With the contribution of the LIFE Programme
of the European Union
LIFE20 CCM/GR/001642

CO2toCH4 SUMMARY PROJECT DATA

The project implementation started in October 2021 and it is expected to be completed by June 2026, in selected regions of Greece and Italy.

Total Eligible Project Budget:
3,888,985 Euro

Project Implementation period:
57 months

EU financial contribution requested:
2,138,941 Euro
(= 55.00% of total eligible budget)

PROJECT PARTNERS

PPC Renewables

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CO2toCH4 Life

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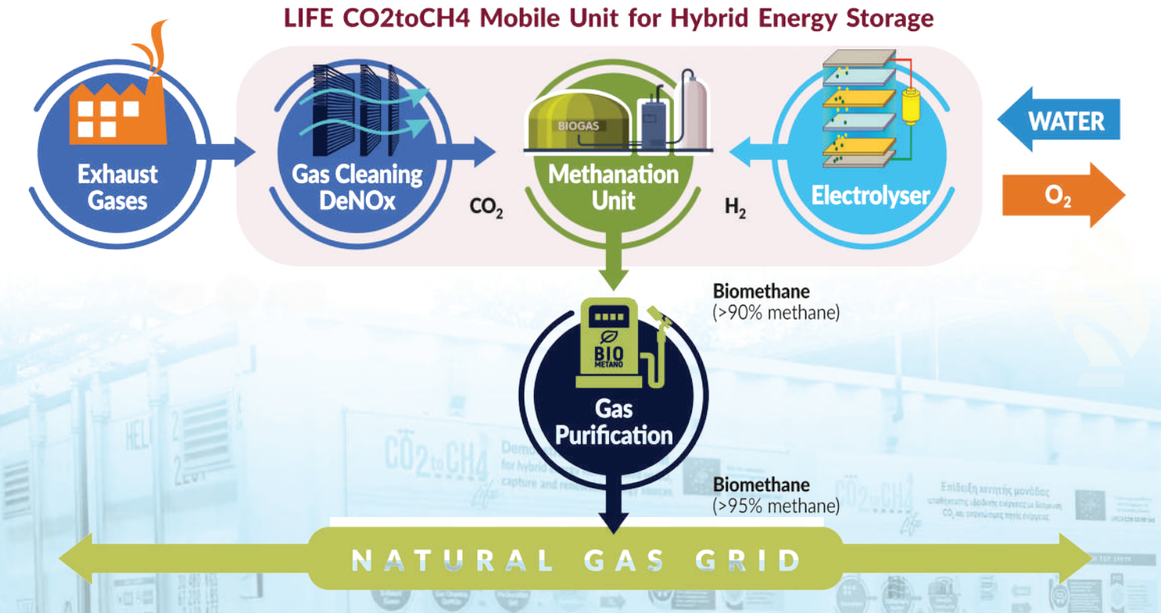
DEMONSTRATION OF AN INNOVATIVE, INTEGRATED AND SUSTAINABLE INDUSTRIAL PROCESS

FOR THE SIMULTANEOUS STORAGE OF ENERGY AND THE CAPTURE AND UTILIZATION OF CO_2



LIFE CO2toCH4 MOBILE UNIT FOR HYBRID ENERGY STORAGE

FROM DEMONSTRATION TO DEPLOYMENT

Climate impact, replicability and the road ahead for CO_2-to-biomethane technology

As LIFE CO2toCH4 approaches its scheduled completion in June 2026, the project has successfully closed the loop between laboratory, pilot and field demonstration at a real power-plant site, and a mobile, replicable solution ready for the next stage of deployment. This leaflet looks beyond the technical results presented in earlier issues and asks the question that matters now: what does this technology change?

The numbers behind the demonstration

>135 kg	>95%	4.65 $L_{CH4}/(L_{reactor}\ day)$	>180
CO_2 converted to biomethane	CH_4 purity in product gas	Peak methane production rate	Days of continuous operation

$L_{CH4}/(L_{reactor}\ day)$ peak production rate, CH4 purity sustained above 95% across multiple gas-retention regimes

WHY THIS MATTERS NOW

Europe needs to scale up renewable methane production by an order of magnitude before 2030. Most of the current pipeline focuses on agricultural biogas upgrading; comparatively little capacity exists for the second route, the EU has explicitly called for Power-to-Methane from CO_2 point sources combined with renewable hydrogen. CO2toCH4 demonstrates that route at a relevant scale, with off-the-shelf equipment, and at a site that mirrors the conditions of a real industrial deployment. Crucially, the demonstration unit is mobile, automated, and designed for start–stop operation, matching the realities of intermittent renewable electricity and seasonal industrial loads. This combination is what makes the technology suitable not only for large CO_2 emitters but also for the smaller, decentralised sites where Europe's energy transition is most exposed.

WHERE THIS TECHNOLOGY BELONGS NEXT

Non-interconnected islands

- Greek & Mediterranean islands relying on diesel generators
- Curtailed wind & solar can be stored as biomethane
- Reduces dependence on fuel shipments

Industrial CO_2 point sources

- Cement, lime, biogas-upgrade, and waste-to-energy plants
- Direct capture from real flue gas
- Turns a cost (emissions) into a product (SNG)

Surplus-RES regions

- Areas with grid-curtailed wind or PV
- Stores excess electricity in chemical form
- Injectable into existing natural-gas grids

ALIGNED WITH THE EU POLICY AGENDA

The relevance of the CO2toCH4 approach extends well beyond the project consortium. By integrating CO_2 capture, renewable H_2 production, and biological methanation in a single mobile unit, the demonstration speaks directly to several of the EU's current decarbonisation instruments:

EU FRAMEWORK	HOW CO2TOCH4 CONTRIBUTES
REPowerEU Plan	Supports the EU target of 35 bcm of sustainable biomethane production by 2030 by demonstrating a non-agricultural, CCU-based pathway to renewable methane.
Fit-for-55 / EU Climate Law	Directly reduces CO_2 emissions from hard-to-abate industrial sources by recycling flue-gas CO_2 into a fuel that displaces fossil natural gas.
RED III (Renewable Energy Directive)	Produces a renewable, non-fossil fuel (biomethane) eligible for renewable-energy accounting and capable of grid injection.
Innovation Fund / Clean Industrial Deal	Provides a TRL-8 demonstration of an integrated CCU & Power-to-Gas process, directly relevant to next-generation industrial decarbonisation funding calls.

WHAT WE LEARNED

ROBUST UNDER REAL CONDITIONS

- **Start-stop resilience:**
  CH_4 output recovered above 90% within 24–48 hours after each start–stop cycle, confirming exceptional resilience of the hydrogenotrophic microbial consortium.
- **Continuous operation:**
  Stable operation for more than 5 months on synthetic-derived CO_2, with no microbial inhibition and only minor, recoverable VFA accumulation.
- **Gas-cleaning performance:**
  Two-stage hollow-fibre membrane system delivered CO_2 at >93% purity from impure industrial sources, eliminating the need for upstream amine scrubbing.

LESSONS FOR NEXT-GENERATION DEPLOYMENTS

- **Coupling with RES:**
  PEM electrolysis pairs naturally with biological methanation: the biology absorbs H_2 fluctuations that would otherwise destabilise a chemical (catalytic) reactor.
- **Mobility as a feature:**
  The mobile unit opens a clear pathway for replication at sites that cannot host fixed CCS infrastructure.