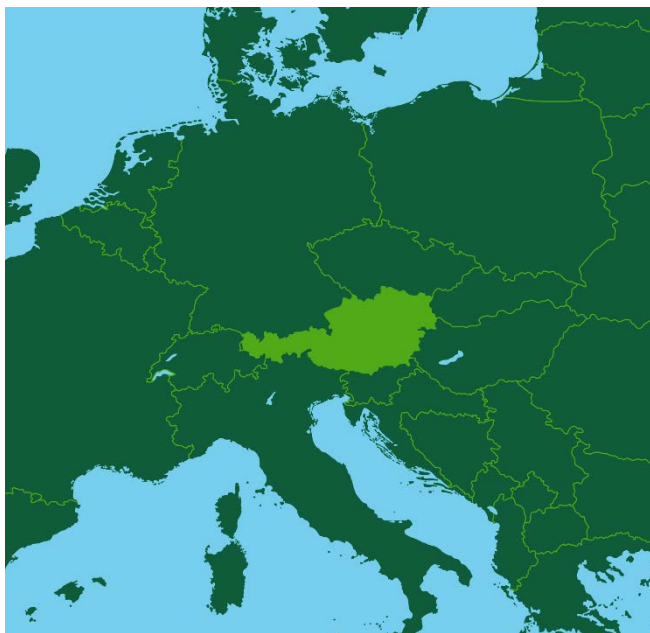




**IEA Bioenergy**  
Technology Collaboration Programme



# Country Report Austria

Update

Dr. Jitka Hrbek, Prof. Christoph Pfeifer

20.10.2023, Lyon, France

*The IEA Bioenergy Technology Collaboration Programme (TCP) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the IEA Bioenergy TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.*

