



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

IEA FORSCHUNGS
KOOPERATION

Task 33 – Gasification: Biomassevergasung, ein Grundprozess für Bioraffinerien – Praktische Entwicklungserfahrungen

Highlights der Bioenergieforschung 2. Dezember 2010, Wien

Dr. Reinhard Rauch

Vienna, University of Technology
Institute of Chemical Engineering

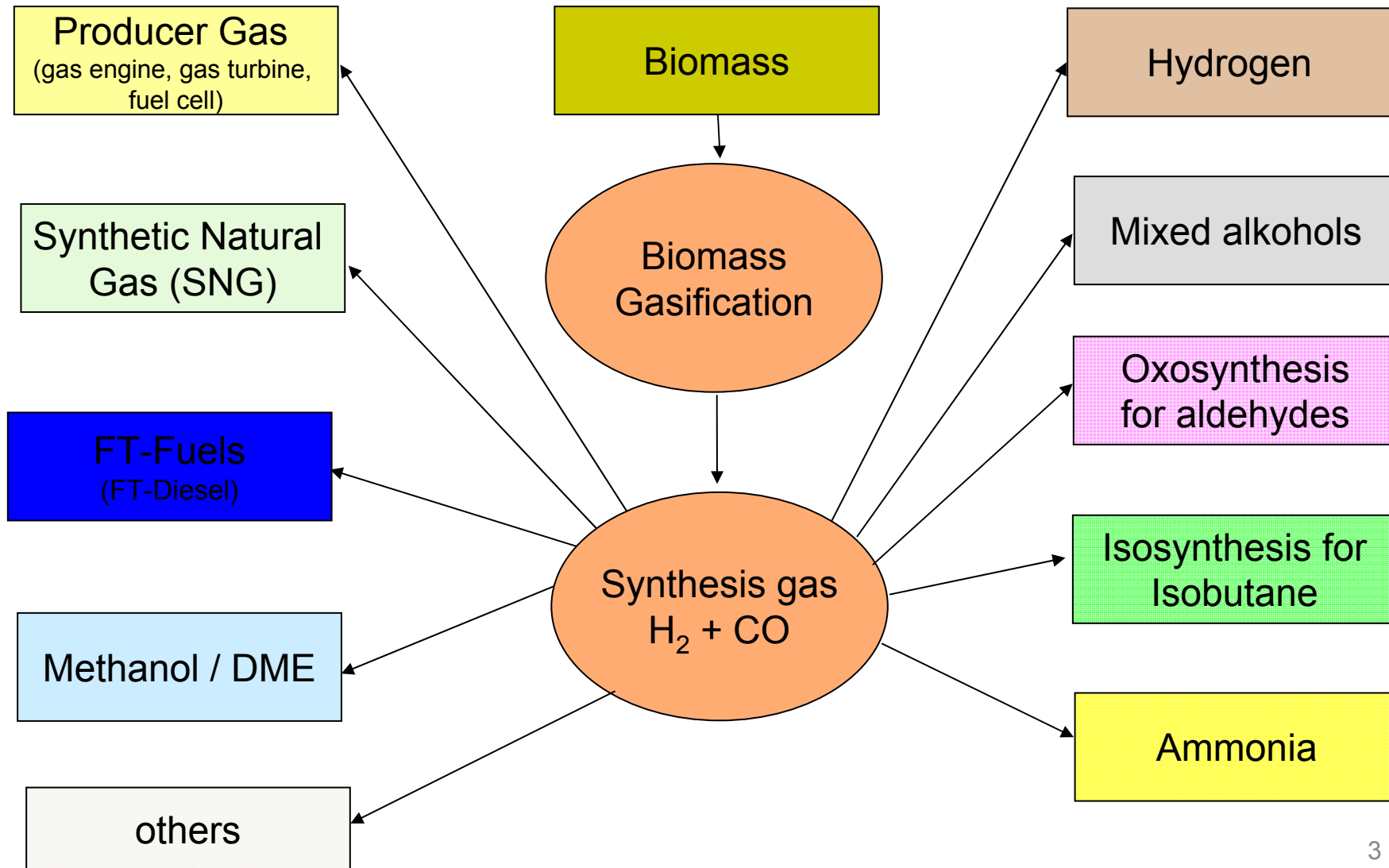
Participation in IEA Bioenergy is financed by



