

IEA Bioenergy

# Country report Austria

November 2019



**Dr. Jitka Hrbek and Prof. Christoph Pfeifer**

**University of Natural Resources and Life Sciences Vienna  
(BOKU)**

Photo: SYNCRAFT@Werk Beta / Mierschach / South Tyrol / Italy



IEA Bioenergy, also known as the Technology Collaboration Programme (TCP) for a Programme of Research, Development and Demonstration on Bioenergy, functions within a Framework created by the International Energy Agency (IEA). Views, findings and publications of IEA Bioenergy do not necessarily represent the views or policies of the IEA Secretariat or of its individual Member countries.

# Content

- Research organizations and projects
- Austrian companies active in thermal gasification
- Implementations



# Research organizations and projects

# Research organizations



University of Natural Resources  
and Life Sciences, Vienna

## University of Natural Resources and Life Sciences Vienna (BOKU Wien)

### Project: BioAdd

Gasification/combustion of biomass with additives—  
additives are used to avoid microbiological degradation

### Project: Flash

Determination of ash melting behavior (ash melting  
temperature, ash viscosity) for high temperature  
gasification

# Research organizations



University of Natural Resources  
and Life Sciences, Vienna

## University of Natural Resources and Life Sciences Vienna (BOKU Wien)

### Project: BioAdd

Focus: during the storage of wood chips, the degradation processes take place and in this way up to 30% of the wood could be lost.

Different additives were tested to avoid this degradation process. Their influence on degradation, combustion/gasification and ash melting process was tested.

BOKU:

Gasification/combustion of biomass with and without additives

- 20 kW facility has been built at BOKU
- Ash melting tests

# Research organizations



University of Natural Resources  
and Life Sciences, Vienna

**University of Natural Resources and Life Sciences  
Vienna (BOKU Wien)**

## **Project: Flash**

Determination of ash melting behavior (ash melting temperature, ash viscosity) for high temperature gasification

# Research organizations



## Project: Heat-to-Fuel

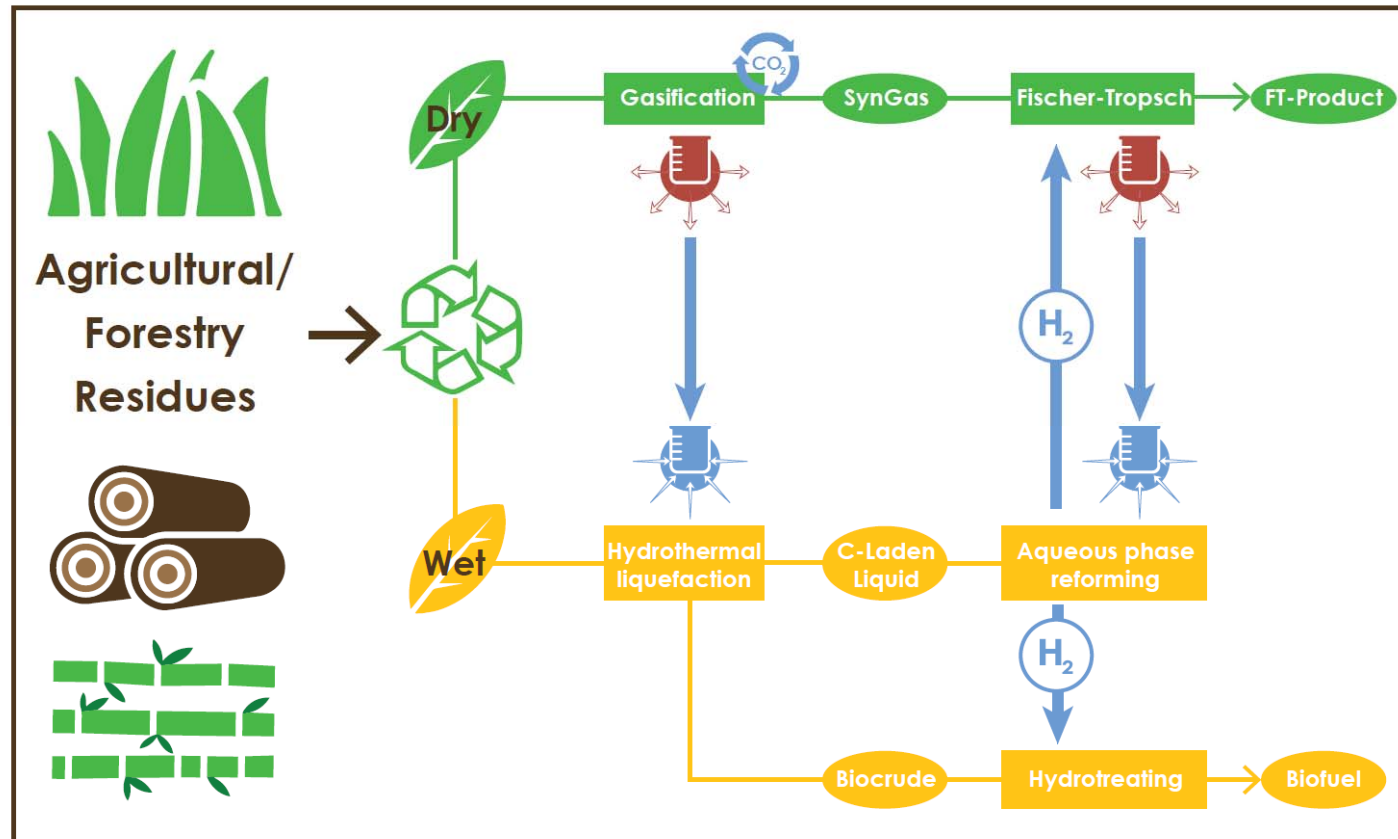
- Upgrading of alternative, residual biomass feedstock and **conversion of excess heat to liquid fuels** in a combined gasification, FT and aqueous phase reforming plant.
- a Horizon 2020 EU-funded project carried out by 14 partners from across Europe

