



Pilot Testing of Chemical Looping Gasification for Biofuel Production

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Chemical Looping Webinar
26 January 2026

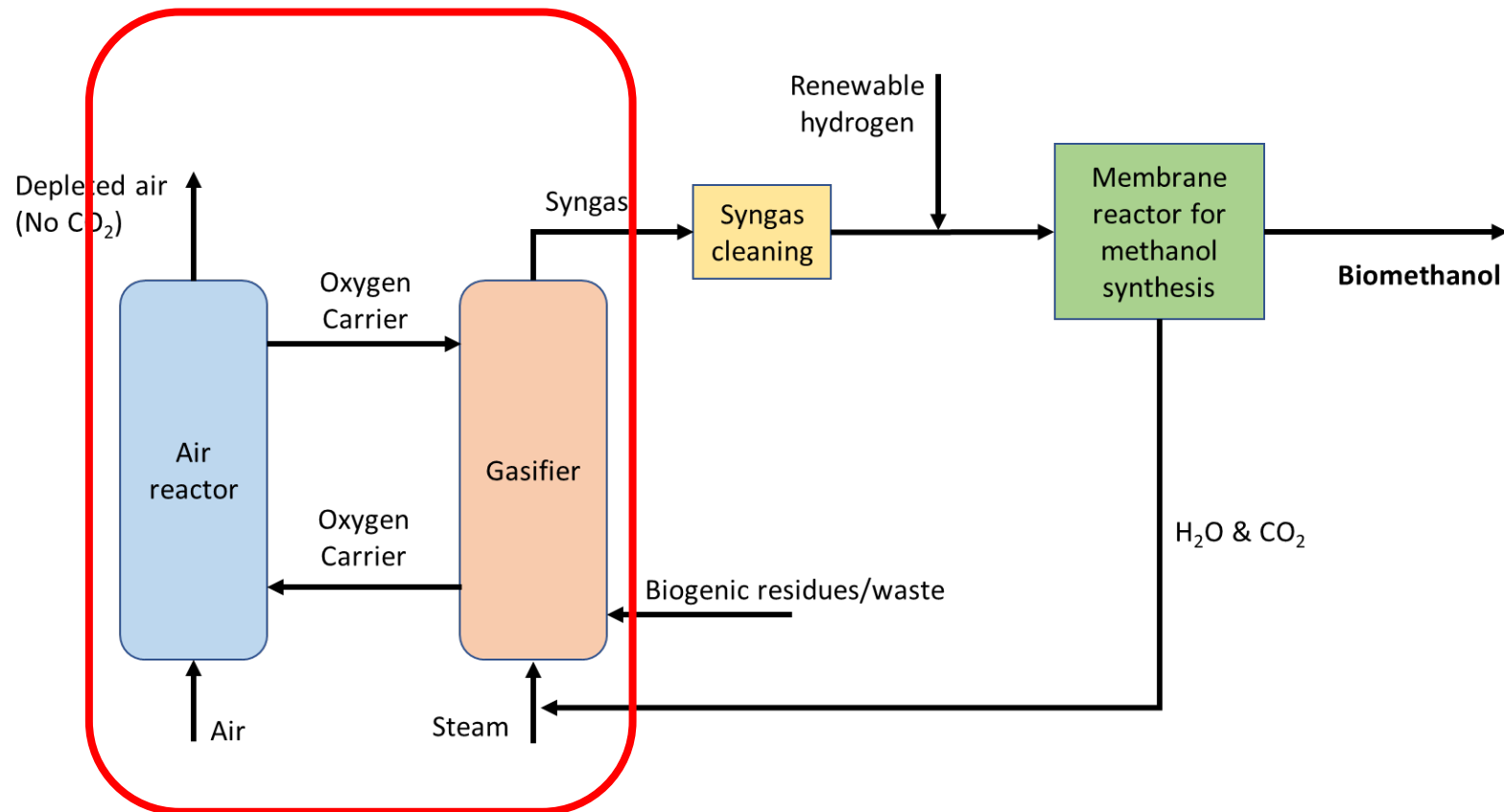


Outline

- Gasification process
- Previous pilot tests
- New results from Bio-MeGaFuel project
- Outlook on planned pilot tests