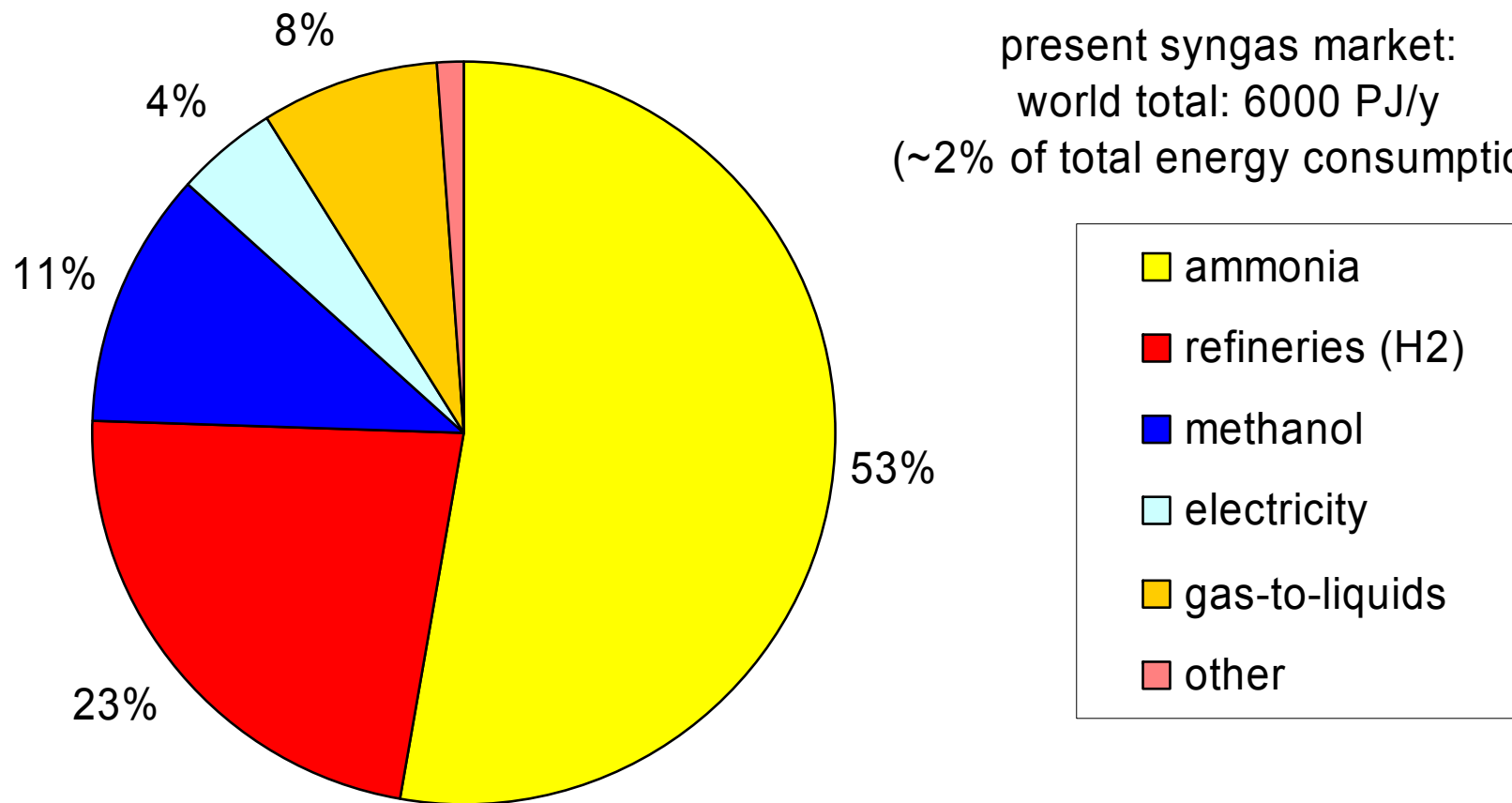
Content

- Synthesis gas
- Technology
- Examples
- Experience in Austria

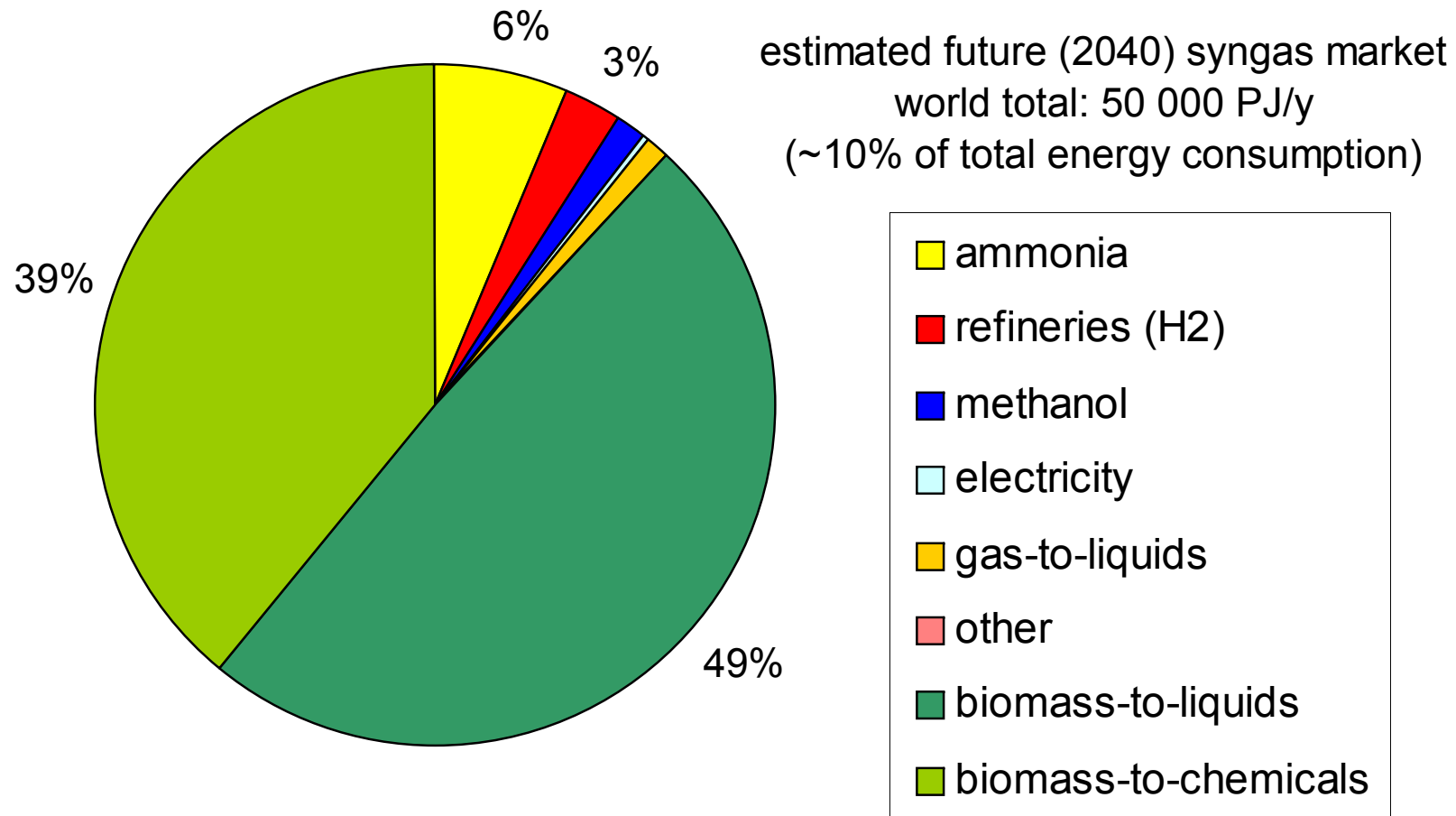
Why Gasification



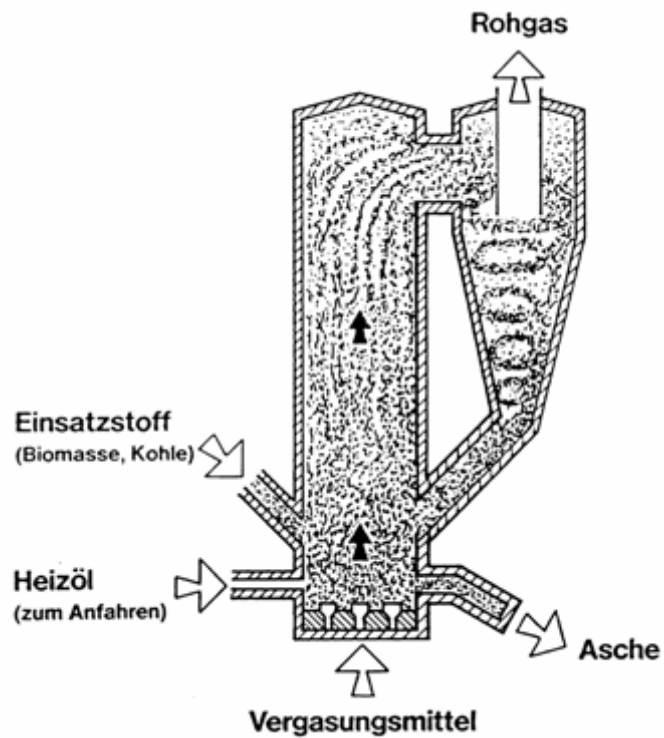
