BioTheRoS

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale

BEST

Bioenergy and Sustainable Technologies

Syngas Platform Vienna

# Syngas Platform Vienna

## Gasification of residues and synthesis of fuel and chemicals

Gerald Weber, BEST

Workshop on Advancing Industrial-Scale Biofuels:

Innovative Pathways in Thermochemical Conversion

12th of March 2025

The BioTheRoS Project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101122212.

# Agenda

- BEST
- Syngas Platform Vienna
- Full chain demonstration within BioTheRoS

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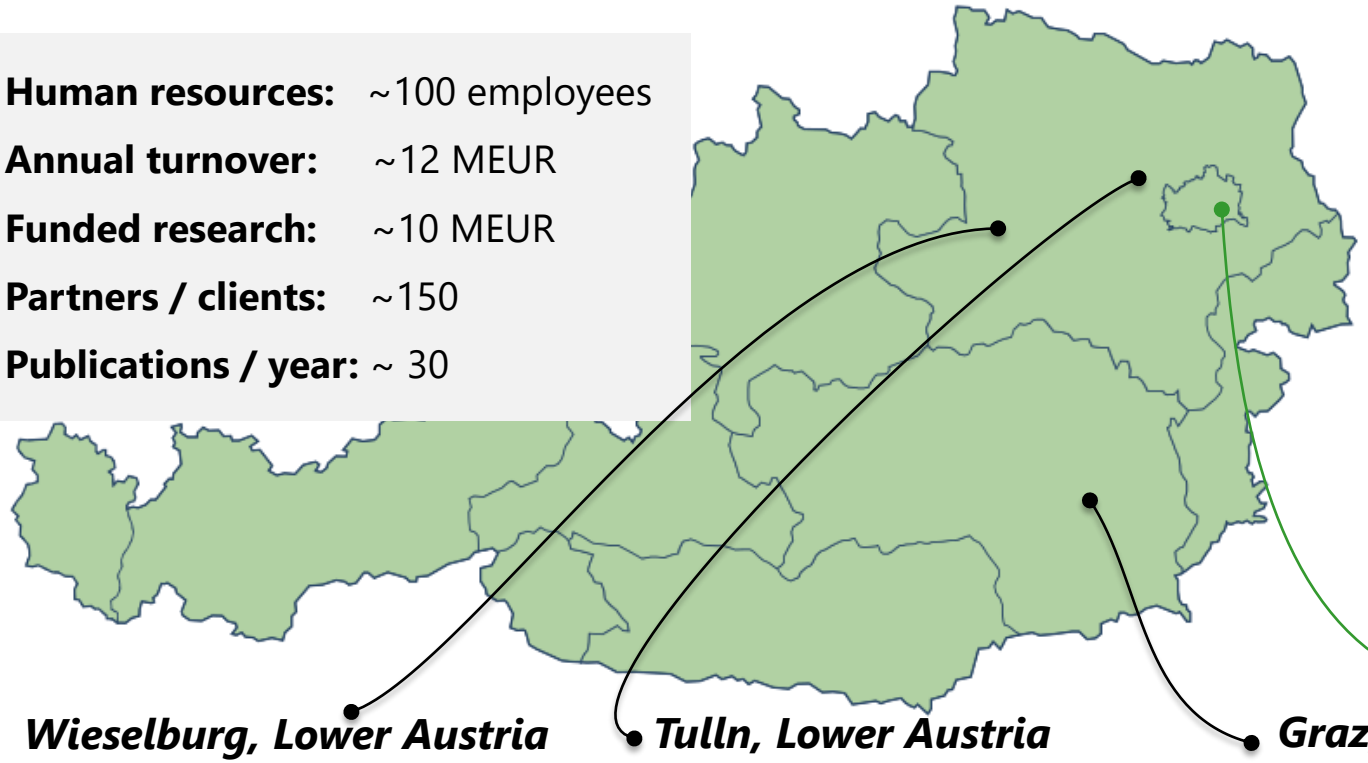
## BEST

- Syngas Platform Vienna
- Full chain demonstration within BioTheRoS

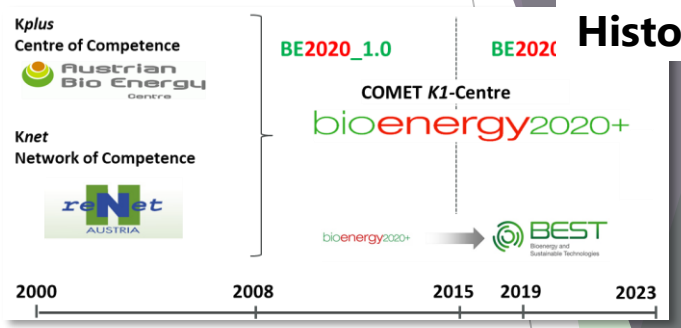
# BEST
# in a nutshell

***Bridging the gap between fundamental research and industrial deployment with RTD services to shape the transition to a sustainable and climate friendly bioeconomy***