Gasification

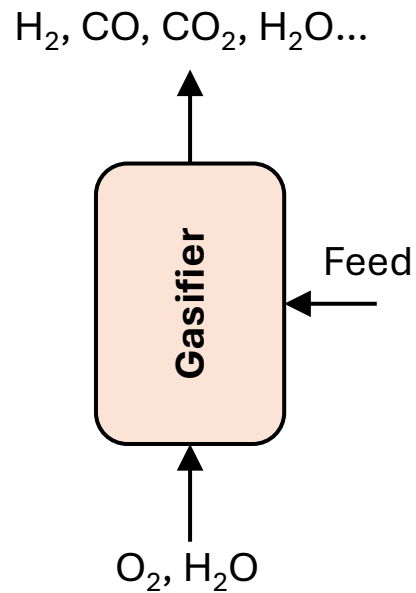
to convert **low-value biogenic residues** and waste to a **N₂-free syngas (H₂ + CO)**



CLG

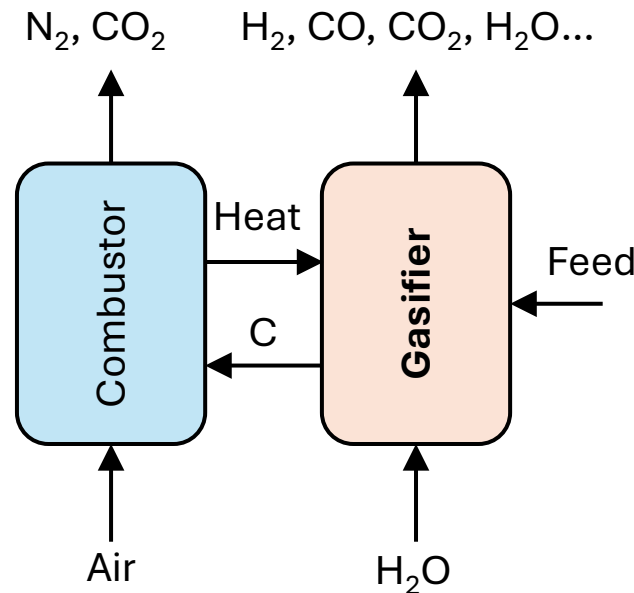
Gasification technologies

Oxy-Gasification



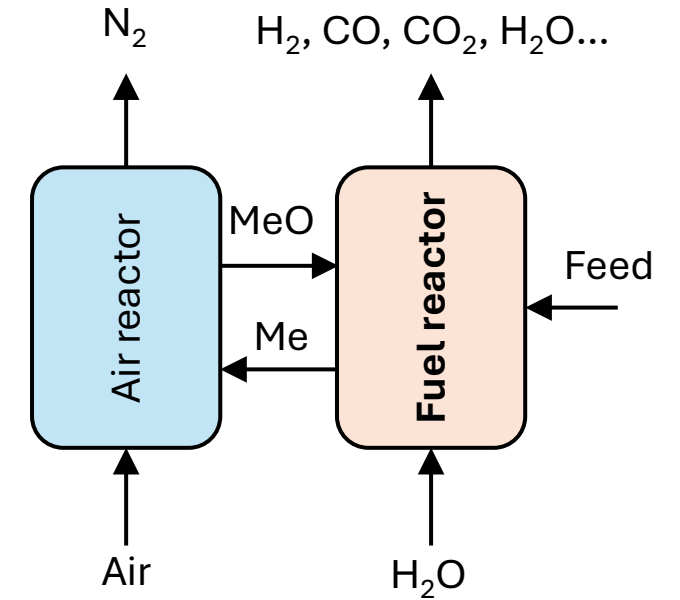
- Air separation needed
- + All carbon is syngas

