H ₈	g/m ³	~0,5
C ₁₀ H ₈	g/m ³	~2
TARS	mg/m ³	20-30

Possible poisons		
H ₂ S	mgS/Nm ³	~200
COS	mgS/Nm ³	~5
Mercaptans	mgS/Nm ³	~30
Thiophens	mgS/Nm ³	~7
HCl	ppm	~3
NH ₃	ppm	500-1000
HCN	ppm	~100
Dust	mg/Nm ³	< 20

H₂:CO = from 1.7:1 to 2:1

BioSNG Demonstration Project

A 1 MW SNG Process Development Unit (PDU) is erected within the EU project BioSNG and allows the demonstration of the complete process chain from wood to SNG in half-commercial scale.

A consortium consisting of four partners is responsible for the PDU:

- CTU – Conzepte Technik Umwelt AG
- Repotec GmbH
- Paul Scherrer Institute
- Technical University Vienna

The project BioSNG is co-funded by

- the European Commission
- 6th Framework Programme
PrNo TREN/05/FP6EN/
S07.56632/019895
- Swiss electric research
- Bundesförderung Österreich
- WIBAG



Results

- December 2008: First conversion of product gas into rawSNG
- June 2009: BioSNG at H-Gas quality produced
- June 24th : inauguration – CNG cars were fuelled using BioSNG from wood
- June 2009 CNG-car was successfully used for 1000km with BioSNG



Quality BioSNG

	unit	Germany DVGW regulation G260	Austria ÖVGW regulation G31	BioSNG
Wobbe Index	[kWh/m ³]	12,8-15,7	13,3-15,7	14,15
Relative density	[-]	0,55-0,75	0,55-0,65	0,56
Higher heating value	[kWh/m ³]	8,4-13,1	10,7-12,8	10,7

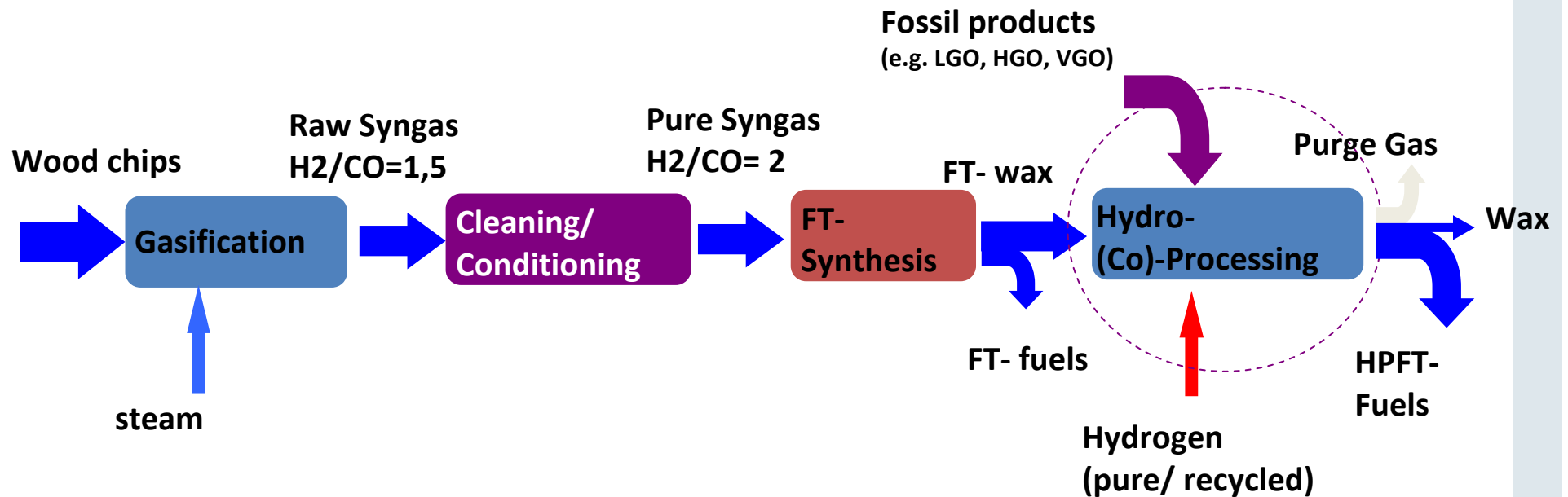
Synthetic biofuels (FT- Route)



