TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

IEA FORSCHUNGS KOOPERATION

Country Report Austria

IEA Bioenergy Task33 Meeting

24. May 2016

Trondheim, Norway

Dr. Reinhard Rauch, Dr. Jitka Hrbek

Institute of Chemical Engineering

Working Group Zero Emission Technology

Prof. Hermann Hofbauer

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FFG FORSCHUNG WIRKT.

Content

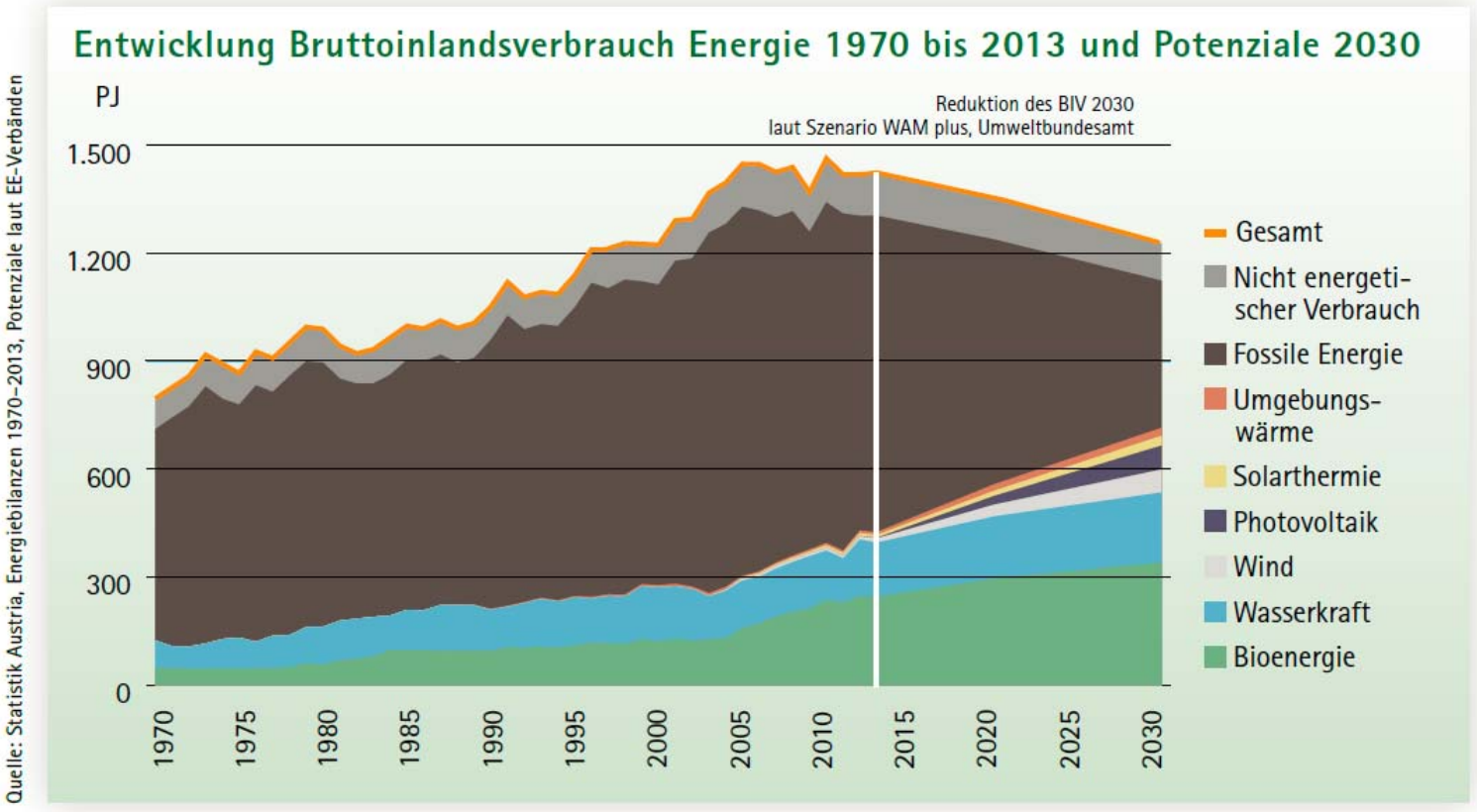
- Statistics
- Research organisations
- Companies
- Implementations