Indirect gasification



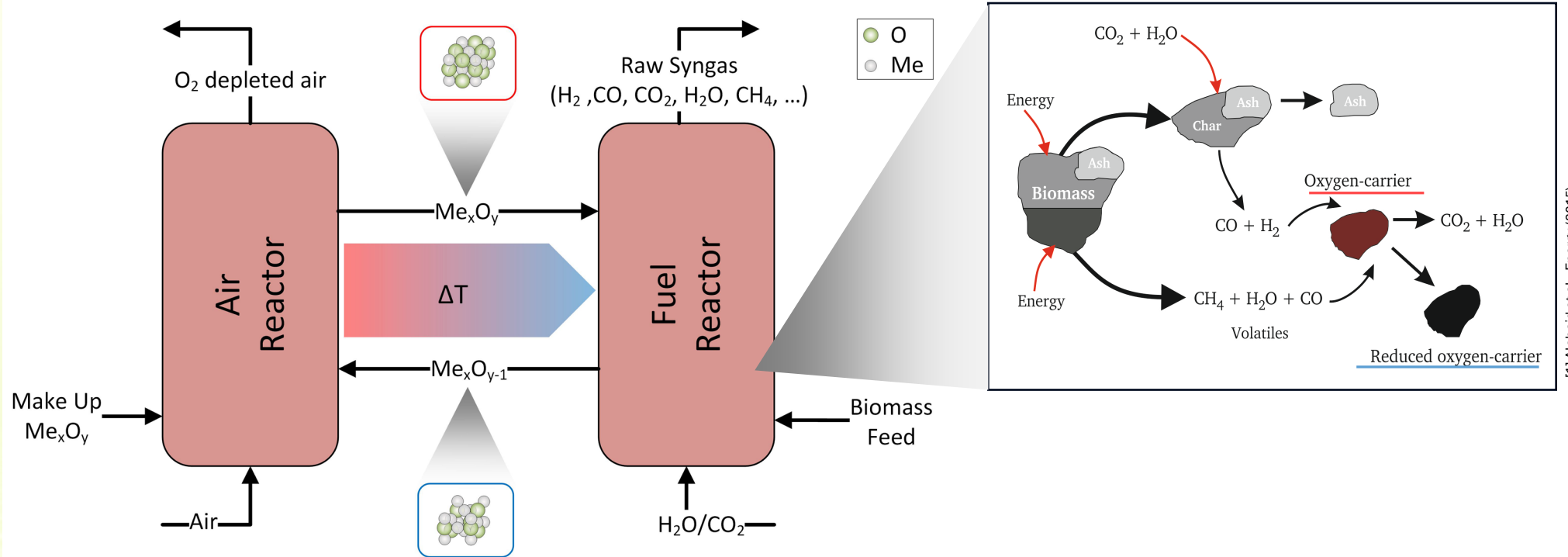
- + Air separation not needed
- Carbon in off-gas