Actual Usage of Synthesis Gas



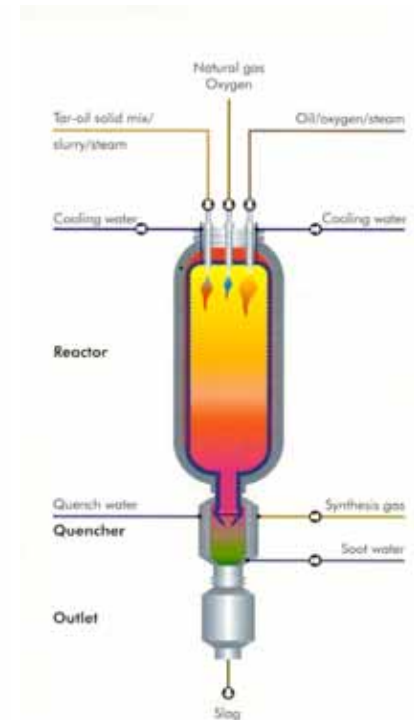
Predicted world syngas market in 2040



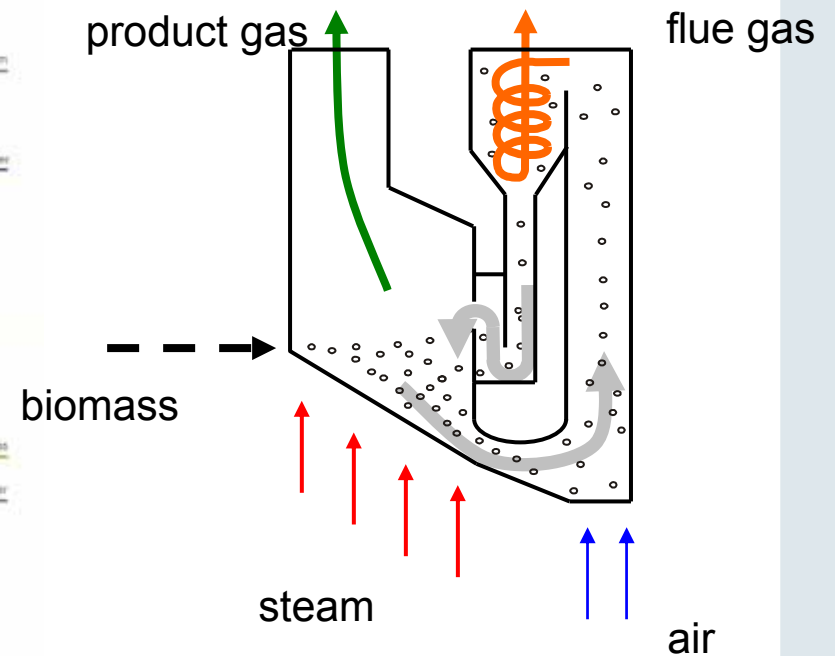
Reactors for Gasification



Fluidised Bed (Steam/O₂)