New president of Austria

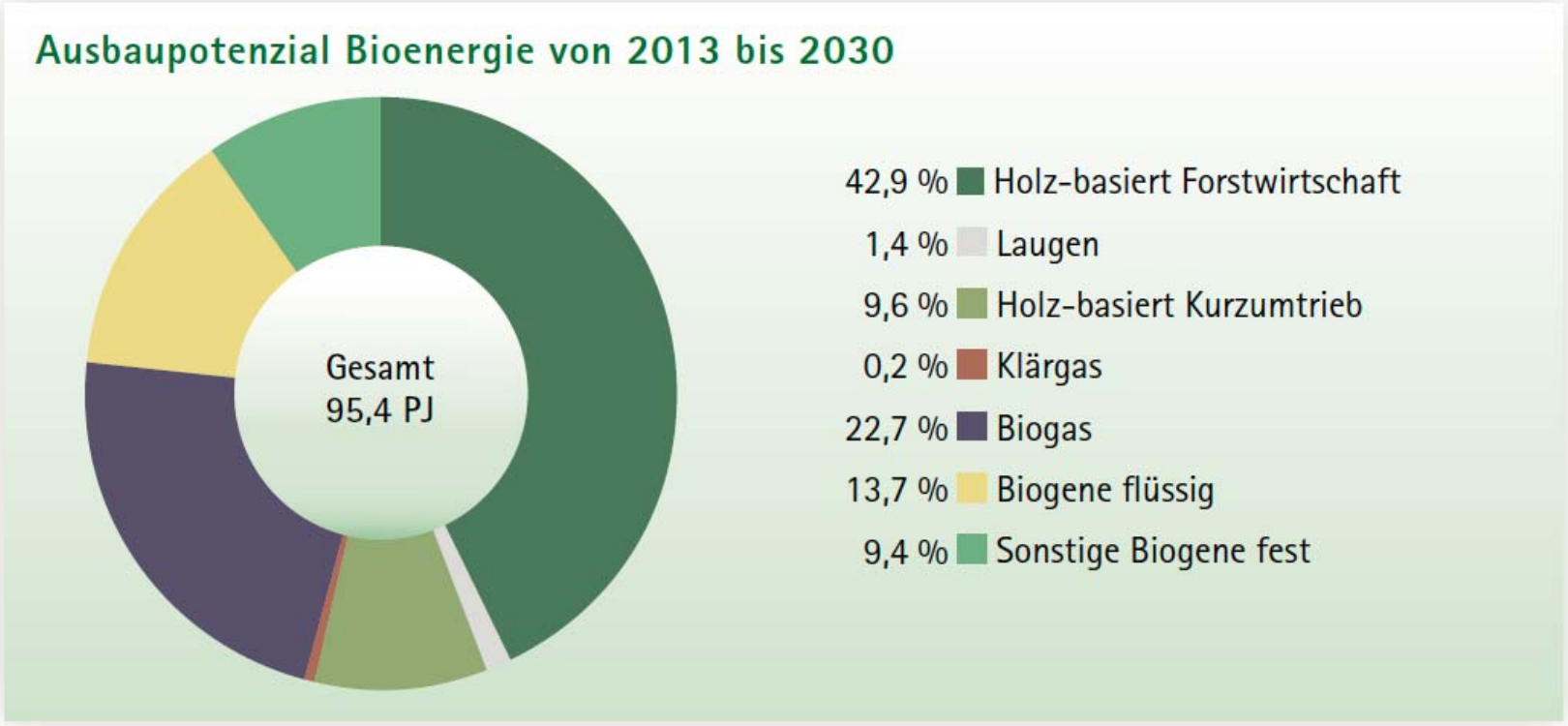
Alexander Van der Bellen, former green party, with 50,3% elected