Chemical looping gasification



- + Air separation not needed
- + All carbon in syngas

Chemical looping gasification

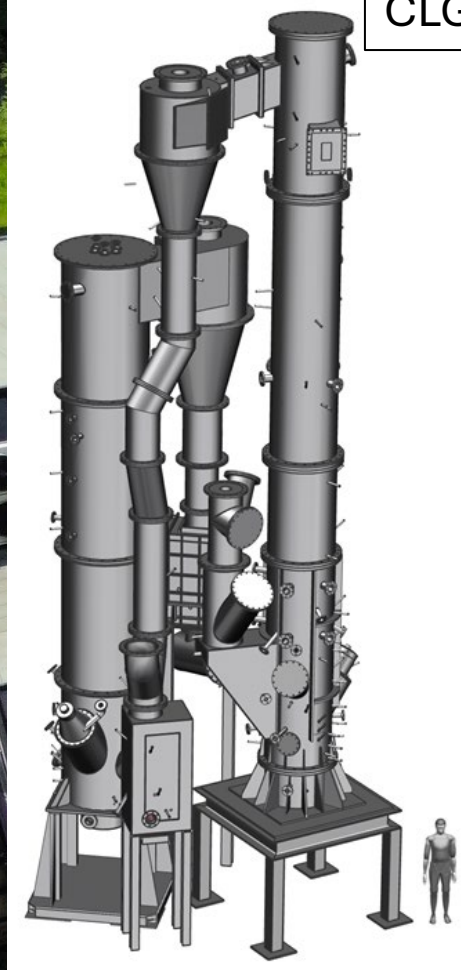


Challenge: Limit oxygen transport to achieve high H_2+CO yield, while maintaining high heat transfer to sustain endothermic gasification

