Vienna University of Technology

Gas Upgrading from Thermal Gasification

Dr. Reinhard Rauch

at

Task 37 “Energy from Biogas” Research Exchange Workshop
BIOGAS UPGRADING
8. Oktober 2009 IFA-Tulln

Gasification Systems

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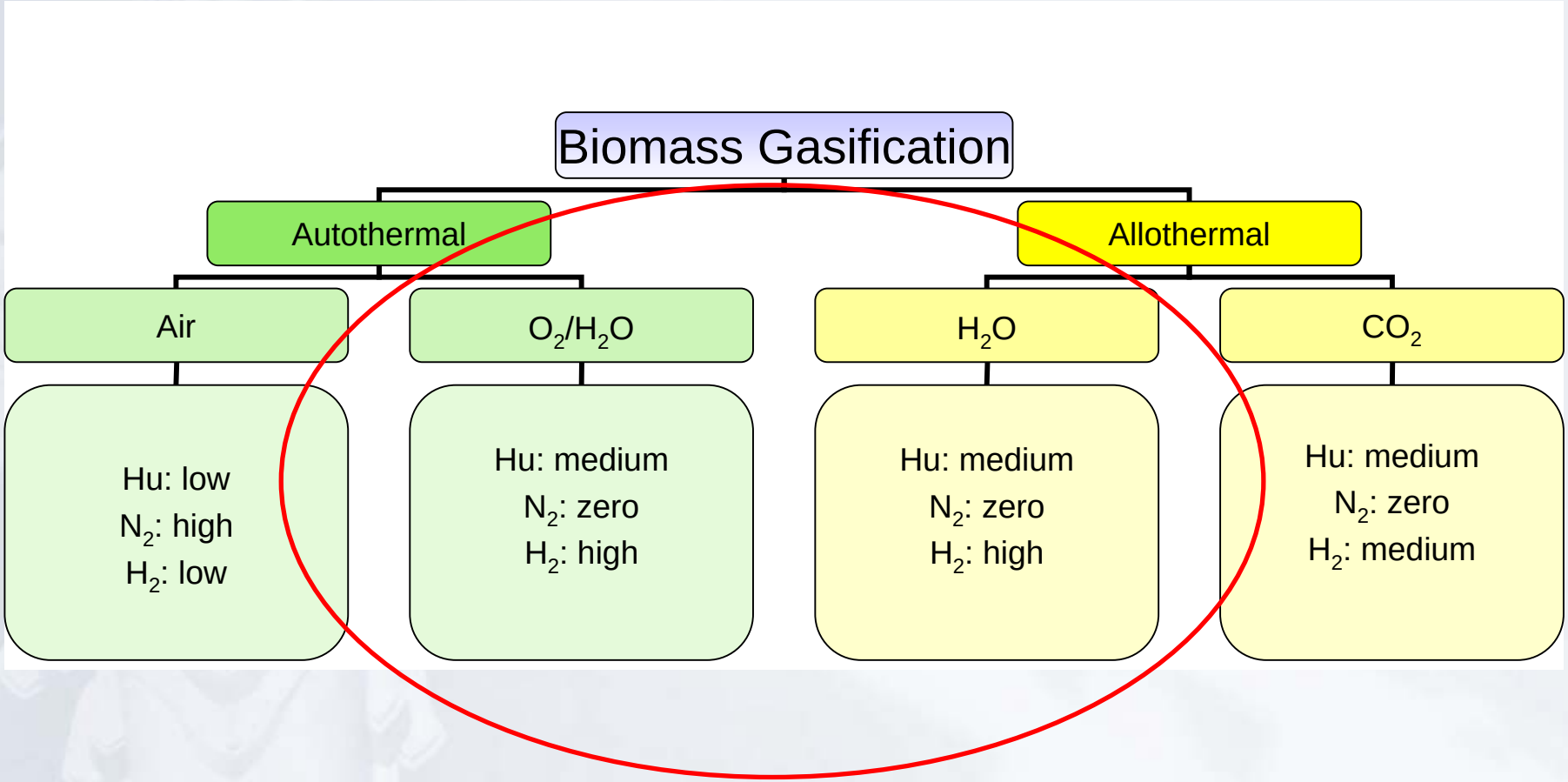
Working group: Zero Emission Energy Technology



