



Construction work on the Enosis biological methanation installation coupled with the Energia Thiérache agricultural methanation unit – Photo credit:© Enosis.

A French pioneer in the recycling of CO₂ into gas and renewable fuels through biological methanation, Enosis began construction this summer on its first industrial-scale installation. This facility, coupled with an agricultural methanization unit called Energia Thiérache, is located in Lesquielles-Saint-Germain in the Aisne department of the Hauts-de-France region. Operated by Enosis, the installation will inject e-methane, produced by the methanation of CO₂ from methanization, into the natural gas network managed by GRDF. This project is part of the “demonstration” phase of DENOBIO, a collaborative initiative involving Enosis and its long-standing scientific partner, INSA Toulouse.

Toulouse, the 14th of October 2024,

The DENOBIO project marks another significant milestone in Enosis’ industrialization of its biological methanation process, which is applied to the treatment of carbon dioxide (CO₂) and methanization biogas. This project precedes the development of commercial projects currently in preparation and is the culmination of ten years of research and technological advancements, spanning from laboratory work to real-world testing with semi-industrial pilot units.

The technology at the core of the Enosis’ systems: a French industrial innovation serving the ecological transition.

Enosis designs and deploys industrial systems that recycle CO₂ and ensure its conversion, via the “methanation” process, into renewable or low-carbon gas, injectable into existing gas networks, replacing fossil natural gas, reducing its consumption. The CO₂ treated by Enosis can originate from methanization units, pyrolysis or gasification installations, or industrial sites.

The methanation technology employed by Enosis is an innovative and sustainable biotechnology that utilizes microorganisms. Developed with the scientific support of the TBI (Toulouse Biotechnology Institute) laboratory at INSA Toulouse, this process is known as biological methanation or biomethanation.

Integrated into methanization sites, Enosis’s biological methanation units directly treat biogas or the CO₂ released by purification systems that transform biogas into biomethane. These units increase the methane

production of the sites by more than 50% without additional biomass consumption, addressing the challenges of “biomass loop.”

In this case, Enosis’s biomethanation units require hydrogen, which can be supplied by the electrolysis of water using renewable or “low-carbon” electricity. The methane produced by methanation, known as “e-methane,” can then be classified as renewable or low-carbon gas and used as a substitute for fossil gas, contributing to the “greening” of the gas mix. Transported and stored via existing gas infrastructures, e-methane can serve specific uses, such as maritime transport where it can be used as fuel.

The deployment of Enosis’s biomethanation installations, coupled with methanization and electrolysis, serves as a catalyst for establishing and accelerating renewable or low-carbon hydrogen production centers in our territories.

In « Perspectives gaz 2024 », French gas network operators forecast that French production of e-methane will reach 3 TWh by 2030 and 8 TWh by 2035. This increase will contribute to France’s energy independence. For context, biomethane production in 2023 is estimated at 9 TWh.

ENOBIO, an industrial-scale biological methanation installation, is the first in France to inject its gas production directly into the natural gas network.

The installation is a demonstration unit. It aims to test the injection of the gas produced (e-methane) into the natural gas network operated by GRDF, to optimize the operating conditions and methods (in cooperation with the operators of the methanization site) and to evaluate its environmental footprint. It is powered by hydrogen stored on site, supplied from an existing electrolysis production unit.

The installation represents the first industrial-scale biomethanation unit in France, producing e-methane that is injected into natural gas networks. This model can be replicated and adapted to other configurations, such as territorial methanization and sludge from wastewater treatment plants.

Enosis plans to operate the installation from 2025, first by treating the CO₂ contained in the gas released by the purifier of the methanization unit, then by directly treating the biogas.

ENOBIO, a collaborative project bringing together territorial, industrial and scientific stakeholders.

The DENOBIO project is the result of collaborations between Enosis and various partners.

A collaboration with Energia Thiérache which illustrates the synergies between local agriculture and industrial innovation. From the start of the project, Energia Thiérache agreed to host the biomethanation installation and support its implementation.

a technical-economic collaboration with GRDF focuses on implementing new metering devices specific to e-methane (measuring gas volumes and quality) and conducting e-methane injection operations into the natural gas network.

A scientific collaboration with the TBI laboratory at INSA Toulouse, a historic partner of Enosis which will carry out work related to the implementation of the industrial-scale installation. This work will include advanced modeling of the process, the creation of a digital twin, the analysis of the energy efficiency of the methanization-biomethanation system, and the optimization of control strategies. To this end, TBI will conduct tests with its DEMETHA semi-industrial biomethanation pilot unit, co-developed with Enosis and integrated into the SOLIDIA platform.