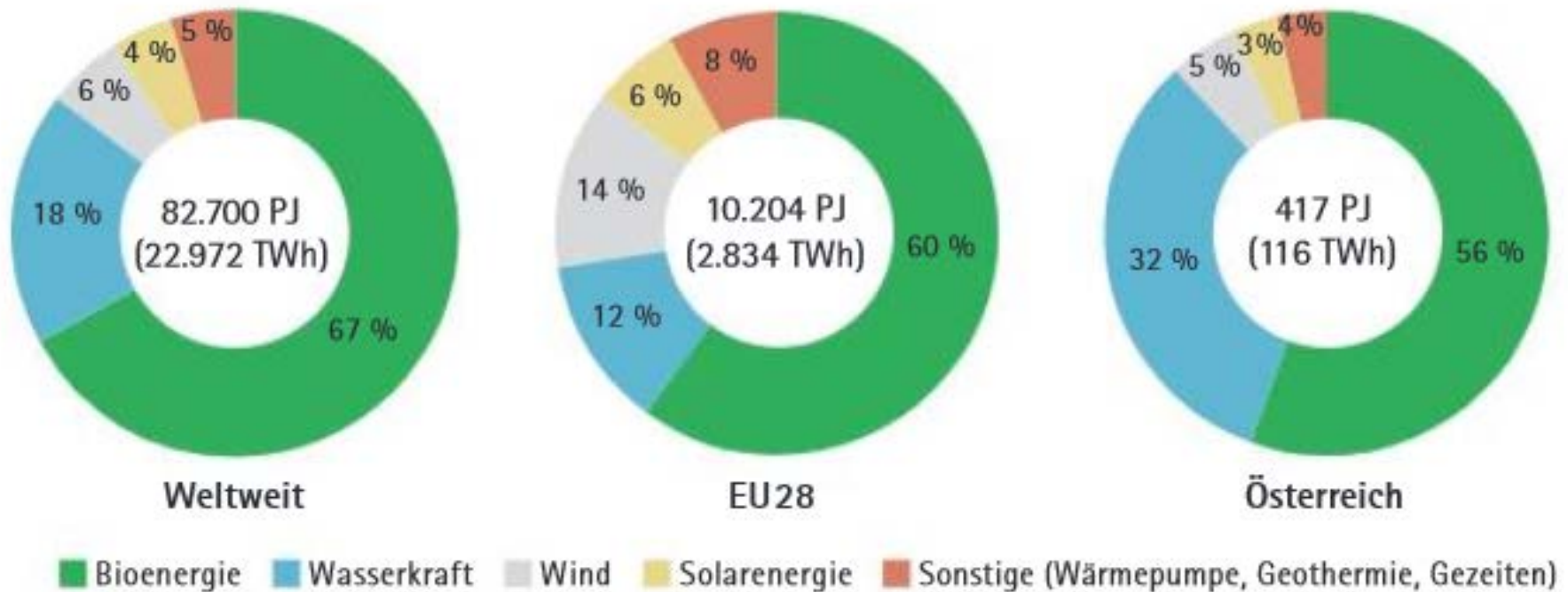
**Technology Collaboration Programme**

by **iea**

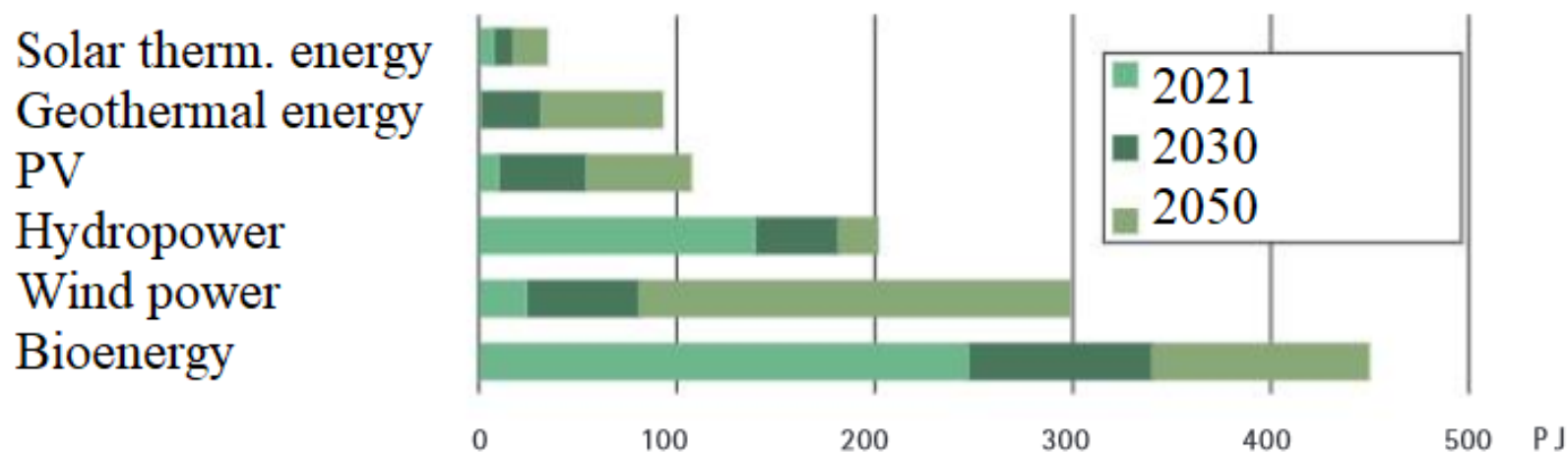
# Outline

- Energy consumption in Austria
- Research on gasification
- Industry
- Implementations