Reactors for Gasification

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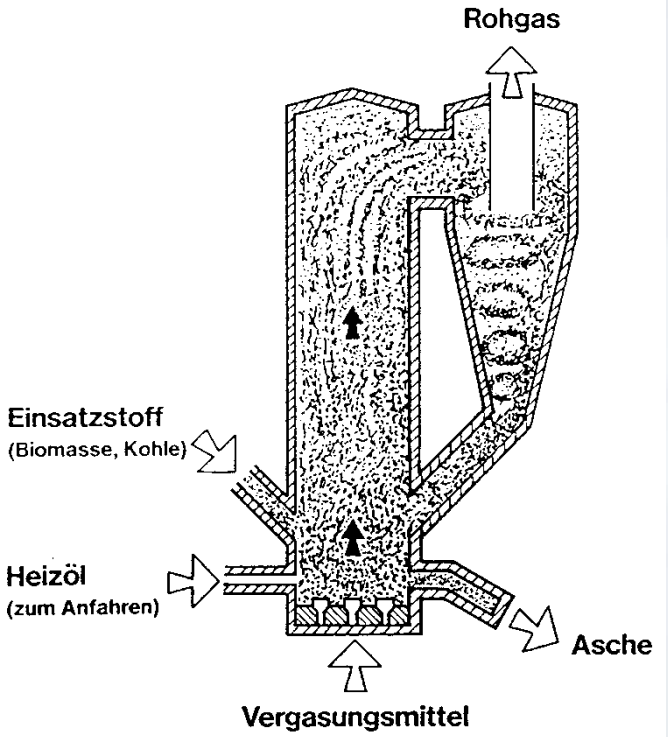

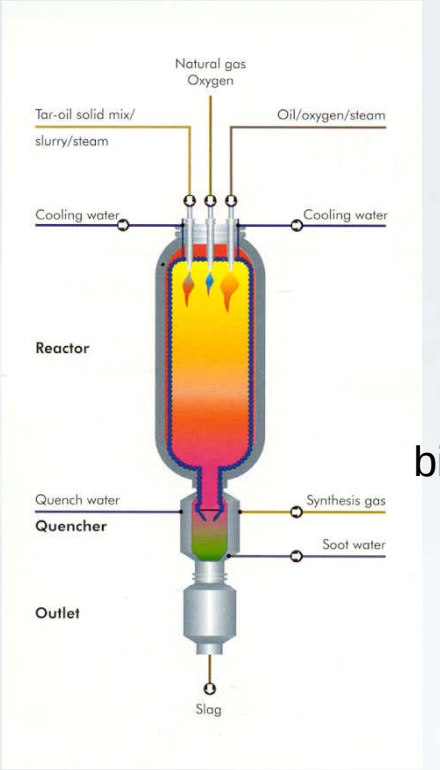

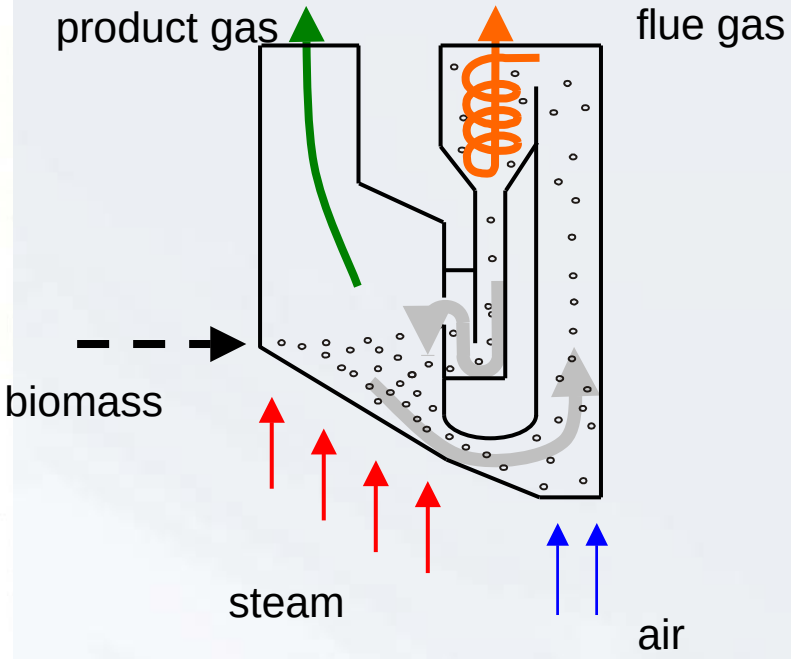

Fluidised Bed (Steam/O_2)

Entrained Flow (O_2)

Dual Fluidised Bed (Steam)

The basic concept – "Green Chemistry"

