



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

IEA FORSCHUNGS
KOOPERATION

Country Report Austria

IEA Bioenergy Task33 Meeting

May 2013

Golden/Denver, USA

Dr. Reinhard Rauch, Dr. Jitka Hrbek

Institute of Chemical Engineering

Working Group Zero Emission Technology

Prof. Hermann Hofbauer

Participation in IEA Bioenergy Task 33 is financed by



Content

- Policy
- Research organisations
- Companies
- Implementations

Policy Targets

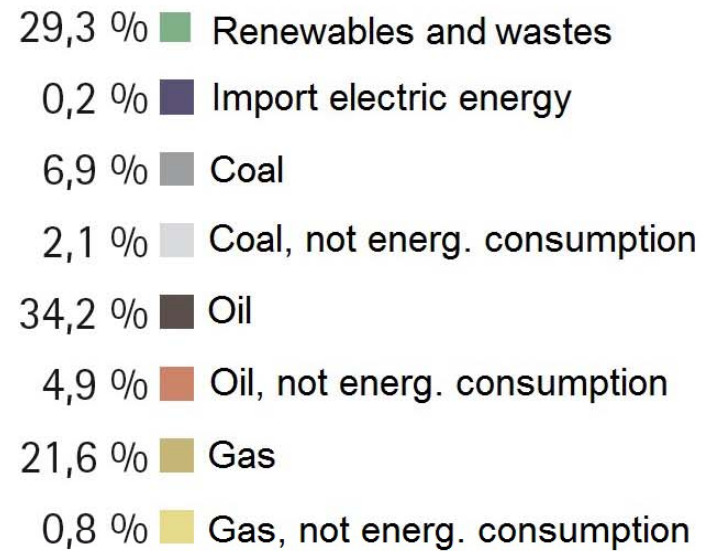
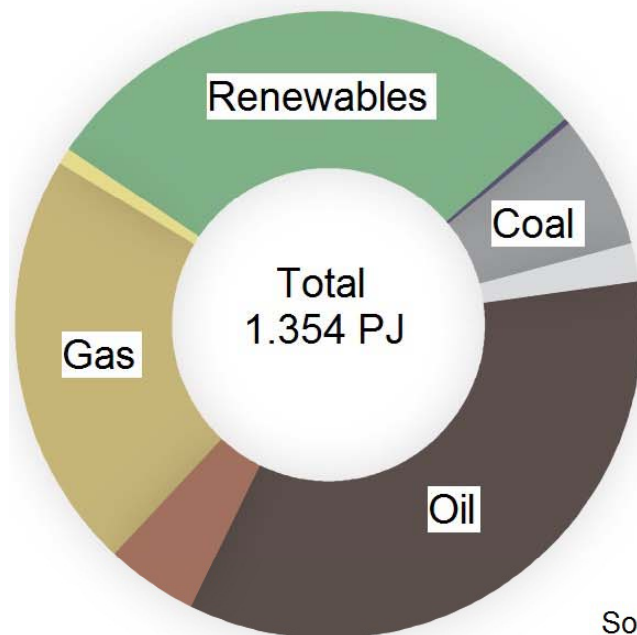
EU's Climate and Energy Policy 20/20/20 Targets:

- a reduction in greenhouse gas emissions of at least 20% below 1990 levels
- 20% of energy consumption to come from renewable resources
- - an increase in energy efficiency by 20 % by 2020 as opposed to a business-as usual scenario

Austria's 2020 Targets:

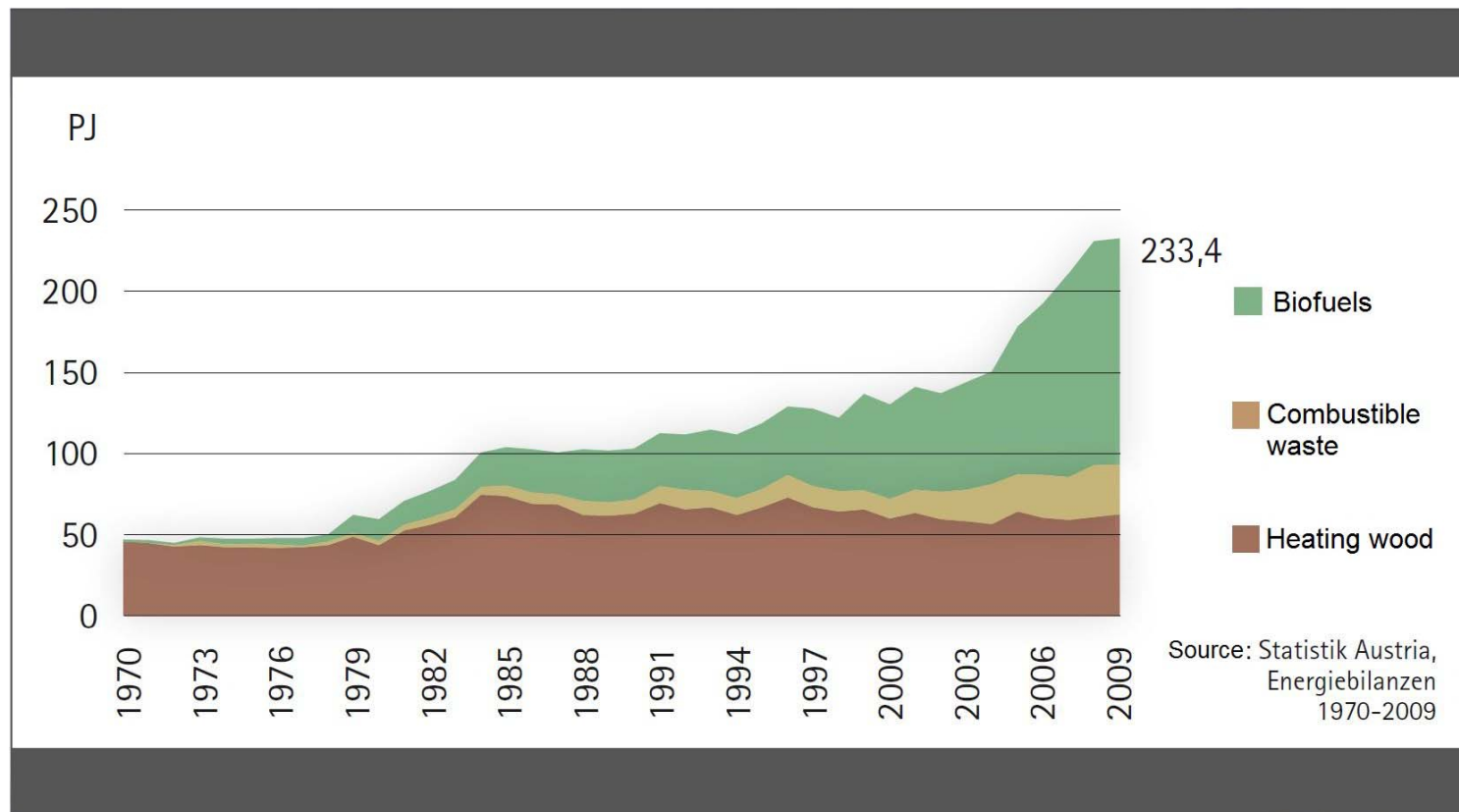
- 34% share of renewable energy
- 16% reduction of GHG emissions in non-ETS sectors