# Gross energy consumption (renewables)



# Utilization of renewable energy and its potential in Austria



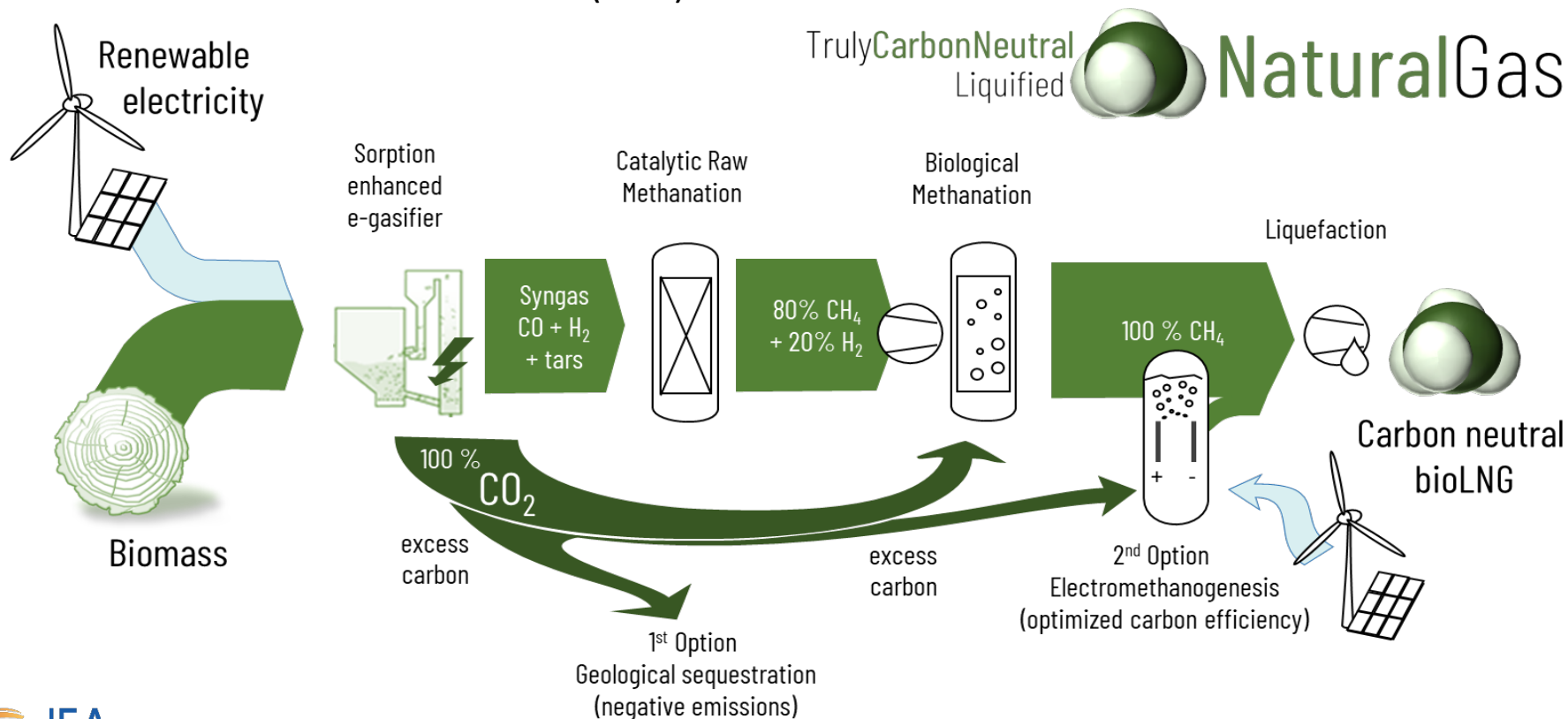
Source: Statistik Austria

# Research in Austria

University of Natural Resources and Life Sciences Vienna

## (BOKU Wien) CarbonNeutralLNG

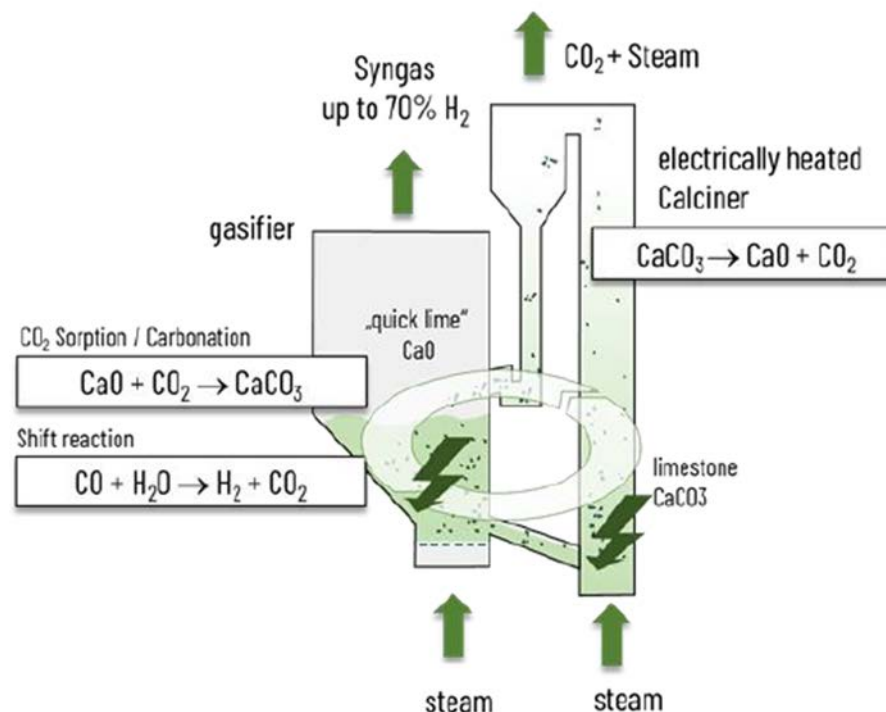
Trully Carbon Neutral Electricity Enhanced Synthesis of Liquefied Natural Gas (LNG) from Biomass