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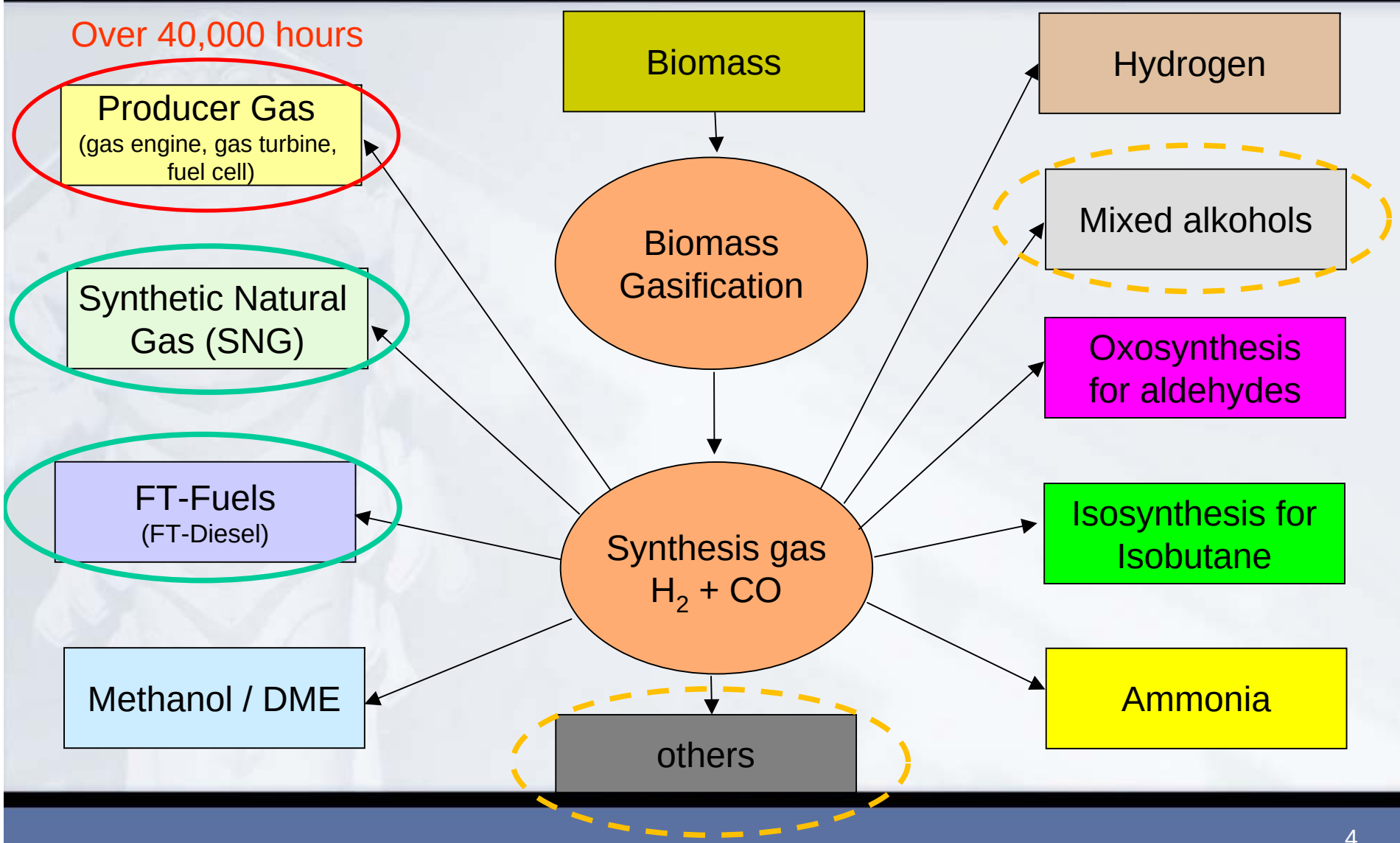

Why BioSNG

- Efficiency
- Usability of product
- Robust synthesis
- Know how available

Research in BioSNG

Gothenburg Biomass Gasification Plant	Sweden	Feasibility study
Dakota Gas	USA	Commercial plant
BioSNG	Güssing Austria	Demonstration
Milena Gasification	Netherlands	R&D
Heat Pipe Reformer Agnion	Germany, Austria	R&D
ArtFuel Cutec	Germany	R&D

Biomass CHP Güssing design data

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• Start of construction	September 2000		
• Start up	January 2002		
• Fuel	2,2	to/h	(Wood chips)
• Water content	15	%	(35 %)
• Fuel power	8	MW	
• Electrical power	2	MW	
• Thermal power	4,5	MW	
• Electrical efficiency	25	%	(20%)
• Total efficiency	80	%	
• Owner and operator	Biomass Power Station Güssing Association		