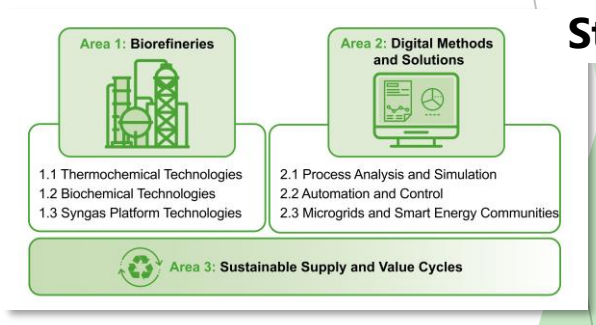
**Human resources:** ~100 employees
**Annual turnover:** ~12 MEUR
**Funded research:** ~10 MEUR
**Partners / clients:** ~150
**Publications / year:** ~ 30



## History




## Structure




***Wieselburg, Lower Austria***

***Tulln, Lower Austria***

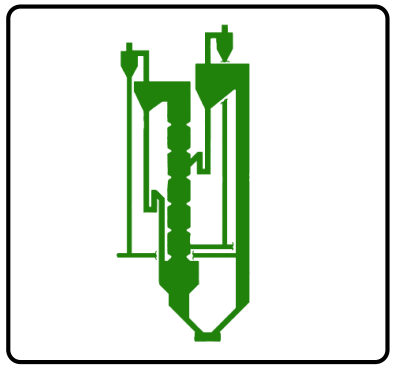
***Graz, HQ, Styria***

***Vienna***

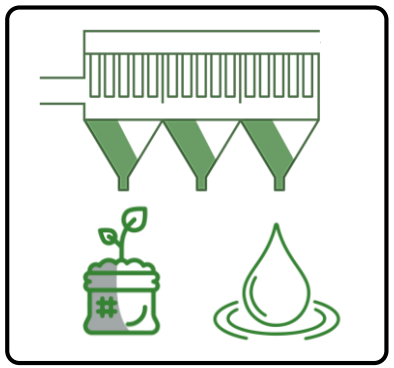
# Area 1.3: Syngas Platform Technologies

## *TECHNOLOGY DEVELOPMENT enabling SUSTAINABLE PROCESS CHAINS in INDUSTRIES*

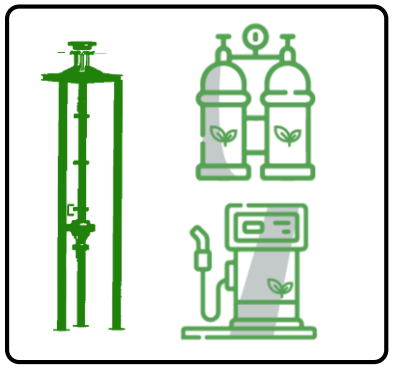
### Strategic fields of action



Dual fluidized bed (DFB) processes

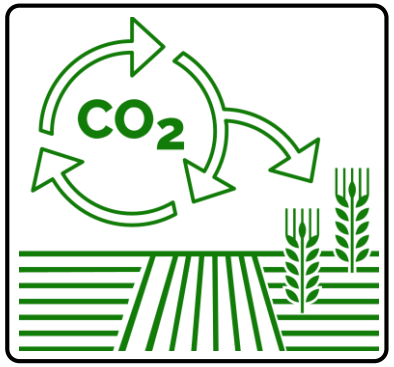


Linking process chains



Gas upgrading and synthesis

High value products from residues




Negative emissions

**Lab-, pilot- and demonstration-scale infrastructure** for **experimental de-risking** to enable **industrial implementation**

# Agenda

- BEST
- **Syngas Platform Vienna**
- Full chain demonstration within BioTheRoS

# SYNGAS PLATFORM VIENNA

A **research hub** featuring a Waste2Value process chain: 1 MW **DFB gasification +** 250 kW **Fischer-Tropsch** synthesis demo

A connected **laboratory** supplied **with real syngas** for gas cleaning and upgrading