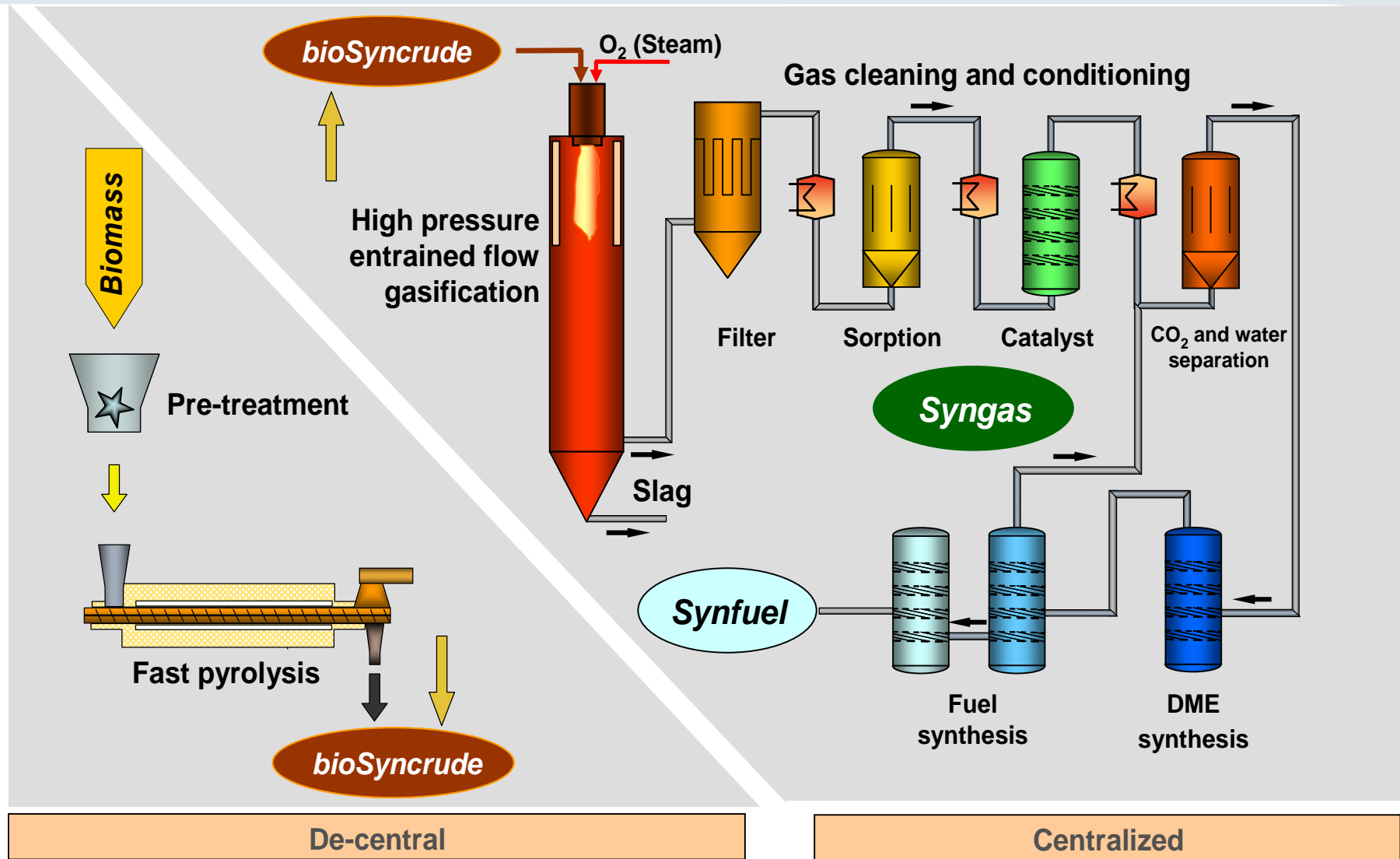


Entrained Flow (O₂)



Dual Fluidised Bed (Steam)

Technology	Gasification agent	Type of reactor	Location	Status
AER	steam	dual fluidised bed	Geislingen (GER)	Planning of Demoplant
Artfuel	oxygen/ steam	CFB	Clausthal (GER)	Pilot plant in operation
Bioliq	oxygen	staged gasification (decentral + central)	Karlsruhe (GER)	Commissioning of Demoplant
BioMCN	oxygen	entrained flow	The Netherlands	Planning of Demoplant
Carbo V	oxygen	staged gasification	Freiberg (GER)	Commissioning of Demoplant
Chemrec	oxygen	entrained flow	Sweden	Pilot plant in operation
Chrisgas	oxygen/ steam	CFB	Värnamo, Sweden	Commissioning of Demoplant
Energem	oxygen/ steam	BFB	Canada	Construction of Demoplant
FICFB / Repotec	steam	dual fluidised bed	Güssing (AT)	In operation
FICFB / Ortner	steam	dual fluidised bed	Oberwart (AT)	In operation
GoBiGas	steam	dual fluidised bed	Göteborg, Sweden	Planning of Demoplant
Heat Pipe Reformer	steam	indirekt fluidised bed	Pfaffenhofen (GER)	Commissioning of Demoplant
MILENA	steam	dual fluidised bed	ECN, (The Netherlands)	Commissioning of pilot plant
Range Fuels		staged gasification	US	Construction of commercial plant
Ultra Clean Gas	oxygen/ steam	CFB	Finland	Commissioning of Demoplant