CHP-PLANT GÜSSING

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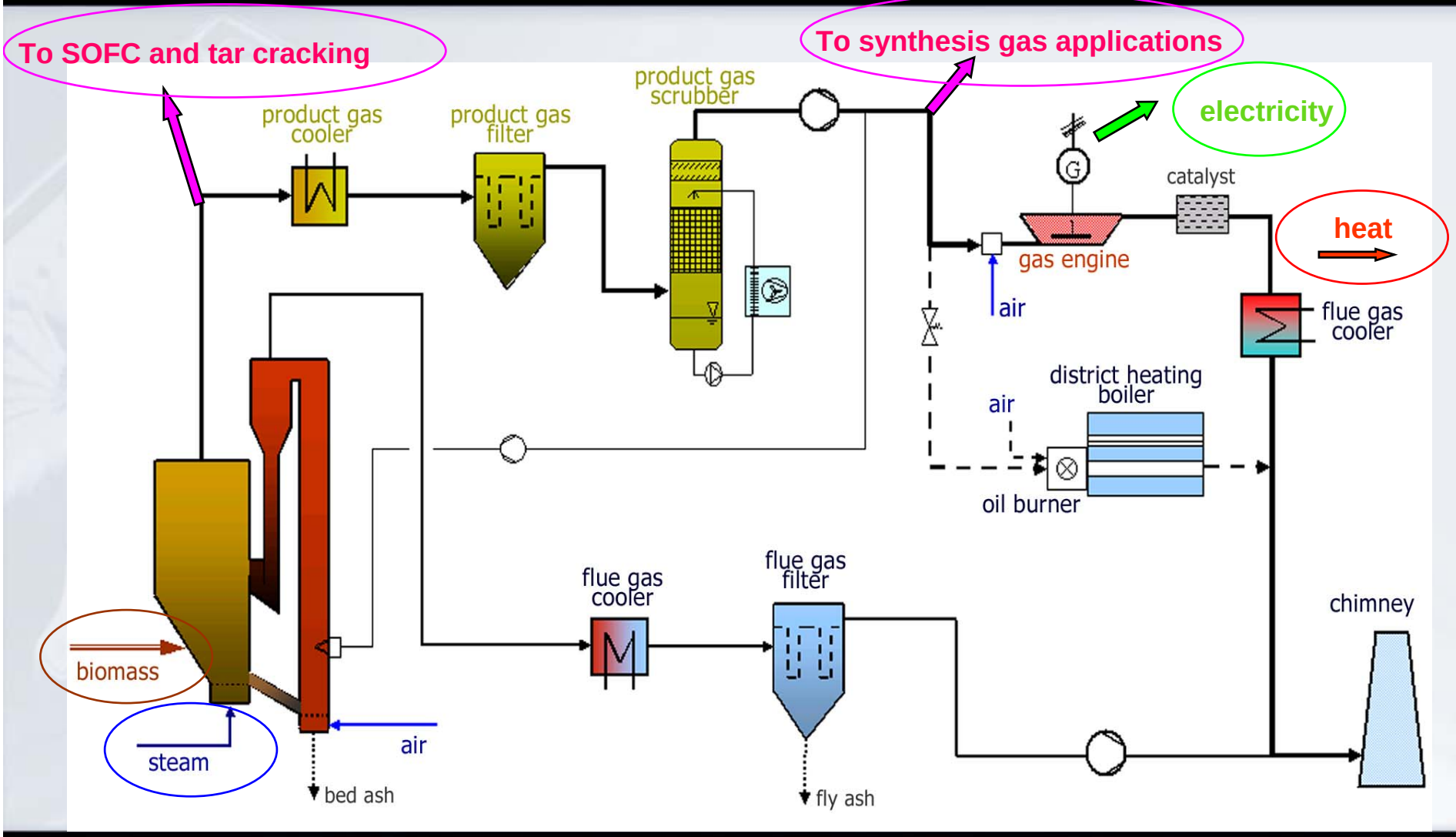

Gas Composition (after gas cleaning)

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Main Components		
H_2	%	35-45
CO	%	22-25
CH_4	%	~10
CO_2	%	20-25

Minor Components		
C_2H_4	%	2-3
C_2H_6	%	~0.5
C_3H_6	%	~0,4
O_2	%	< 0,1
N_2	%	1-3
C_6H_6	g/m^3	~8
C_7H_8	g/m^3	~0,5
$C_{10}H_8$	g/m^3	~2
TARS	mg/m^3	20-30

