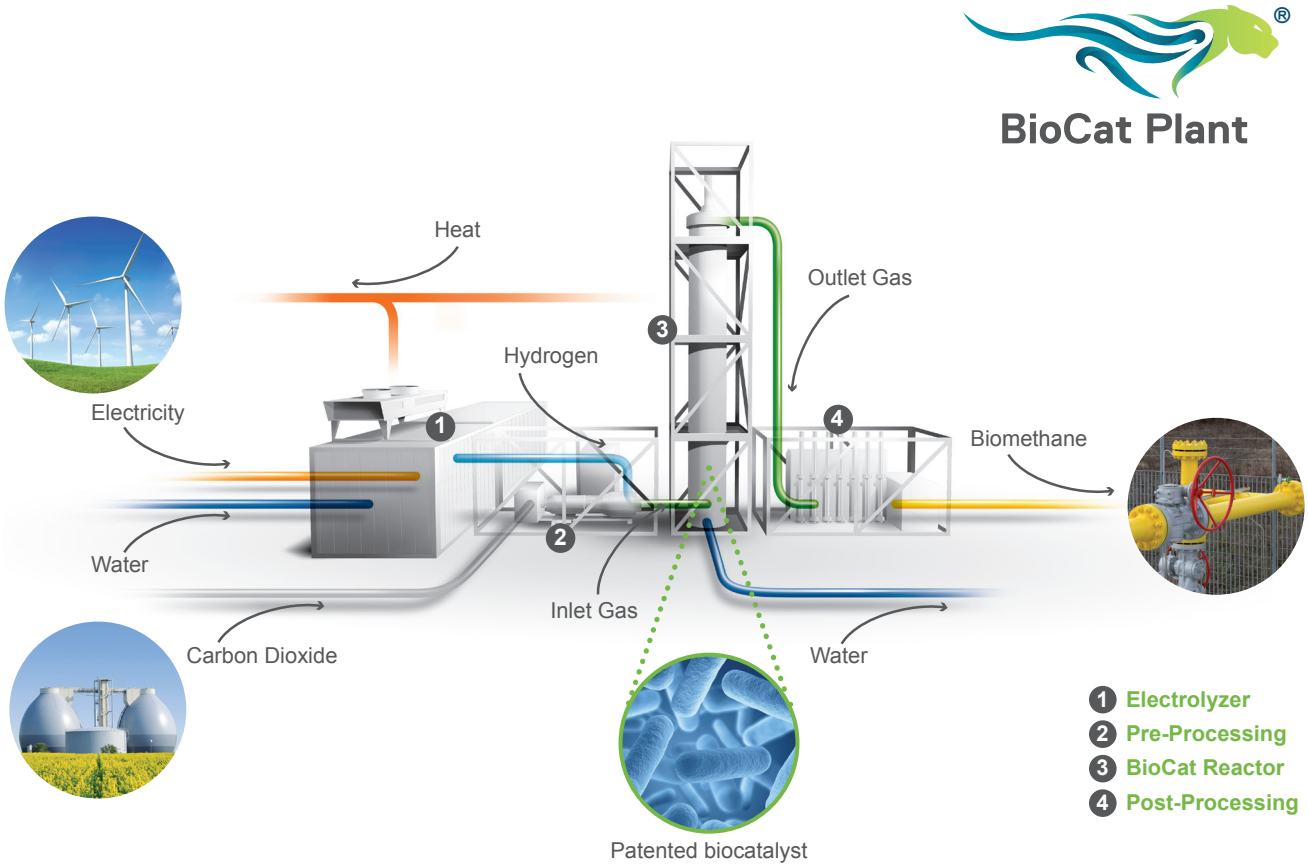
Electrochaea
CARBON AND ENERGY STORAGE

Electrochaea's "Power-to-Gas" technology is available for a wide range of biomethanation applications. The technology produces renewable biomethane (natural gas) and stores electrical energy in the chemical bonds of methane, while using CO_2 as the carbon source.

