



A Clean Energy  
Technologies  
Company

# CLEANER POWER, GREENER PLANET

Our waste to energy technology processes industrial and municipal organic waste into renewable fuels and biochar.

Nasdaq: CETY



# BIOMASS

## High Temperature Ablative Decomposition (HTAD)

Our technology processes various industrial and municipal organic waste into renewable natural gas, green hydrogen and value-add chemicals using a high temperature ablative decomposition process. This enables us to process various types of waste and adjust the resulting mix of products.

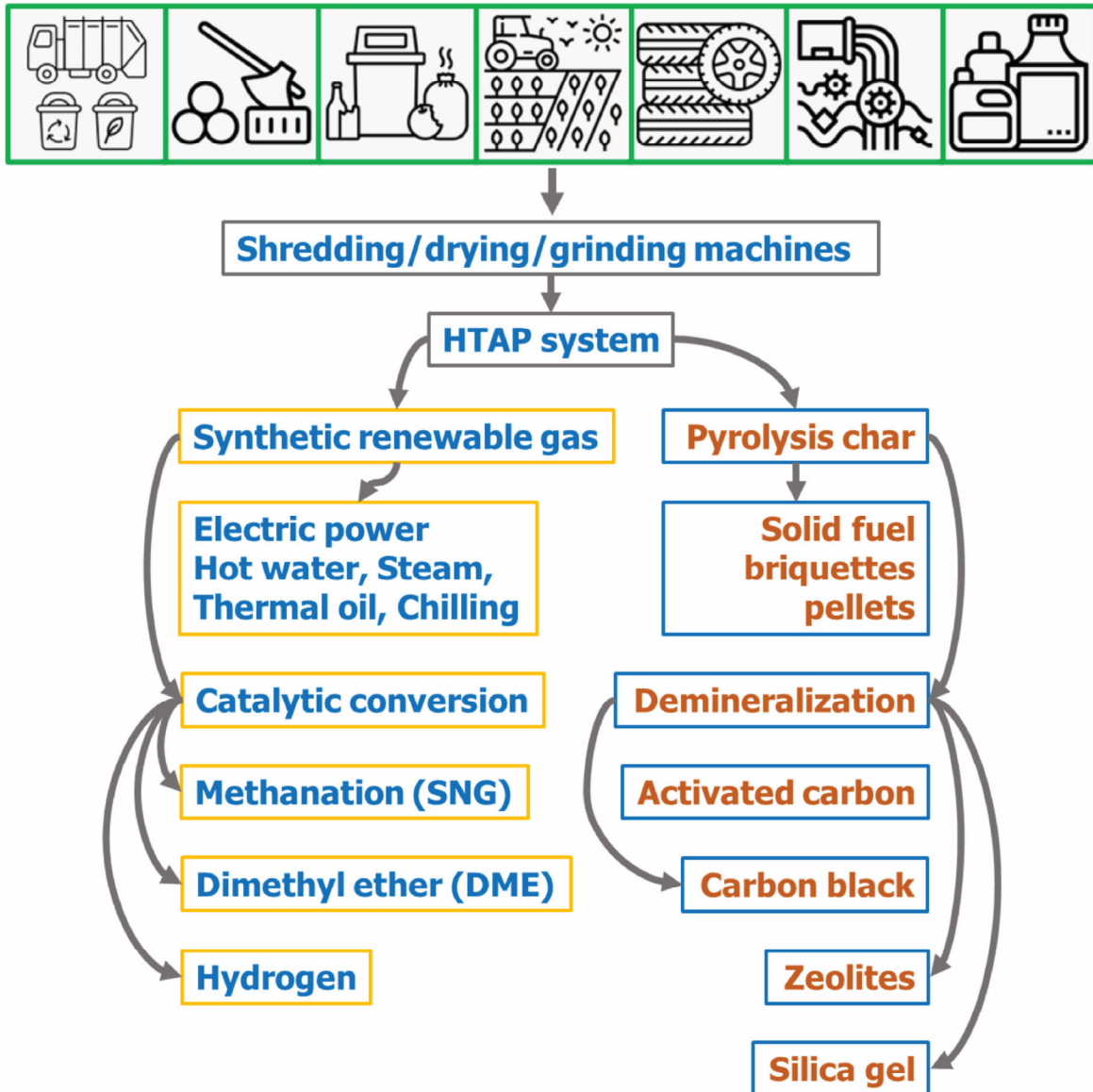
### 1. KEY FEATURES

- Waste source and mixing flexibility
- Designed to maximize high heating value synthetic fuel production
- BioChar (for fuel briquettes, adsorbents, soil amendments, carbon black, construction materials, etc.)
- Zero emissions (no added oxidizing agent, exothermic reaction does not require external heat supply)
- Zero liquid residue waste discharge
- Zero solid residue waste discharge
- Option for converting produced synthetic gas into liquid hydrocarbons (dimethyl ether, methanol, etc)
- Option for converting produced synthetic gas into renewable hydrogen