Cellulose, Polyose (Hemicellulose)
Lignin

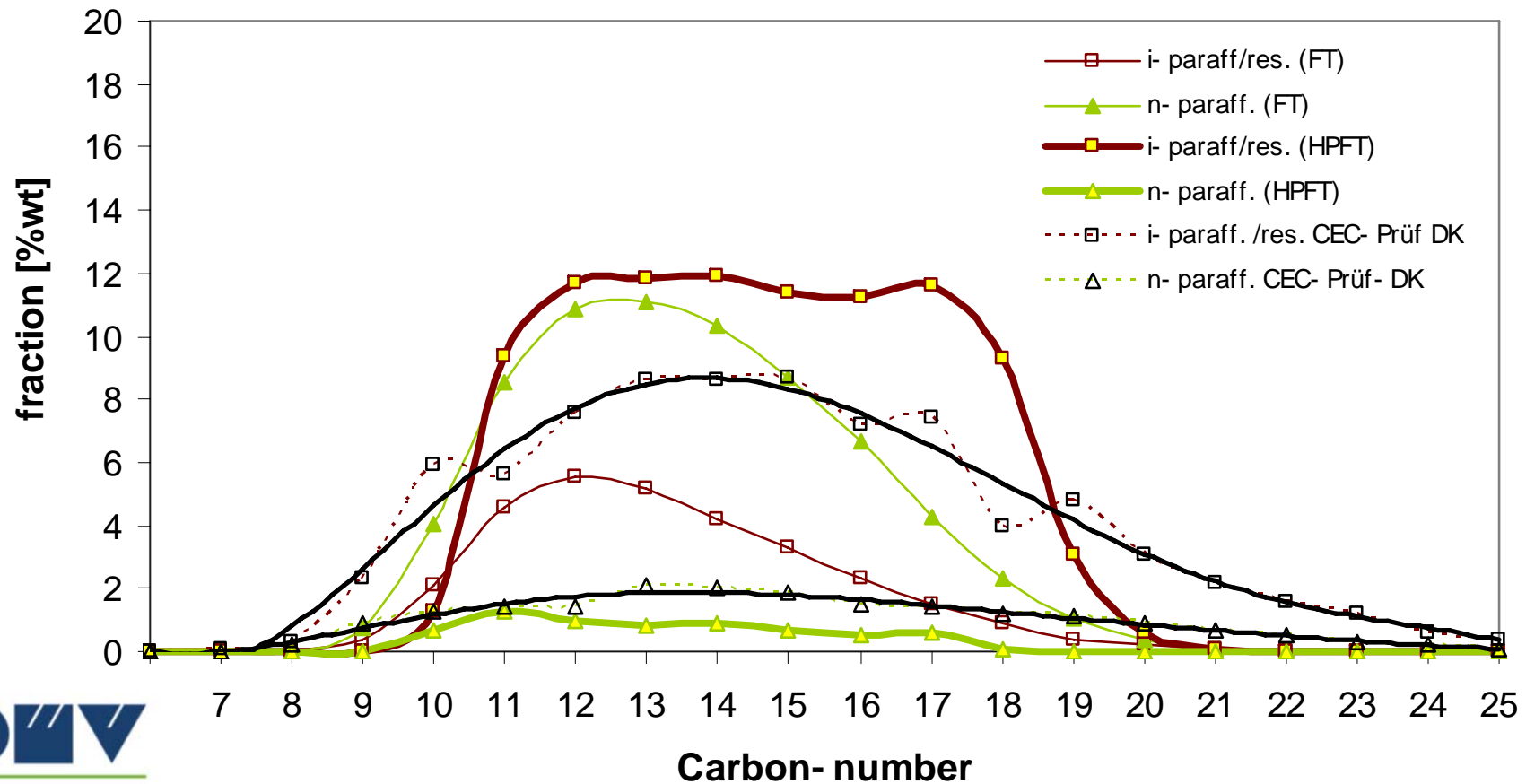


i/n- paraffins
(hydrocarbons)