# Syngas Platform Vienna


DFB Gasification demo

Industrial site of

WIEN ENERGIE


Fischer-Tropsch

Fischer-Tropsch pilot

Aqueous phase reforming

Temperature swing adsorption

Feedstock containers


Analytics lab

# Technologies
# Process Overview

**Residues** forestry, agriculture, industry and WWT

**DUAL FLUID** Gasification

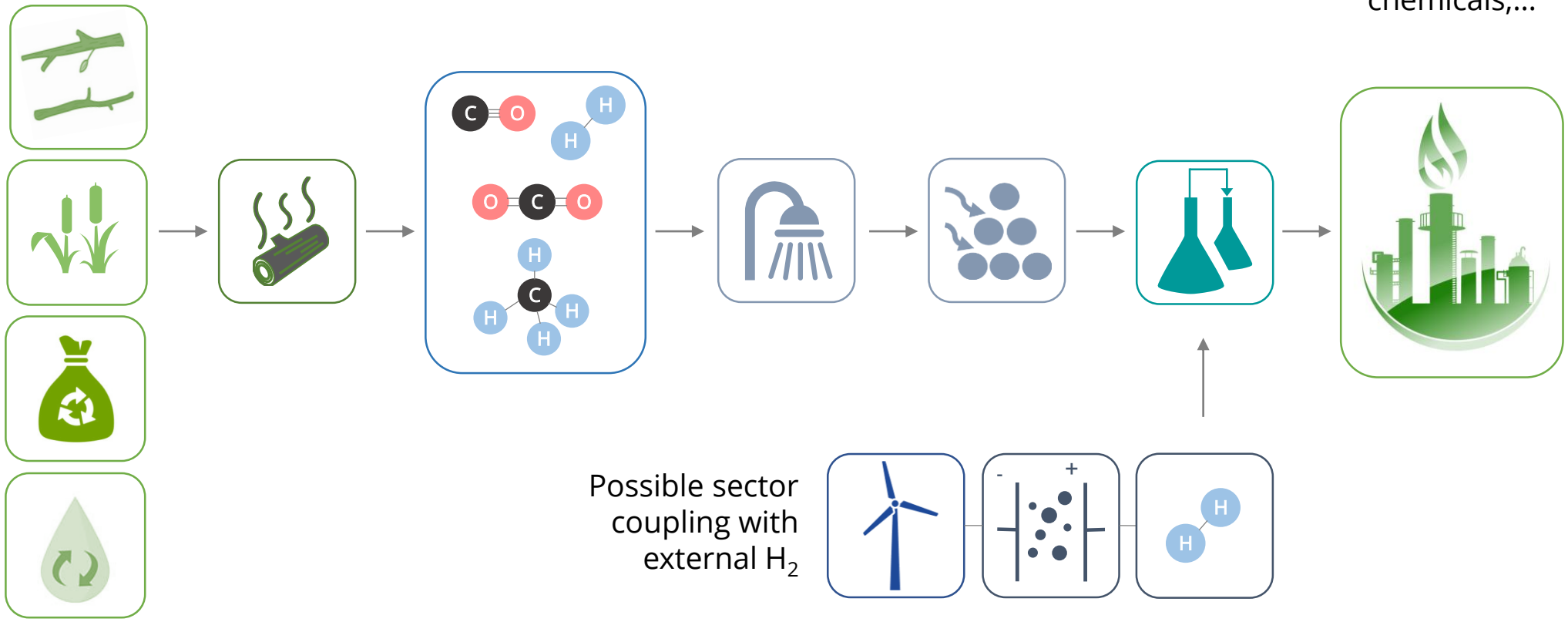
Product gas

Coarse gas cleaning

Fine gas cleaning to obtain $H_2$-rich synthesis gas

Downstream synthesis

**Sustainable (bio)refinery products** - SNG, $H_2$ transportation fuels, chemicals,...

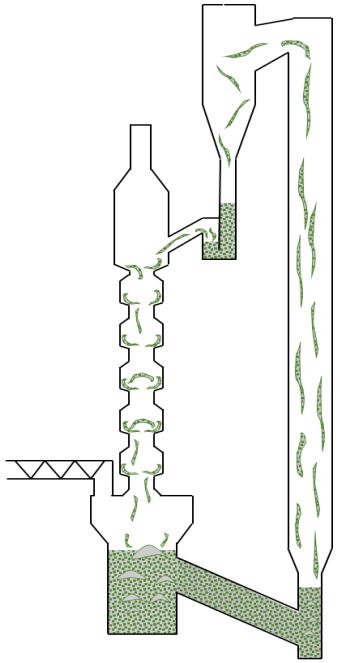



Possible sector coupling with external $H_2$

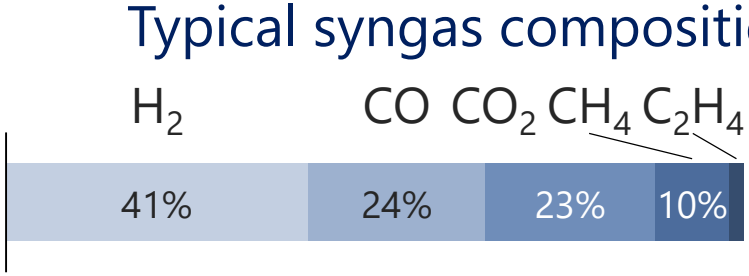
# Syngas Platform Vienna: experimental equipment

## Dual fluidized bed (DFB) gasification:

- 1 MW demonstration-scale plant for long-term campaigns of multiple weeks continuous operation
- Advanced DFB gasification (aDFB) reactor design upscaled from 100 kW



### Typical syngas composition



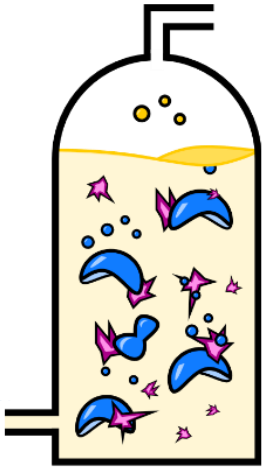

TU WIEN

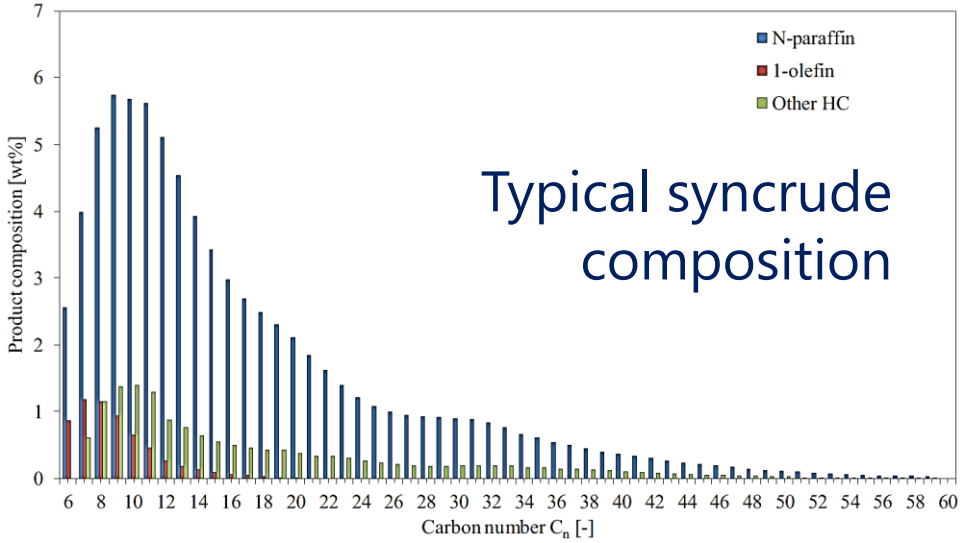
Based on a 100 kW DFB plant at TU Wien

# Syngas Platform Vienna: experimental equipment

## Slurry-Bubble-Column-Reactor (SBCR):

- 250 kW pilot-scale Fischer-Tropsch plant for long-term campaigns of multiple weeks continuous operation
- Gas cleaning includes hot filtration, a quench, solvent scrubbers, activated carbon filters and ZnO filters






Typical syncrude composition

Karlsruher Institut für Technologie

In cooperation with KIT Karlsruhe

# Agenda

- BEST
- Syngas Platform Vienna

**Full chain demonstration within BioTheRoS**

# BioTheRoS - At a glance

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale

*TECHNOLOGY DEVELOPMENT enabling SUSTAINABLE PROCESS CHAINS in INDUSTRIES*

Selection of promising feedstocks (WP2)
- Screening of pre-treatment technologies
- AI cost effectiveness models

Pyrolysis value chain

Gasification value chain

Pilot experimental validation pyrolysis based advanced biofuels production (WP3)

Pilot experimental validation gasification based advanced biofuels production (WP4)

Pilot experimental validation CCU from off gases (T3.1 & 4.2)