DENOBIO is a project financed by the State as part of France 2030, operated by ADEME. It is also supported by the Hauts-de-France Region and GRDF.

DENOBIO is the winner of the “Technological bricks and hydrogen demonstrators” call for projects, operated by ADEME as part of the France 2030 investment plan. The project also won a call for projects supported and jointly financed by GRDF and the Hauts-de-France Region, aimed at developing the first biological methanation demonstrator adapted to agricultural methanization units. Specifically, DENOBIO is funded by the Regional Fund for the Amplification of the Third Industrial Revolution (FRATRI) of the Hauts-de-France Region.

Vincent Guerré, President of Enosis, declares : *« At Enosis, we view methanation as a key driver of the energy transition, offering a diverse set of services. It enables the “boosting” of renewable gas production without increasing biomass consumption. When coupled with an electrolyzer, it serves as a storage solution for both electricity and hydrogen. This hydrogen, converted into methane, can be transported via natural gas networks until dedicated networks are established.*

We are excited to announce the launch of the DENOBIO project and the commencement of construction on our first industrial-scale biomethanation installation, integrated into the Energia Thiérache methanization facility. This marks a significant milestone in the industrialization of our CO2 and biogas treatment systems and the commercial launch of our offerings in these markets.

We extend our gratitude to our partners (Energia Thiérache, GRDF, INSA Toulouse), our public financiers (the State, the Hauts-de-France Region), and our associates (Industry, UI Investissement, Banque des Territoires, InnoEnergy) for making DENOBIO a reality.. »

David Batteux, President of Energia Thiérache, declares : *« At Energia Thiérache, we have always been committed to combining local agricultural expertise with industrial innovation. This is why we chose to host this demonstrator, giving us the opportunity to utilize the CO2 from our methanization installation for sustainable use. By integrating renewable energies and establishing synergies between electricity and green gas, we are paving the way for agroecology that supports a respectful and forward-looking agriculture. »*

Bertrand Raquet, Director of INSA Toulouse, declares : *« DENOBIO is much more than a collaborative project; it is a response to global energy challenges. Our partnership with Enosis, strengthened by the GRDF chair and the SOLIDIA Biogas platform with TEREKA, demonstrates the importance of uniting research and industry for sustainable development based on renewable gas. »*

About Enosis :

An innovative SME based in Toulouse and a French pioneer in biological methanation technologies, Enosis designs systems for recycling CO₂ to produce renewable or low-carbon methane. This methane can substitute fossil natural gas and be injected into existing networks or used as fuel. Integrated into methanization sites (agricultural, territorial, or for wastewater treatment sludge), Enosis's biomethanation equipment recycles the CO₂ contained in biogas into "e-methane." Coupled with electrolyzers, they form a bridge between the electrical grid and the gas network (known as "Power-to-Gas" or "Power-to-Methane" systems).

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About Energia Thiérache :

A company specializing in the production of biomethane, Energie Thiérache owns and operates a methanization installation located in the commune of Lesquielles-Saint-Germain, in the Aisne department of the Hauts-de-France region. Powered by organic materials of agricultural origin (such as silage from intermediate crops for energy purposes, energy crops, and pressed beet pulp), the installation produces approximately 570 Nm³/h of biogas, which is on average 55% biomethane.

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About INSA Toulouse :

INSA Toulouse is a major public engineering school, which develops cutting-edge scientific research in 10 laboratories, including TBI (Toulouse Biotechnology Institute), the historic scientific partner of Enosis in the treatment of CO₂ and biogas. by biological methanation. TBI has skills in optimizing bioreactors and hydrodynamic processes, analyzing biological activities on gaseous substrates, as well as guiding consortia for the intensification of autotrophic (CO₂-fixing) transformation reactions. Furthermore, TBI operates SOLIDIA, an experimental platform dedicated to biogas and its treatments, made up of pilot installations in semi-industrial conditions. The research work carried out alongside Enosis since 2015 has enabled TBI, with the CRITT GPTE (Regional Center for Innovation and Technology Transfer in Process Engineering and Environmental Technologies), to become the French scientific pioneer of biological methanation.

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About GRDF

GRDF ensures the management and maintenance of the largest gas distribution network in France. Present in more than 9,500 municipalities, GRDF is the partner of local authorities that it supports in their decarbonization through their choices of energy policies and sustainable mobility. GRDF distributes gas to nearly 11 million customers for heating, cooking and transportation, regardless of their supplier. For each use, GRDF offers pragmatic solutions to reduce the carbon footprint of its customers: sobriety, green gas, energy efficiency and efficient equipment. The company is mobilizing to achieve 20% green gas in the networks in 2030, an objective which will allow as many people as possible to benefit from renewable energy produced in France.

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