Gross domestic energy consumption

1970-2013 and its potentials

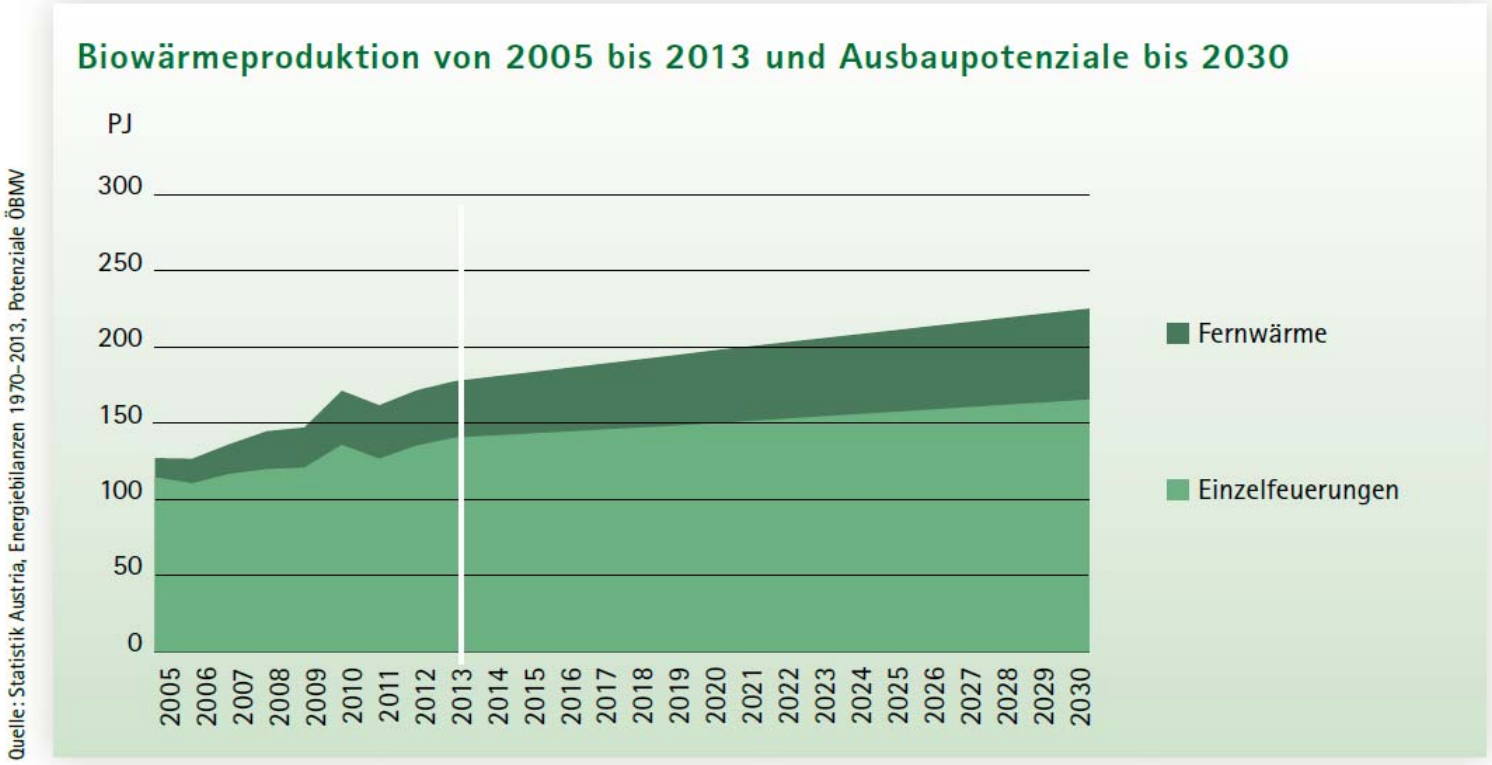


Bioenergy potential 2013-2030



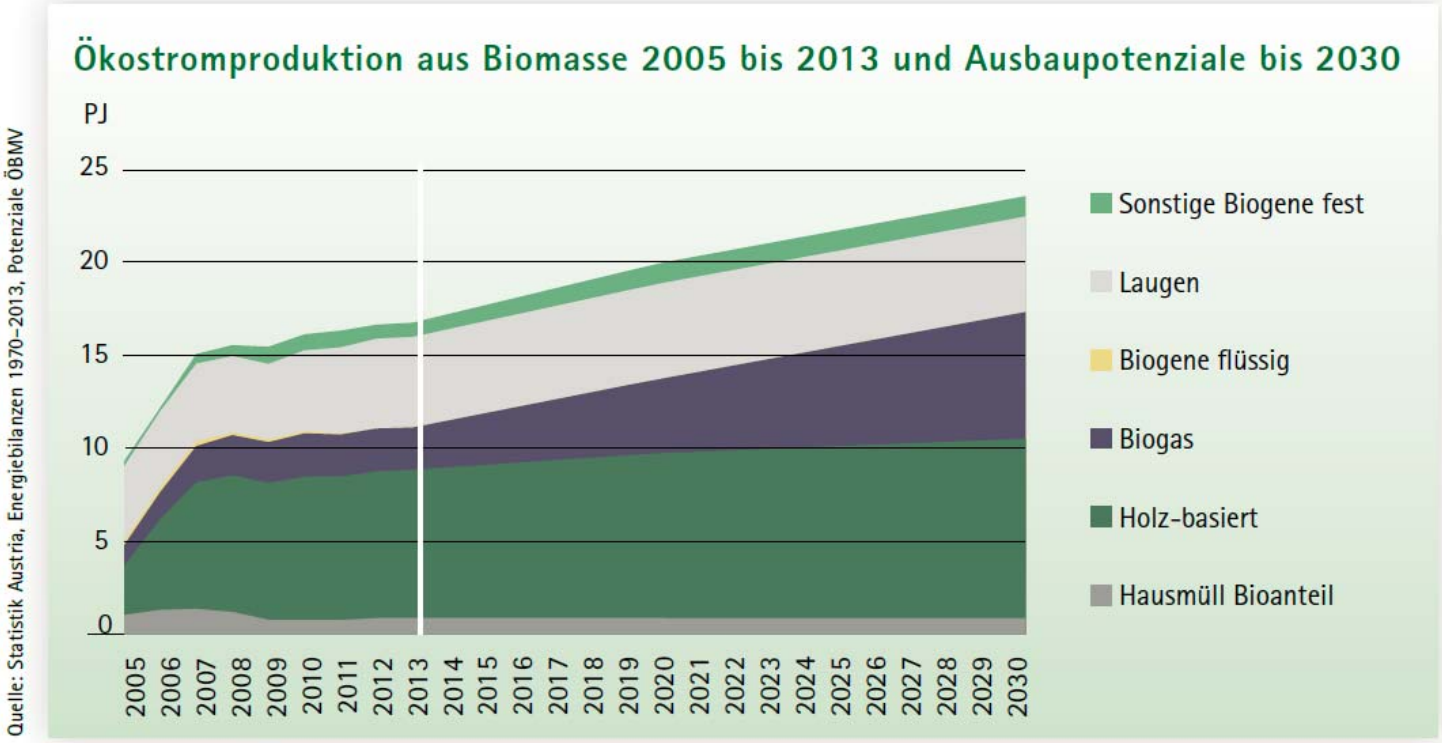
Verteilung der Ausbaupotenziale Bioenergie bis 2030 auf verschiedene Energieträger