### Aims:

- biofuel prices below €1 per liter. This is achieved by a 20% cost reduction in the biofuel production processes;
- Contribute to delivering goals of EU's energy security by increasing the share of local resources used for producing energy, and thus reducing EU's dependency of energy's imports;
- Prove the technological feasibility and economic worthiness of the concept acting as a catalyst of future industrial units.

# Research organizations

## Project: Heat-to-Fuel





# Research organizations

## Project: Heat-to-Fuel

Heat-to-fuel aims at converting any kind of biogenic residue into high quality fuels with highest efficiency. Due to the perfect heat- and mass integration the HtF-process will raise the typical carbon conversion of current biofuel technologies from 40% to more than 70%.

Heat integration takes place from the endothermic dry route to hydrothermal liquefaction and to aqueous phase reforming. All the excess (or currently waste) heat can be utilized in order to increase the yield of Biocrude produced by the Hydrothermal liquefaction unit.

Another radical innovation is the production of hydrogen from organic-laden wastewater (2 - 20 mass % organic content). Fundamental research has been carried out in HTL in order to understand the yield of different feedstocks, like this publication reveals:

<https://www.mdpi.com/1996-1073/12/4/723>



# Research organizations

## Vienna University of Technology



### Current projects

- ReGas 4 Industry
- CEMphos
- GasStorage
- Heat-to-Fuel
- RenewableSteelGases
- VergRestWert
- PHENOLIVE

### More information:

[https://www.vt.tuwien.ac.at/chemical\\_process\\_engineering\\_and\\_energy\\_technology/future\\_energy\\_technology/gasification\\_and\\_gas\\_cleaning/projects/EN/](https://www.vt.tuwien.ac.at/chemical_process_engineering_and_energy_technology/future_energy_technology/gasification_and_gas_cleaning/projects/EN/)

# Research organizations

## Graz University of Technology Institute of Thermal Engineering

### Projects areas:

- Combustion and gasification
- 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
- CO<sub>2</sub>-free gas- and coal-burning power plant

# Research organizations



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

Projects areas:

- Multi-staged fixed bed gasification systems
- Valorization of biomass
- Biomass to power and heat
- Engine & emissions
- Energy distribution and storage

# Research organizations

bioenergy2020+

(Locations in Güssing and Wieselburg)

Projects areas:

- Product gas production/treatment/utilization
- Process development and optimization
- Measuring and analysis technology
- Fundamental R&D on ashes and bed materials
- 1<sup>st</sup> and 2<sup>nd</sup> generation biofuels
- Representative of Austria in IEA Bioenergy Task 39 liquid biofuels
- Secretary of IEA Advanced Motor Fuels
- ExCo member in IEA Bioenergy (Dina Bacovsky)
  
