



#reversepowerplant



BHKW des Jahres 2021

Negative Emissions through staged gasification from SynCraft – an evaluation



**IEA Bioenergy Task 33 Workshop and Site visit
Workshop "Valuable (by-)products of gasification"**

Date: 19.10.2022

Location: Living Hotel Kaiser Franz Joseph Vienna and online

COMPANY.



Founded in **2009** as an **MCI** university spin-off

Multiple **award-winning** and patented **technology**

Turnover now amounts to a good **20 million**

More than **40 employees** now form

#TeamSynCraft that's common goal is

to together **stabilize the climate.**



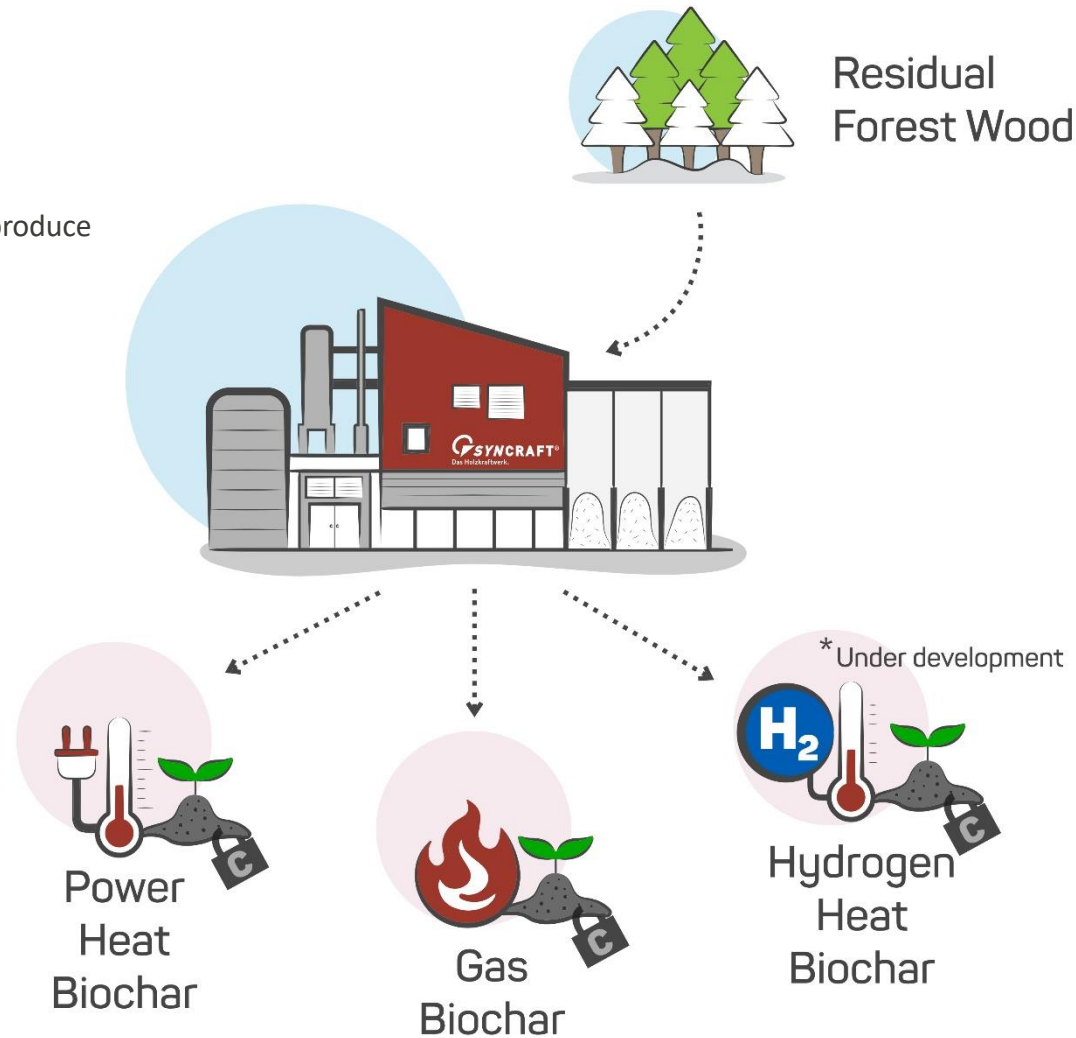
Energy Globe



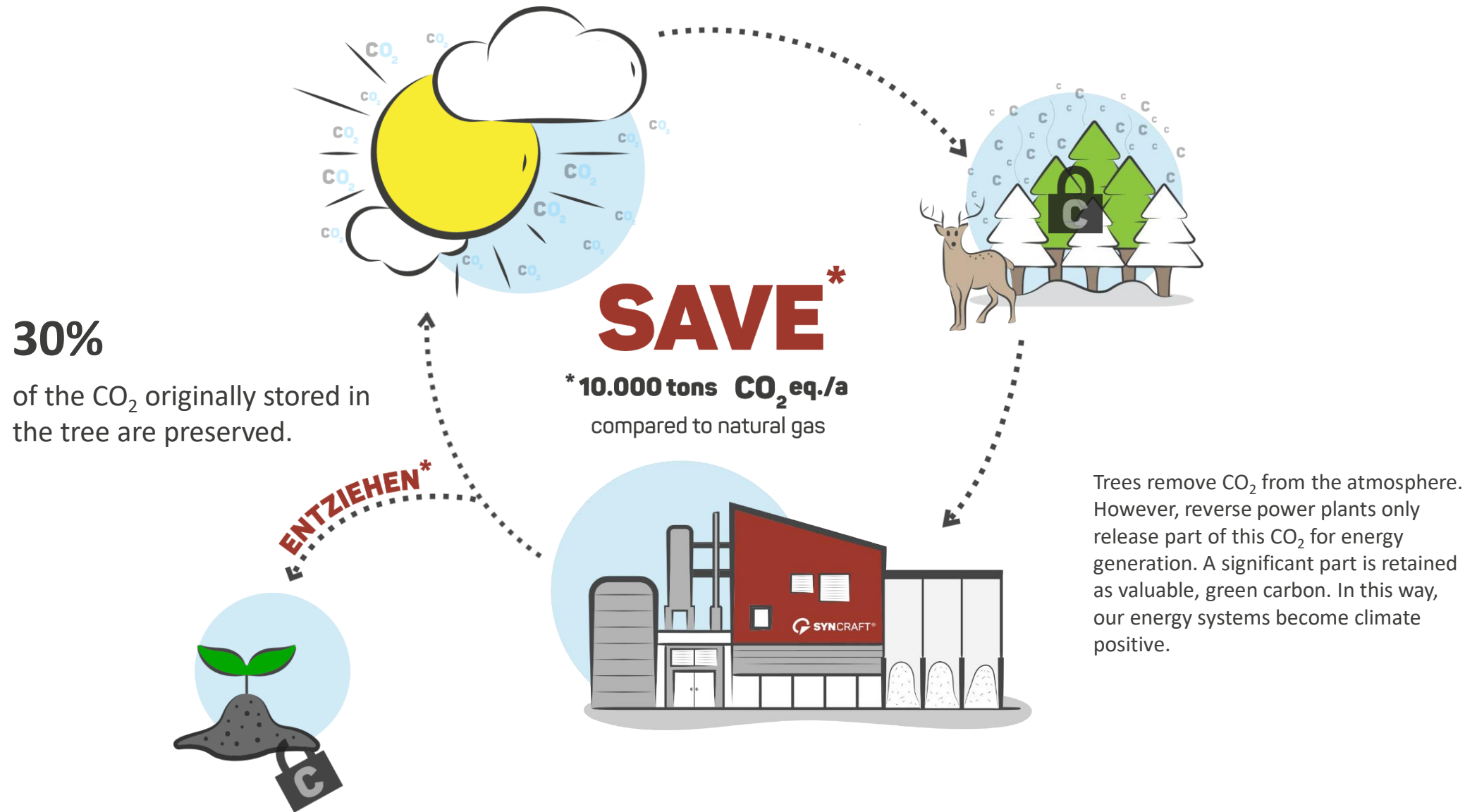
Trigos

CLIMATE POSITIVE ENERGY SYSTEMS.

From forest residues our systems produce a wide range of sustainable energy products and energy services.