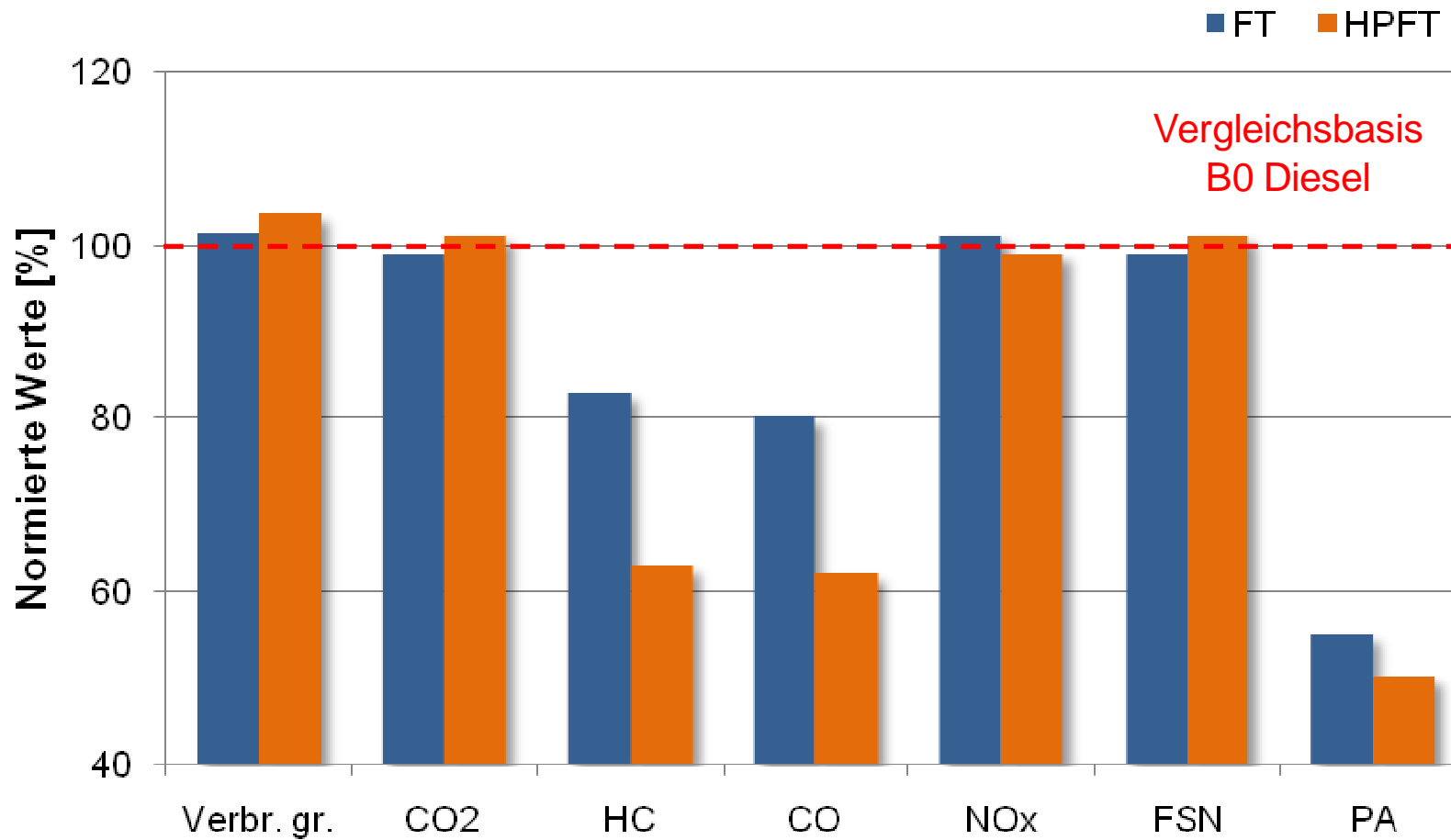


Comparison of produced FT Fuels

	FT- Diesel	HPFT- Diesel	CEC- Prüf.
ACN:	>72 $t_d = 2,5$ s	68,5 $t_d = 2,91$ s	>51,8 /
CFPP/CP/FP:	-12/ -9/ - °C	-62/ -60 / -98°C	-18/ -5 °C



Results on engine tests with 20% blends



Mixed alcohols

- Funded by „Klima und Energiefonds“ and Bioenergy 2020+
- Aim is to get fundamental know how in the synthesis of mixed alcohols from biomass
- Main advantage is very simple gas cleaning, due to sulphur resistant catalyst

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Actual status: first experiments are done



Reformer

Drying
(glycol-scrubber)

Compressor
(5-7 Nm³/h;
90-300 bar)