- Available factory containerized packaged solutions
- Modular design for rapid project implementation

**One HTAD-10 system produces enough synthetic fuel gas to generate 2,400 kW of electric power.**



## 2. HTAD Modular ECO-System



# 3. HTAD Technical Specification

Description	HTAD5	HTAD10
Capacity tons per day (dry mass basis)	15	30
Annual capacity, tons (dry mass basis)	5,250	10,500
Synthetic fuel gas production (% mass)	70 ... 95	
Bio char discharge (% mass)	5 ... 30	
Synthetic fuel gas heating value (MJ/nm <sup>3</sup> ) (i)	16 ... 20	
Bio char heating value (MJ/kg) (ii)	25	
Waste to energy application:		
Installed electric generation power, kW	1,300	2,400
Net electric power supply to the grid, kW	1,000	1,800
Annual operating hours	8,400 ... 8,600	
Scheduled maintenance intervals, hours	4,000	
Scheduled overhaul intervals, hours (iii)	60,000	
Cold start electric power requirements, kW	200	300
Cold start time period, minutes	45 ... 60	
Operating temperature inside reactor, °C	900 ... 970	
Operating personnel (qty per shift)	2	
<b>Configuration</b>	<b>Containerized</b>	<b>Under the shed</b>
Weight, kg	16,200	15,700
<b>Dimensions, mm (iv)</b>		
length	12,200	9,350
width	2,400	6,000
height	8,000	8,000

