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RENEWABLE ENERGY NETWORK AUSTRIA

Possible Role of Gasification in Biorefineries

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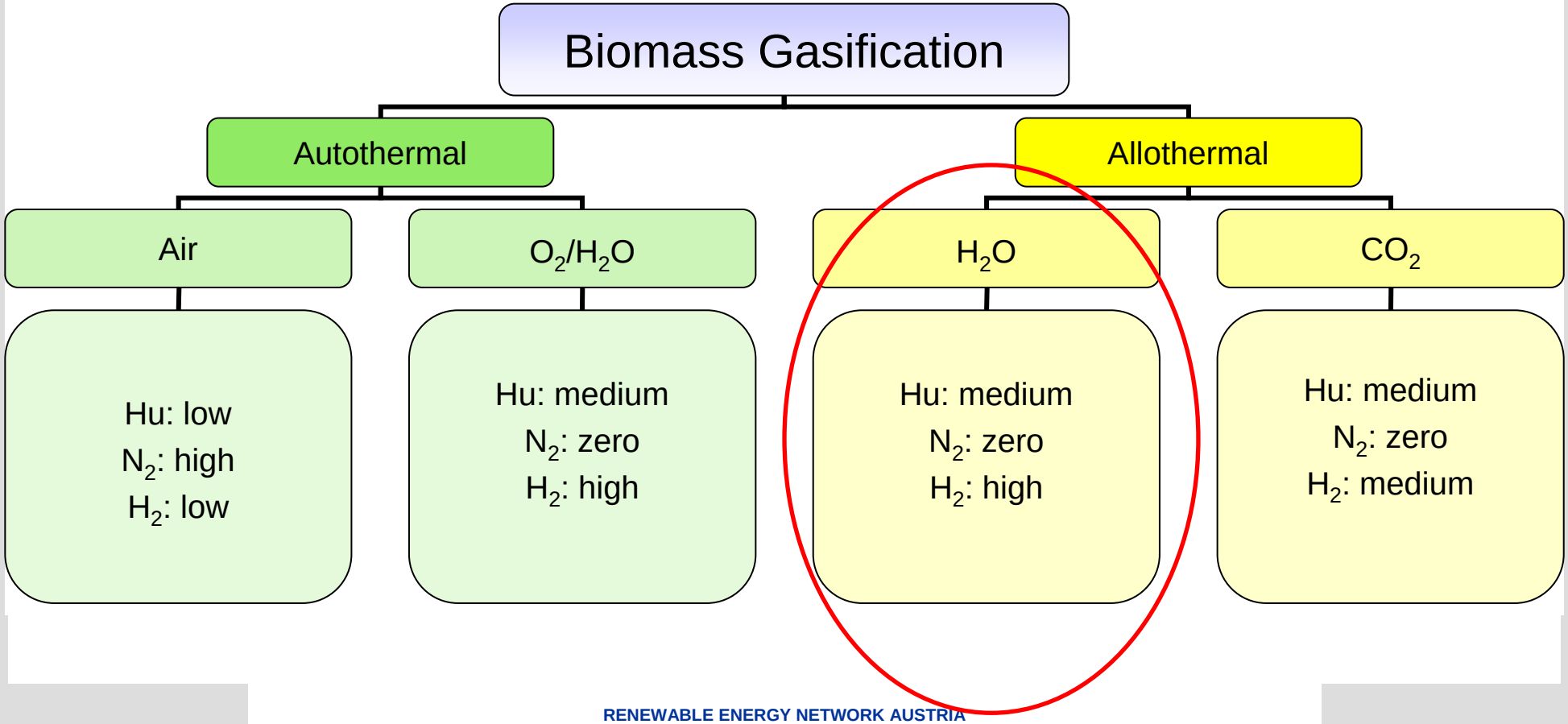
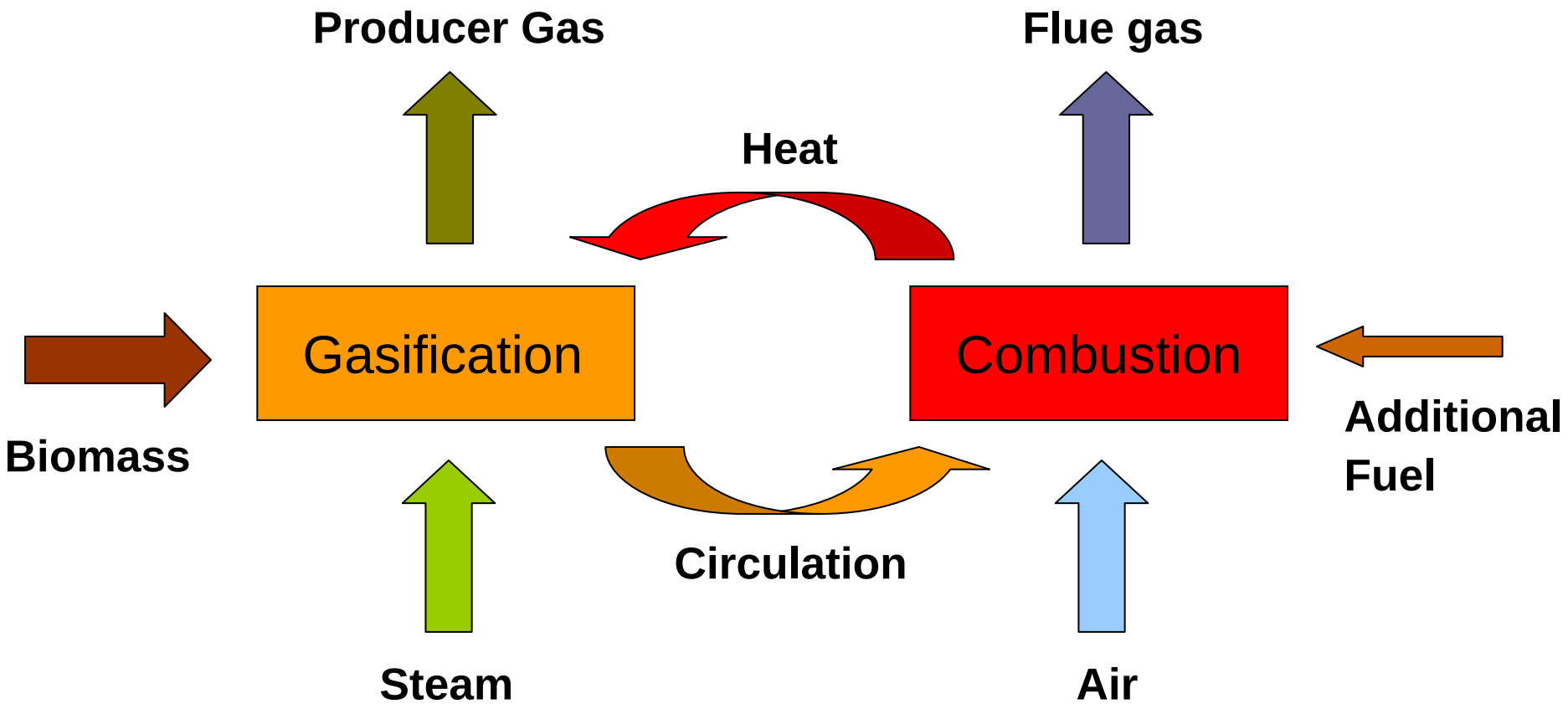
Content of Presentation