Process

Previous tests

1 MW_{th} chemical looping pilot plant



CLG pilot plant



Syngas cleaning plant

Synthesis reactor

1 MW_{th} CLG pilot tests



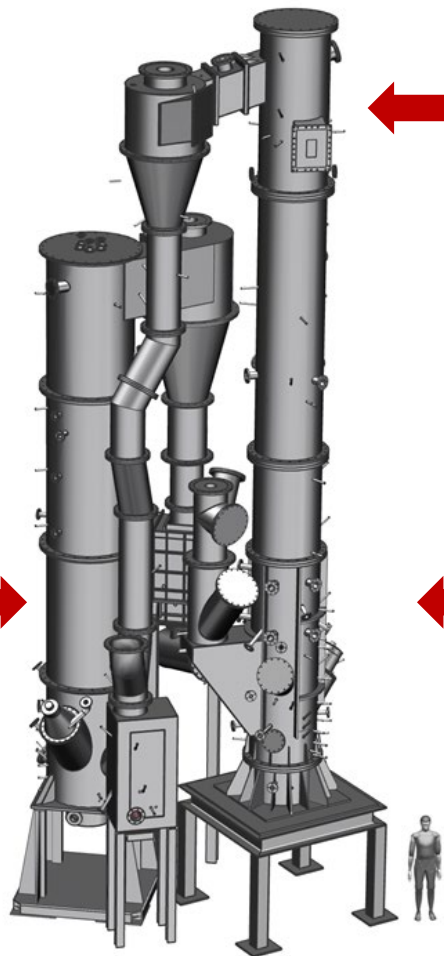
Industrial Wood Pellets

Pine Forest Residue

Wheat Straw



Ilmenite



- 40 days 24/7 testing (in 2022)
- >400 h CLG operation

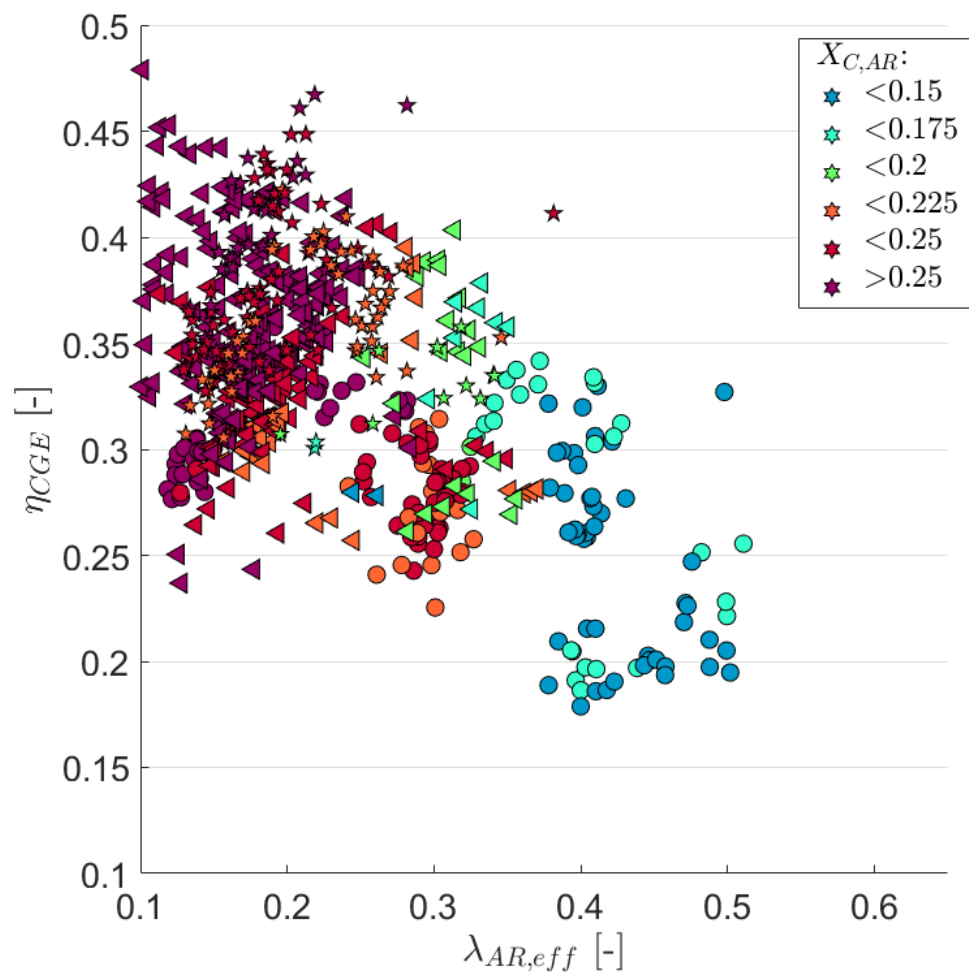


SRF Pellets



- 7 days 24/7 testing (in 2024)
- Interrupted operation

Cold gas efficiency

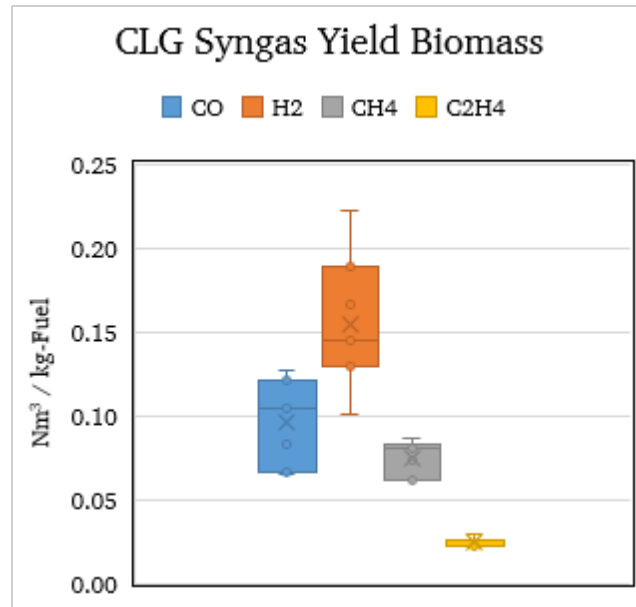


Pine Forest
Residue



$$\frac{\text{Energy in H}_2, \text{CO}, \text{CH}_4}{\text{Energy in feedstock}}$$