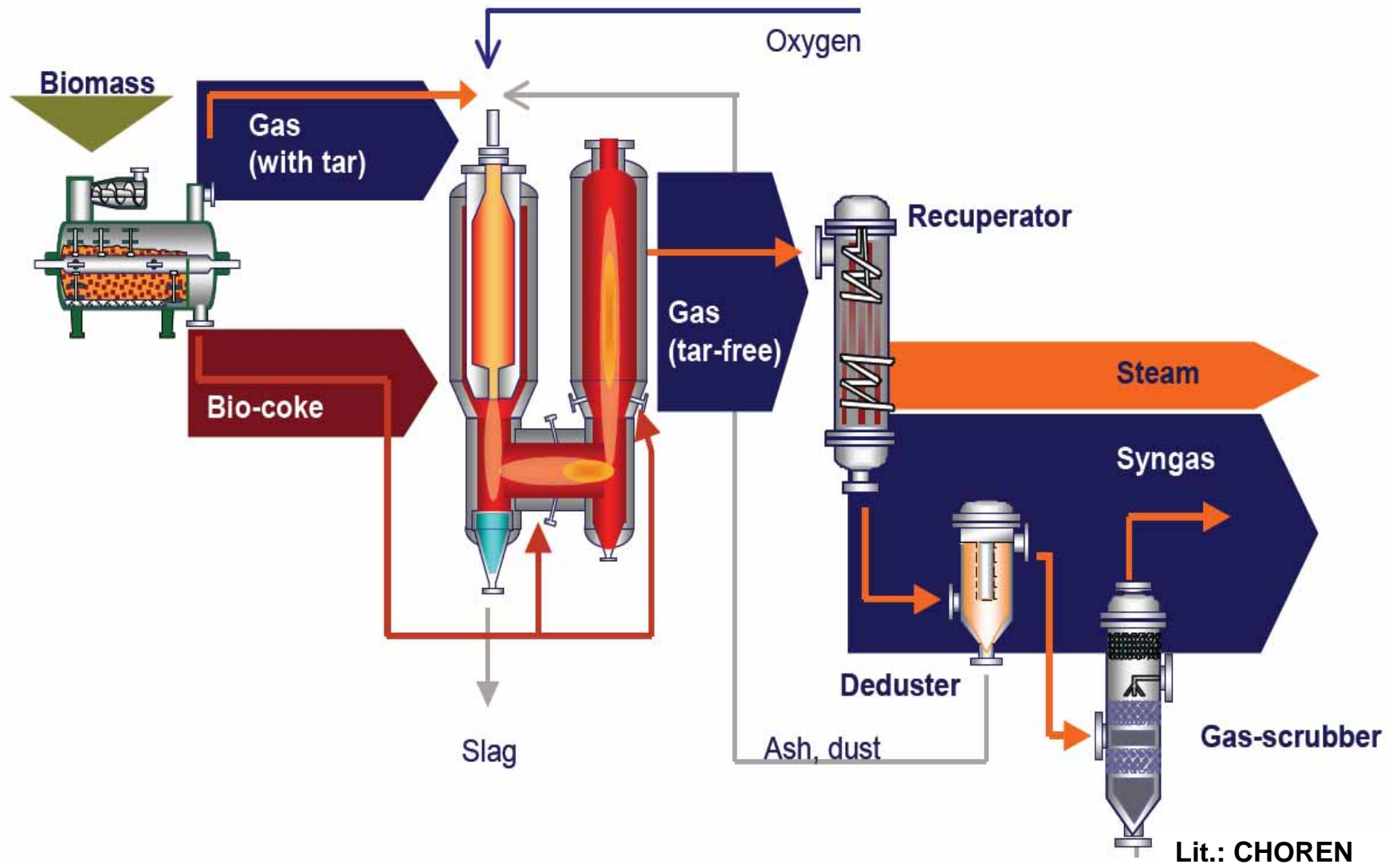


BioMCN

Methanol Chemistry Netherlands

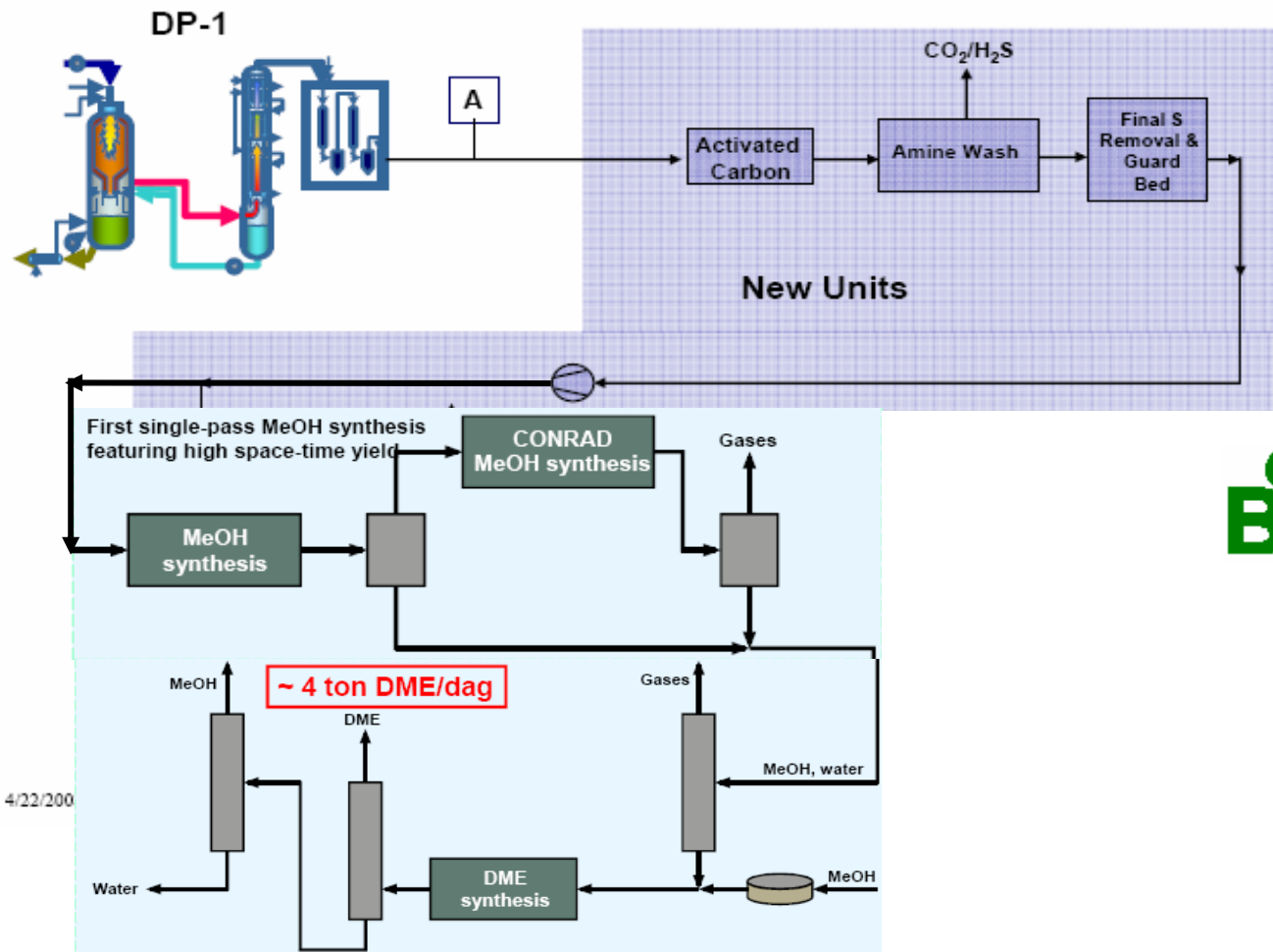
- raw glycerin upgrading
- 30-40% glycerin in Natural Gas reformer, ~150 kton/y bio-methanol ($\sim 150 \text{ MW}_{\text{bio-methanol}}$)
- Looking for options to go to 100% bio-methanol: gasification





DP1 integration with DME pilot

New process units downstream the DP-1 plant in Piteå