# Research in Austria

## CarbonNeutralLNG

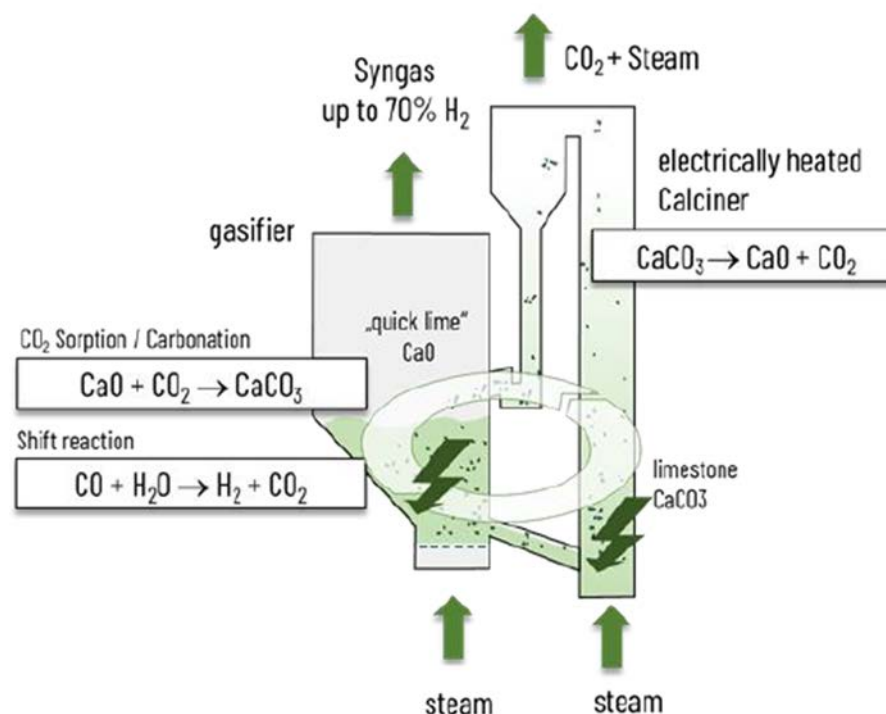
- Sorption enhanced electrically heated DFB steam gasification
- Use of electricity from renewables for heat supply
- $\text{CaCO}_3$ -CaO loop for  $\text{CO}_2$  removal and pure  $\text{CO}_2$  sequestration
- Increased conversion of fuel carbon to syngas



# Research in Austria

## CarbonNeutralLNG Status

- Process simulation and novel concept design
  - Design of additional reactor units
  - Process modeling in IPSEPro
- Erection of a cold flow model for validation and scientific studies
  - Fluid dynamics validation
  - Control of mass flows
  - Pressure gradients



# Research in Austria

Vienna University of Technology (TU Wien)

Institute of Chemical Engineering



No update received



# Research in Austria

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 in Austria

## 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
- JRZ spin-off

# Research in Austria

Technology & life sciences

## Central goals in the JRZ – Waste wood gasification and production of activated carbon

- Goals:
  - Use of waste wood / municipal wood residues as a feedstock for the production of heat/power and activated carbon
  - Production of activated carbon with high specific surface

