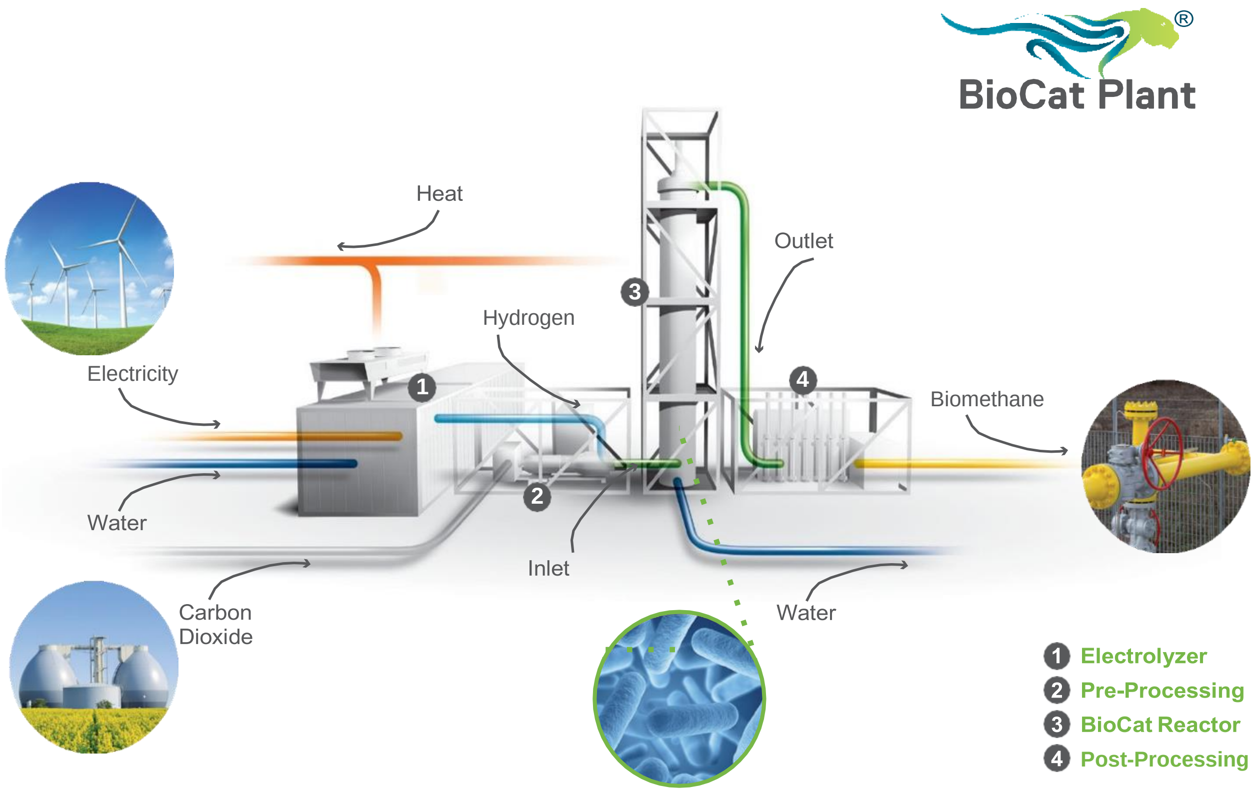
Electrochaea

Electrochaea's power-to-gas technology is available for a wide range of biomethanation applications. The technology produces renewable biomethane (natural gas) and stores 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 wastewater treatment, biogas plants and landfill sites
- Processing of biomass gasification or geothermal gases
- Utilization of carbon dioxide from industrial sources (e. g. fermentation, cement and steel plants)



How it works

1. Our proprietary biocatalyst 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 renewable 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. The power-to-gas process links the gas and electricity grid bi-directionally and recovers the process heat to be transferred to local heating grids or used in on-site processes.
4. Electrochaea supports deployment of its technology through its process design package, support for predevelopment and EPC/engineering qualification and selection, operator training, as well as biocatalyst supply and commissioning. Electrochaea does not provide system hardware or detailed engineering services.

BioCat Plant

Specifications of Electrochaea's BioCat biomethanation plants

	BioCat 1 (pilot plant)	BioCat 10	BioCat 50
Biocatalyst [a] **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% [b] 52-58% [c]	 >74% [b] 52-58% [c]	 >74% [b] 52-58% [c]
Footprint (excludes electrolyzer)	1600 ft^2	5160 ft^2	11500 ft^2
Controls and automation	Fully automated operation, according to client requirements/systems		

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	Suited to on-site delivery for use as required

Additional design considerations

Flare	Flare for burning the product gas when no injection or storage possible
Media/biocatalyst retention	Since metabolic water is produced in the process, a portion of the media must be discharged to maintain volume in the reactor. The media/biocatalyst can be recycled/reintroduced in a module incorporated into the plant having a beneficial 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

[a] The biological catalyst ECH 0100 is provided under a user-specific license. The catalyst warranty is provided for 2 years after successful commissioning and use within Electrochaea's system operating parameters. Optimal CO_2 conversion efficiency is measured in catalytic phase.

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

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