- Requirements on gasification
- Demonstration plant for CHP-production
- Examples of process applications
  - BioSNG
  - BioFuels

Overview of Gasification Processes



Gasification Concept



CHP- Plant Güssing

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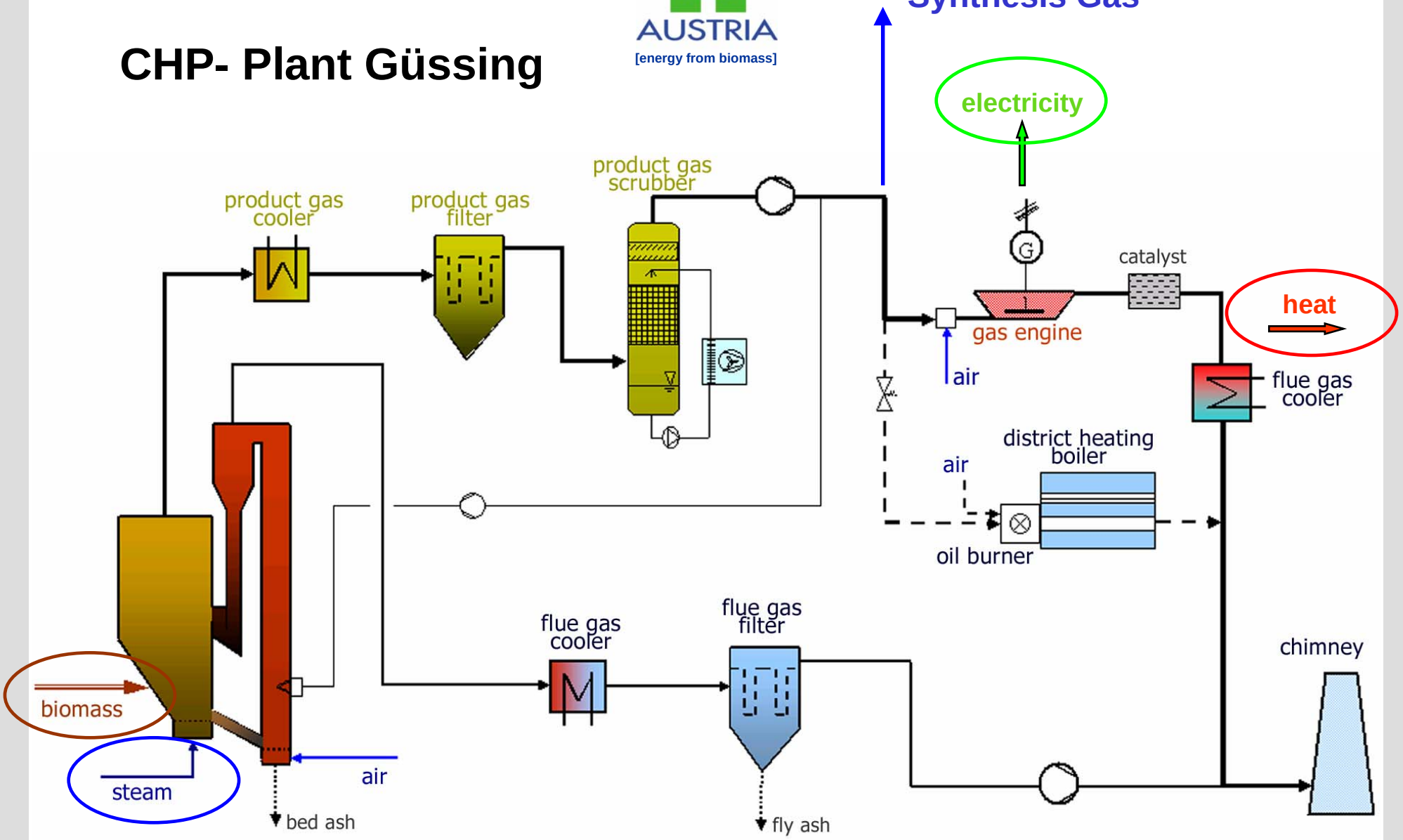