Energy consumption in Austria (2009)

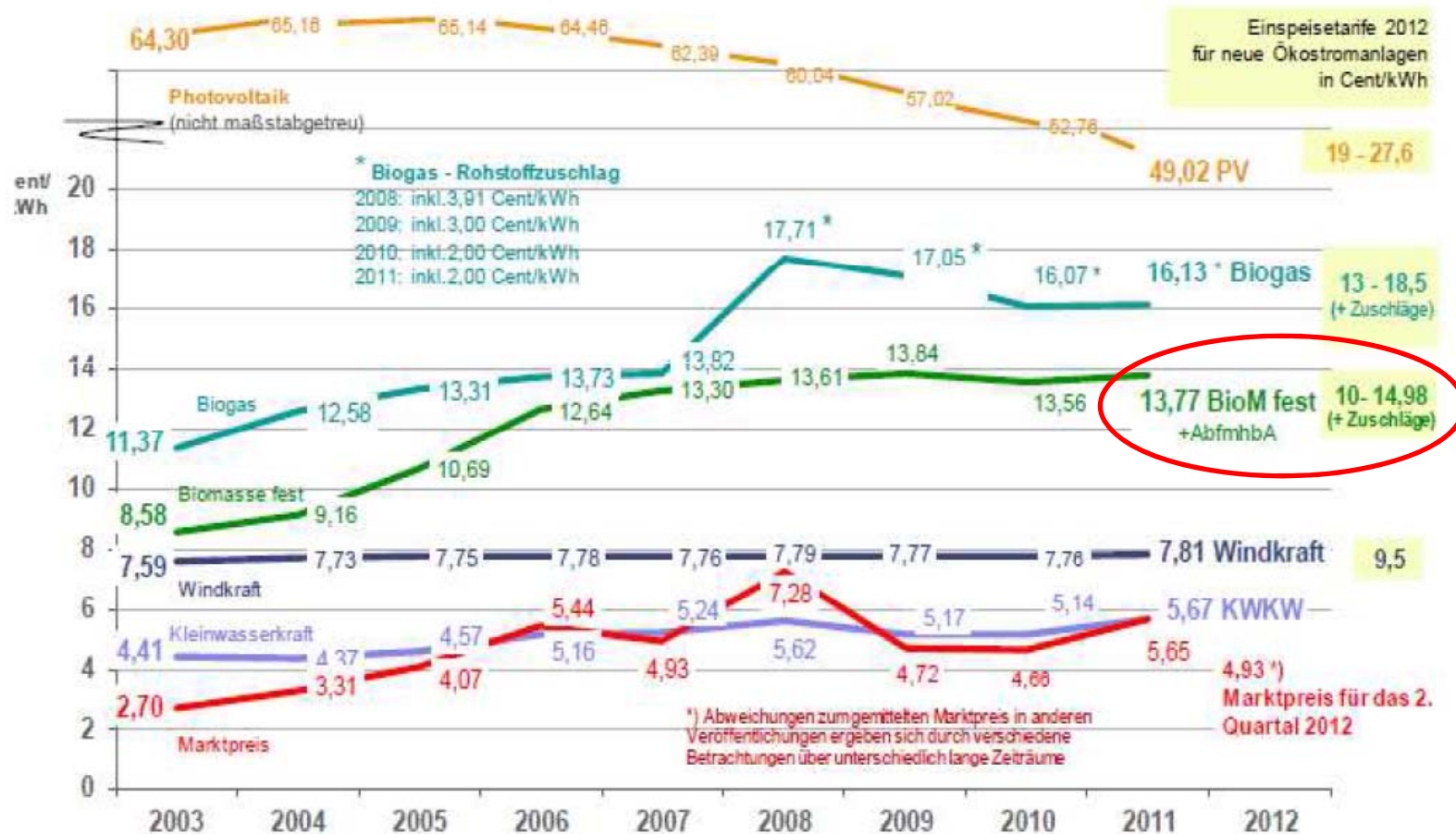


Source: Statistik Austria, Energiebilanzen 1970-2009, Österreichische Energieagentur