- Relocation of infrastructure from Güssing to Vienna

# Austrian companies

# Austrian companies

**ANDRITZ ENERGY & ENVIRONMENT GmbH**  
([www.andritz.com](http://www.andritz.com))



- Energy and environmental systems, fluidised bed gasifiers, biomass-handling systems
- Steam and power generation
- Patent owner of FICFB gasification

# Austrian companies



## Aichernig Engineering GmbH (former REPOTEC)

(<http://www.repotec.at>)

- Engineering of FICFB gasifiers for CHP, BioSNG and other synthesis (Güssing, Ulm, Göteborg)

### Gasification

- 2018 Namie/JAP - engineering, commissioning support
- 2017 Hwaesong/KOR - concept study
- 2016 Wajima/JAP - engineering, commissioning support
- 2013 R&D/FRA - general contractor for lot gasification
- 2011 R&D/FRA - engineering and construction
  - WSC/ITA - retrofitting of a Biomass gasification plant
- 2010 Dende/BRA - Biomass gasifier to serve a biofuel plant - design
- 2009 Gas Conditioning Plant/Güssing, AUT - engineering, construction and commissioning
  - Biomass gasification power plant/Brandenburg, GER - design
- 2008 CHP/Chemnitz, GER - Basic Engineering and approval planning
  - TBM/GER – design, tender
- 2007 Energy Hub Baden/GER – studies and basic engineering
  - Cegaz/FRA – design, basic engineering
- 2006 GoBiGas/SWE – design
  - HGA Senden/GER – design, approval planning, detail engineering
- 2005 Gasification-CHP-plant/FRA – studies und basic engineering
  - CHP/Wiener Neustadt, AUT - improved efficiency
- 2004 CHP/Oberwart, AUT - basic engineering, approval planning
- 2003 Vathorst/NED – conceptional design and basic engineering
- 2000 CHP/Güssing, AUT - start-up and optimization



Güssing



Senden



GoBiGas



Wajima



Heiligenkreuz



Funder



# Austrian companies

## GET- Güssing Energy Technologies (get.ac.at)



- Research, consulting and engineering
- CHP
- Synthetic biofuels
- Heating & cooling
- Domestic installations
- Education Centre (since 2006 in cooperation with Vienna University of Technology)

# Austrian companies

## Güssing Renewable Energy

<http://www.gussingrenewable.com>



A cosmopolitical managed enterprise aiming at the global market, offering customized instantly usable CO<sub>2</sub>-neutral solutions all over the world

- Nongbua (Thailand) gasification facility



NEWS

BANGKOK – GUSSING RENEWABLE  
ENERGY (THAILAND) CO. LTD. APPROVED  
AS R&D ORGANIZATION

# Austrian companies

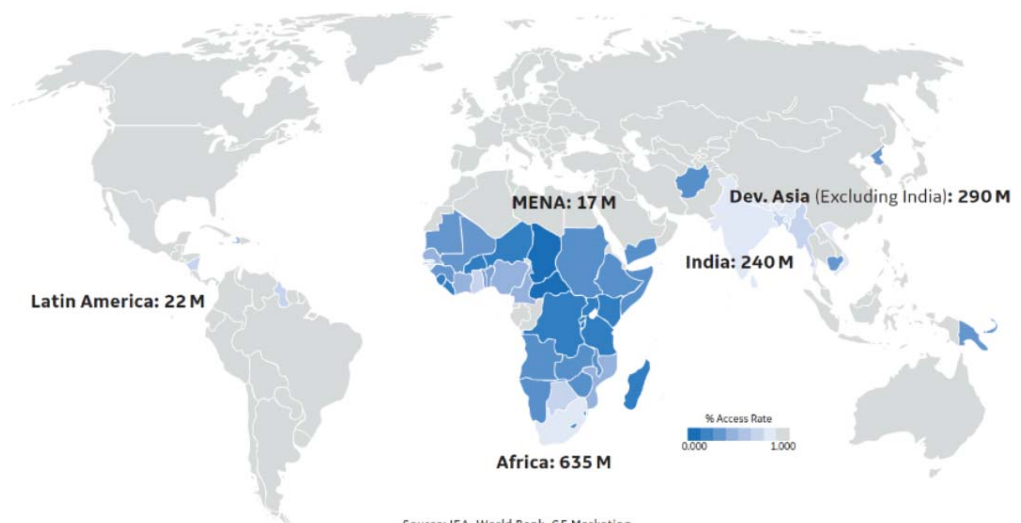
**GE Jenbacher Energiesysteme AG**



(<https://information.jenbacher.com/index.php>)