Value chain improvement
- Carbon capture (and storage or utilisation) (T4.3, T6.3)
- Renewable hydrogen use (T6.3)
- Synergies of blending pyrolysis and gasification based biofuels (T3.5)

Sustainable scale-up (WP5)
- LCA framework development
- Multicriteria analysis
- Rules for scale-up modelling and holistic assessment

Market dynamics & business modelling (WP6)
- Policy framework & interlinked market potentials
- Techno-economic assessment
- Business modelling for scale-up and global rollout

International cooperation (WP7)
- Synergies with EU and international projects
- Cooperation with international networks
- Network for knowledge sharing

Coordination (WP1)

Dissemination (WP 8)

**Scope BEST**

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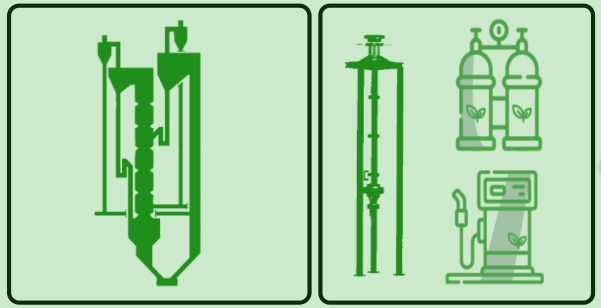

**Dual fluidized bed (DFB) processes**

**Gas upgrading and synthesis**

**High value products from residues**

**Lab-, pilot- and demonstration-scale infrastructure** for **experimental de-risking** to enable **industrial implementation**

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Coordinator
CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

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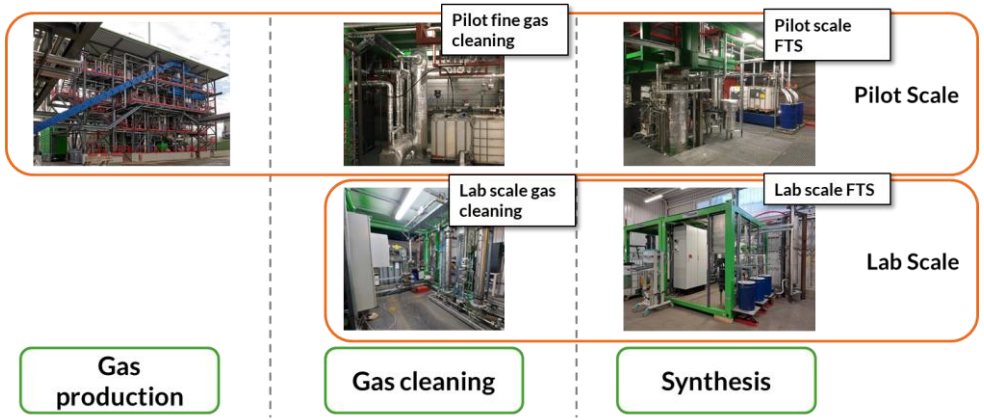
WIP RENEWABLE ENERGIES

MOTOR OIL

# BioTheRoS - Gasification value chain

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale




## Main activities

- **Gasification of biogenic waste feedstock**
- **Screening on gas impurities and gas cleaning strategies**
- **Operation of full process chain and production of FT raw product**

FT raw product

Syngas Platform Vienna

Information

## Main activities

- **Hydrocracking of FT raw product**
- **Integration of carbon capture technology into thermochemical processes**
- **Simulation and modelling for scale-up of gasification process**

Coordinator

# BioTheRoS - Gasification value chain

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale

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Wood chips

Forestry residue

Gasifier

Fine gas cleaning

FT-synthesis

**Full Gasification value chain operation**

**Gas production**

**Gas cleaning**

**Synthesis**

FT raw product

**Full chain demonstration successfully accomplished!**

Coordinator

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# BioTheRoS - Summary

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale

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## Aim:

*Investigation of biogenic waste feedstocks for gasification value chain for the production of advanced biofuels*

## Work:

- **Full process chain demonstration using biogenic waste feedstock at the Syngas Platform Vienna**
  1. Investigation on gas cleaning strategies and characterization of gas impurities
  2. Production of FT raw products
  3. Production of SAF from FT raw products

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# BioTheRoS - Summary

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## Outcome:

- Approved usage of waste feedstock to improve economics
- Operational knowledge on the usage of biogenic waste feedstocks (e.g. feedstock supply,..)
- Knowledge on increased impurities amount on gas cleaning
- Investigations on the further scale-up
- Valuable input for TEA and LCA

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# Thank you!

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Syngas Platform Vienna

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https://www.biotheros.eu/de/startseite/

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