Bioenergy consumption in Austria (1970-2009)

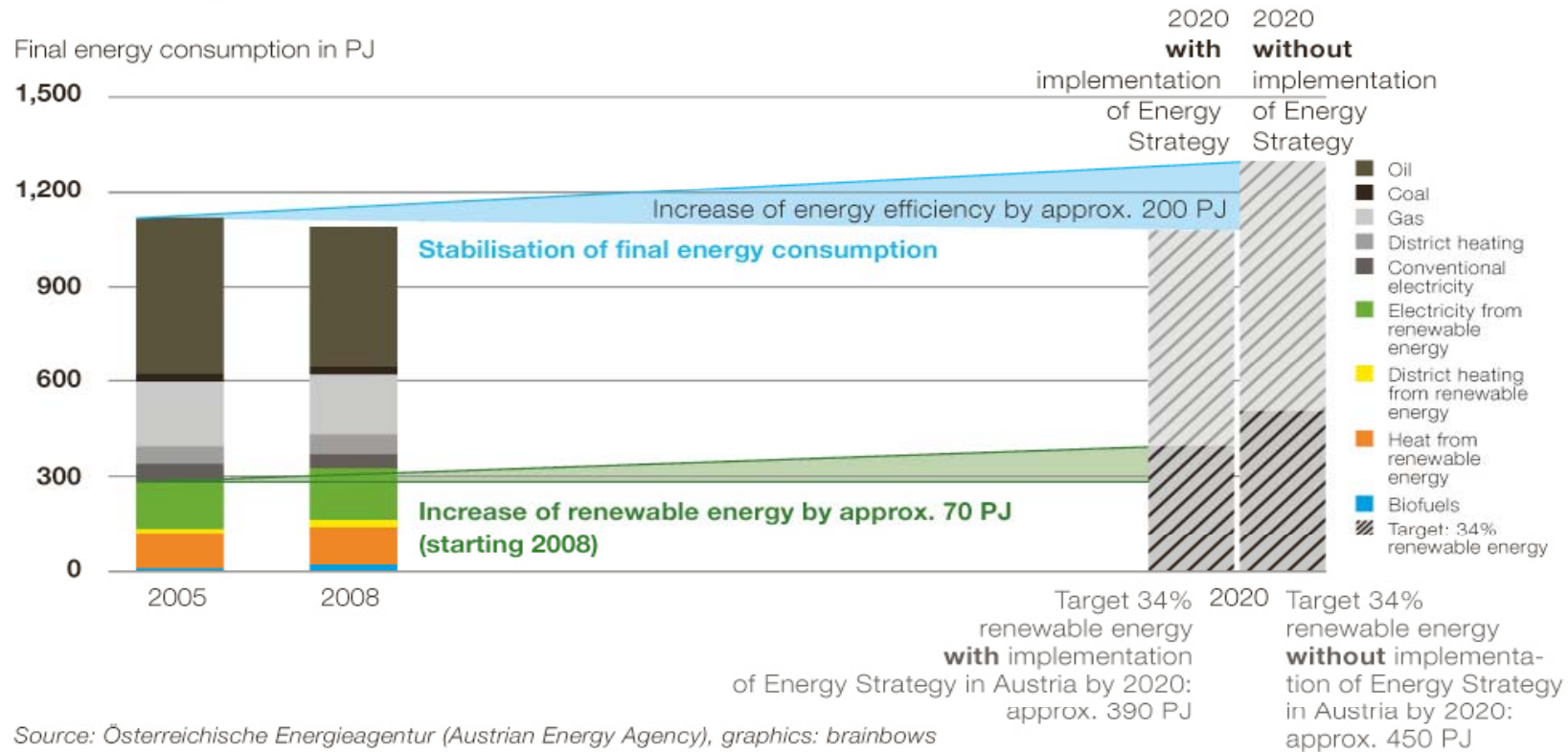


REFIT Austria 2012



Energy strategy model for 2020

Energy Strategy model



Source: Österreichische Energieagentur (Austrian Energy Agency), graphics: brainbows

Austrian Research Organisations

Graz University of Technology – Institute of Thermal Engineering

- Heat pipe reformer (former Technical University Munich, Prof. Jürgen Karl changed to University of Erlangen, Germany, work is still going on in Graz)
- Small scale CHP with heat pipe reformer
- Distributed SNG production
- Health, Safety and environmental issues for gasification systems

Joanneum Research Graz - Department of Energy Research

- Life Cycle Assessment
- Microchannel FT technology

MCI – University of Applied Sciences for Environmental-, Process- and Biotechnology, Innsbruck

- Multi-staged fixed bed gasification systems

FJ-BLT Wieselburg (HBLFA) in Cooperation with Bioenergy 2020+

- 1st and 2nd generation biofuels
- Representative of Austria in IEA Bioenergy Task 39 liquid biofuels
- Secretary of IEA Advanced Motor Fuels

Austrian Research Organisations

Bioenergy 2020+ (in cooperation with Vienna University of Technology)

- Pressurised gasification
- Usage of product gas from biomass CHP Güssing in a SOFC
- Production of FT liquids
- Production of Hydrogen
- Waste gasification in FICFB gasifier (a 1MW gasifier is designed at the moment)

Vienna University of Technology, Institute of Chemical Engineering

- R&D in dual fluidised bed steam gasification (G-volution)
- Production of Fischer Tropsch fuels
- Production of BioSNG
- Production of mixed alcohols
- Production of hydrogen for refineries
- Scientific Partner in Bioenergy 2020+
- Representative of Austria in IEA Bioenergy Task 33 Thermal Gasification of Biomass