Reactor



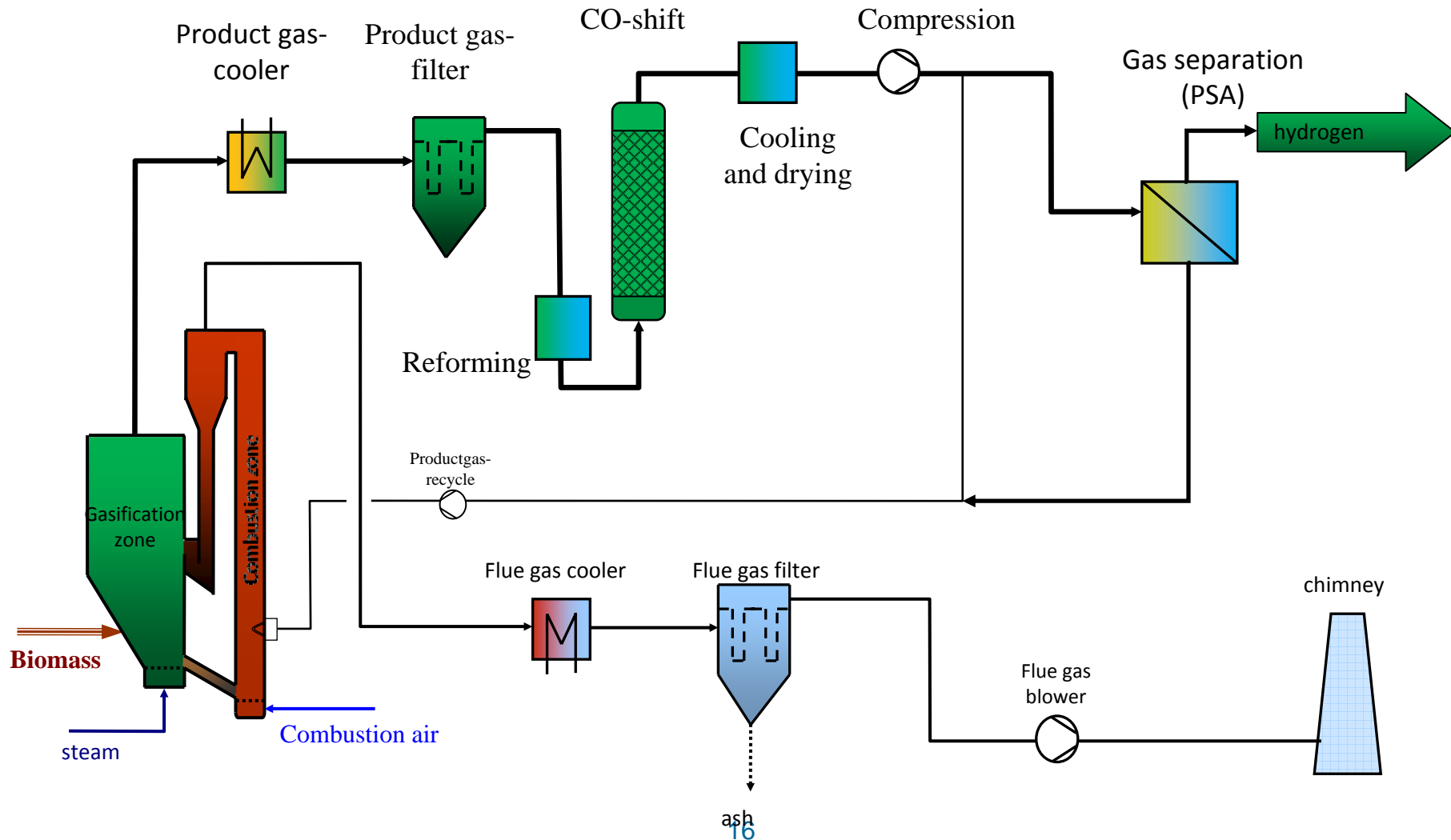
BioH₂-4Refineries

Economic evaluation of production of hydrogen for a refinery

- Coordination by OMV
- 50 MW fuel plant to replace fossil hydrogen
- Evaluation of the biomass resources available for such a plant
- Basic - engineering of the gasifier as well as of all other sub units, including pipelines, utility systems, logistic needs
- Optimal use of by-products
- Economic evaluation



Simplified flow chart



Summary

- Biomass CHP Güssing has excellent frame conditions for R&D on synthesis gas applications
- Focus of R&D is on small CHP and on synthesis gas applications (BioSNG, Fischer Tropsch, Mixed Alcohols, Hydrogen)
- Gasification enables the conversion of biomass to many useful products

More info at
<http://www.ficfb.at>