CLIMATE POSITIVE CIRCLE.



CARBON SINK ECOSYSTEM.

From the cradle to the sink.

Our carbon sink ecosystem is fully developed and is already providing our customers with ongoing and reliable additional income.



Certified by:
(Carbon & Sink)



Tracked by:
(via Blockchain)



Supported by:
(Association)

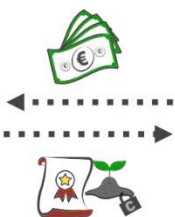


Rückwärtskraftwerk

Approved by:

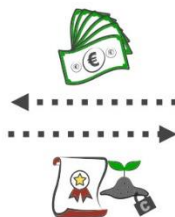


Nature based solution
#BioChar

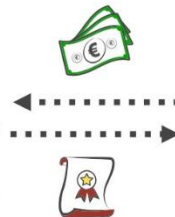


Händler/Veredler

Traded by:



Abnehmer



Zertifikatshändler

Traded by:



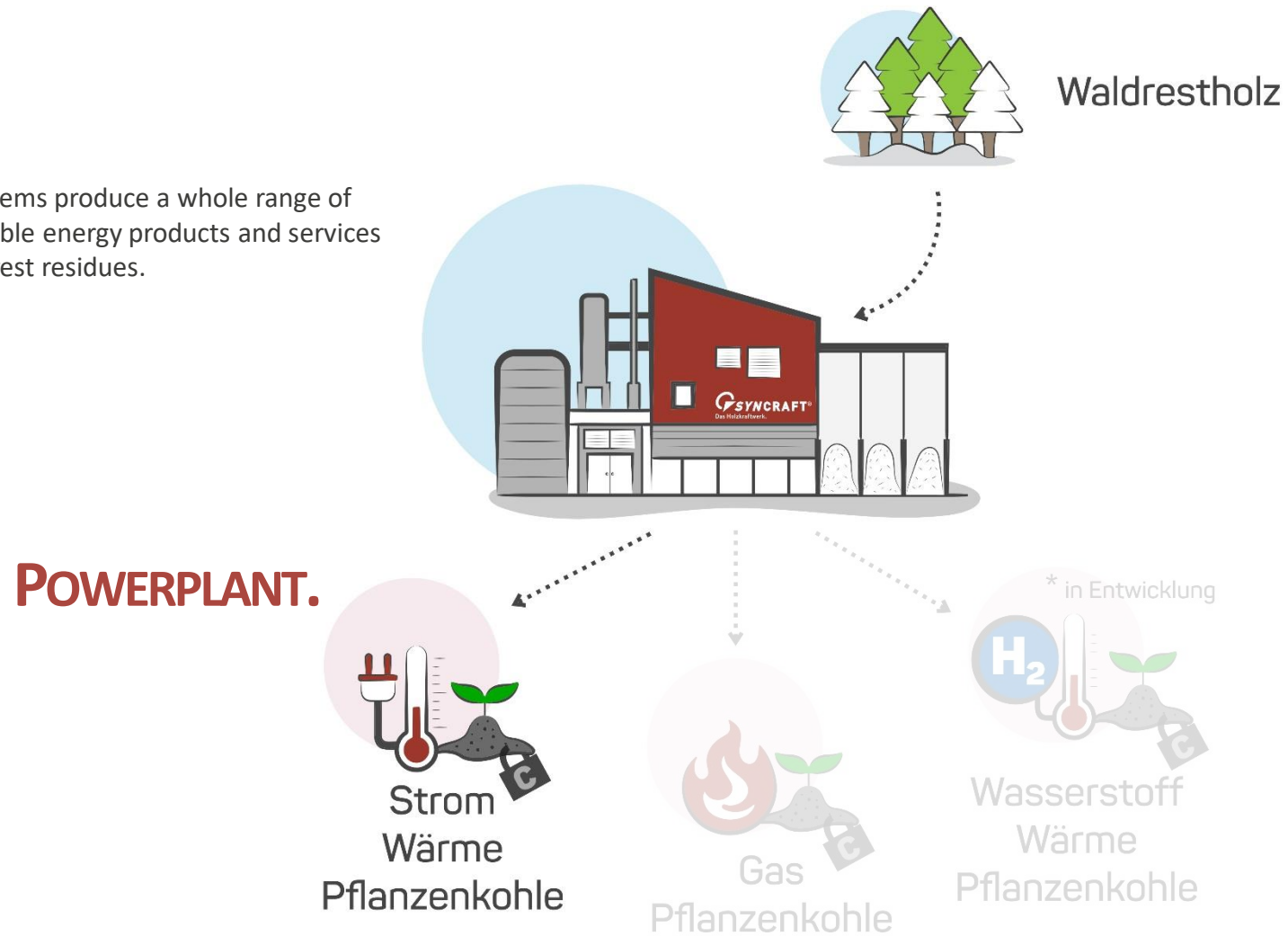
Zertifikatsnehmer

Purchased by:



CLIMATE POSITIVE ENERGY SYSTEMS.

Our systems produce a whole range of sustainable energy products and services from forest residues.



PRODUCT RANGE.