- Gas engines

PEOPLE WITHOUT ELECTRICITY TODAY



# Austrian companies

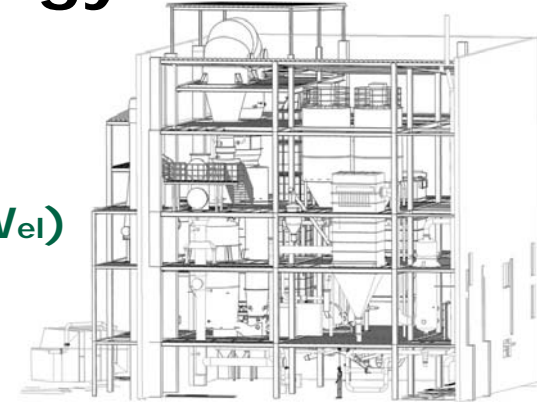
## Small scale fixed bed gasification



# Implementations

# Implementation – DFB technology

- Senden/Ulm, Germany (14 MW<sub>fuel</sub>, 5 MW<sub>el</sub>)
- ? (CR Germany)
- Gaya, France
  - 0,5 MW<sub>fuel</sub>
  - BioSNG R&D
  - commercial operation in 2023
- Nongbua, Thailand
  - (4 MW<sub>fuel</sub>, 1 MW<sub>el</sub>)
- Demoplant in Daigo, Japan
  - (4 MW<sub>fuel</sub>, 1 MW<sub>el</sub>)