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CHP-PLANT GÜSSING, design data

• 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	%	
• Total efficiency	80	%	
• Owner and operator	Biomass Power Station Güssing Association		

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CHP-Plant Güssing with castle of Güssing

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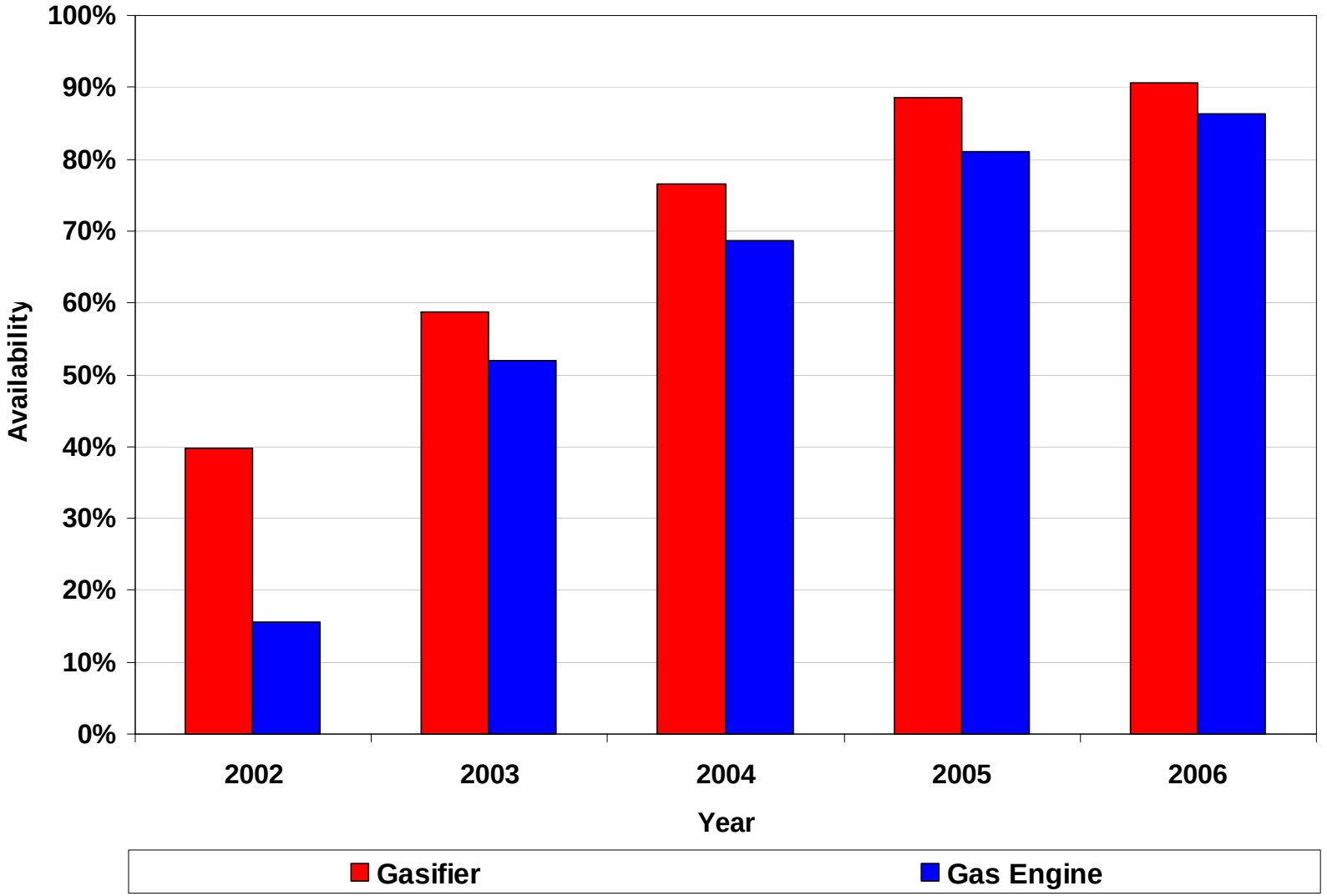
Increase of Availability of the Plant