Heat production from renewables 2005-13 and its potential up to 2030



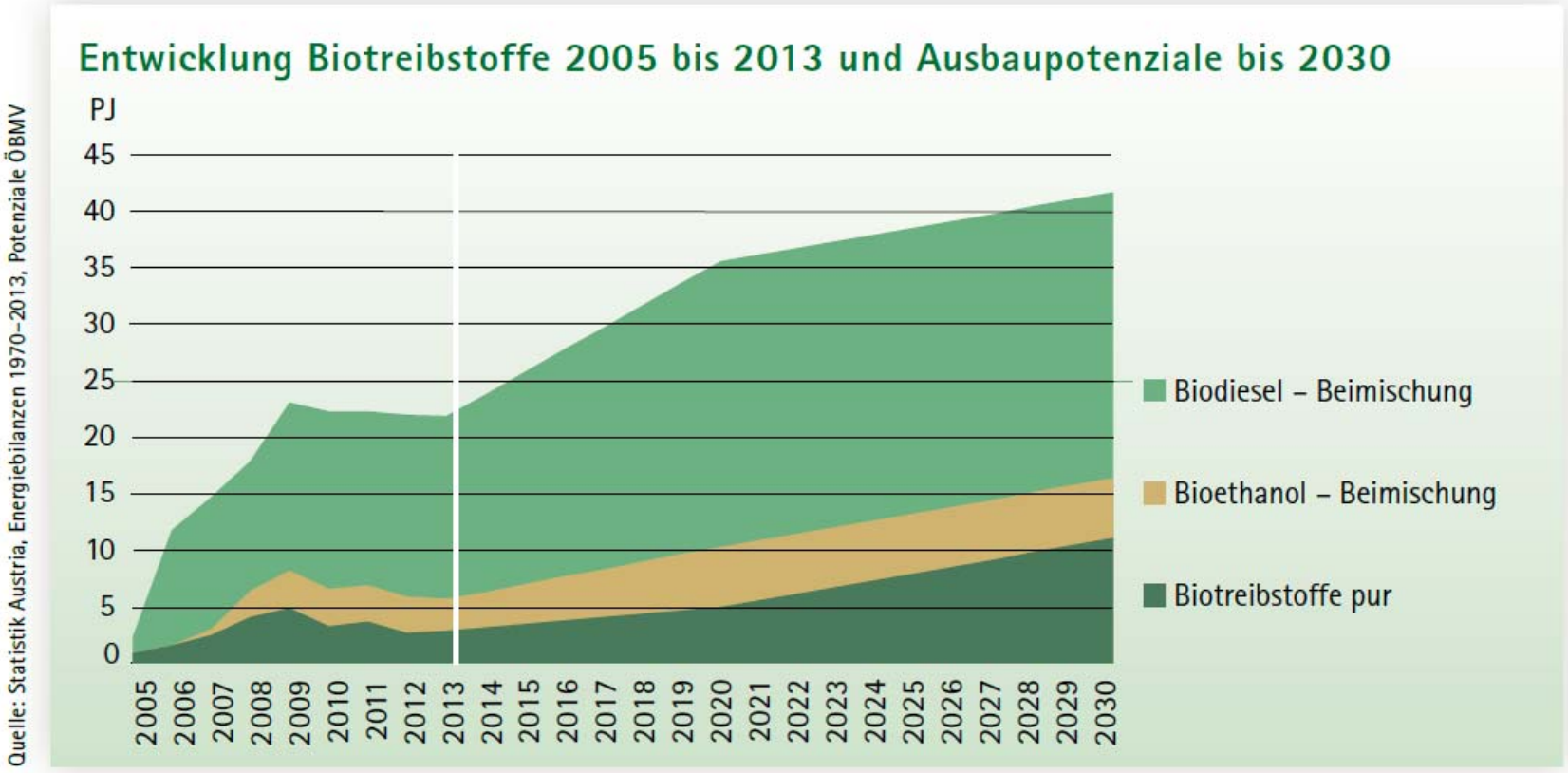
Entwicklung der Biowärmeproduktion von 2005 bis 2013 und Ausbaupotenziale bis 2030

Power production from biomass 2005-13 and its potential up to 2030



Entwicklung der Ökostromproduktion aus fester und flüssiger Biomasse sowie Biogas von 2005 bis 2013 und Ausbaupotenziale bis 2030

Biofuels 2005-13
and their potentials up to 2030



Entwicklung der Biotreibstoffe von 2005 bis 2013 und Ausbaupotenziale bis 2030

Status Infrastructure

CNG App, almost from every car manufacterer

- 179 public fuelling stations with CNG in Austria
- 85 Biodiesel (pure)
- 32 Ethanol (E85)
- 35 LPG
- 1 Hydrogen (public)

- 1433 Gasoline Super
- 1720 Diesel

- 1786 Electric fuelling stations!!!