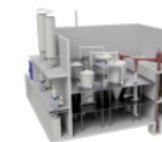
CW700-200+



CW1200-400

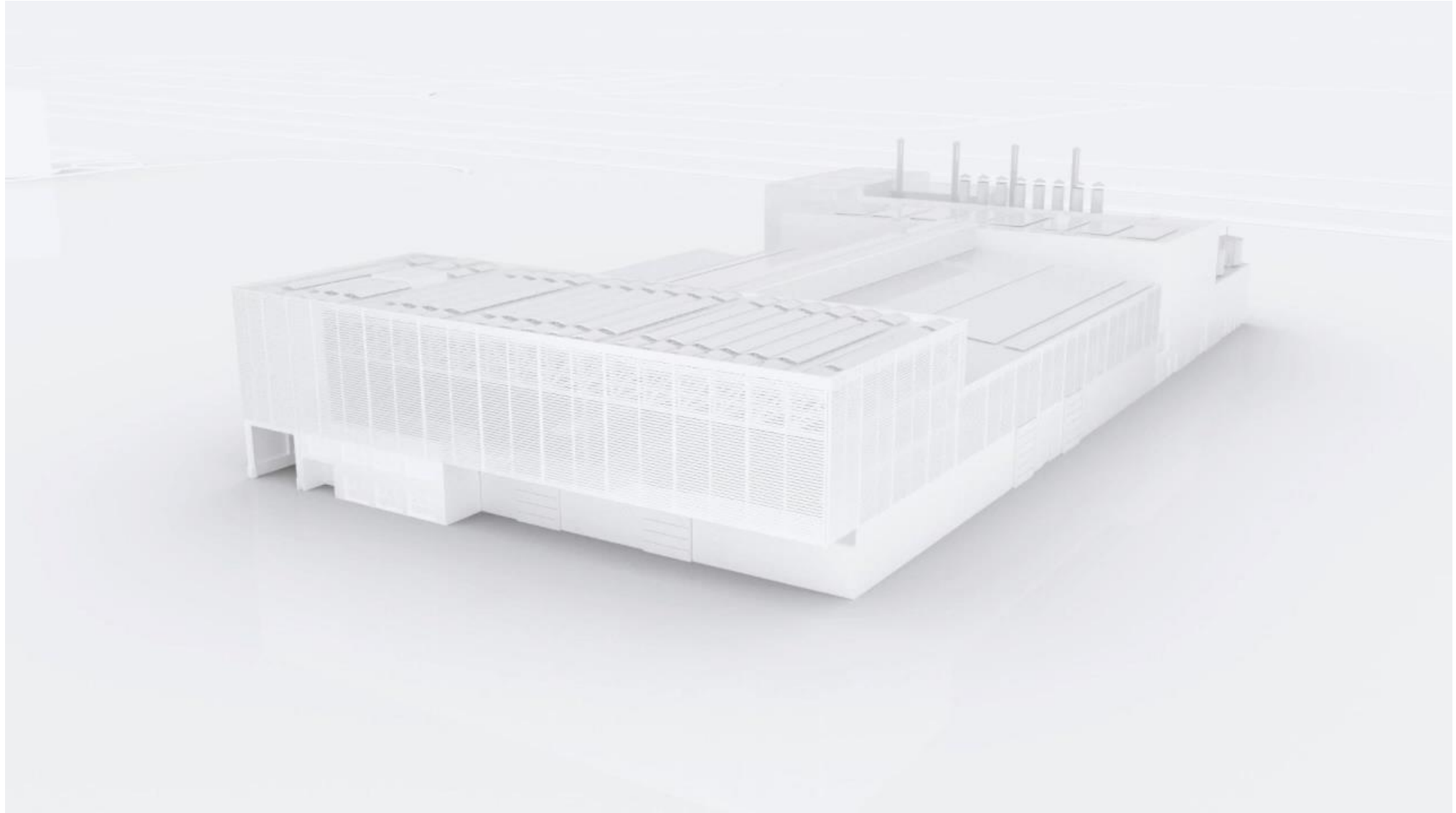


CW1800-500



CW1800x2-1000

| | | | | |
|--|------------------------|------------------------|------------------------|---------------------|
| Electrical power | 220 kW (1) | 400 kW | 500 kW | 1,000 kW |
| Thermal power 90 °C | 328 kW | 572 kW | 740 kW | 1,404 kW |
| Thermal power ~50 °C (2) | 123 kW | 227 kW | 250 kW | 500 kW |
| Fuel heat capacity | 806 kW | 1,429 kW | 1,808 kW | 3,527 kW |
| Fuel demand (dry) | 161 kg/h | 286 kg/h | 362 kg/h | 705 kg/h |
| Specific fuel demand (dry) | 0.73 kg/kWh el | 0.71 kg/kWh el | 0.72 kg/kWh el | 0.71 kg/kWh el |
| Premium charcoal | 2 m ³ /d | 3.5 m ³ /d | 4.5 m ³ /d | 9 m ³ /d |
| Space required by gas generator (3) | ca. 100 m ² | ca. 120 m ² | ca. 120 m ² | 145 m ² |
| Space required by engine (3) | ca. 55 m ² | ca. 55 m ² | ca. 55 m ² | 65 m ² |
| Space required for bunker (week's supply) | 155 m ³ | 278 m ³ | 418 m ³ | 480 m ³ |





CW1800x2-1000 x4:
Bioenergie Frauenfeld / CH

2022
4.000kW





CW1800-500:
Dornbirn / AT

2019
500kW





CW1800x2-1000:

Laas / IT

2018

1.000kW



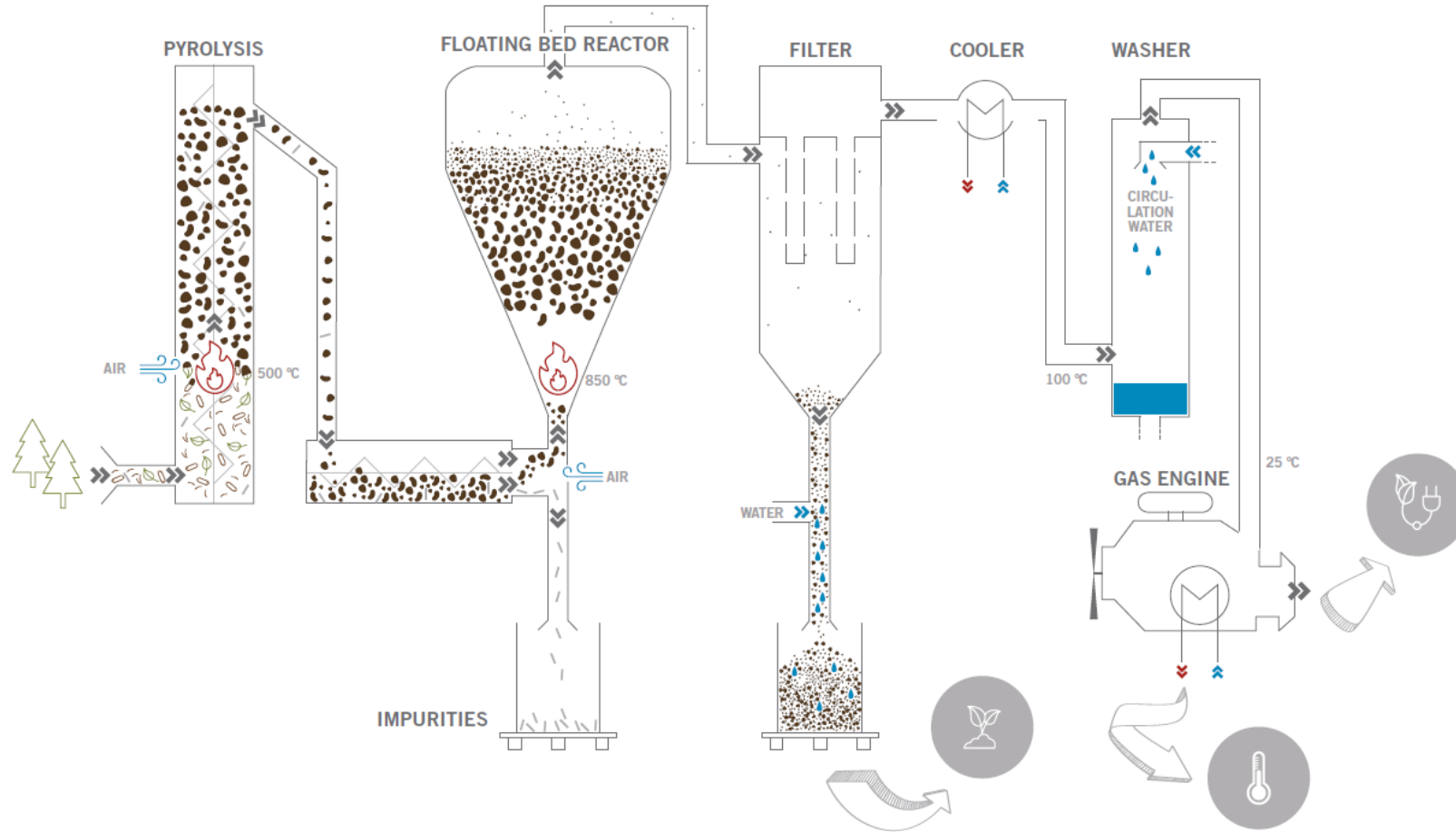


CW1800-400 x4:
Shingu / JP

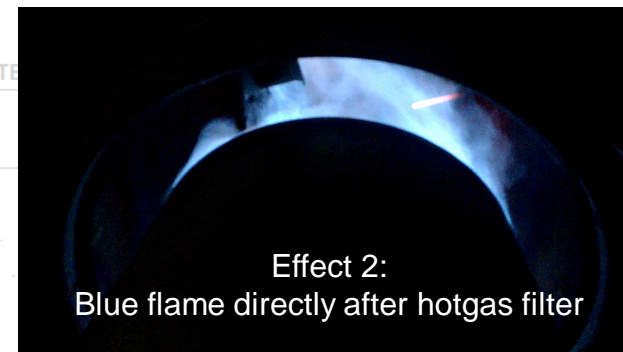
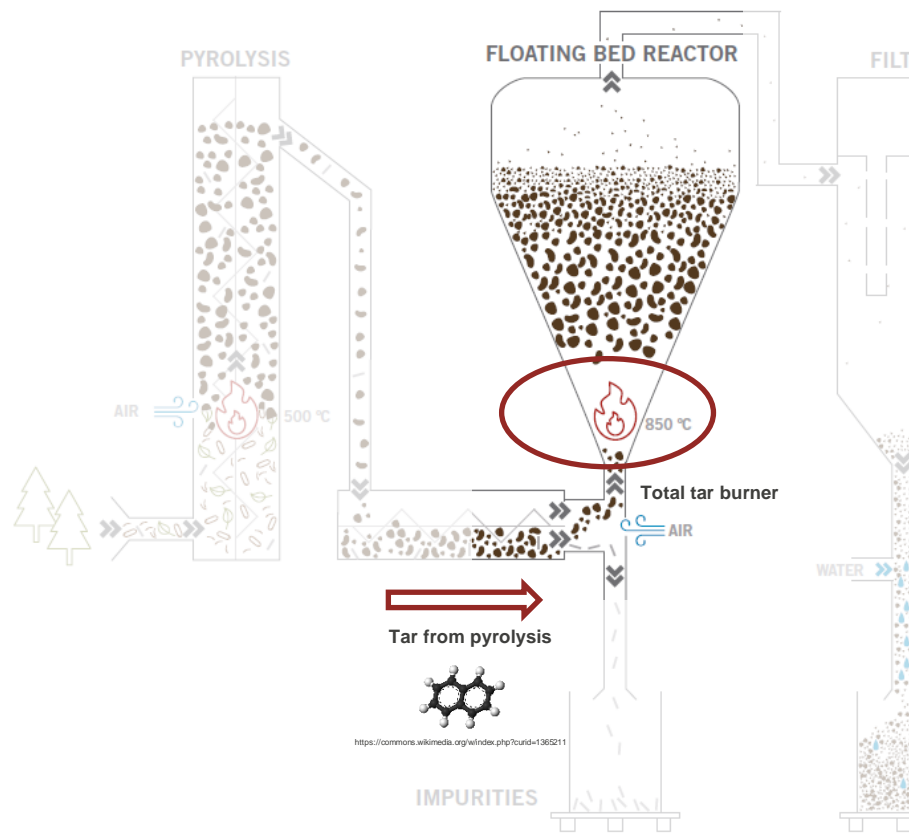
2020
1.600kW