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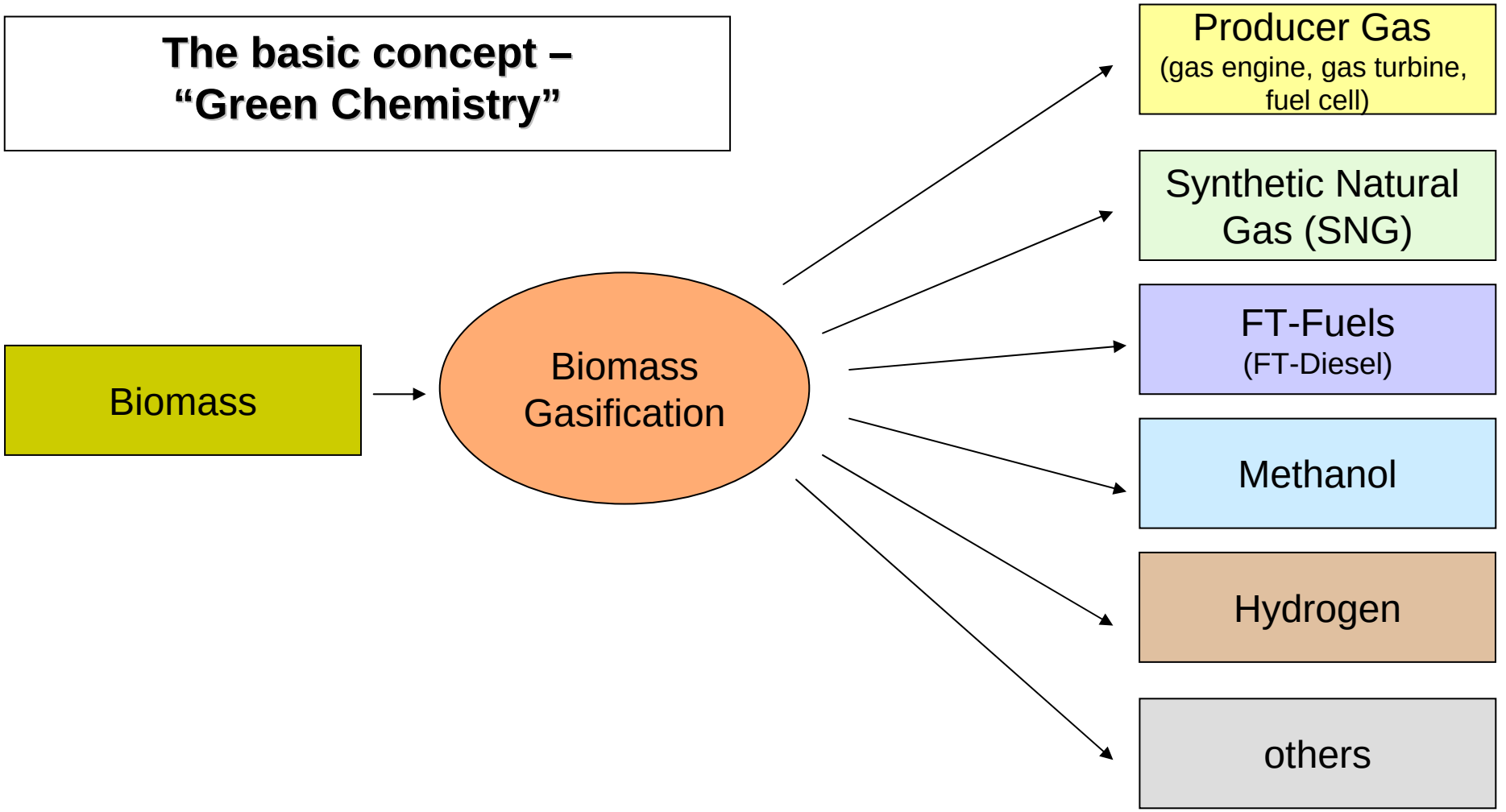
Comparison of Main Gas Composition for Selected Gasifiers

		Air blown gasifier Fixed Bed	Steam blown gasifier Fluidized Bed	Oxygen blown gasifier Entrained Flow
Calorific Value	MJ/Nm^3	4-6	12-14	10-12
H_2	%	11-16	35-45	23-28
CO	%	13-18	22-25	45-55
CO_2	%	12-16	20-23	10-15
CH_4	%	2-6	9-11	<1
N_2	%	45-60	<1	<5

The basic concept – "Green Chemistry"



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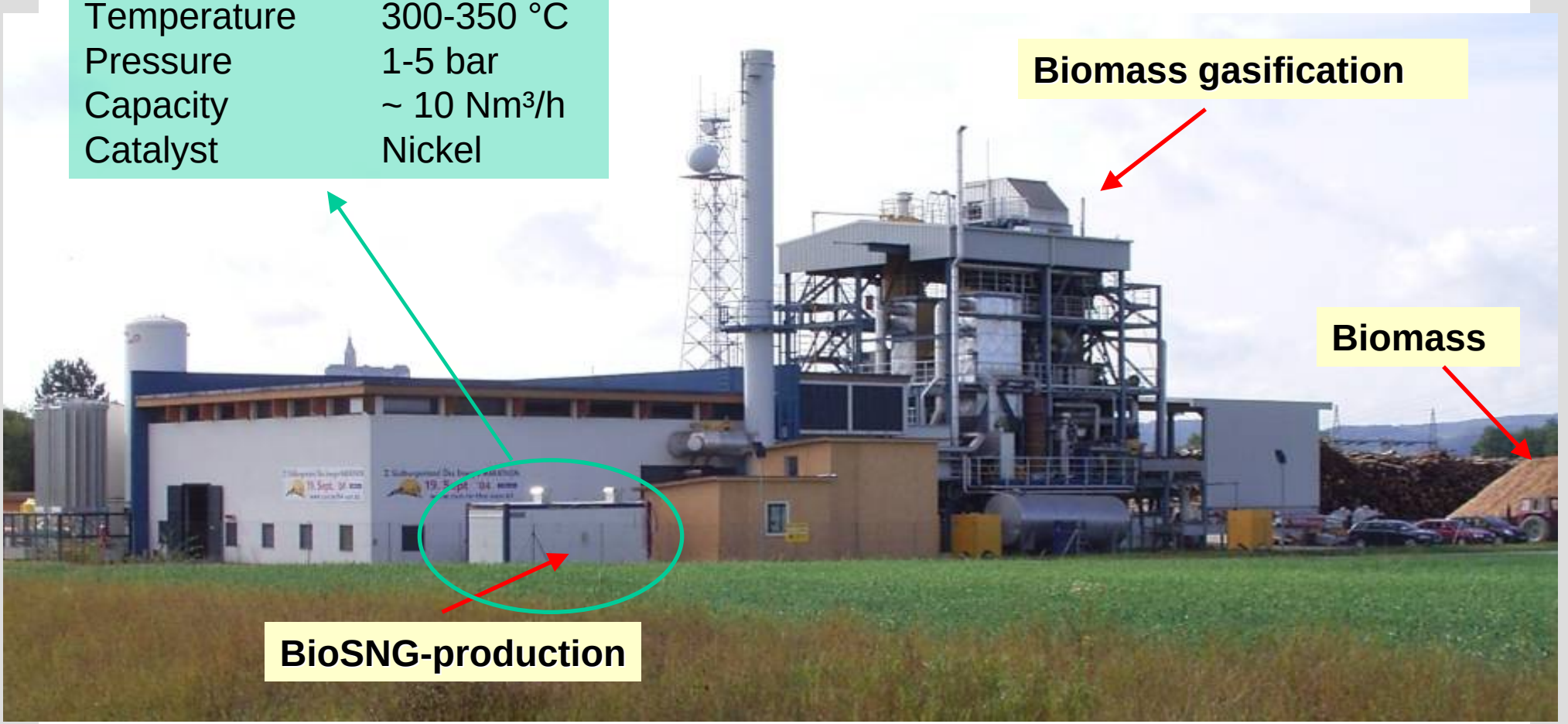
Methanation (BioSNG)
Fluidized bed reactor