Data from ÖAMTC

Cars used in Austria

- In total there are 4.75 mill. cars
- 57 % diesel-PKW and 43 % gasoline
- 16.000 Hybrid (gasoline or diesel + electric)
- 6.000 Flex-Fuel cars (gasoline + Bioethanol)
- 5.000 electric cars
- 5.000 CNG cars
- 6 fuel cell cars (hydrogen)

Austrian Research Organisations

Graz University of Technology – Institute of Thermal Engineering

- Combustion and gasification
- Energetic utilization of biomass
- CFD-simulations
- reactive fluid flows
- solar thermal processes
- extrusion and injection molding (polymers)
- Thermal Management
- Thermo dynamical process simulation
- Fluidized bed combustion
- Second Generation Fuels and fuel cells
- CO2-free gas- and coal-burning power plant

Joanneum Research Graz - Department of Energy Research

- Life Cycle Assessment
- Microchannel FT technology

Austrian Research Organisations

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

- Multi-staged fixed bed gasification systems

Bioenergy 2020+ (location Wieselburg)

- 1st and 2nd generation biofuels
- Representative of Austria in IEA Bioenergy Task 39 liquid biofuels
- Secretary of IEA Advanced Motor Fuels
- ExCo member in IEA Bioenergy (Manfred Wörgetter)

Austrian Research Organisations

Bioenergy 2020+ (location Güssing) together with TU Vienna

- Production of FT liquids
- Upscaling of the FT synthesis to 1 barrel/day
- Production of Hydrogen (as polygeneration in Oberwart and full conversion in Güssing)
- Mixed alcohols
- BioSNG
- Waste gasification in FICFB gasifier
- Fundamental R&D on ashes and bed materials

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 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)
  - No activities with FICFB, has still patent
  - Involved in Skive (over Carbona)
  - **www.andritz.com**

- **AGT Agency for Green Technology**
  - Low Temperature Conversion (LTC) is a thermo catalytic decomposition process operating without air supply
  - **http://www.agt-international.eu/**

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

- **Güssing Renewable Energy (GREG)**
  - FICFB gasifiers for CHP, BioSNG and other synthesis (sister company of the biomass CHP Güssing)
  - **http://www.gussingrenewable.com/**

Austrian companies

- **Repotec**
  - Engineering of 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**
- **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_{fuel} / 2.0_{el}	2002	AE&E, Repotec	Operational
Oberwart, AT	Gas engine / ORC / H_2	8.5_{fuel} / 2.8_{el}	2008	Ortner Anlagenbau	Maintanance
Villach, AT	Gas engine	15_{fuel} / 3.7_{el}	2010	Ortner Anlagenbau	On hold
Senden/Ulm, DE	Gas engine / ORC	14_{fuel} / 5_{el}	2011	Repotec	Operational
Burgeis, IT	Gas engine	2_{fuel} / 0.5_{el}	2012	Repotec, RevoGas	On hold
Göteborg, Sweden	BioSNG	32_{fuel}/20_{BioSNG}	2013	Repotec/ Valmet	Operational
California	R&D	1 MW_{fuel}	2013	GREG	Operational
Gaya, France	BioSNG R&D	0,5 MW_{fuel}	2016	Repotec	Under construction
Thailand	Gas engine	4_{fuel} / 1_{el}	2016	GREG	Under construction