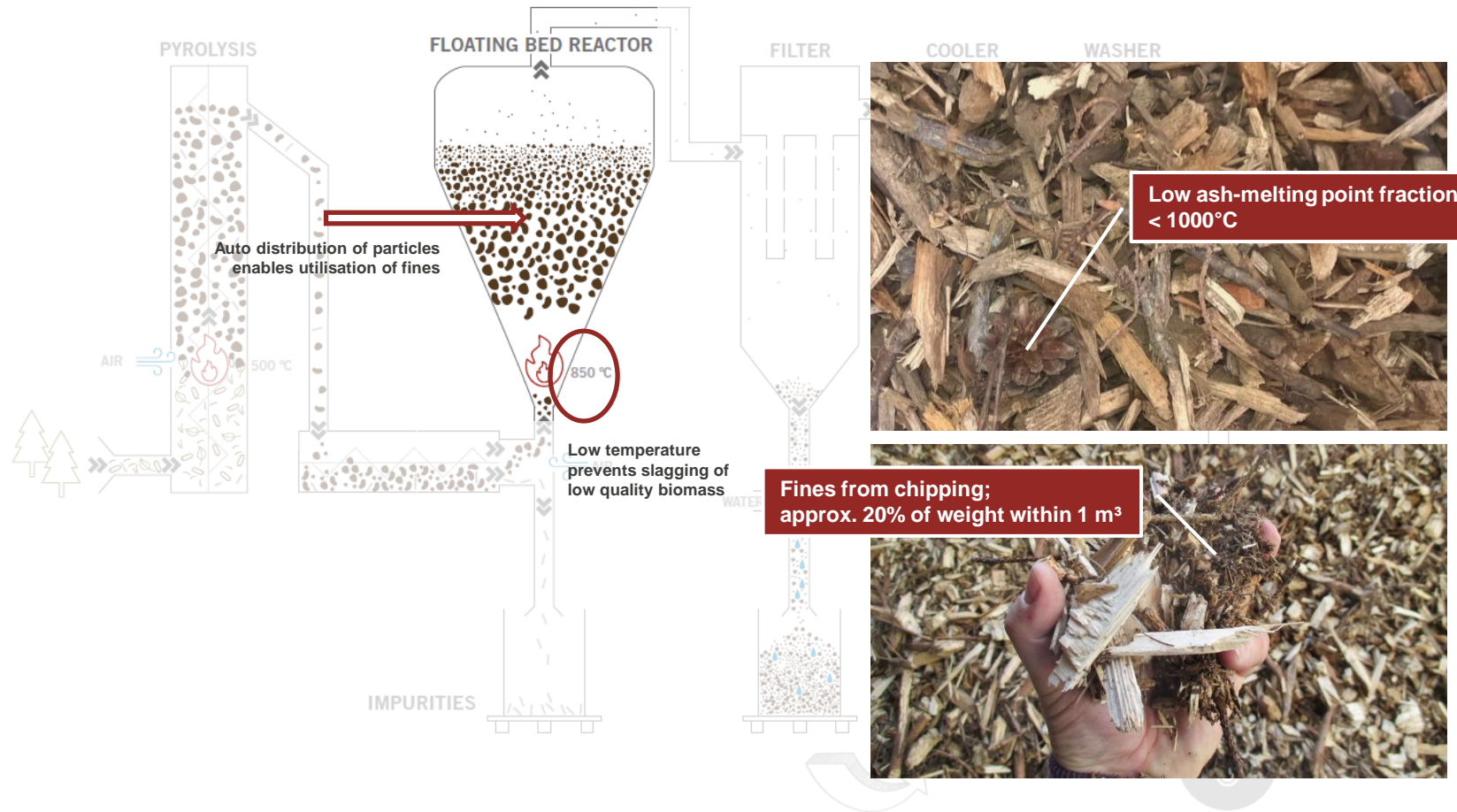
POWERPLANT.



TAR ELIMINATION.



FUEL FLEXIBILITY.



THAT'S WHAT DEFINES US!

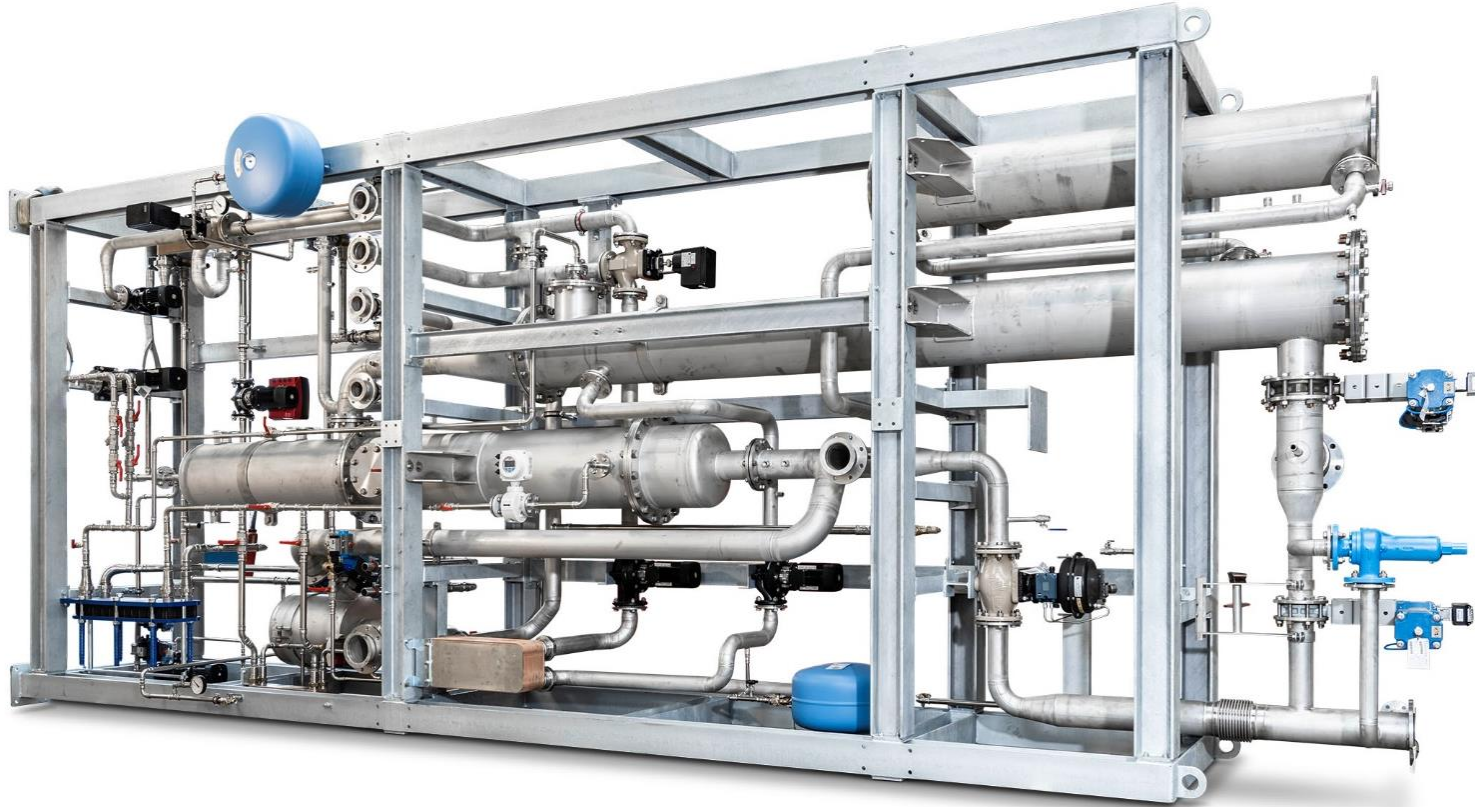
Affordable fuel

forest residue wood chips

Powerplant
Woodfire
H₂



THAT'S WHAT DEFINES US!