Syngas Yield

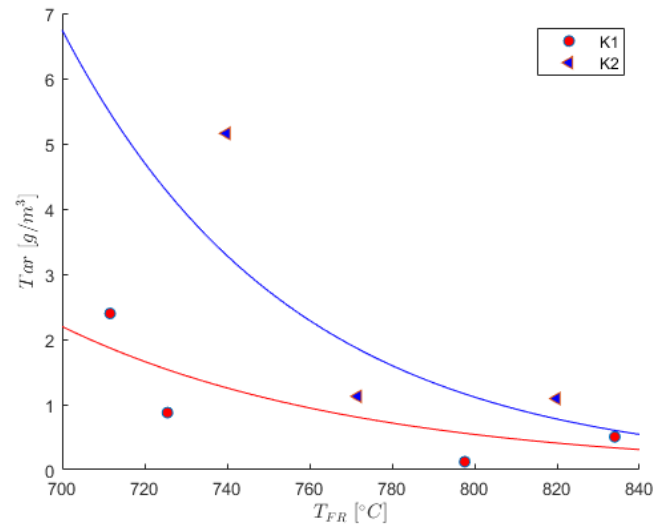


Pine Forest
Residue

Lara

Hydrocarbons

Tars



Pine Forest
Residue



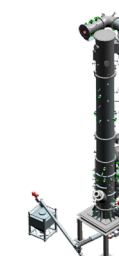
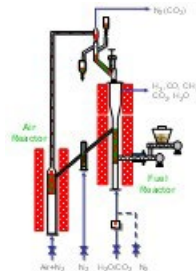
Feedstock selection