Temperature	300-350 °C
Pressure	1-5 bar
Capacity	~ 10 Nm³/h
Catalyst	Nickel

$$CO + 3\ H_2 = CH_4 + H_2O$$



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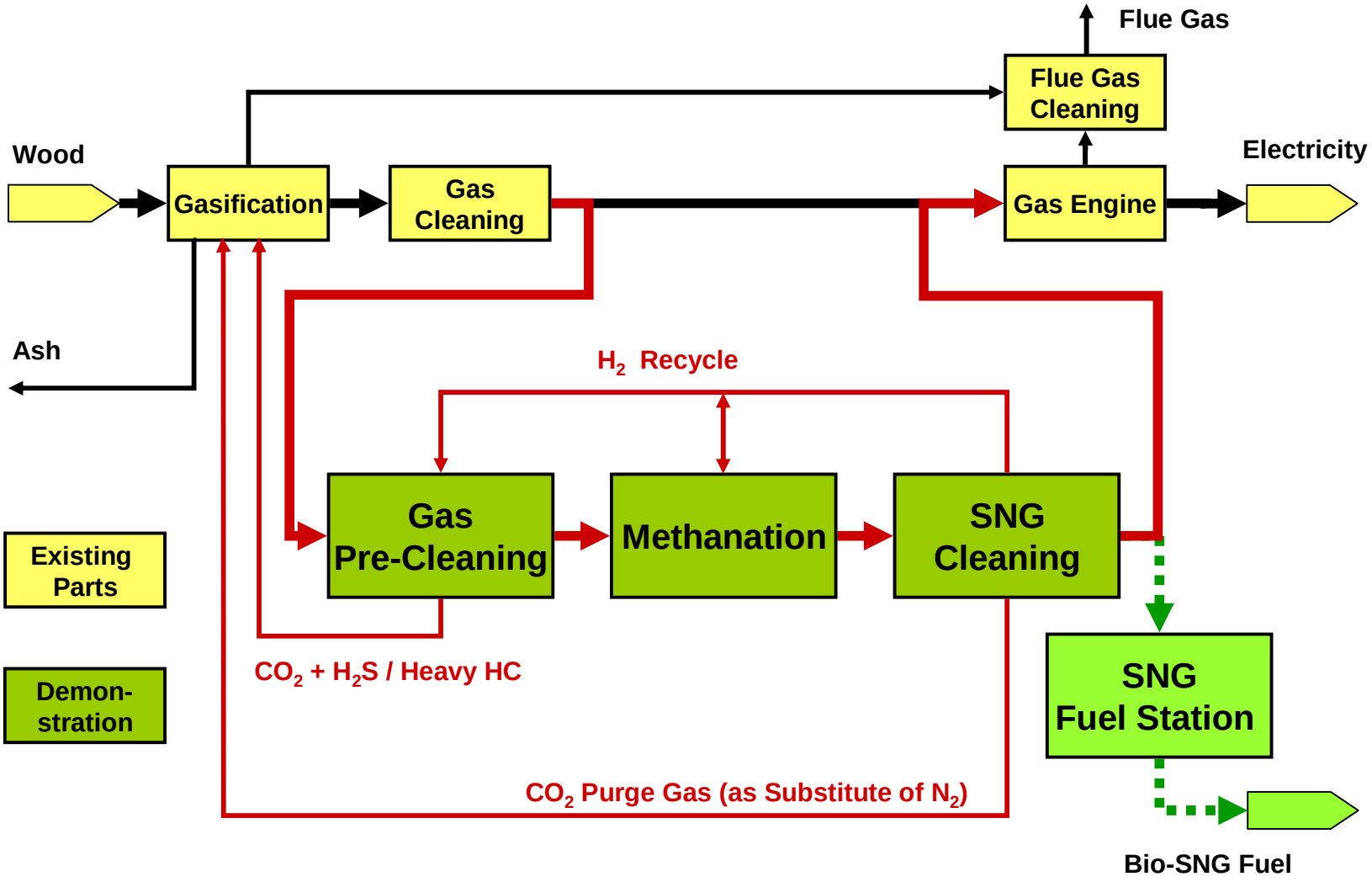
1 MW BioSNG Demonstration Plant – EU-Project