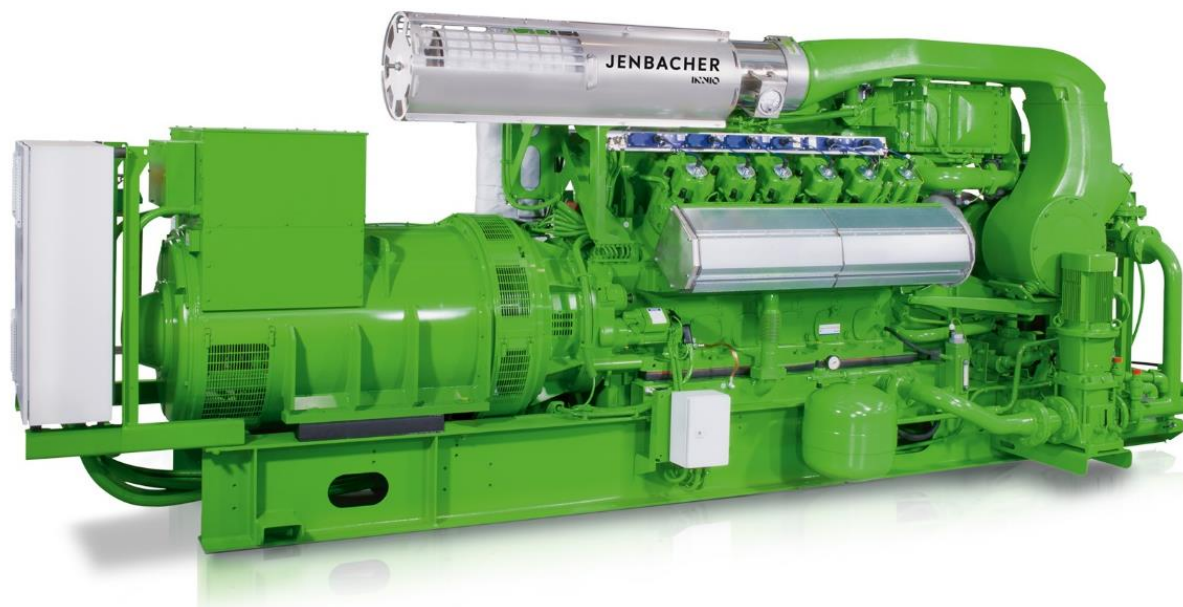
**INDUSTRIAL DESIGN
FOR MAXIMUM INTRINSIC VALUE**

THAT'S WHAT DEFINES US!

2G* engines till 400 kW




INNIO Jenbacher* engines from 400 kW



*We are recommended by the leading gas-engine manufacturers.
The engines are provided with full manufacturer warranty.


HIGHEST EFFICIENCIES
DUE TO APPLYING THE BEST WOODGAS-ENGINES

THAT'S WHAT DEFINES US!

 Pflanzen
Kohle


EnergieWerk Ilg GmbH

www.biomassehof.at
info@biomassehof.at

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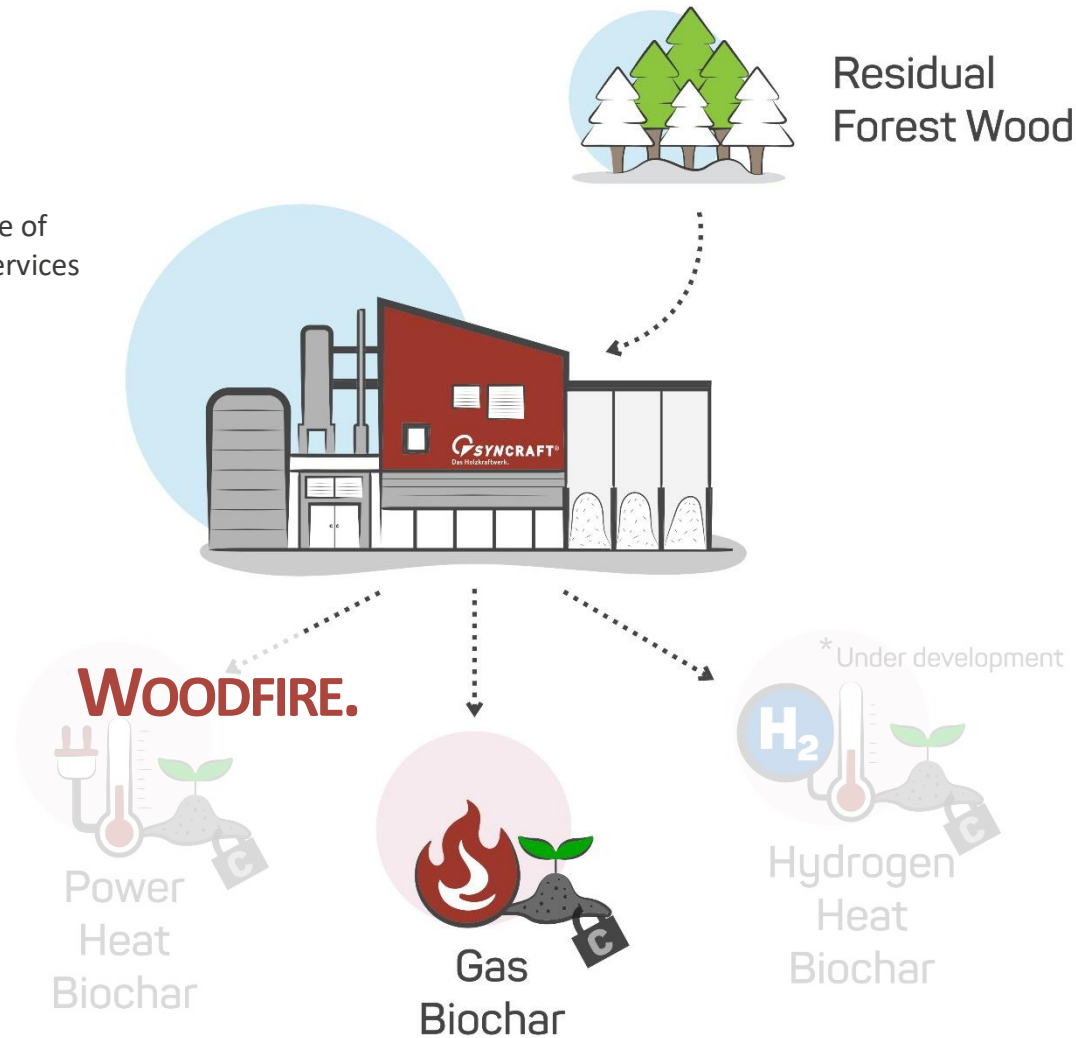
www.biomassehof.at
info@biomassehof.at