1.5 kW CLG CSIC

20 kW CLG CSIC

1 MW CLG TUDA

HTW[®] TUDA



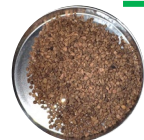
Biogenic waste

Waste Wood Type B



Agricultural residues

Olive pits



Buckwheat pellets



Forestry residues

Spruce tree tops and branches








Algae

Microalgae

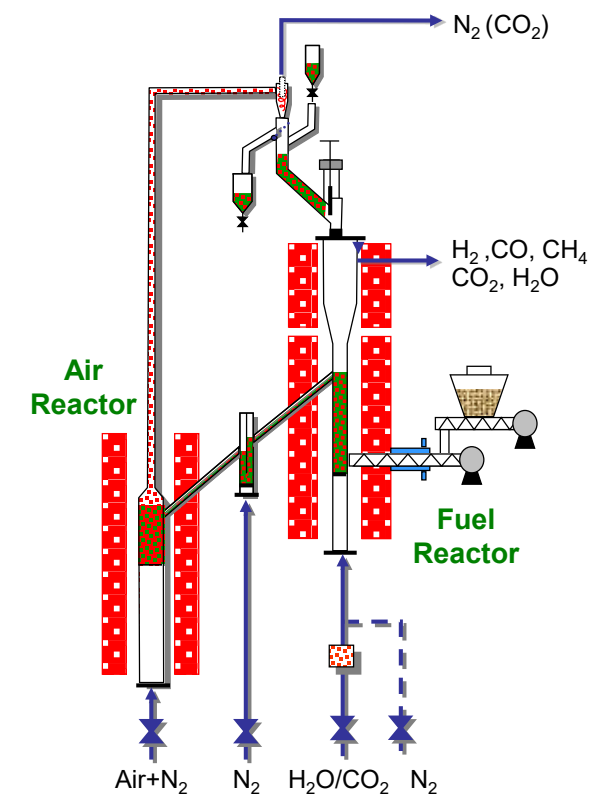
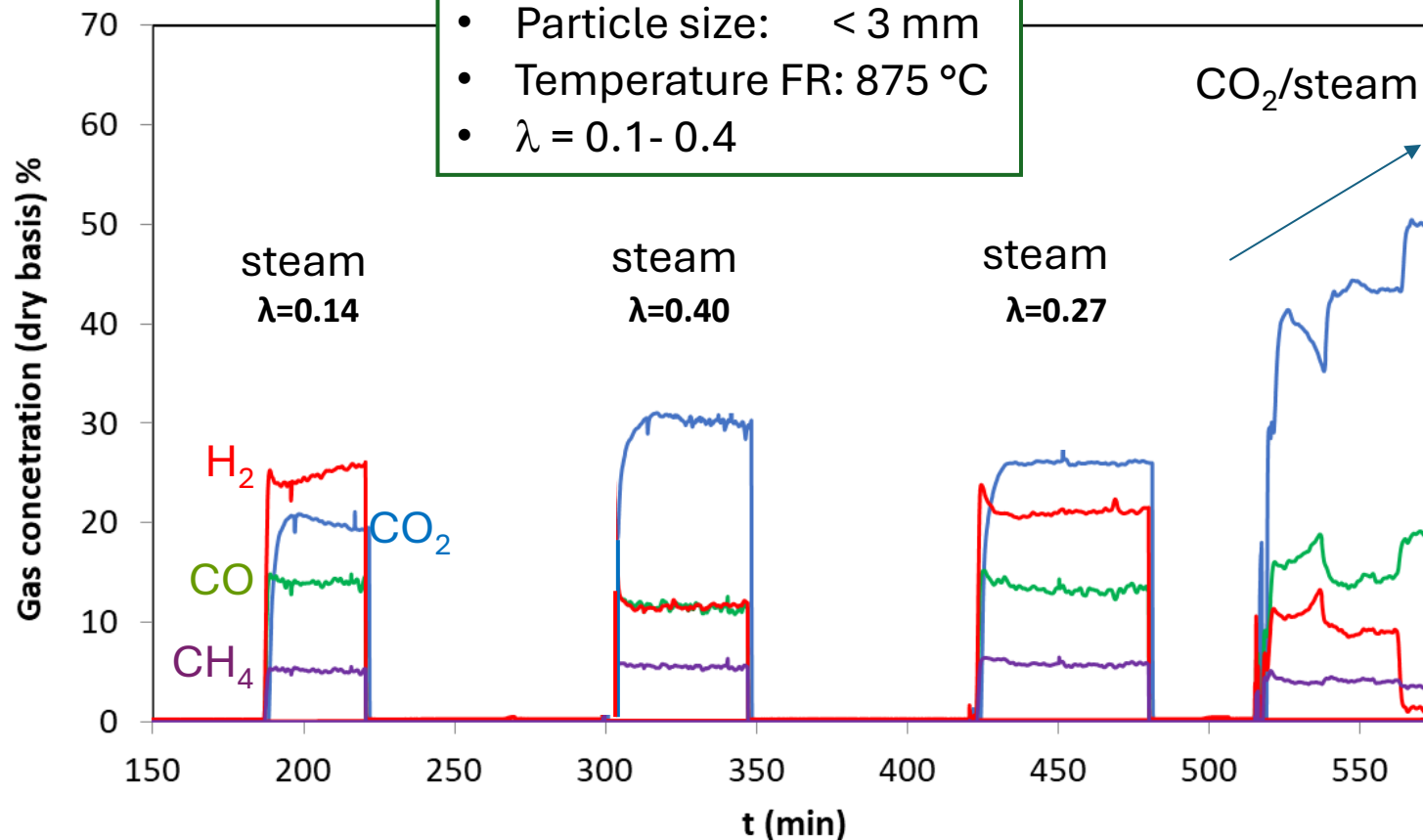