Source: REPOTEC

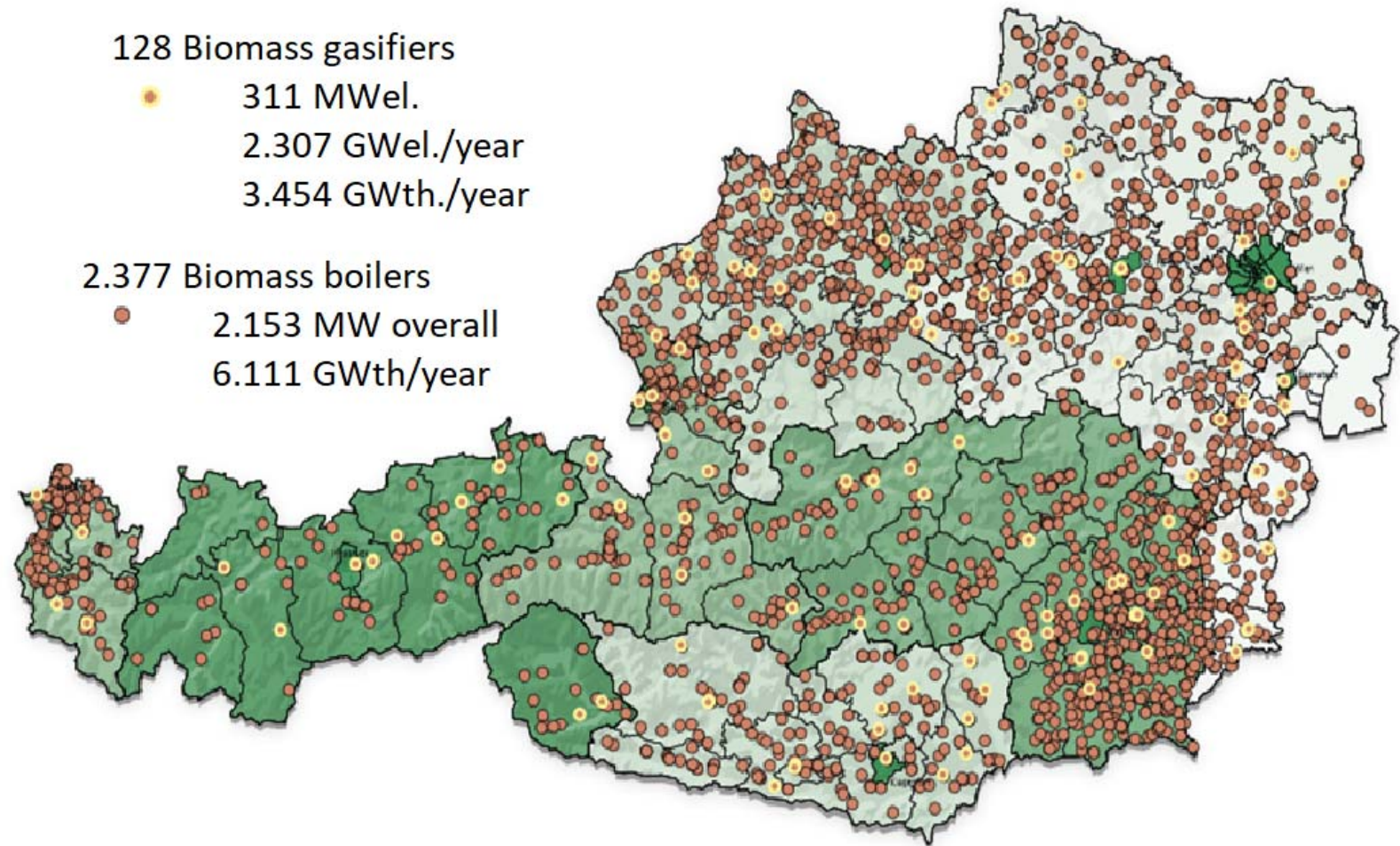


Source: projetgaya.com



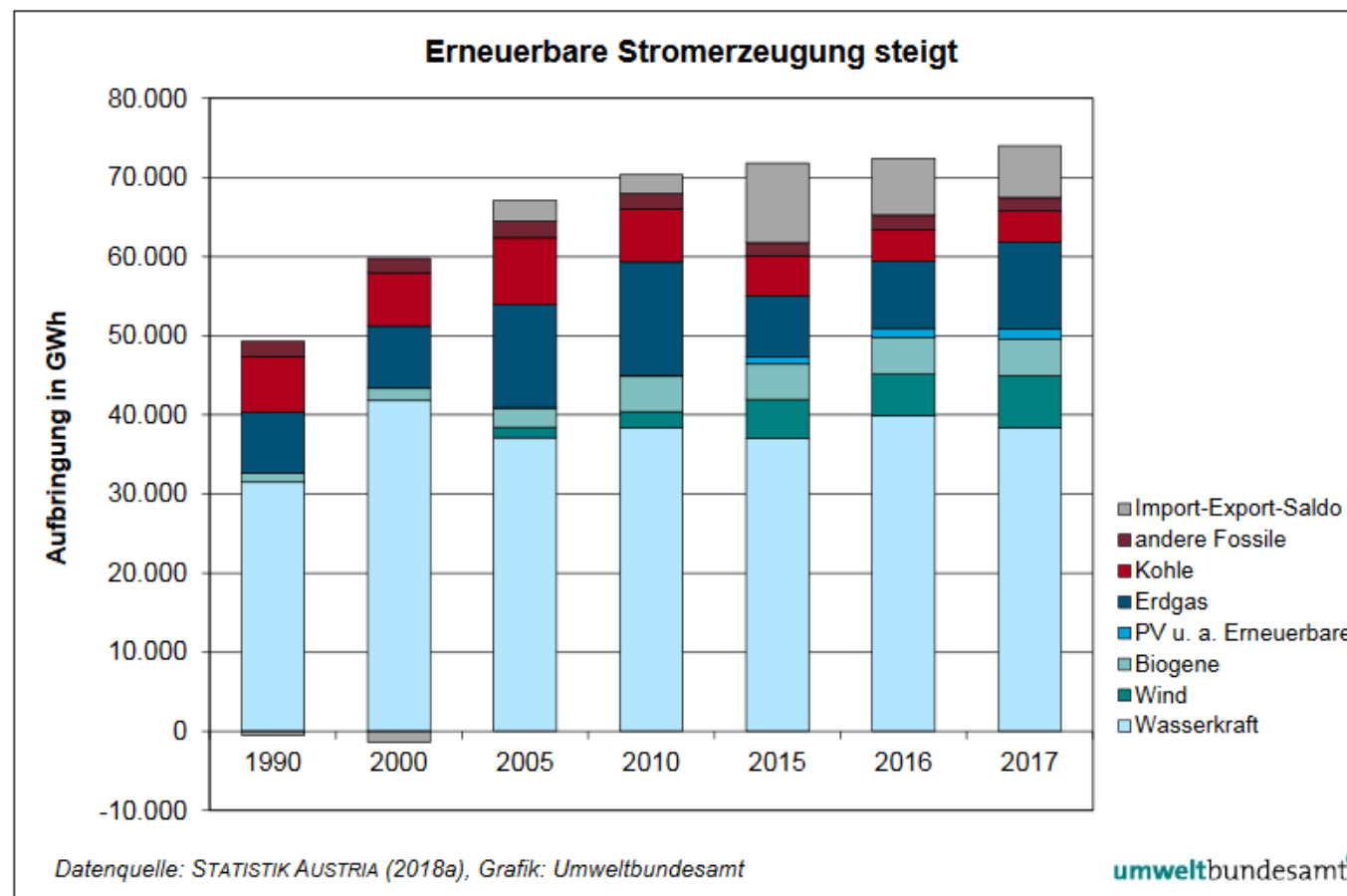
Source: Gussingrenewable.asia

# Implementations – small scale gasification



Source: biomasseverband.at

# Power from renewables in Austria





# Implementation – small scale gasification



<b>Power output</b>	<b>kW</b>	<b>49/51</b>
<b>Heat output</b>	<b>kW</b>	<b>~ 107</b>
<b>Feedstock (wood chips) consumption by 6000 op.hours</b>	<b>t</b>	<b>300</b>
<b>Overall efficiency</b>	<b>%</b>	<b>~83</b>
<b>Power efficiency</b>	<b>%</b>	<b>~27</b>

<b>Biowaerme Grabner Wenigzell, AT</b>	<b>Initially 3 facilities In 2016 4th facility Over 8.400 operating hours per year</b>
<b>Fernwaerme und Brennholzrocknung Suhodolnik, SI</b>	10 facilities in operation
<b>Osserhotel Silbersbach, DE</b>	Since 2014 – 1 facility in operation
<b>Fernwaerme Jennersdorf</b>	District heating + 200 kW electricity
<b>Molzbachhof Kirchberg am Wechsel</b>	Heating for hotel and school 2 facilities – 100 kWel + 200 kWth



# Implementation – small scale gasification



Location	Type	Output gasification unit