VALUABLE BIOCHAR

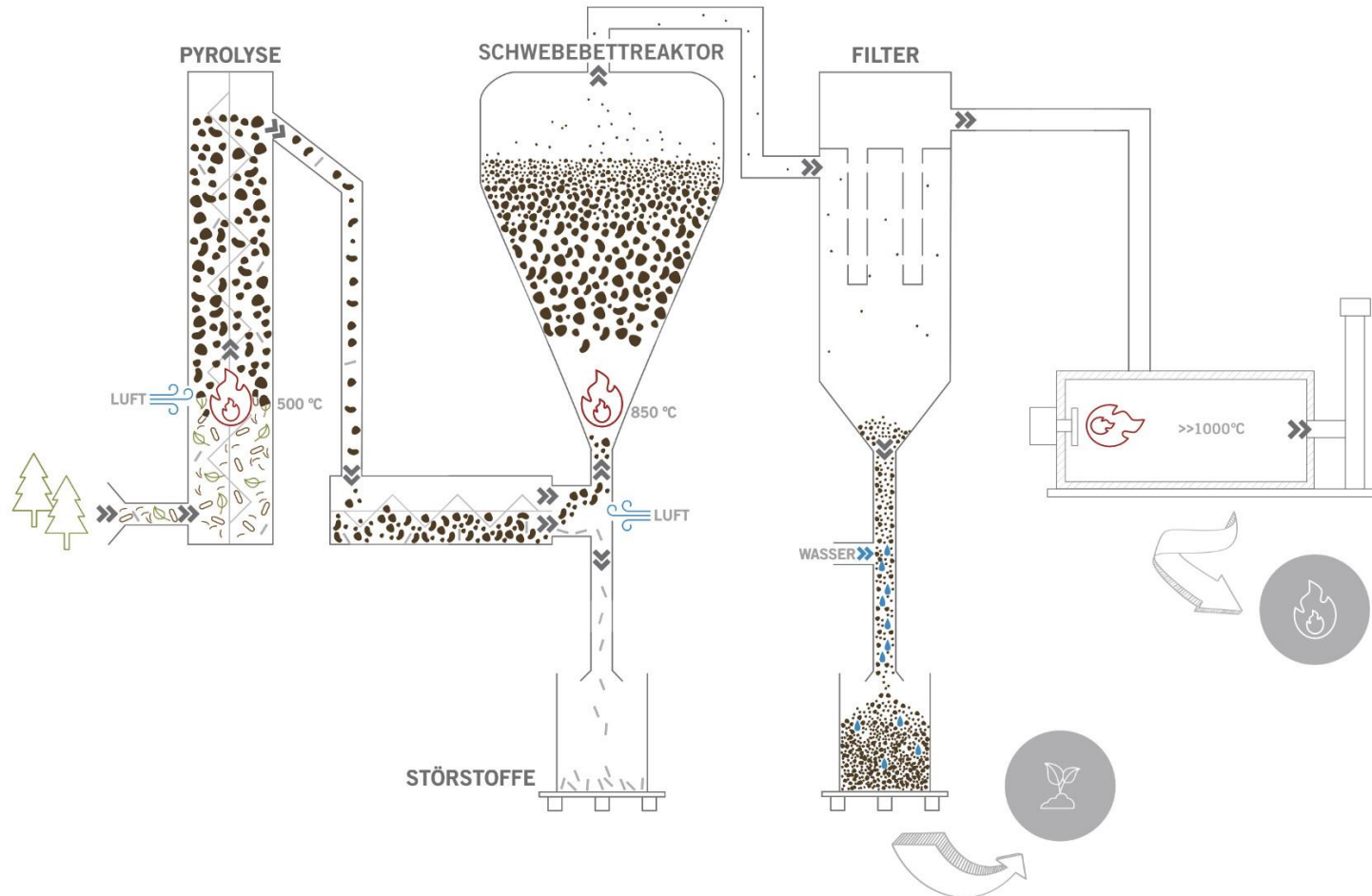
BY THE WAY

CLIMATE POSITIVE ENERGY SYSTEMS.

Our systems produce a whole range of sustainable energy products and services from forest residues.



WOODFIRE.



THAT'S WHAT DEFINES US!

Affordable fuel

waste wood

Powerplant
Woodfire
H₂



THAT'S WHAT DEFINES US!

#Green, hot Flame

clean and dust free

EVALUATION – WOODFIRE GAS COSTS.

Table 1: comparison of heat supply concepts for an industrial melting furnace with 3.5 MWth heat demand.

| | Fossil LPG* | Fossil NG | Green/blue hydrogen | FLOBU-GAS**** forest residues | FLOBU-GAS**** woody residual waste |
|--|---------------|--------------|---------------------|-------------------------------|------------------------------------|
| Heat demand | 3.5 MWth | 3.5 MWth | 3.5 MWth | 3.5 MWth | 3.5 MWth |
| Input demand | 1,930 t/a LPG | 2,020 t/a NG | 0.84 t/a | 9.1 t/a | 9.1 t/a |
| Fuel costs | 27.5 €/MWh | 23.8 €/MWh** | 60 €/MWh (2€/kg)*** | 19 €/MWh (80€/t) | 4,5 €/MWh (20€/t) |
| Fossil CO2-emission | 5,770 t/a | 5,500 t/a | 0 t/a | 0 t/a | 0 t/a |
| Plant costs***** | 250,000 €/a | 60,000 €/a | 60,000 €/a | 450,000 €/a | 450,000 €/a |
| CO2-costs @50€/t (CO2-tax) | 288,000 €/a | 277,000 €/a | 0 €/a | 0 €/a | 0 €/a |
| Heat supply costs (fuel cost+COP+ CO2-costs) | 46 €/MWh | 36 €/MWh | 62 €/MWh | 41 €/MWh | 23 €/MWh |

*) calculation based on existing plant of project partner

**) statistic Austria, 2020: mean value for industrial applications

***) not state-of-the-art, target value 2030, compare [ISBN: 978-92-9260-151-5

Citation: IRENA (2019), Hydrogen: A renewable energy perspective, International Renewable Energy

Agency,

Abu Dhabi]

****) assumptions: cold gas efficiency of gasification 72%

*****) for LPG, NG and hydrogen only OPEX, for FLOBU INVEST/20 years and OPEX



CW1200-400:

Ternitz / AT

2020

400kW

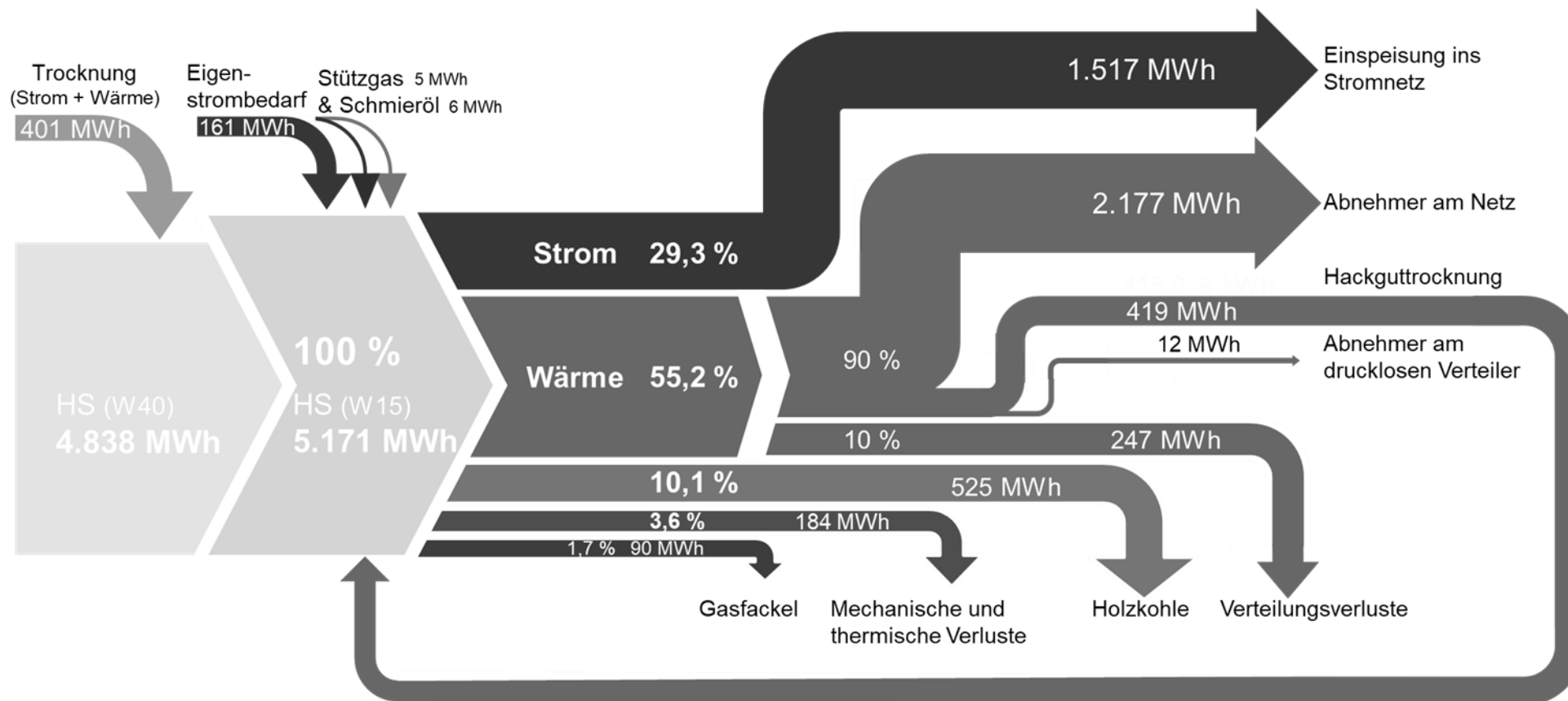


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EVALUATION – KEY FIGURES.

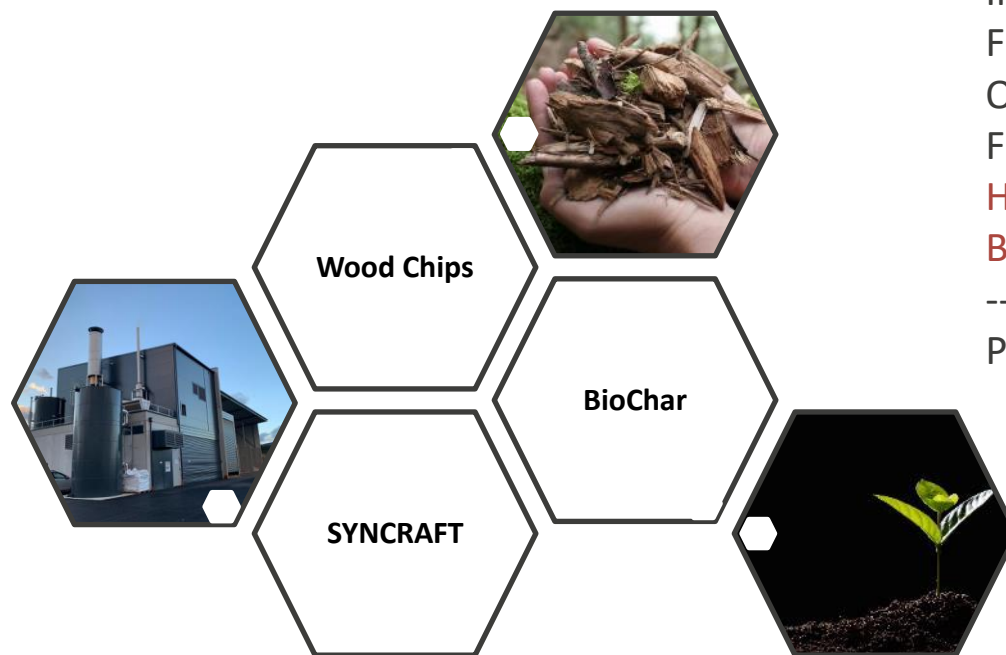
- **Invest:** ~3.5 Mio. € (all in)
- **Building time:** 9 month (during Covid-19)
- **Power 400kW:** sold to grid FIT; Ökostromtarif
- **Heat 600kW:** Baseload for district heating; 95 / 65°C
- **Operating hours: 2021:** 8.333h (95,1%)
- **Total operating hours:** 14.600h (in 21 Monaten)
- **Overall efficiency:** 93,1% incl. BioChar
- **Area:** ~500 m² (1000 m² incl. Storage and dryer)
- **BioChar usage:** BBQ

EVALUATION - TYPICAL PROCESS FLOW DIAGRAM.



Source: Käßler et al; 2016; [PowerPoint-Präsentation \(syncraft.at\)](https://www.syncraft.at)

EVALUATION — ECONOMICS.



| | |
|---------------|----------------|
| Investment | + 6 cent/kWh |
| Financing | + 1 cent/kWh |
| O&M | + 3 cent/kWh |
| Fuel | + 7 cent/kWh |
| Heat yield | - 6 cent/kWh |
| BioChar yield | - 1 cent/kWh |
| ----- | |
| Power costs | + 10 cent/kWh* |

* Based on plant type CW 1200-400 incl. infrastructure, 7,500h per year, 90 €/t fuel, 4 cent/kWh heat yield; Revenue from charcoal 200 €/t

NUMBERS & FACTS

31

Energiesysteme weltweit



11,45 MW

elek. bisher realisiert



90,2%

Anlagenverfügbarkeit



341.808

Betriebsstunden





**LET'S WORK
TOGETHER**

office@syncraft.at

