

Low-carbon, Grid-quality E-methane Production

Electrochaea's innovative biomethanation technology uses a patented biocatalyst (*methanogenic archaea*) to convert green hydrogen (H₂) and carbon dioxide (CO₂) into renewable, grid-quality e-methane.

Operating as part of a **Power-to-Gas (P2G) system**, our biomethanation tech offers cross-sector applicability, industrial-scale e-methane production and a variety of benefits.

- ✔ Independently certified e-methane for direct grid injection
- ✔ Emissions reductions via untreated CO₂ recycling
- ✔ Conversion to low-carbon, renewable liquid fuel (eLNG)
- ✔ Storage and transportation of renewable energy
- ✔ Displacement of fossil natural gas

Industry-leading Biomethanation Tech

Electrochaea's proprietary biomethanation tech is designed to streamline the production process and maximize e-methane outputs, regardless of site conditions. Our industry-leading technology and services incorporate a range of features, including:

- ✔ 98.5% CO₂ conversion efficiency
- ✔ High tolerance to CO₂ feed gas contaminants
- ✔ Very mild process conditions
- ✔ Untreated CO₂ recycling, compatible with CCU and DAC
- ✔ Pre-qualified engineering and manufacturing partners
- ✔ Biocatalyst commissioning and operator training

Modular and Scalable Cross-Sector Solutions

With cross-sector applicability, Electrochaea's modular biomethanation technology can be integrated into numerous sites and sectors for industrial-scale e-methane production:

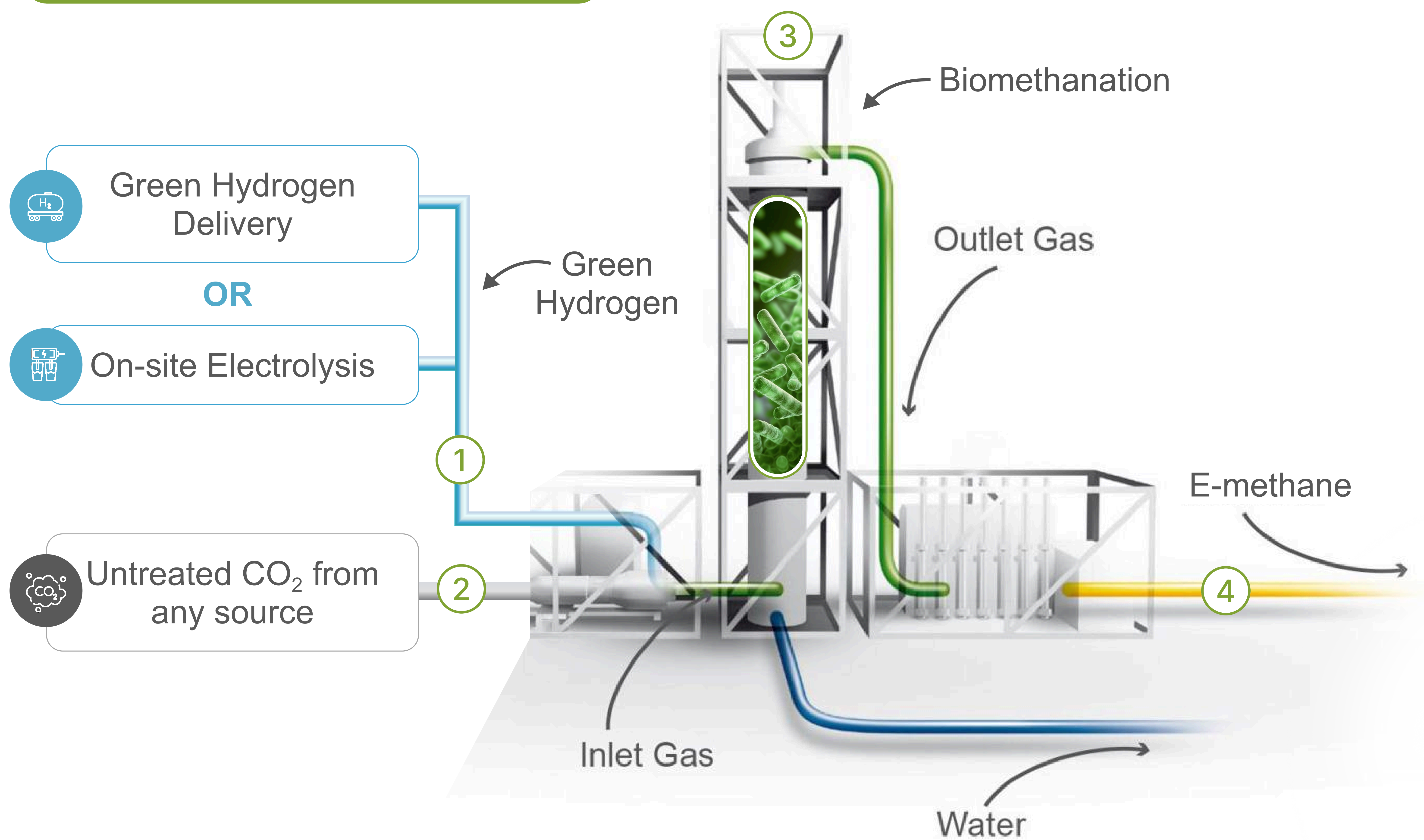
- ✔ Increase clean energy outputs at renewable energy plants
- ✔ Convert raw, untreated biogas into grid-quality e-methane
- ✔ Recycle industrial CO₂ via CCU or DAC all applications
- ✔ Recover methane slips at landfills, biogas and biomethane plants
- ✔ Reduce carbon emissions across all applications
- ✔ Store and transport renewable energy from wind and solar farms