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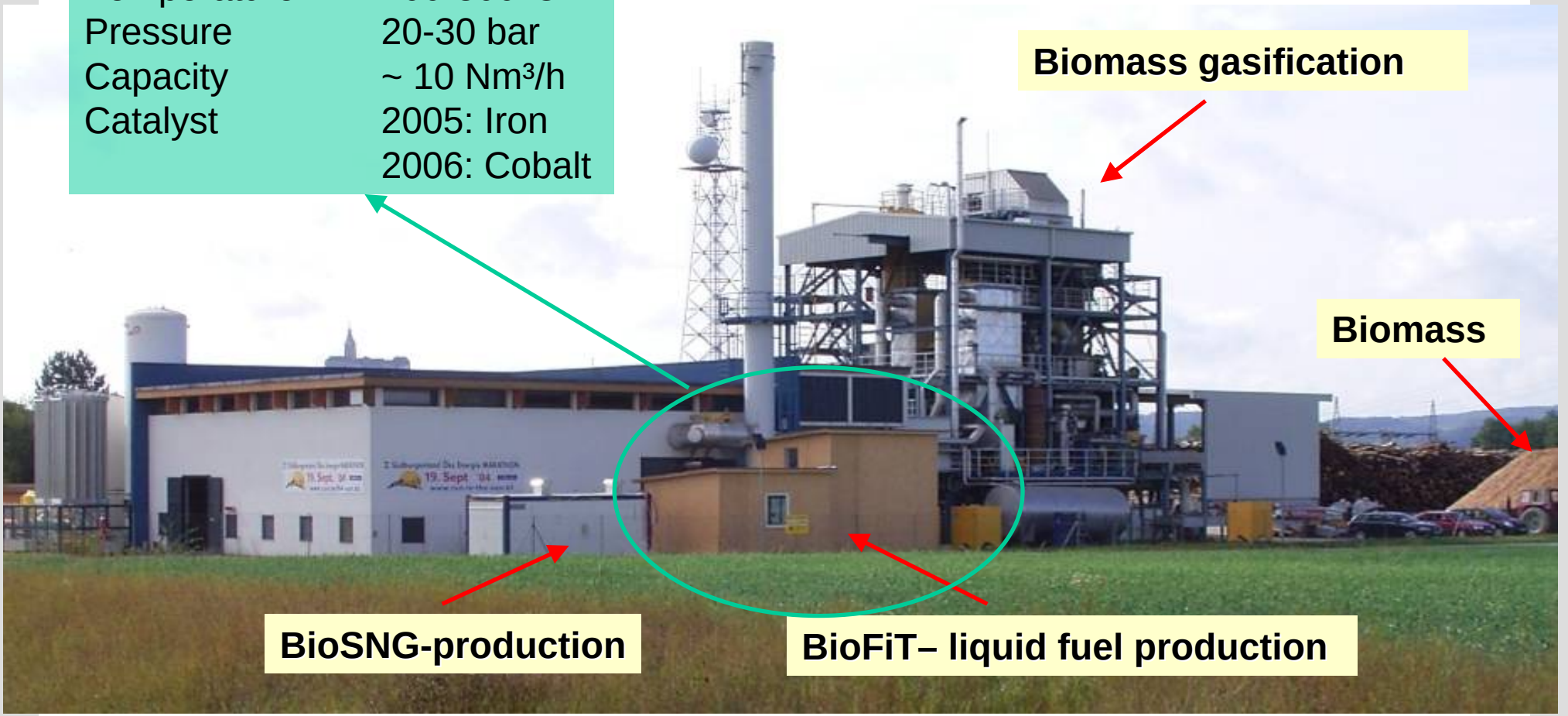
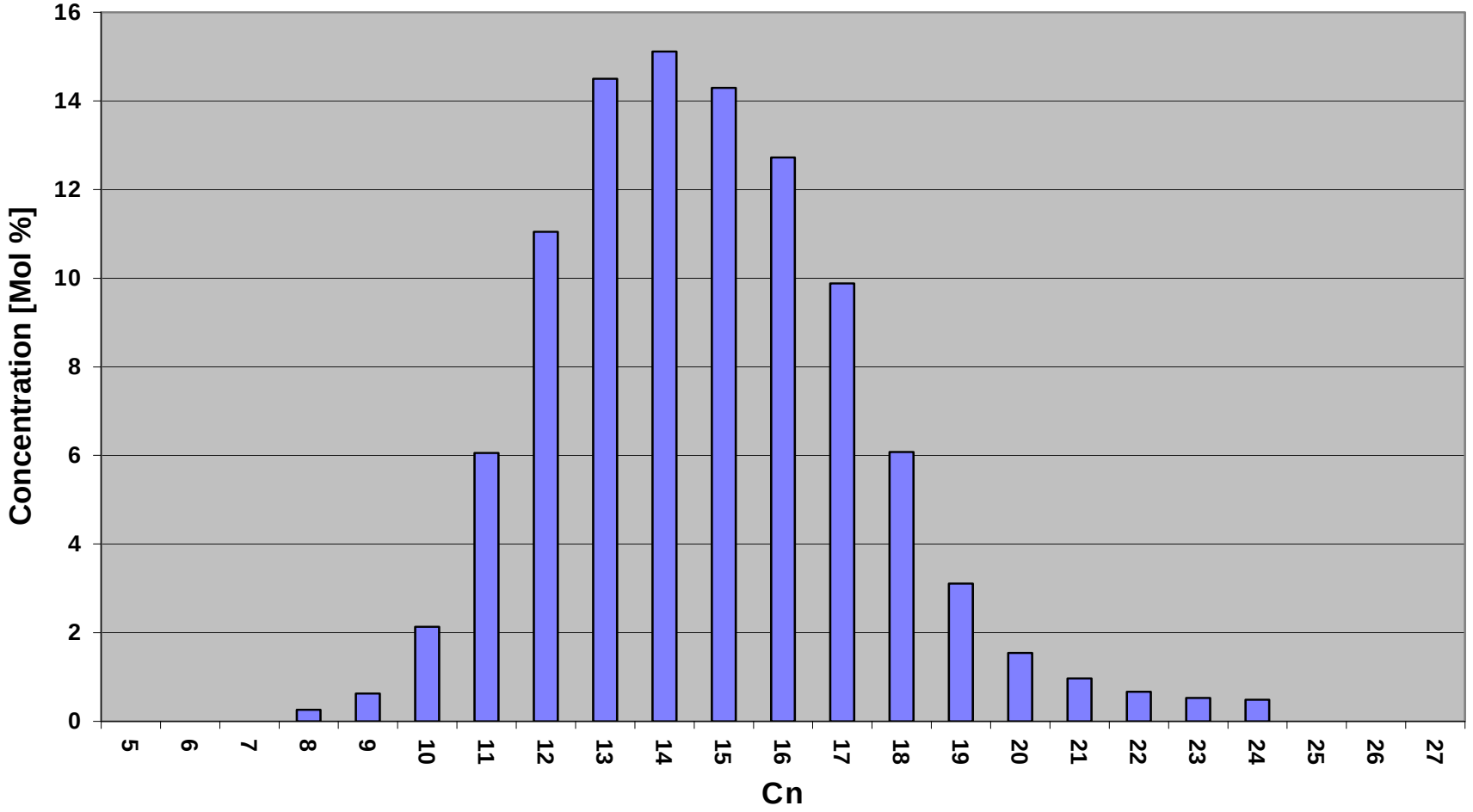
Fischer-Tropsch BioFiT
Slurry bed reactor