**Notes:**

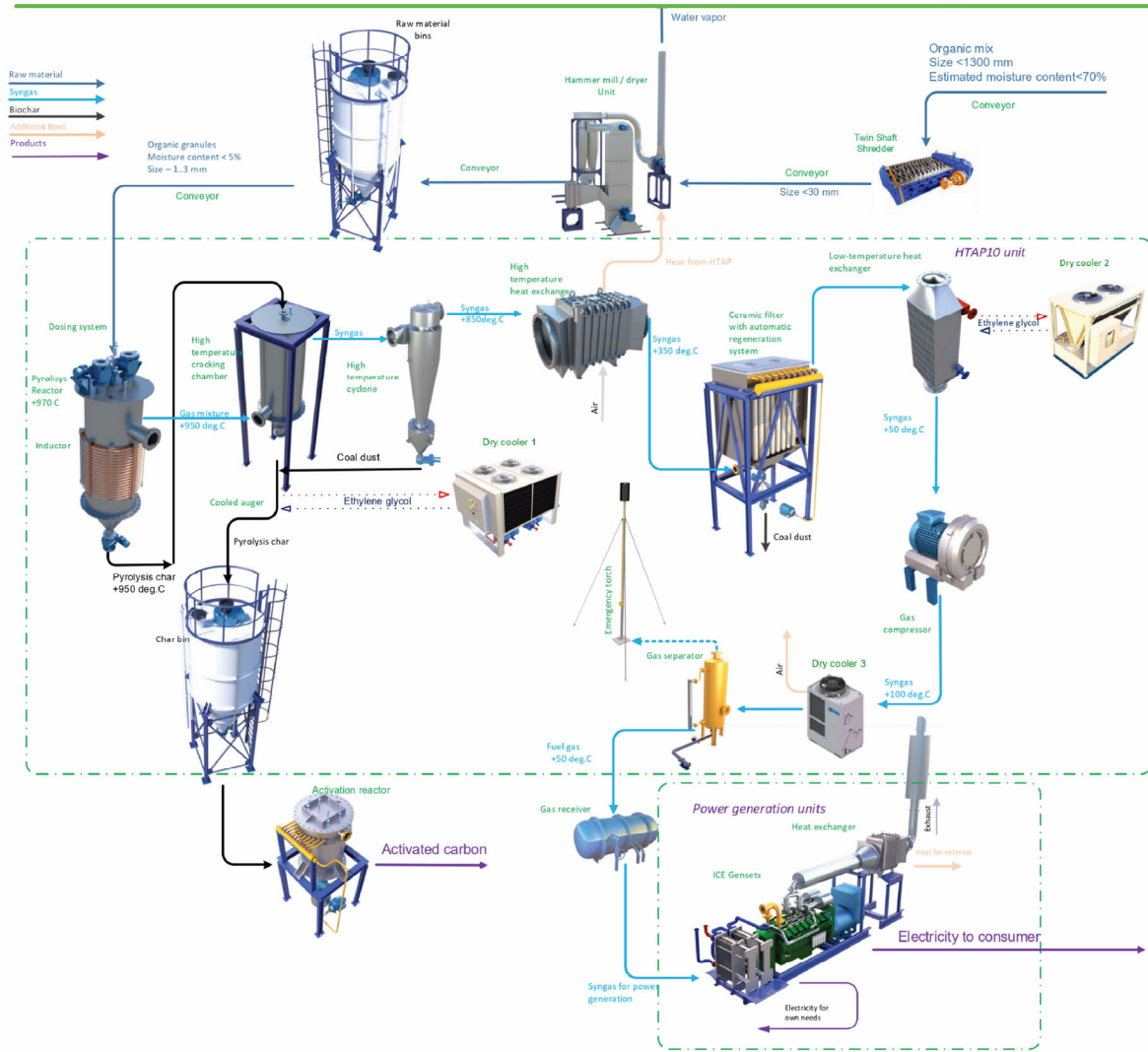
(i) Syntenic fuel gas – produced mixture of hydrogen, carbon monoxide, methane and higher hydrocarbons. Quantity of produced gas is dependent on volatiles in the waste source.

(ii) Bio char – mixture of fixed carbon and mineral ash compounds.

(iii) All overhaul operations are performed onsite. No need to send any major technological equipment to the factory.

(iv) HTAD5 is supplied in two sea high cube sized containers for onsite vertical coupling.

# 4. HTAD Process Flow Diagram



Organic waste stream is:

1. shredded and dried to a:
  - a. 2-4% moisture content, and
  - b. 1-3 mm particle size
  - c. shredding and drying machines are waste source dependent
2. reacted and cracked at temperatures above 900 °C (1650 °F)
  - a. syngas vapor sent to overheating chamber
  - b. Biochar sent to cooler
3. syngas polycyclic aromatic hydrocarbons are decomposed in imbedded overheating chamber
4. syngas (hydrogen, methane, etc) supplied to:
  - a. onsite storage, or
  - b. ICE engine or boiler

5. cooled Biochar is sent to storage buffer vessel.
  - a. optional activation reactor.
  - b. optional solid fuel briquettes.
6. continuous 8,600 hours/year operating
  - a. maintenance stops every 4,000 hours.



# 5. Case Studies

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## Wood Sawmill

### (Bajina Basta, Serbia Republic)

- One high-temperature ablative decomposition (CETY HTAD) system was installed to recover whole tree wood chips and sawdust
- up to 75 tons of wet wood waste recovered per day.
- ~1,500 Nm<sup>3</sup>/hour of Syngas produced.
- Syngas used as fuel for power generation and heat production to cover sawmill on site demands.



Wood chips renewable syngas replaced 1,400 tons/year of diesel fuel.

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## Sunflower seeds oil production

### (Krasilov, Ukraine)

- One high-temperature ablative decomposition (CETY HTAD) system was installed to convert sunflower seed husks and straw.
- up to 60 tons of wet waste converted per day.
- ~1,200 Nm<sup>3</sup>/hour of Syngas produced.
- Syngas powered on-site steam boiler.
- HTAD control system adjusted for the variable waste source flow to ensure stable steam supply.



Sunflower seed husks replaced 18.7 MMBTU per hour of natural gas.