BEVZ GmbH Kirchberg an der Raab	2 x GGV 1.7 Prototypes & 1 x GGV 1.7 Series maschine	54 kWel 132 kWth
Mayer GmbH Zeltweg, Murtal	2 x GGV 1.7	36 kWel 88 kWth
Biowärme Lassnitz Steirisch Lassnitz. Murau	1 x GGV 2.7	55 kWel 125 kWth
FM Holzstrom GmbH St. Lambrecht, Murau	2 x GGV 2.7	110 kWel 250 kWth
Heizwerk Fritzer Sirnitz, Feldkirchen	3 x GGV 2.7	165 kWel 375 kWth
Kirchheimerhof Bad Kleinkirchheim Spittal an der Drau	1 x GGV 2.7	55 kWel 125 kWth
Regionalwärme St. Margareten St. Margareten in Rosental	1 x GGV 1.7	18 kWel 44 kWth
Heim AG-Fischer Schleitheim- Schaffenhäusern, Switzerland	1 x GGV 1.7	18 kWel 44 kWth
Haffhus GmbH Hotel und Ferienanlage, Ueckermünde, Germany	1 x GGV 1.7	18 kWel 44 kWth

GGV 1.7	GGV 2.7
<b>18 kWel./44 kWth output</b>	<b>55 kWel. /120 kWth output</b>
<b>19 kg/h chips consumption</b>	<b>50/60 kg/h chips consumption</b>
<b>400 V/50 Hz el. output</b>	<b>400 V/660 Hz el. output</b>
<b>Max. 90°C thermal output</b>	<b>Max. 90°C thermal output</b>
<b>5.209 x 2.221 x 2.620 mm dimensions</b>	<b>5.000 x 2.700 x 3.400 mm dimensions</b>