Temperature	200-300°C
Pressure	20-30 bar
Capacity	~ 10 Nm³/h
Catalyst	2005: Iron
	2006: Cobalt

$$nCO + 2nH_2 = nCH_2 + nH_2O$$



FT-Diesel after distillation



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Current Status and Outlook

- Successful scale up of a dual fluidized bed steam gasification system from laboratory to industrial scale **(within 10 years)**

- Industrial plant available with
  - High electrical efficiency (> 30 % with combined gas engine and ORC-process)
  - No solid residues (without ash, carbon content <0,5 %)
  - No liquid condensates
  - European emissions requirements are met
  - High availabilities (>90 %)

- High potential for biofuels (BioSNG, BioFiT) and hydrogen

Energy Centre Güssing

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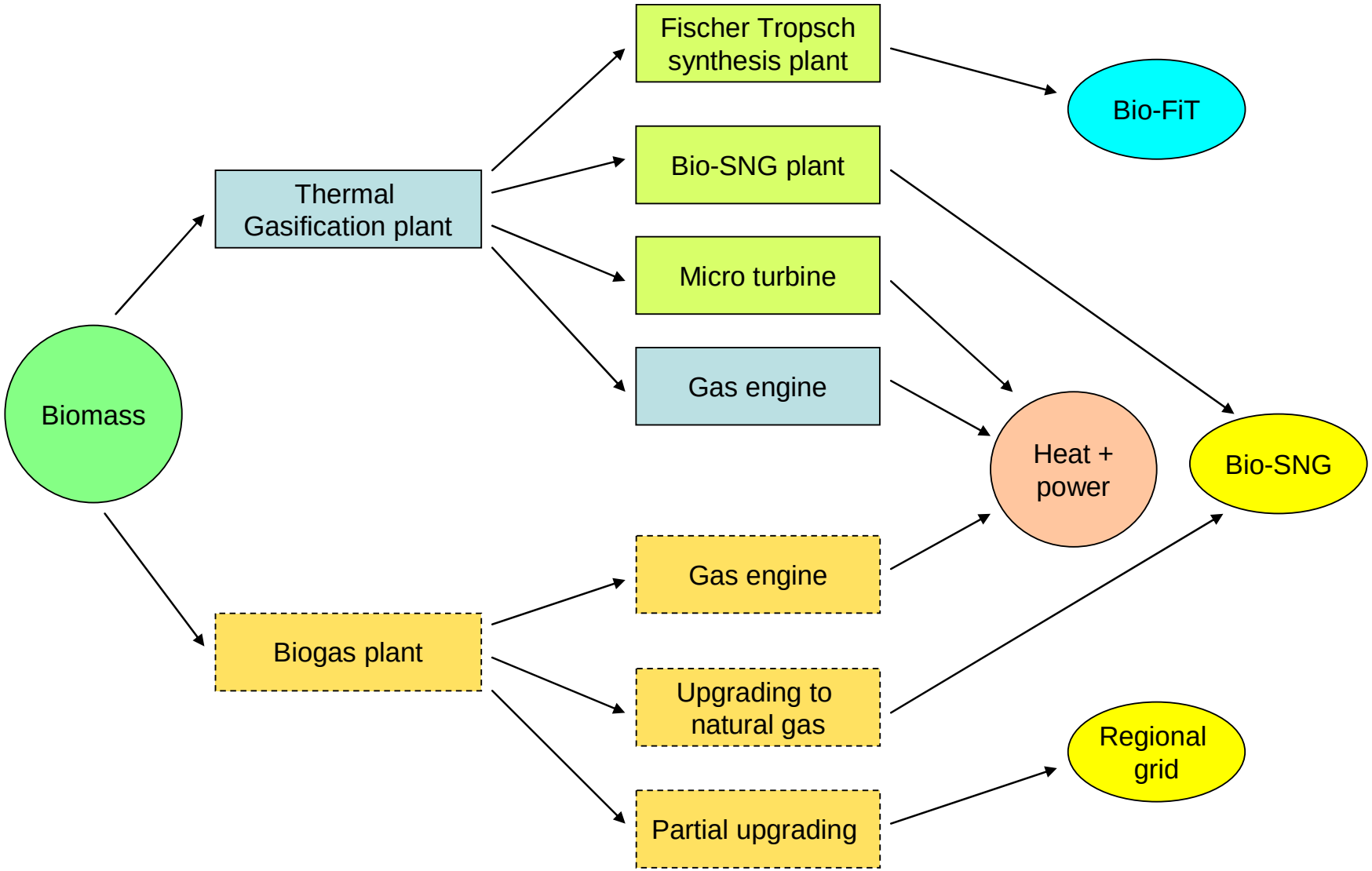

