

PROJECT BENEFICIARIES



PUBLIC POWER CORPORATION RENEWABLES
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DEMONSTRATION OF A MOBILE UNIT FOR HYBRID ENERGY STORAGE BASED ON CO₂ CAPTURE AND RENEWABLE ENERGY SOURCES

CONVERTING CO₂ INTO BIOMETHANE: A SUCCESSFUL FIRST YEAR OF THE PILOT BIOMETHANATION UNIT

The LIFE CO₂toCH₄ Pilot Biomethanation Unit has completed its first full year of operation at the premises of the beneficiary Hellenic Agricultural Organisation (ELGO) - Dimitra under the systemic monitoring of its team. The unit aims to reduce CO₂ emissions by converting CO₂ to biomethane, a renewable energy source.

ABOUT THE PILOT UNIT:

- **Location:** Hellenic Agricultural Organisation – DIMITRA.
- **Objective:** Convert CO₂ into biomethane using hydrogenotrophic methanogens.
- **Reactor Type:** Trickle bed reactor (TBR), made of high-grade stainless steel, with a 0.1m³ active volume.
- **Packing Material:** K1 micro media Raschig rings.
- **Operating Temperature:** 55 ± 2°C
- **Reaction:**
$$\text{CO}_2 + 4\text{H}_2 \rightarrow \text{CH}_4 + 2\text{H}_2\text{O}$$

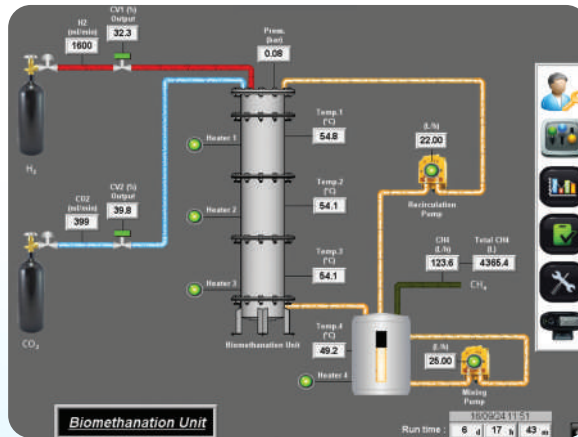


Methanation
Pilot Reactor
(Render)

AUTOMATION AND CONTROL

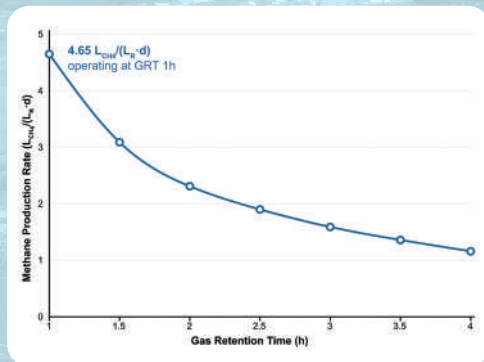
The unit features a fully automated system controlled by a Programmable Logic Controller (PLC) with the following key features:

- Fully – automated operation.
- Continuous monitoring and recording of the main operating parameters,
- Remote access for monitoring and adjustments.
- Consistent and reliable operation.

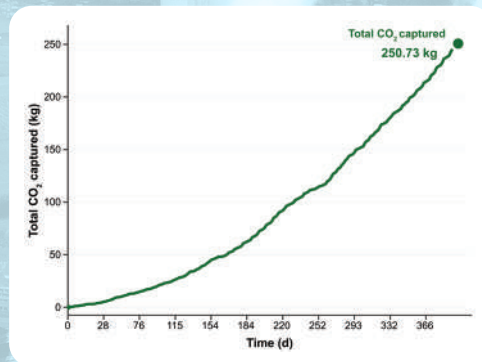


KEY ACHIEVEMENTS DURING THE FIRST YEAR

- **Duration of Operation:** Over 300 days (exceeding the target of 180 days).
- **Biomethane Output:** Achieved 91-98% methane in the output gas, surpassing the 90% target.
- **CO₂ Utilization:** Over 250 kg of CO₂ successfully converted to biomethane.
- **Methane Production Rate (MPR):** Highest achieved rate of 4.65 L_{CH₄}/(L_R·d).

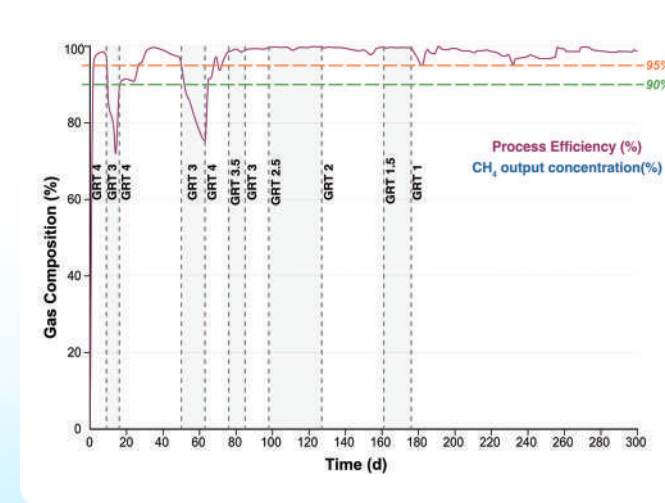


Methane Production Rate



Total CO₂ capture

PILOT UNIT'S PERFORMANCE INDICATORS



Output concentration

Gas Retention Time (GRT): Continuously optimized to improve efficiency.

Efficiency: Maintained high methane output (>95%) under various operational conditions.

Reduction of Intermediate Fermentation Metabolites:

Target: <1000g/L acetate concentration.
Achieved: <0.12g/L acetate concentration.

PROJECT RESULTS UP TO DATE

The pilot's successful year of operation: **paves the way** for the next step of the project which is its transport, installation and operation at the PPC Power Plant of Agios Dimitrios and significantly contributes to global efforts to **reduce carbon emissions** and **promote renewable energy sources**.

The first year of operation provided valuable insights into the relationship between GRT, MPR, and economic efficiency.

The success of this pilot is a significant step forward in using CO₂ for renewable energy production.

CO₂toCH₄ SUMMARY PROJECT DATA

Total Eligible Project Budget:
3,888,985 Euro

Project Implementation period:
4 years

The project implementation started in October 2021 and it is expected to be completed by September 2025, in selected regions of Greece and Italy.

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



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