Possible poisons		
H_2S	mgS/Nm^3	~200
Mercaptans	mgS/Nm^3	~30
Thiophens	mgS/Nm^3	~7
HCl	ppm	~3
NH_3	ppm	500-1000
Dust	mg/Nm^3	< 20

H_2:CO = from 1.5:1 to 2:1

Gas composition

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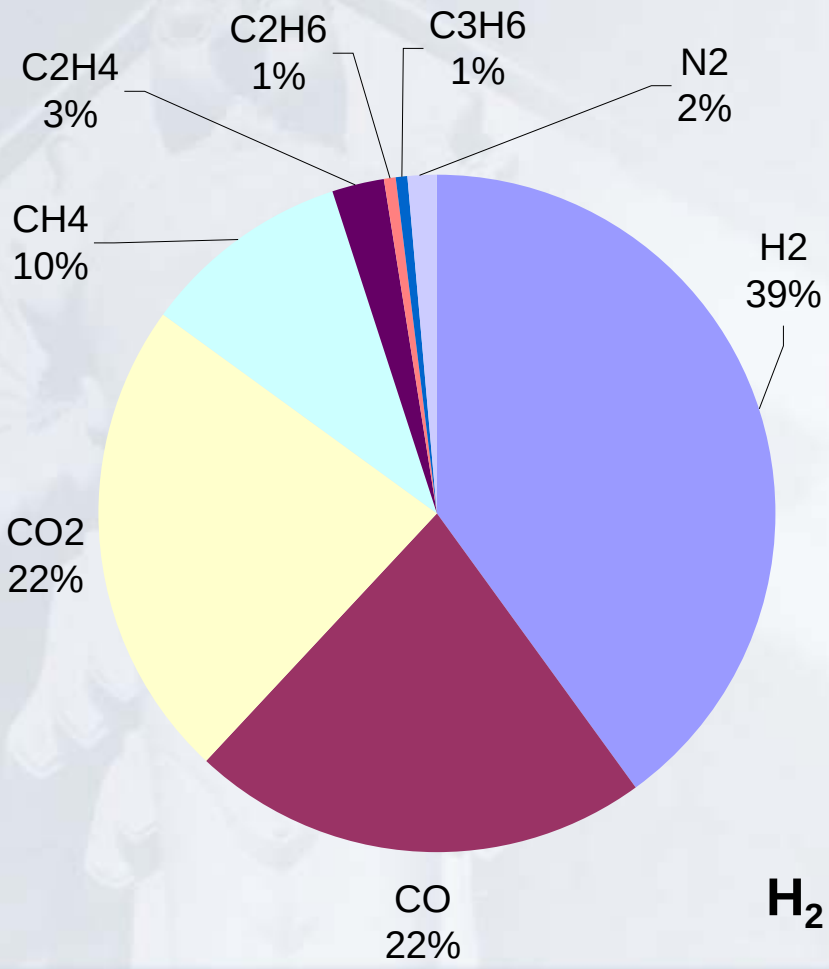
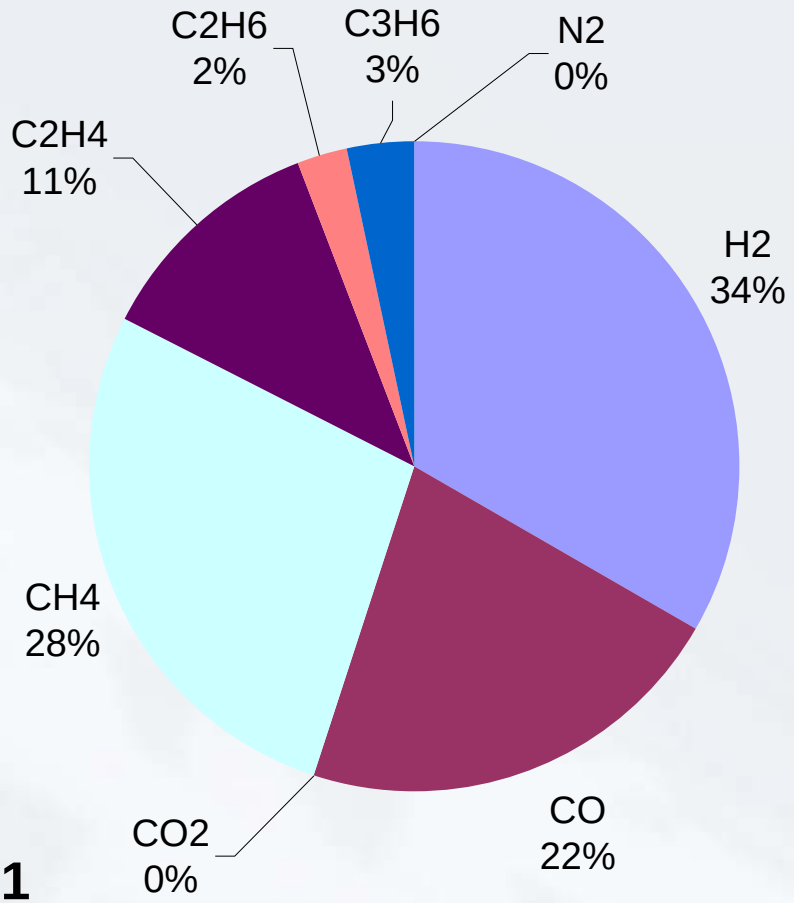
On volume basis