Hydrogen Rich Gas Production

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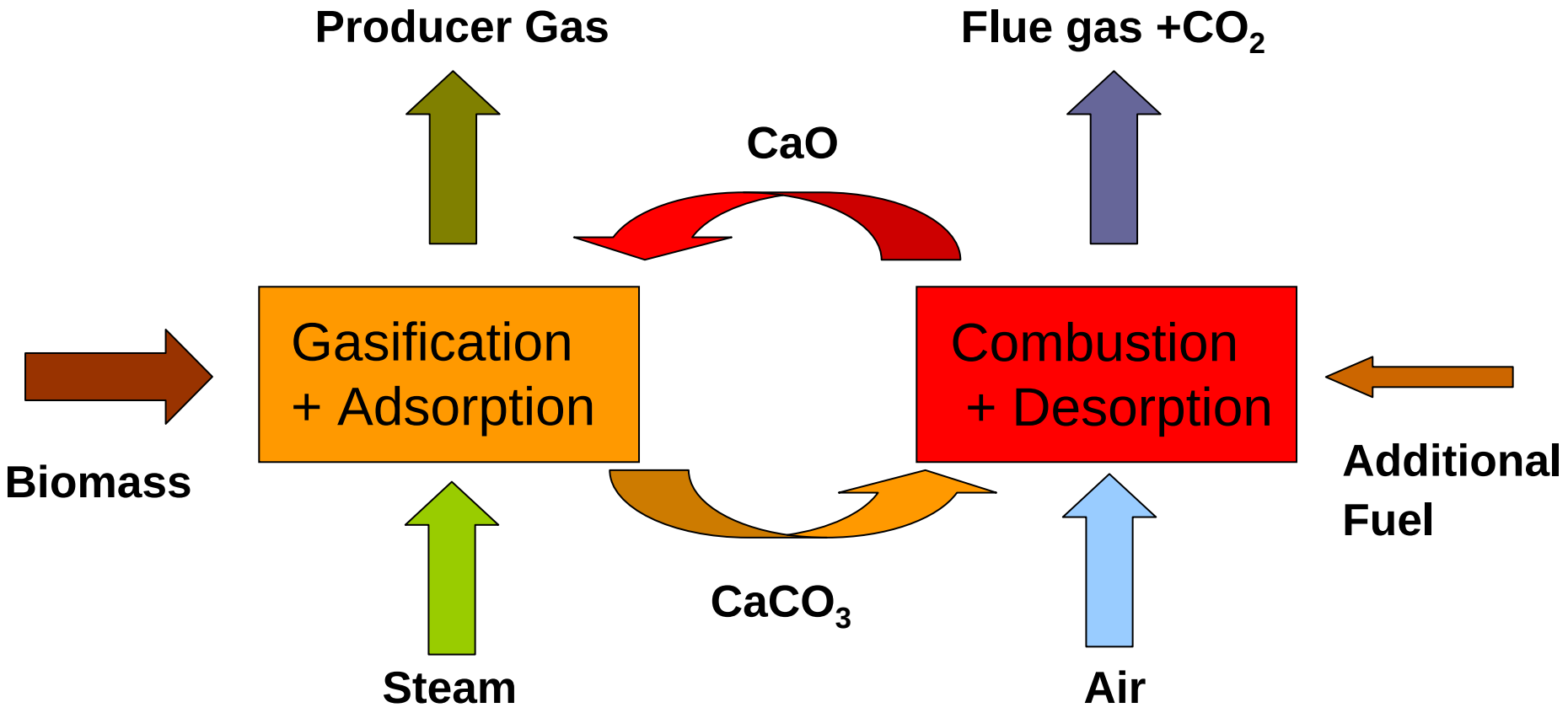
AER-Gas Process



$CO_2 + CaO \rightarrow CaCO_3$

$CO + H_2O \rightarrow H_2 + CO_2$

$CaCO_3 \rightarrow CO_2 + CaO$

$H_2 > 70\ \%$

Producer Gas Conventional / AER (Absorption Enhanced Reforming) Gas

Component	Unit	Conventional	AER-Gas
Hydrogen	vol%	35-45	66 - 74
Carbon monoxide	vol%	22-25	5-8
Carbon dioxide	vol%	20-23	6-8
Methane	vol%	9-11	7-9
Ethene	vol%	2-3	1,1
H_2/CO	-	1,6- 1,8	8-10