Austrian companies

- **Andritz including AE&E** (Andritz Energy & Environment)
 - Activities with FICFB unclear, has still patent
 - Involved in Skive (over Carbona)
 - <http://www.aee-austria.at/>

- **Austrian Enviro Technologies**
 - <http://www.austrian-enviro.com>

- **Cleanstgas** (Clean staged gasification)
 - joint venture between EBNER Industrieofenbau and KWB Biomasseheizungen
 - affordable, decentralized, efficient power plants to supply the base load of heat and power
 - www.cleanstgas.com

- **GE Jenbacher**
 - <http://www.jenbacher.com>

- **Güssing Renewable Energy (GREG)**
 - <http://www.gussingrenewable.com/>

Austrian companies

- **Ortner Anlagenbau**
 - builds FICFB gasifiers for CHP applications (Oberwart, Villach)
 - <http://www.ortner-anlagen.at>

- **Repotec**
 - builds FICFB gasifiers for CHP, BioSNG and other synthesis (Güssing, Ulm, Göteborg)
 - <http://www.repotec.at>

- **SynCraft Engineering GmbH**
 - <http://www.syncraft.at>

- **Urbas**
 - fixed bed gasification
 - <http://www.urbas.at>

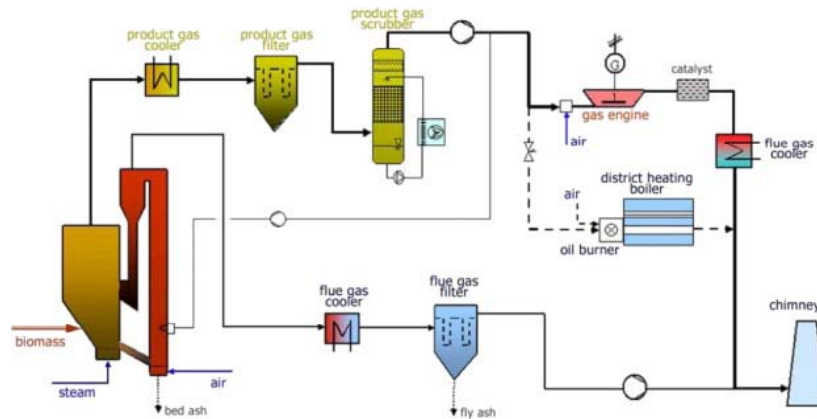
- **Xylogas**
 - fixed bed gasification
 - <http://www.xylogas.com>

- **ZT Lettner**
 - <http://www.zt-lettner.at>

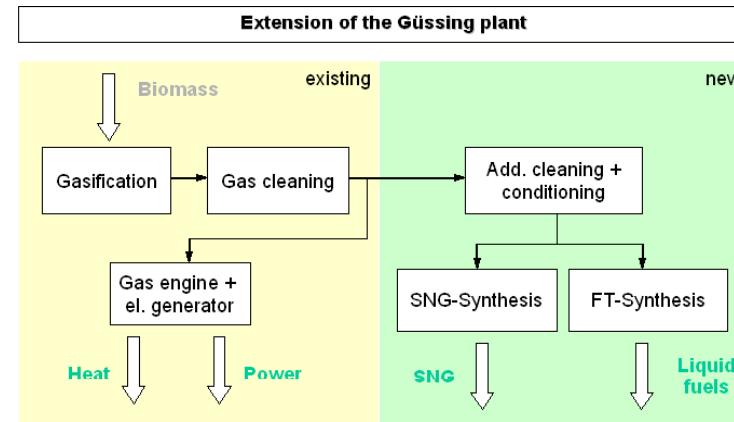
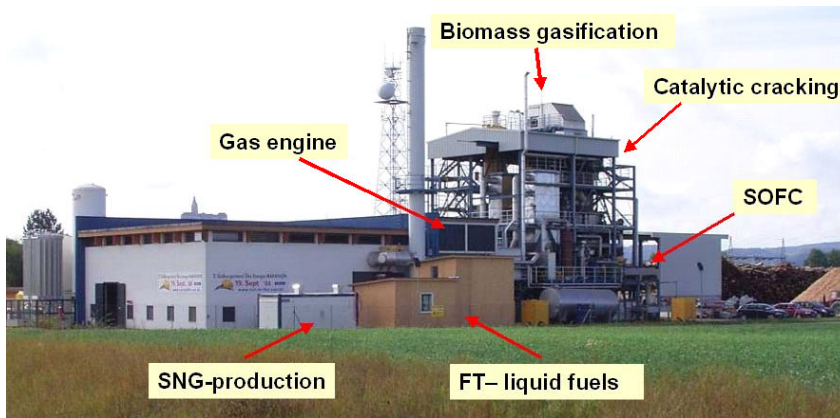
Commercial FICFB gasifiers

Location	Usage / Product	Fuel / Product MW, MW	Start up	Supplier	Status
Güssing, AT	Gas engine	$8.0_{\text{fuel}} / 2.0_{\text{el}}$	2002	AE&E, Repotec	Operational
Oberwart, AT	Gas engine / ORC	$8.5_{\text{fuel}} / 2.8_{\text{el}}$	2008	Ortner Anlagenbau	Operational
Villach, AT	Gas engine	$15_{\text{fuel}} / 3.7_{\text{el}}$	2010	Ortner Anlagenbau	On hold
Senden/Ulm DE	Gas engine / ORC	$14_{\text{fuel}} / 5_{\text{el}}$	2011	Repotec	Commissioning
Burgeis, IT	Gas engine	$2_{\text{fuel}} / 0.5_{\text{el}}$	2012	Repotec	Commissioning
Göteborg, Sweden	BioSNG	$32_{\text{fuel}} / 20_{\text{BioSNG}}$	2013	Metso/Repotec	Construction
Vienna, OMV	Hydrogen	$50_{\text{fuel}} / 30_{\text{hydrogen}}$	2016	Repotec	Canceled