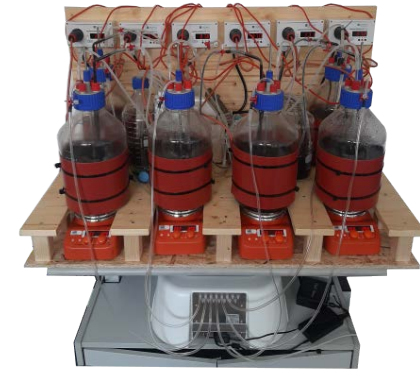


- **Central outcome of research year 3:**
  - 2nd generation waste wood gasifier in operation – stable gas production with low tar concentrations from waste wood (A I – A III)
  - Lab-scale activation successful
    - > 800 m<sup>2</sup>/g with thermal activation of gasification char (in-situ)
    - > 2.000 m<sup>2</sup>/g with chemical activation of waste wood (ex-situ)
  - Continuous activation with two different reactor setups in pilot-scale in test-phase



# Central goals in the JRZ – Application of activated carbon in WWTP

- Goal: Implementation in waste water treatment plants:
  - Pre-treatment of high contaminated waste water
  - Stabilisation of anaerobic fermentation
  - Fourth treatment step / adsorption of micro-pollutants
- **Central outcome of research year 3:**
  - A two-line pilot-scale WWTP plant is operated at WWTP Zirl/Tyrol.
  - A six-line lab-scale continuous anaerobic reactor is operated



# Research in Austria



## Competence area - gasification:

- 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
- **ExCo chairman (Dina Bacovsky)**
- Secretary of IEA Advanced Motor Fuels
- *Project partner Waste2Value*

# Austrian companies

## **Aichernig Engineering GmbH (former REPOTEC)**

<http://www.repotec.at>

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

## **GET- Güssing Energy Technologies**

[get.ac.at](http://get.ac.at)