Conversion of wind and photovoltaic to transportation fuels

H_2O electrolysis

H_2

Gas cooling and cleaning

CO_2 removal

H2/CO = 2:1

FT synthesis

Upgrading

H_2:CO from 1:1 to 2:1

CO_2

Product gas

Flue gas

GASIFIER

COMBUSTOR

Biomass

Steam + CO_2

Air + additional fuel

FT-diesel
FT-kerosene

$H_2 + CO_2 \longleftrightarrow H_2O + CO$

RWGS

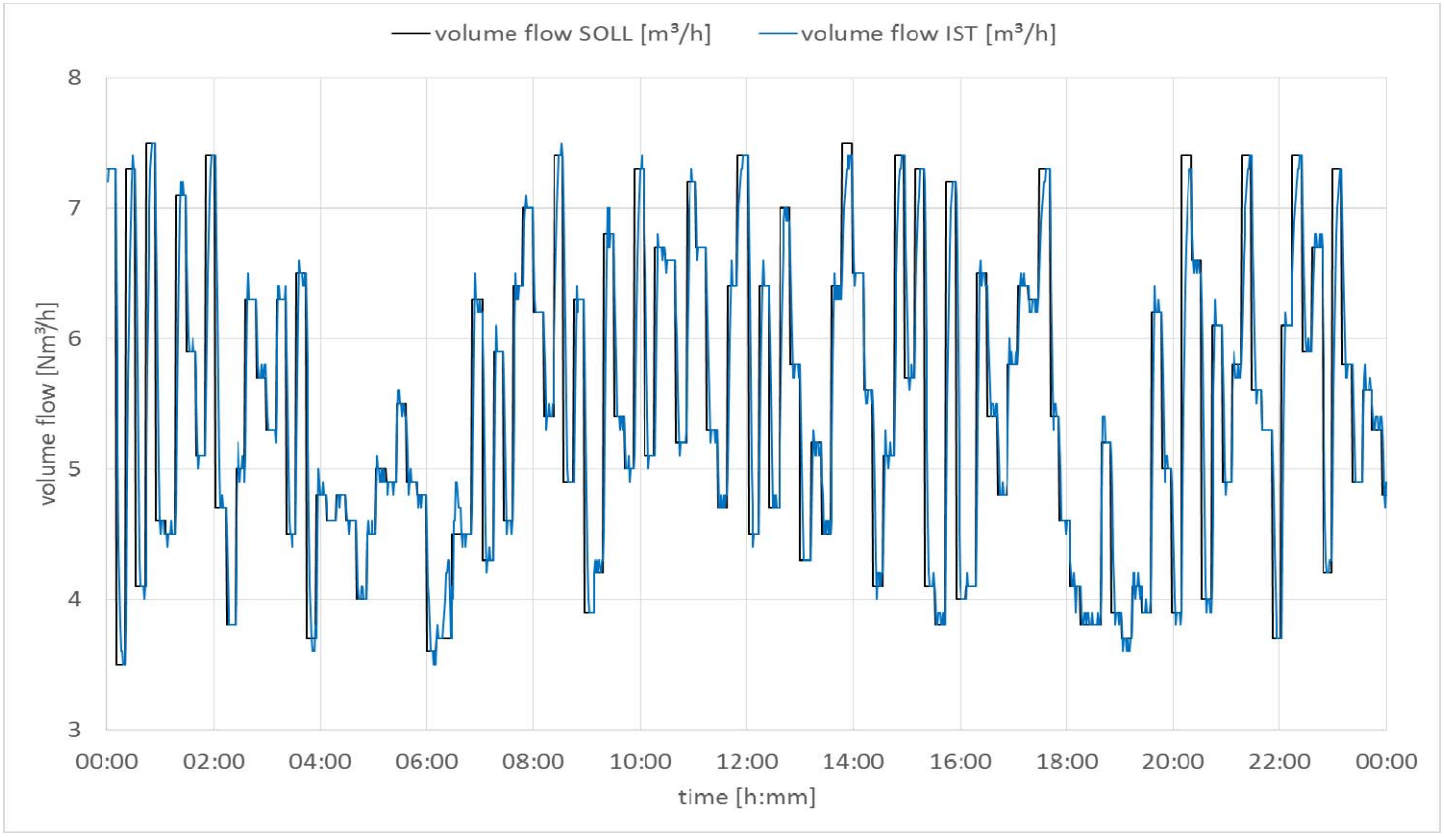
Aim of experimental work:

Verifying Winddiesel Technology in the area of the synthesis stage according to the impact of varying load conditions on