On energy basis



H_2:CO = 1.8:1

Efficiencies over 60% from biomass to SNG are possible

BioSNG Demo Plant

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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

Biomass CHP Güssing

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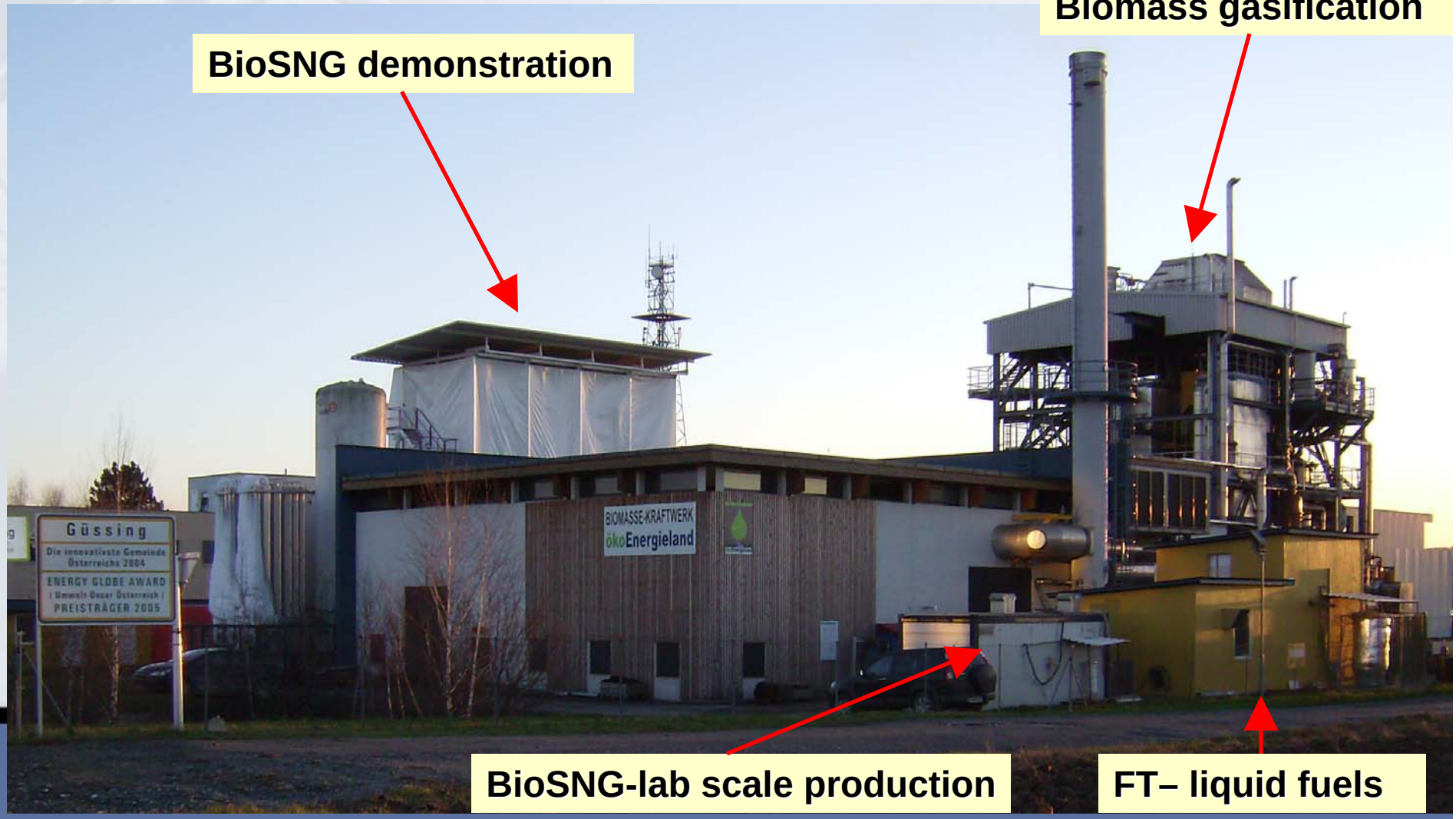
Test plants – Renewable Synthetic Natural Gas (SNG), Renewable Liquid Fuels