Gasification plant Güssing

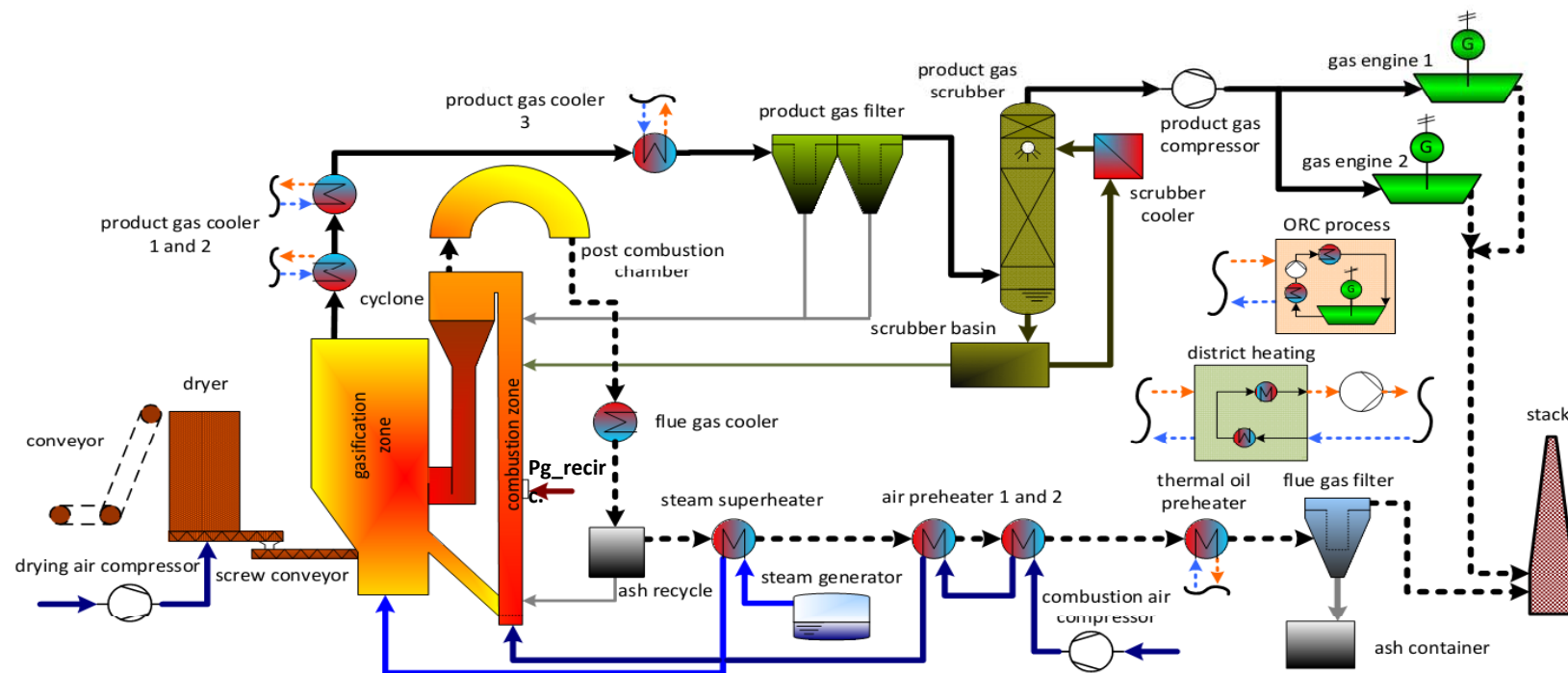


- FICFB, gas engine
- 4,5 MW_{th}, 2 MW_{el}
- Wood chips
- Start up 2002
- Supplier: AE&E, Repotec
- Status: operational



- FICFB, gas engine, ORC
- 8.5 MW_{fuel}, 2.8 MW_{el}
- 17.000 t wood chips/year
- District heating distance 5.2 km

Product gas composition	
H ₂	35 - 42 vol. %
CO	18 - 22 vol. %
CO ₂	20 - 24 vol. %
CH ₄	7 - 10 vol. %
C _x H _y	1-3 vol. %