How It Works

Electrochaea's biomethanation technology operates as part of a two-step Power-to-Gas system to convert green hydrogen and CO₂ into grid-quality e-methane.

1 Firstly, green hydrogen is generated on site via a standard electrolyzer using water and renewable energy or via pyrolysis. Alternatively, green hydrogen can be delivered directly to the site.

3 Inside the bioreactor, our patented biocatalyst (methanogenic archaea), synthesize e-methane from the H₂ and CO₂.



2 Untreated biogenic or industrial CO₂, or raw biogas, is fed into the bioreactor, alongside the green hydrogen.

4 The e-methane output can be used as fuel on site, transported, injected directly into the gas grid or converted into eLNG via liquefaction.

If necessary, additional post-processing can be incorporated to optimize meet specific requirements.

Biomethanation Plant Specifications

	1 MWe plant	10 MWe plant	50 MWe plant
Biocatalyst^[a] CO₂ conversion efficiency	ECH 0100 97– 99.5 %	ECH 0100 97– 99.5 %	ECH 0100 97– 99.5 %
Nominal gas input	200 Nm ³ /h H ₂ 50 Nm ³ /h CO ₂	2000 Nm ³ /h H ₂ 500 Nm ³ /h CO ₂	10000 Nm ³ /h H ₂ 2500 Nm ³ /h 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	50 Nm ³ /h CH ₄ 130 kWth 80 l/h	500 Nm ³ /h CH ₄ 1275 kWth 800 l/h	2500 Nm ³ /h CH ₄ 6400 kWth 4000 l/h
Reactor temperature and pressure	63 °C; 10 bar	63 °C; 10 bar	63 °C; 10 bar
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)	150 m ²	480 m ²	1070 m 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)	2– 4 bar, <50 °C
Water discharge to sewer	Bioreactor liquid composition meets standard discharge requirements
Tap water	2– 6 bar; 10–30 °C
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 CO₂ conversion efficiency is measured in catalytic phase.

[b] Efficiency calculation based on high heating values for the conversion of CO₂ + 4H₂ → CH₄ + 2H₂O including methanation parasitic losses.

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