Results BioSNG lab scale

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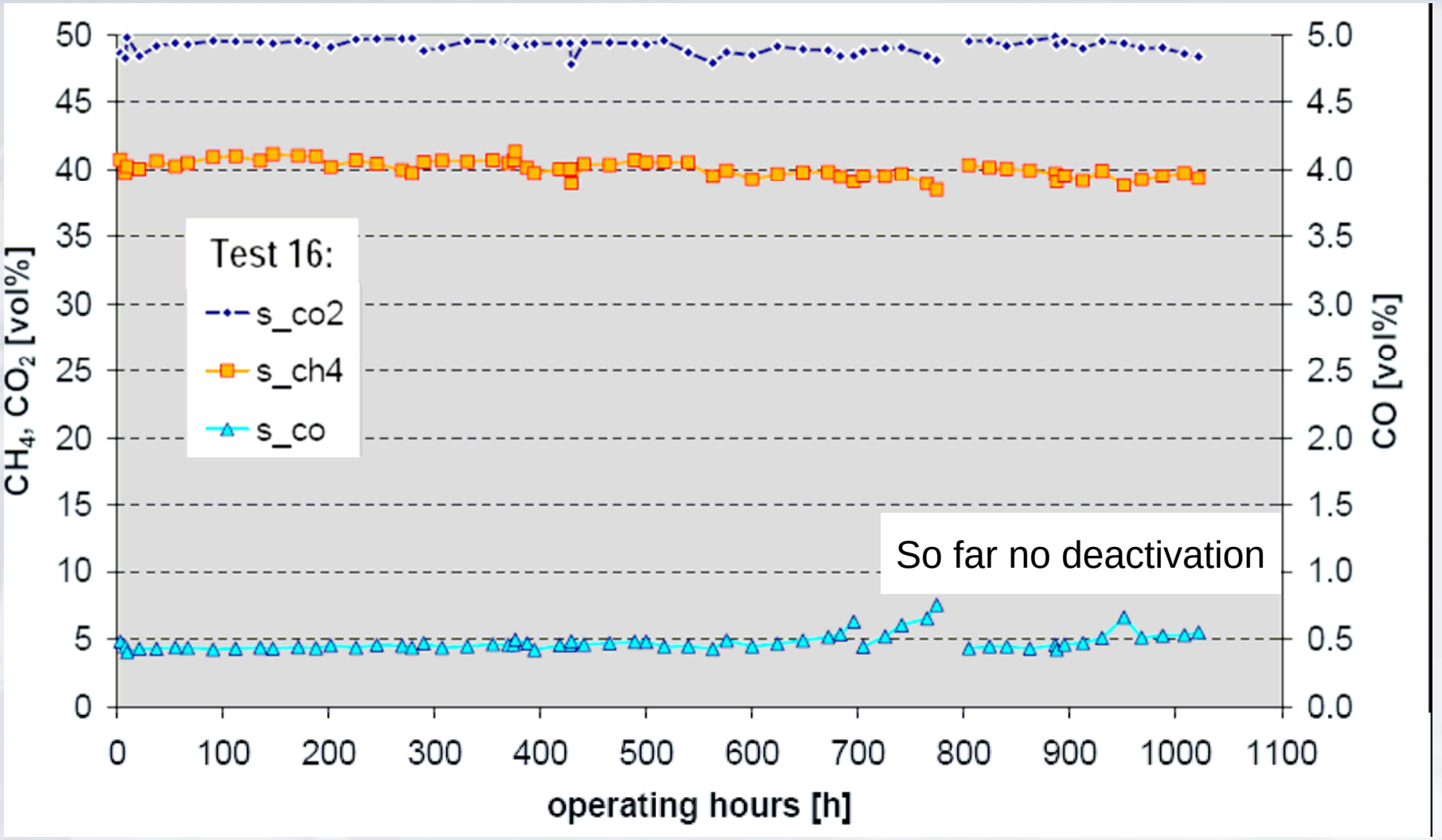