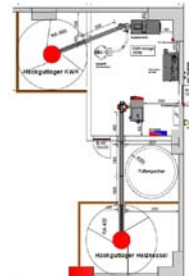
**About 15 facilities in operation, further facilities under construction**

## Implementation – small scale gasification



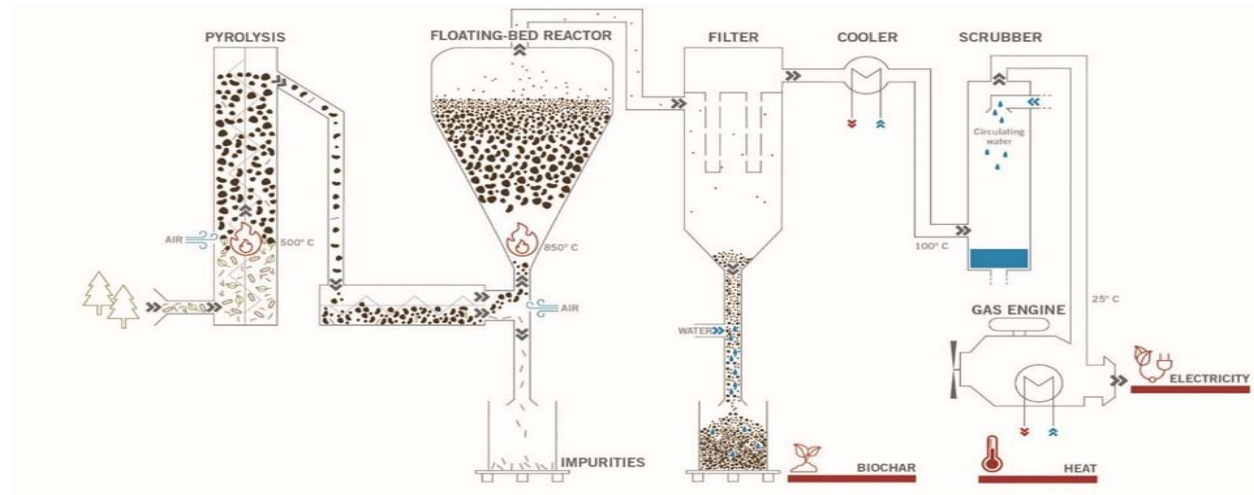
### Now 6 reference facilities in operation:

- Local heating Weng im Innkreis (since 2017)
- Farming Enterprise Schönauer (Salzburg, since 2018)
- Farming Enterprise Eblinger (NÖ, since 2018)
- Farming Enterprise Hubinger (OÖ, since 2018)
- Local heating Dellach (Kärnten, since 2019)
- Farming Enterprise Fuchsgruber (Bayern, since 2018)



**5-10 further projects in planning/construction**

# Implementation – small scale gasification



- Floating fixed bed technology
- The charcoal makes the difference – considerable additional earnings due to valuable product

**Now 7 facilities in operation and  
8 facilities under  
construction/commissioning**



CraftWERK 1000-300 / Innsbruck / AT  
Commissioned early 2017; produces 261kW power and 601kW heat. Delivered including low-temperature heat utilisation and dryer.



CraftWERK 2x CW 1800-400 / Laas / IT  
Commissioned end of 2018; produces 800kW power and 1.230kW heat. Powers with 2 gasifiers 1 gas engine Typ Jenbacher 420.



CraftWERK CW 700-200 / Dornbirn / AT  
Commissioned end 2014; produces 220kW power and 500kW heat. Delivered with 185kW power. Low-temperature heat utilisation retrofitted 2016.



CraftWERK CW 4x1800-500 / Shingu / JP  
First 4-units plant designed for the Japanese market. Commissioning 2019/2020; 1,76MW electric capacity. Scope of supply: from dryer to gas engines.