Biomass CHP Güssing



Gasifier

BioSNG Demo

Technikum

BioSNG Fuelling
Station

Experience: 10.000 hours of operation



FICFB Ulm, Germany

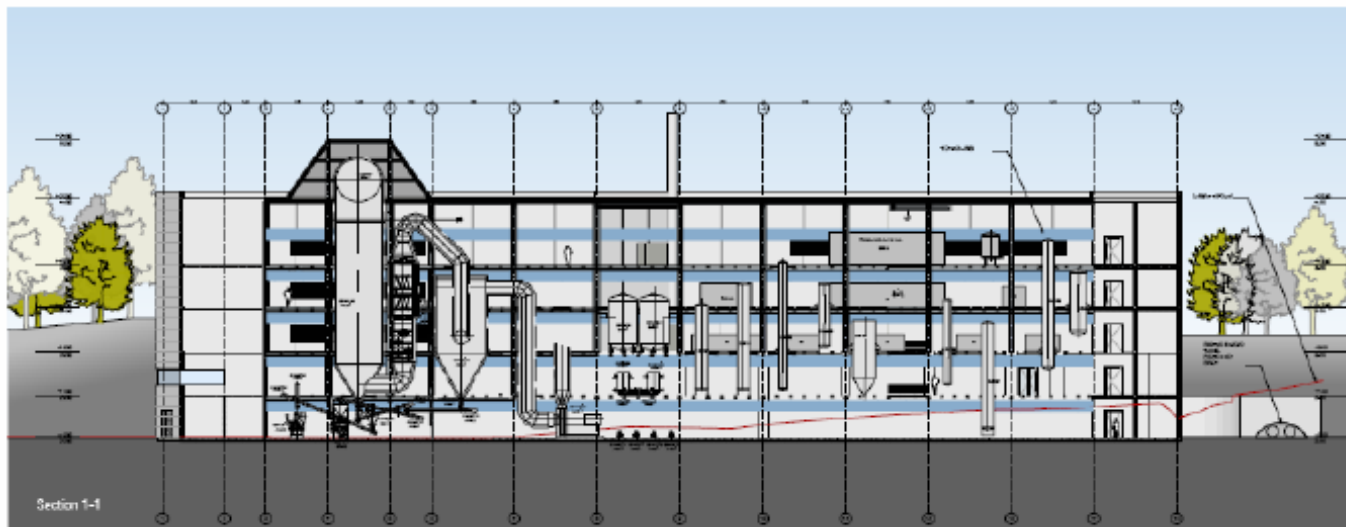


http://www.swu.de/index.php?eID=z7_swuwebcam_popup

Biomass to SNG: GOBIGAS

GoBiGas – phase 1

Production:		Consumption:	
Bio-SNG	20 MW	Fuel (pellets)	32 MW
District heating	4 MW	Electricity	2,5 MW
Heat to heat pumps	8 MW	RME (bio-oil)	0,5 MW