In cooperation with PSI

Schema BioSNG demonstration

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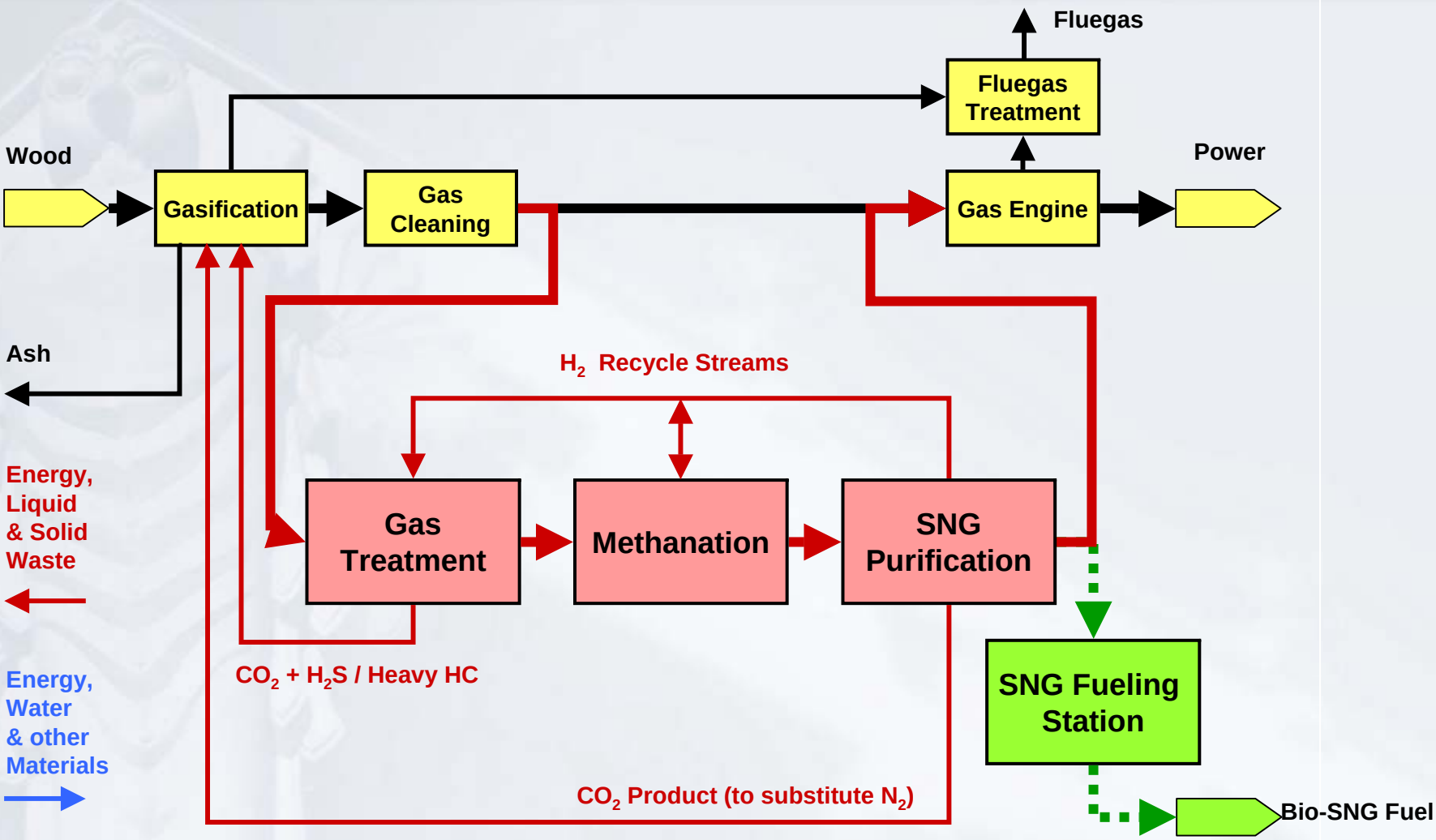

1MW BioSNG demonstration plant

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Results of the PDU

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- 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

Results BioSNG

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	unit	Germany DVGW regulation G260	Austria ÖVGW regulation G31	BioSNG
Wobbe Index	[kWh/m³]	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/m³]	8,4-13,1	10,7-12,8	10,7

Information

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http://www.ficfb.at

Visits under
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Conzepte Technik Umwelt

BIOMASSE KRAFTWERK GÜSSING

Industrielle Kompetenzzentren und Netzwerke
EIN PROGRAMM DES BMWA

ENERGIE SYSTEME der Zukunft

repotec renewable power technologies

Bio-SNG

PAUL SCHERRER INSTITUT PSI

JENBACHER Intelligent Energy

renew