- catalyst aging, especially in terms of mechanical stability

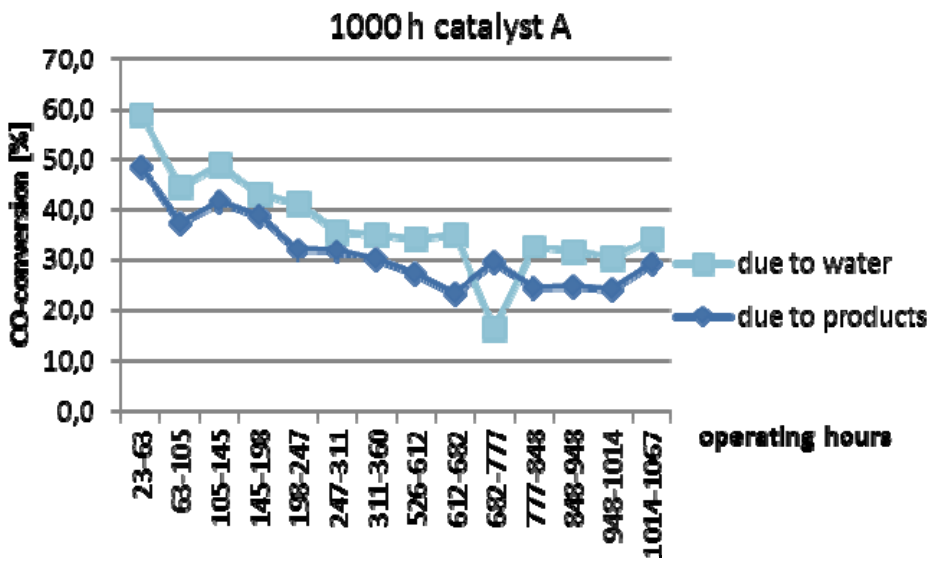
- product yield and composition

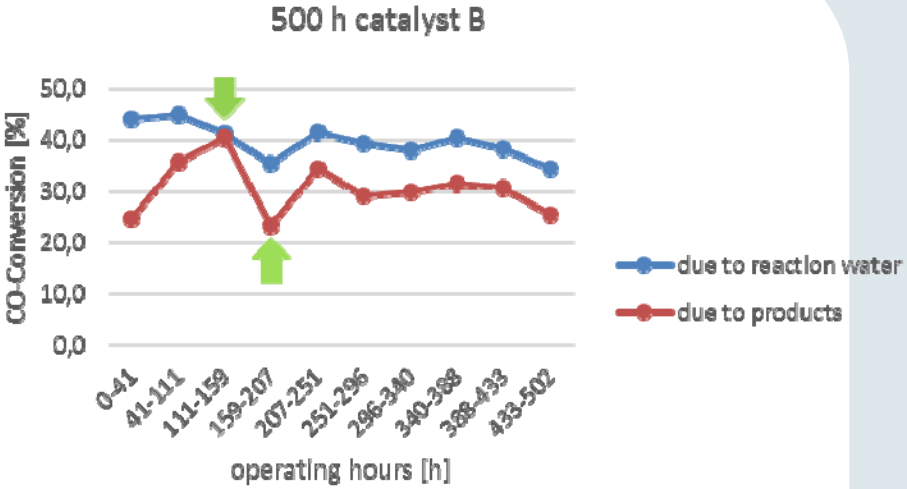
Example of flow variation in Loadchange experiment



Long time experience

Institute of Chemical Engineering
Working Group Zero Emission Technology





Commercial CHP gasifiers

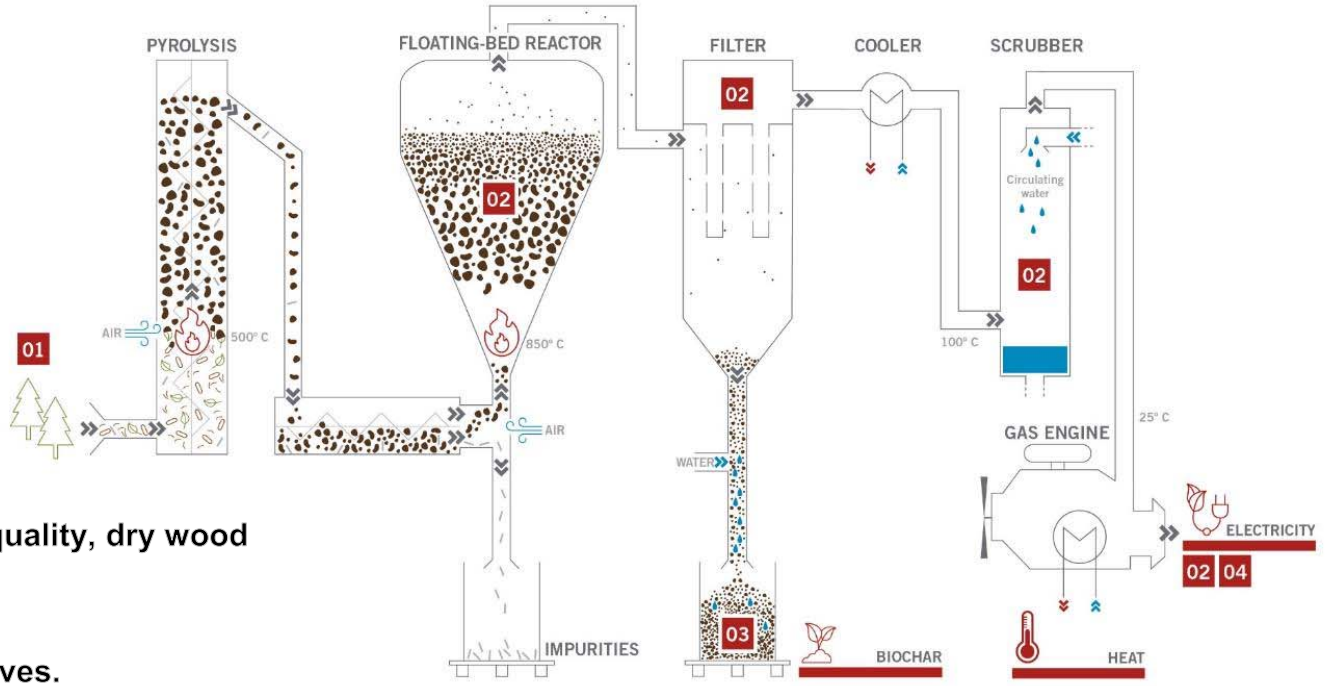
- Companies active in Austria

Company	Output kW el/th	Technology
Christof Group **REP**	13/31 20/45	Fixed bed
Spanner RE²	20/48 30/73 45/108	Fixed bed
Syncraft	180/270 280/550	Staged gasification
Urbas	150/300 280/550	Fixed bed
Xylogas	50/105 220/410 440/870	Fixed bed
Holzenergie **Wegscheid**	125/230	Fixed bed
Fröling	50/107	Fixed bed
Burkhard	180/240	Fixed bed