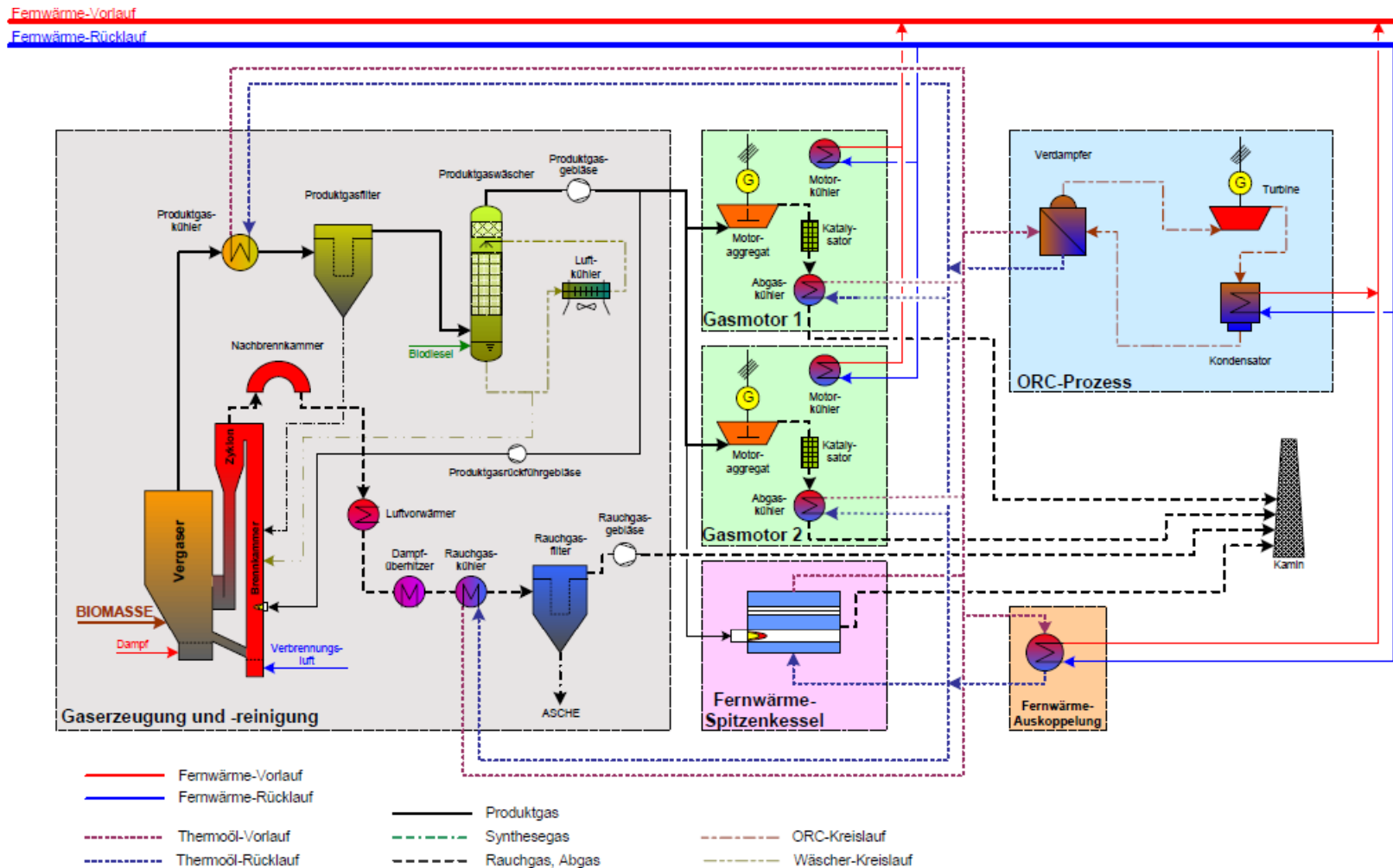


Biomass gasification plant Senden/Ulm, DE



Start of the construction	12/2009	
In operation	03/2012	
Fuel	Wood chips	
Output	14,3	MW _{fuel}
	5,0	MW _{el}
	6,2	MW _{th}
Total efficiency	78	%
Investigations	33	Mio. €

Biomass gasification plant Senden/Ulm, DE



Commercial CHP gasifiers



Commercial CHP gasifiers



Location	Product kW	Start up
Ruden, AT	150el./300th. 70el./150th.	Development since 2001
Eberndorf, AT	2x120el + 70el./650th.	2006-2008
Neumarkt, AT	2x120el./580th.	2008
Sulzbach-Laufen, DE	130el./280th.	2009
Neukirchen, AT	2x150el./300th.	2011
Konstanz, DE	150el./300th.	End of 2011
Cogen Srl., Terni, IT	5x 220 kWel + 2000 kWth	Under construction