Stora Enso / Neste Oil Joint Venture for FT BTL Diesel Fuel

50/50 Joint Venture “NSE Biofuels Oy” to first develop technology and later produce next generation renewable diesel crude from wood / forest residues

Currently commissioning a 12MW demonstration plant in Stora Enso’s Varkaus mill, to be in use in 2010

Investment decision for a commercial scale plant when the parties have enough experience from the demonstration plant

Strong development consortium

- Joint Venture partners:
- Testing & research partner:
- Gasification supplier:



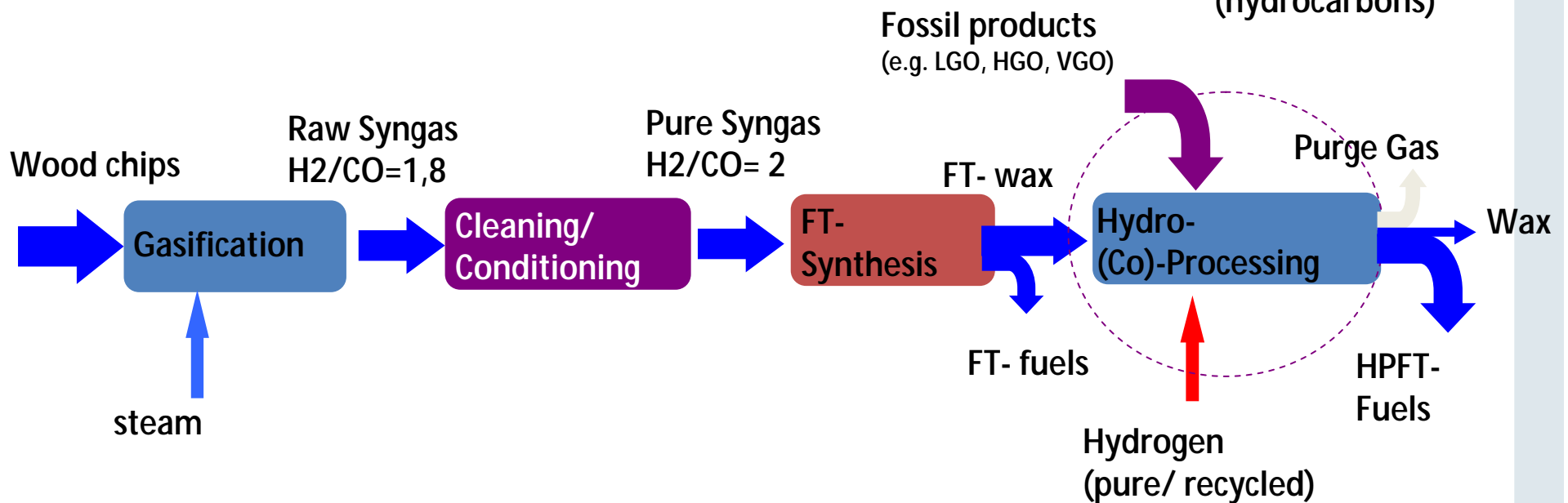
Biomass process chain (FT- Route in Austria)