Feedstock analysis

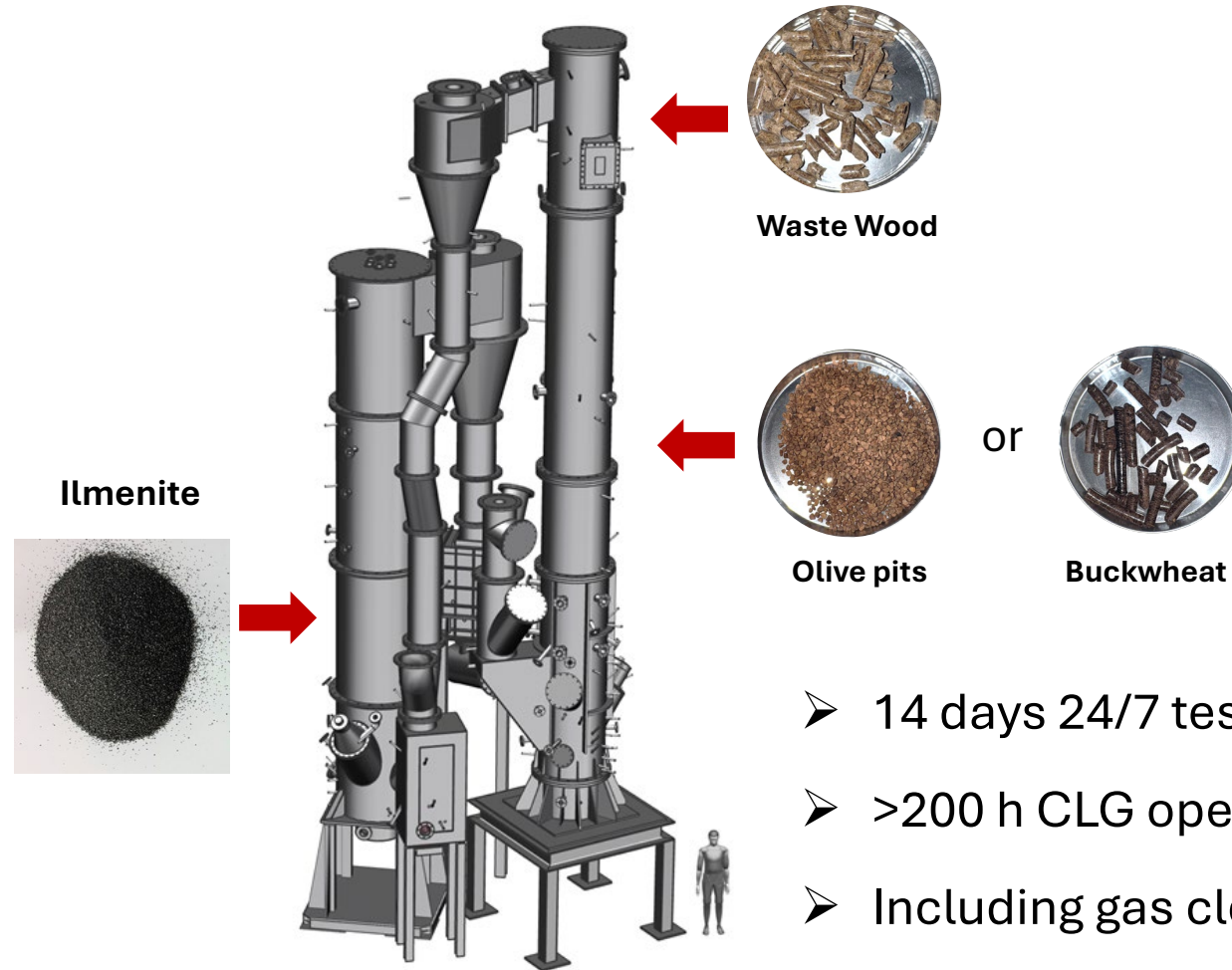
					
ANALYSIS (wt.%)	Waste Wood Type B	Olive pits	Buckwheat pellets	Spruce branches	Microalgae
Moisture	6.8	7.3	9.7	8.0	7.9
Ash	1.7	0.3	2.0	2.5	6.3
Volatiles	74.2	74.9	66.4	72.1	72.9
Fixed carbon	17.3	17.4	21.8	17.5	12.8
C	46.3	46.3	45.0	46.7	44.1
H	5.5	5.5	5.2	5.4	5.7
N	1.1	1.1	0.6	0.4	8.1
S	0	0	<0.1	<0.1	0.7
O(by diff.)	38.5	38.5	38.5	37.0	27.2
LHV (kJ/kg)	16664	17352	16375	16808	17635

Small-scale continuous CLG gasification tests

Results with Waste Wood Type-B



Planned 1 MW_{th} CLG pilot tests



- 14 days 24/7 testing (in 2026)
- >200 h CLG operation
- Including gas cleaning



THANK YOU QUESTIONS/COMMENTS

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