Urbas – Wood gasifiers

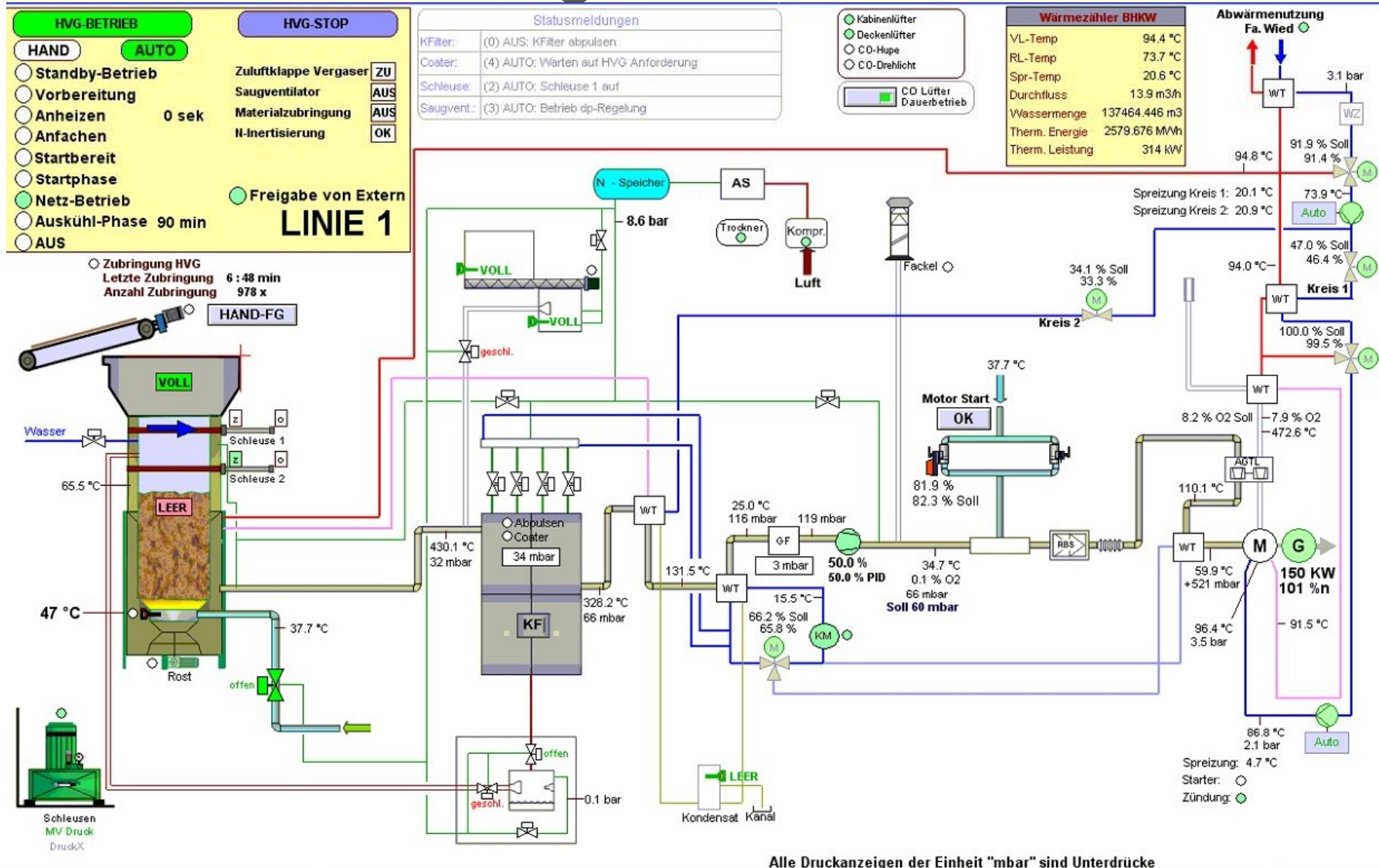


Output: $150 \text{ kW}_{el.}$ $\eta_{el.} = 27\%$

$310 \text{ kW}_{th.}$ $\eta_{th.} = 57\%$

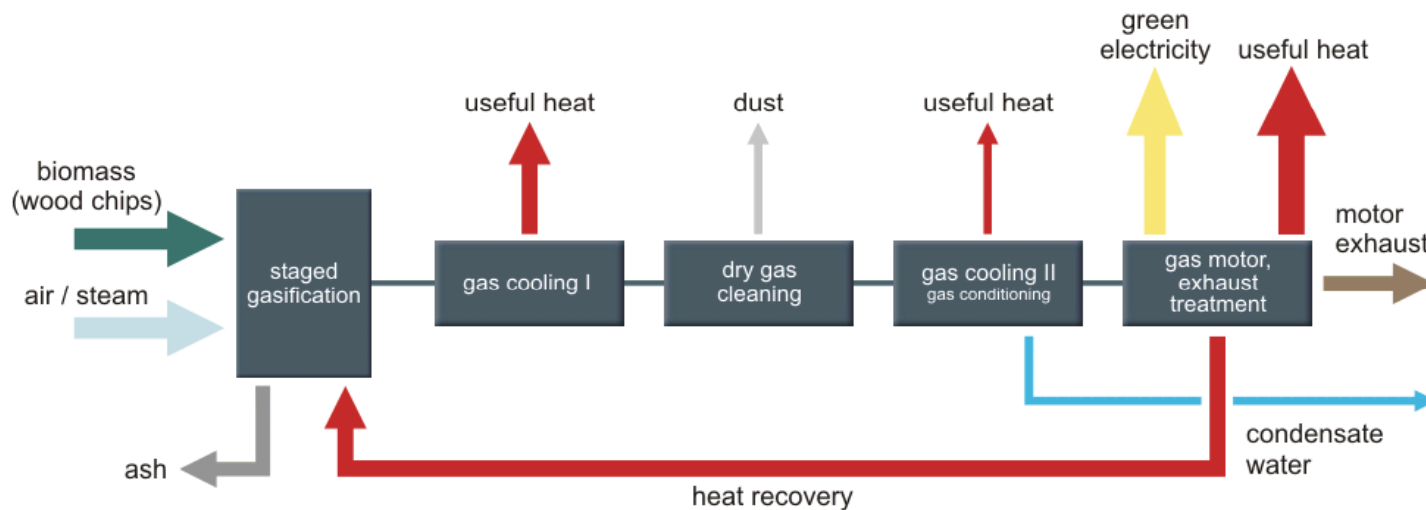
Feedstock: *Wood chips (8-15 % moisture, size < 150 mm)*

Urbas – Wood gasifiers



The advantages of CLEANSTGAS (Clean Staged gasification) technology

- Unlike conventional gasification, CLEANSTGAS technology does not require several process stages to produce high quality wood gas.
- Biomass is a domestic fuel that is available in abundant quantities. Owning a power station becomes reality, along with reduced dependence on fossil fuel suppliers.
- Local power stations increase the value of the region and create jobs.
- Biomass is carbon-neutral, making a significant contribution to climate protection.