Applications of Electrochaea's BioCat biomethanation technology

- Increasing biomethane output of waste water treatment, biogas plants and landfill sites
- Processing of geothermal or biomass gasification upstream gases
- Utilization of carbon dioxide from industrial sources (e. g. fermentation, cement and steel plants)



How it works

1. Our proprietary biocatalyst [a] is fed with CO_2 and H_2 to produce biomethane.
2. The process takes place in our unique reactor achieving the complete conversion of input gases into biomethane and recoverable heat.
3. The biomethane is ready to be injected into the gas grid. This biomethane enables decarbonization of the grid by displacing an equivalent unit of fossil CH_4, links the gas and electricity grid bi-directionally and recovers the excess heat produced to be transferred to local heating grids or used in on site processes.

[a] The patented biocatalyst is exclusively licensed from the University of Chicago. Electrochaea's IP focuses on Power-to-Gas technology including the biomethanation reactor, control strategies, operation of the system, the biocatalyst and products produced using this technology. The system and reactor design and know-how related to design, engineering, control and operation of the system are subject to ongoing intellectual property prosecution.

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BioCat Plant

Specifications of Electrochaea's BioCat methanation plants

	BioCat 1 (pilot plant)	BioCat 10	BioCat 50
Biocatalyst [b] **CO_2 conversion efficiency**	ECH 0100 97–99,5 %	ECH 0100 97–99,5 %	ECH 0100 97–99,5 %
Nominal gas input	124 SCFM H_2 31 SCFM CO_2	1240 SCFM H_2 311 SCFM CO_2	6223 SCFM H_2 1556 SCFM CO_2
Electrolyzer power requirement	1 MWe	10 MWe	50 MWe
Installed power methanation	45 kW	370 kW	1600 kW
Nominal outputs • Grid quality gas • Thermal energy • Metabolic water	 31 SCFM CH_4 0.55 MMBtu/h 0.35 gpm	 311 SCFM CH_4 5.31 MMBtu/h 3.5 gpm	 1556 SCFM CH_4 26.3 MMBtu/h 17.5 gpm
Reactor temperature and pressure	145 °F; 145 psi	145 °F; 145 psi	145 °F; 145 psi
Efficiency at nominal load • Energy conversion efficiency H_2 to CH_4 • Total system energy conversion efficiency	 >74% [c] 52…58% [d]	 >74% [c] 52…58% [d]	 >74% [c] 52…58% [d]
Footprint	1600 ft^2	5160 ft^2	11500 ft^2
Controls and automation	Fully automated operation, according to client requirements/systems		
Conformity	According to client requirements and jurisdictions		

System interconnections

Electricity	According to local grid specifications
Cooling stream (if heat recovery applies)	30–50 psi, <113 °F
Water discharge to sewer	Bioreactor liquid composition meets standard discharge requirements
Tap water	30–75 psi; 50–86 °F
Gas for flare pilot burner	Grid connection or delivered in bottles
Nitrogen for purging and inerting	Delivered in bottle bundles

Optional modules

Flare	Flare for burning the product gas when no injection or storage possible
Media recovery	Since metabolic water is produced in the process, a portion of the media must be discharged. The media can be recycled/reintroduced in a module incorporated into the plant having a positive impact on the operational cost
Biomass retention system	Since metabolic water is produced in the process, a portion of the media containing the biocatalyst must be discharged. The media can be recycled/reintroduced in a module incorporated into the plant having a positive impact on the operational cost
Post processing unit	Post column gas processing to meet local grid injection standards and variability in input gas composition
Winterization	According to local climate conditions
Gas buffer module	Gas storage option to accommodate duty cycle and power availability

[b] The biological catalyst ECH 0100 is sold along with a license agreement. The catalyst warranty is provided for 2 years after successful commissioning and use within Electrochaea's system operating parameters. Electrochaea's biocatalyst is integrated in all our plants and can be tracked. Optimal CO_2 conversion efficiency is measured in catalytic phase.

[c] Efficiency calculation based on high heating values for the conversion of $CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$ including methanation parasitic losses.

[d] Assuming water electrolysis as source for H_2 depending upon electrolyzer efficiency and hydrogen stoichiometry in the methanation system.

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