Research, consulting and engineering, education centre

## **Güssing Renewable Energy**

<http://www.gussingrenewable.com>

## **GE Jenbacher Energiesysteme AG**

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

# Austrian companies

Small scale gasification - overview



Output kWel	Output kWth
18/55	44/120
20	60
50	107

# Austrian companies

Small scale gasification - overview



Output kWel	Output kWth
200-500	320-770
300/500	500/800
120-550	280-880





## Project Waste 2 value



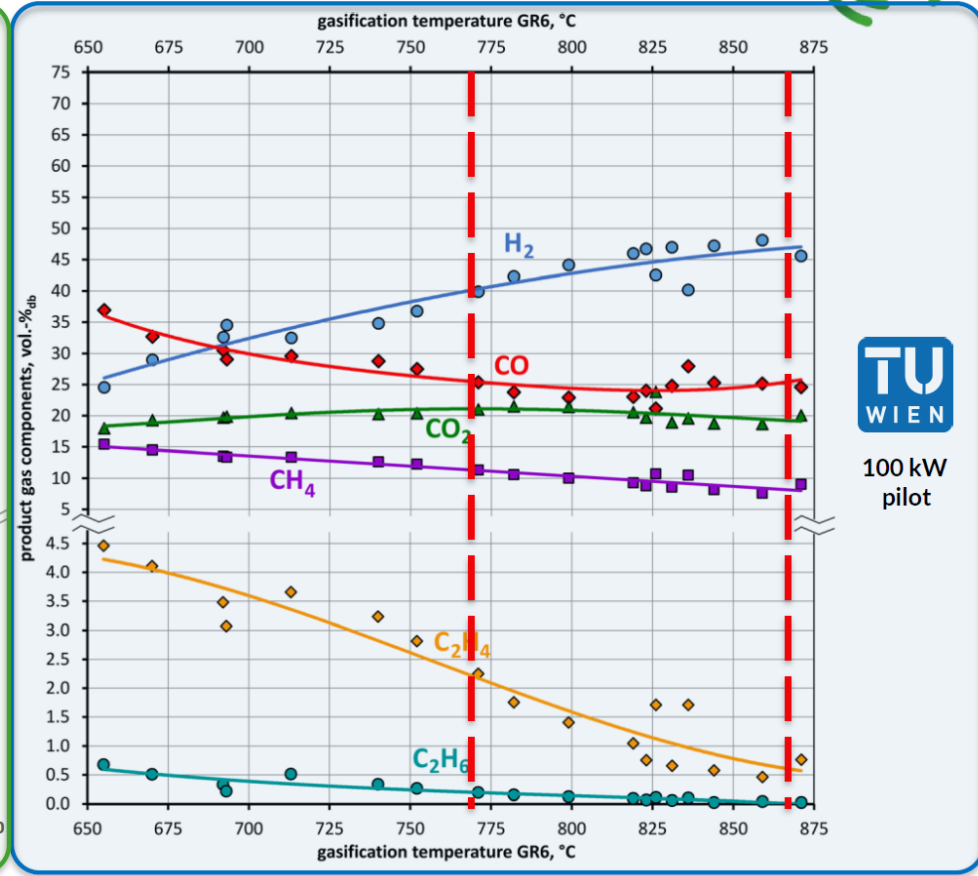
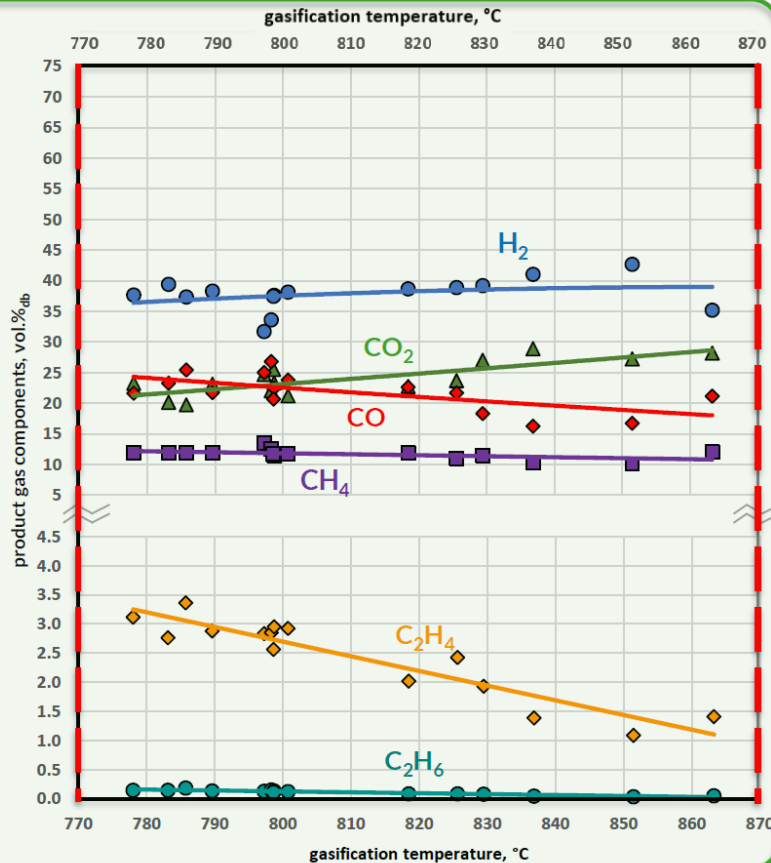
<b>Target</b>	Production of syngas from biomass and waste and downstream synthesis
<b>Scale</b>	1 MW <b>DUAL FLUID</b> gasification 250 kW Fischer-Tropsch synthesis
<b>Operation</b>	Campaigns for research operation
<b>Fuel</b>	wood chips, sewage sludge, plastic waste, sorted waste, agricultural residues

# Project Waste-2-value

## First results VI: Comparison to the experience from 100 kW, GC measurements of main components, H<sub>2</sub> calculated



1 MW demo



100 kW pilot

Schmid, J. C., Benedikt, F., Fuchs, J., Mauerhofer, A. M., Müller, S., & Hofbauer, H. (2021). Syngas for biorefineries from thermochemical gasification of lignocellulosic fuels and residues—5 years' experience with an advanced dual fluidized bed gasifier design. *Biomass Conversion and Biorefinery*, 11, 2405-2442.

# Project Waste-2-value

## Waste2Value LevelUp (W2V-LU): Campaign 1: Lessons learned

- Low water content of feedstock led to additional challenges (high tar content expected based on color of tar samples).
- Parameter variation showed the possibilities of how to influence the performance of the plant.
- The use of limestone as additive had an immediate and dominating effect on the gas composition. ( $H_2:CO$  ratio)
- High amounts of  $N_2$  in the reactor – still under investigation



**=> Basis for further experiments in demonstration-scale. Further optimization necessary!**

# Project Waste-2-value

## Maintenance of the plant



Thanks for your attention

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