References

	Project	Start up	Contact	Output	Application	Feedstock	
						Wood chips	Off - cuts
1	**Demonstrationsanlagen URBAS** A - 9113 Ruden	Development since 2001	Ing. Peter Urbas DI Wolfgang Felsberger	150 kWel +300 kWth + Kessel	CHP - Process heating for own supply	x	x
2	**Fernwärme Neumarkt Ges.m.b.H. & Co KG** A - 8820 Neumarkt	August 08	BM Herbert Ofner fernwaerme8820@gmail.com + 43 664 4501564	2 x 120 kWel + 580 kWth	CHP - District heating	x	
3	**Friedrich Wahl GmbH & Co. KG** D - 74429 Sulzbach Laufen	October 09	GF Sabine Mertzlufft s.mertzlufft@wahl-holzwerk.de +49 7976 9858 40	1 x 130 kWel + 280 kWth	CHP - Process heating for own supply		x
4	**Holzstrom GmbH** A - 5145 Neukirchen an der Enknach	July 11	GF Johann Wurhofer johann.wurhofer@aon.at + 43 664 2425408	2 x 175 kWel + 600 KWth	CHP - District heating	x	
5	**Stadtwerke Konstanz GmbH** D - 78467 Konstanz	December 11	DI Olaf Westerhoff +49 7531 803 266	1 x 140 kWel + 300 kWth	CHP - District heating	x	
6	**Biowärme Mallnitz Gmbh** A - 9822 Mallnitz	November 13	Hr. Anton Glantschnig glantschnig.anton@peak.at + 43 664 156 78 58	1 x 250 kWel + 540 kWth	CHP - District heating	x	
7	**Rau GmbH** D - 72336 Balingen	December 13	GF Joahim Rau linda.rau@rau-gmbh.de + 49 7433 9882 14	1 x 150 kWel + 280 kWth	CHP - Process heating	x	x
8	**Energieversorgung Vals GmbH** I - 39037 Mühlbach	December 14	Kurt Bacher + 39 0472 979042	1 x 296 kWel + 550 kWth	CHP - District heating	x	
9	**Biowärme Eberndorf** A - 9141 Eberndorf	March 15	Ing. Peter Urbas p.urbas@urbas.at + 43 664 1235923	1 x 130 kWel + 250 kWth; 1 x 300 kWel + 600 kWth	CHP - District heating	x	
10	**green Power GmbH** A - 8230 Hartberg	July 15	Andreas Windhaber andreas.windhaber@gat-solar.at +43 3176 8127 0	1 x 200 kWel + 320 kWth	CHP - District heating	x	
11	**Energia Uno** I - 05100 Terni	August 15	Marco Cinaglia +39 3408191329	1 x 199 kWel + 340 kWth	CHP - Process heating	x	
12	**Lamprecht GmbH** I - 3902 Kastelbell	November 15	Hr. Oskar Pfeifer info@lamprecht-holz.com + 39 0473 624131	1 x 199 kWel + 320 kWth	CHP - Process heating	x	
13	**Azienda. Agri. S.A.B.I** I - 47010 Galeata	December 15	Luca Zannotti luca1407@gmail.com + 39 0543 981793	1 x 199 kWel + 320 kWth	CHP - District heating	x	
14	**Prijedor** BIH - 79101 Prijedor	December 15	Zoran Knezevic knezevic.zoran@toplanapd.com +38 765 845 232	1 x 250 kWel + 530 kWth	CHP - District heating	x	
15	**FW Mals** I - 39024 Mals	December 15	Dr.Mag. Ulrich Veith ulrich.veith@gemeinde.mals.bz.it + 39 349 5707 171	2 x 149 kWel + 280 kWth	CHP - District heating	x	
16	**Azienda Agricola Isca di Calvello**	January 15	Gianfranco Misuriello +39 3334711383	1 x 199 kWel + 340 kWth	CHP - Process heating	x	
17	**Chetra SK s.r.o.** SK - 06801 Medzilaborce	January 16	Olga Hethy +49 1637227525	3 x 150 kWel + 840 kWth	CHP - Process heating	x	

Technology



1 Operates on low quality, dry wood chips including bark and fines

2 No need for additives.
Still the condensate is as clear as water and free of tar

3 By-product
premium quality charcoal

4 30% overall electric efficiency
due to high-tech gas engines

The model company from Vorarlberg/Austria shows how to set new standards with a symbiosis between heating plant, biogas plant and the latest wood gas technology from SynCraft.