- **The charcoal makes the difference**



- **Considerable additional earnings due to valuable by-product biochar (instead of ash)**

- **The CO2 balance:**

- **Wood energy from sustainable source is CO2 neutral**
- **But neutral soon will be not enough**
- **CO2 sequestration value\* of SynCraft Carbon**
  - 1t of pure carbon is equivalent to 3,7t\*\* CO2
  - SynCraft carbon contains minerals / ash
  - Further the wood power plant and the fuel carries a „backpack“ of CO2 emissions which have to be considered
  - Outcome of a first draft evaluation (by Ithaka / Hans-Peter Schmidt)
  - **1t SynCraft carbon = 2,8t CO2 Eq.**

	14	15	16
<b>6</b>	<b>C</b>	<b>7</b>	<b>N</b>
Kohlens toff	12,011	Stick toff	14,007
2/4	2,5	2/5	3,0
			<b>8</b>
			<b>O</b>
			Sauerstoff
			15,999
			2/6
			3,5

\*\* Atomic mass comparison for C : CO<sub>2</sub> ratio

- **CO2 trade potential of a CW700-200 wood power plant**

- Based on draft evaluation:
- 1t SynCraft biochar = 2,8t CO2 Eq.
- 600t @ 100 €/t CO2 certificate value
- Annual CO2 trade potential € 60.000\*\*

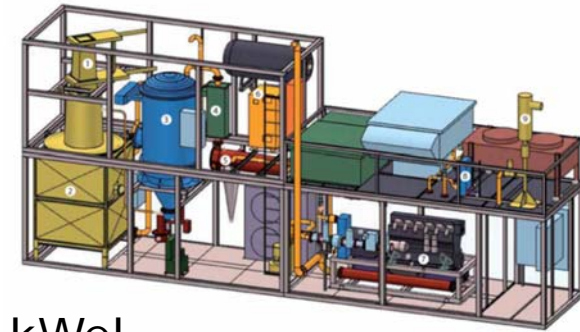
\* Typical output per year; Type CW700-200 on carbon max operation @EnergieWerk Ilg  
\*\* Beside additional net sales value

# Implementation – small scale gasification

**URBAS**  
stahl- und anlagenbau

Over 30 facilities in  
operation all over the  
Europe

Output 120-300 kWel



**CHP PLANTS**

 <p><b>Bioenergy Topolcany s.r.o.</b> COUNTRY: Slovakia OUTPUT: 2 x 18 t/h = 8.1 MW<sub>e</sub> PRESSURE: 78 bar TEMPERATURE: 520 °C EXTRACTION: max. 21,000 kW</p>	 <p><b>URBAS</b> energie-technik</p> <p><b>Plyetou Bois Séglières Power Plant</b> COUNTRY: France OUTPUT: 20.5 t/h = 5.5 MW<sub>e</sub> PRESSURE: 48 bar TEMPERATURE: 520 °C EXTRACTION: max. 14,500 kW</p>
 <p><b>Houlès Bois Energie</b> COUNTRY: France OUTPUT: 54.5 t/h = 13 MW<sub>e</sub> PRESSURE: 48 bar TEMPERATURE: 520 °C EXTRACTION: max. 12,000 kW</p>	 <p><b>Bioenergiezentrum GmbH Liebenfels Power Plant</b> COUNTRY: Austria OUTPUT: 28 t/h = 5 MW<sub>e</sub> PRESSURE: 78 bar TEMPERATURE: 540 °C EXTRACTION: max. 30,000 kW</p>
 <p><b>Société du Limousin</b> COUNTRY: France OUTPUT: 18.5 t/h = 5.5 MW<sub>e</sub> PRESSURE: 48 bar TEMPERATURE: 520 °C EXTRACTION: max. 14,000 kW</p>	 <p><b>Cranon Invest Group Planques Power Plant</b> COUNTRY: Limie OUTPUT: 20.5 t/h = 4 MW<sub>e</sub> PRESSURE: 78 bar TEMPERATURE: 520 °C EXTRACTION: max. 14,000 kW</p>

*Thank you for  
your attention*

[www.ieabioenergy.com](http://www.ieabioenergy.com)  
[www.task33.ieabioenergy.com](http://www.task33.ieabioenergy.com)

IEA Bioenergy



**Contact Details**

Dr. Jitka Hrbek

[Jitka.Hrbek@boku.ac.at](mailto:Jitka.Hrbek@boku.ac.at)

Prof. Christoph Pfeifer

[Christoph.Pfeifer@boku.ac.at](mailto:Christoph.Pfeifer@boku.ac.at)