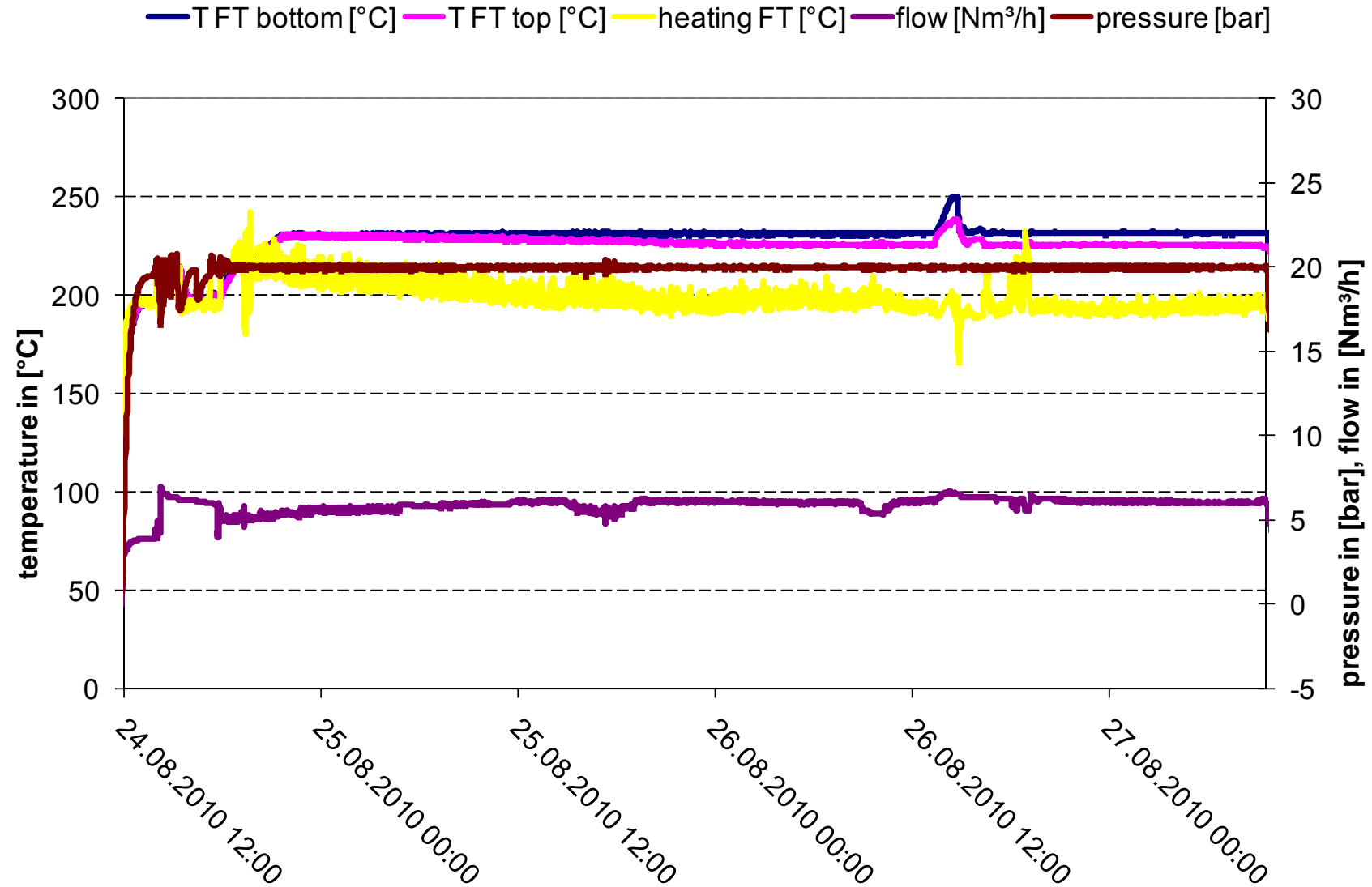


Cellulose, Polyose (Hemicellulose)
Lignin

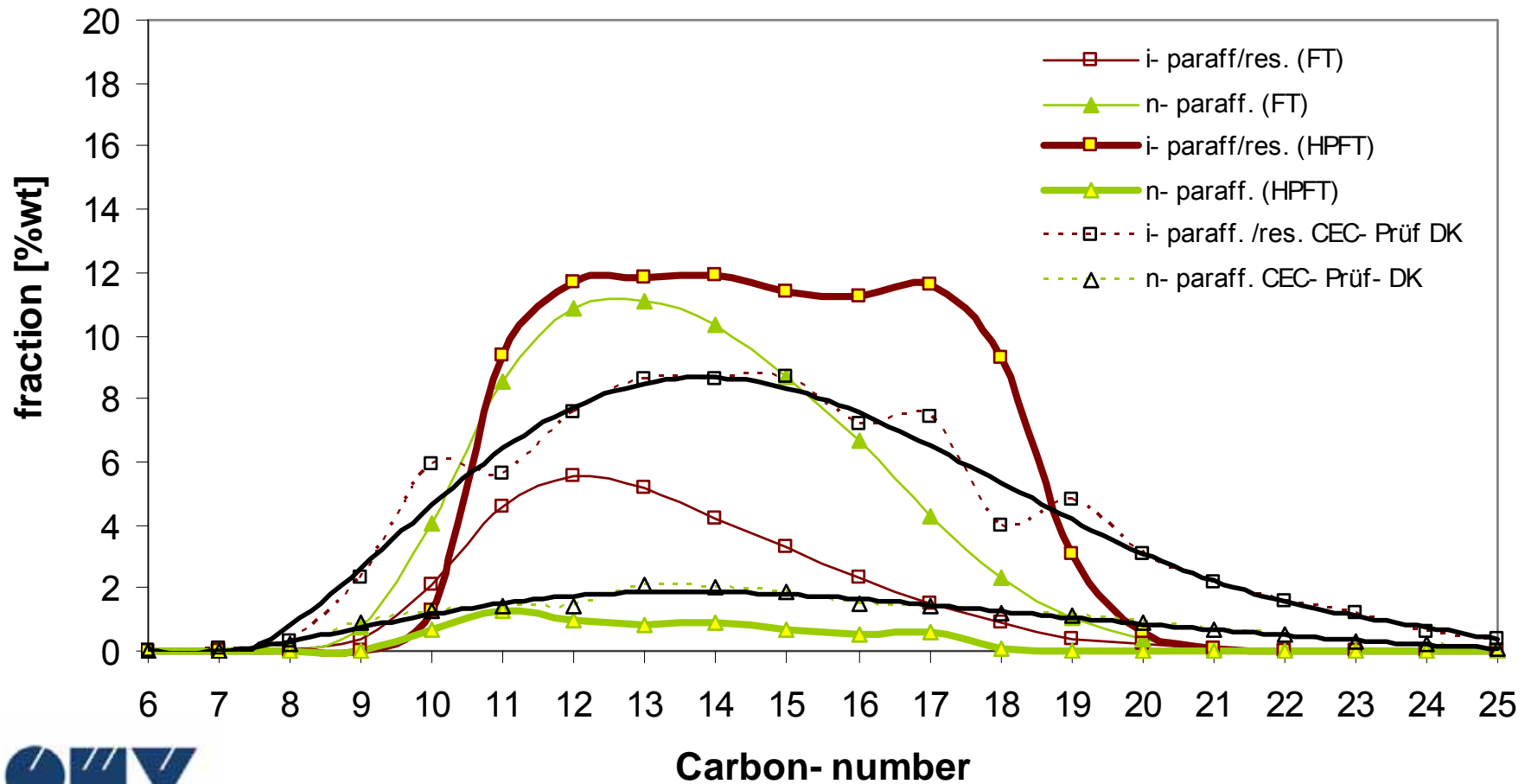


i/n- paraffins
(hydrocarbons)





	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



Outlook: Quality comparison

Renewable

Fossil



Summary

- Work on gasification of biomass is going on
- Political frame conditions are good, but there is the trend to electric cars
- Several Demoplants are on the way!
- Gasification is one possible route for the production of renewable transportation fuels