System sizes available

	CLEANSTGAS 125	CLEANSTGAS 250
El. output	125 kW	250kW
Thermal output	235 kW	480 kW
Fuel	Wood chips G30/G50 to W 30	
Cold gas efficiency	~ 80%	
El. efficiency	~26%	~27%
Total efficiency	~70%	~74%
Size (container design)	9,5 x 6 x 12 m	
Calor. value of the gas generated	4,9 MJ/Nm ³	
Tar content before motor	10 mg/Nm ³	
Dust before motor	< 5 mg /m ³	

Planned projects

Project name	Demo - CLEANSTGAS 250/1	CLEANSTGAS CSG150/2	CLEANSTGAS CSG250/2
Location	confidential until march 2012	confidential until march 2012	confidential until may 2012
Technology	CHP	CHP	CHP
Raw material	Wood Chips, G30/W30	Wood Chips, G30/W30	Wood Chips, G30/W30
Product	CLEANSTGAS 250	CLEANSTGAS 150	CLEANSTGAS 250
Output	250kWe/430kWth	150kWe/240kWth	250kWe/430kWth
Facility type	Demo	Demo	Demo
Partners	KWB Biomasseheizungen GmbH, EBNER Industrieofenbau GmbH	KWB Biomasseheizungen GmbH, EBNER Industrieofenbau GmbH	KWB Biomasseheizungen GmbH, EBNER Industrieofenbau GmbH
Status	Under Construction	Under Construction	Announced
Start up	November 2012	January 2013	May 2013
Technology brief	Staged Biom ass gasification	Staged Biom ass gasification	Staged Biom ass gasification
Related publications	-	-	-
Contact person	DI Dr. Helmut Timmerer, Industriestraße 12, 8321 St. Margarethen/Raab	DI Dr. Helmut Timmerer, Industriestraße 12, 8321 St. Margarethen/Raab	DI Dr. Helmut Timmerer, Industriestraße 12, 8321 St. Margarethen/Raab
Web	www.cleanstgas.com	www.cleanstgas.com	www.cleanstgas.com

About the company

- Established in 2007
- Development and planning of biomass gasification facilities
- Spin-off MCI

They have taken the best...

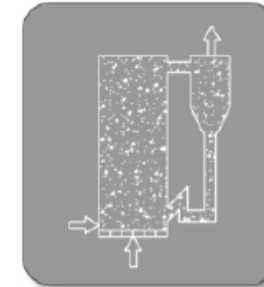


Güssing

Dualer Wirbelschichtvergaser

Stable gas composition

Anlagengröße ab ~ 2 MW elektrisch



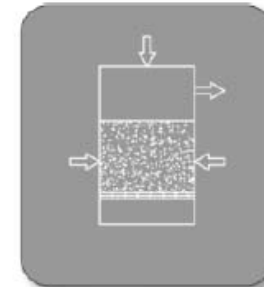
Harboore

Einstufiger Gegenstromvergaser

Produktgas mit ~ 10.000mg/Nm³ Teer

Gasschwankungen

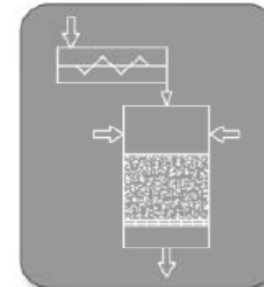
Facility upscaling possible



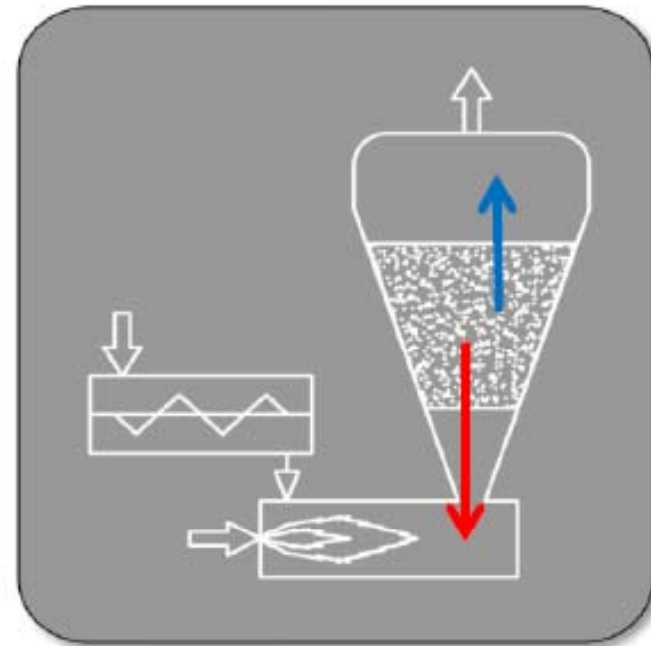
Viking

Product gas with 10 mg/Nm³ tars

Einfache Gasreinigung
Anlagengröße bis ~ 150 kW elektrisch



Output ≥ 250 kWel



CraftWERK Alpha - Pilotplant



2003 2005 2007 **2009** 2011 2013

The diagram shows a process flow starting with a reactor, followed by a condenser, and then a filter. The year 2009 is highlighted in red.



A photograph of the CraftWERK Alpha pilot plant facility, showing a large industrial structure with a metal frame and various pipes and tanks.



Produktgas-
flamme nach
Heissgasfilter



Kondensat kann indirekt eingeleitet
werden gemäß AEV



Filterstaub
100% kompostierbar

CraftWERK Beta – commercial prototype



2003

2005

2007

2009

2011

2013



Produktgas-
flamme nach
Heissgasfilter



Agemitor 312
Holzgasmotor
von 2G

Plans for 2013/14

- The first demoplants will be installed (output 250-500 kWel)
- Cooperation with THÖNI

- R&D on feedstock stabilisation to use also sewage sludge, straw and waste wood



Advantages of the technology

- Max. power efficiency
- Reduction of ash pollution
- Advantageous district heating
- Decentralisation - facility can be installed in biomass-reach area to eliminate the long-way transportation of the feedstock