Transformation of sewage sludge **into biogas**

In partnership with the Var Estérel Méditerranée agglomeration community and GRDF, Veolia is building a biogas production unit to recover sludge from the Reyran wastewater treatment plant (Var).

Starting date of the project	2019
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	Site based on the Reyran wastewater treatment plant in Fréjus, Var. Solution replicable in any geography.
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	**Objective:** Transformation of waste (the sludge of the wastewater treatment plant) into biomethane, a local source of renewable energy
Detailed project description	The project consists in the construction of a biogas production unit, from the valorisation of sludge produced by the Reyran wastewater treatment plant. This production perfectly illustrates the Var Esterel Méditerranée Agglomeration's desire to be part of a real and lasting circular economy approach. Waste become a renewable energy source serving the development of a territory's gren transition. Built by Veolia, the methanization unit is composed of a 4000 m3 digester with a high gaseous sky. 10,000 tons of sewage sludge are treated annually. This amount of sludge vary along the year (+/-30%) especially during the summer and touristic period. The digestate (solid waste at the outlet of the digester) is then composted. The biogas produced, composed of 65% methane, is transformed into biomethane. This biomethane has the same characteristics than the natural gas. the gas is controlled, counted, odorized and injected into the gas distribution network by GRDF. This methanization unit reduces by 30% the amount of slude and produce a renewable and local gas. Bringing together three partners (the Var Estérel Méditerranée agglomeration community, Veolia and GRDF), this installation, a first in the Southern Provence-Alpes-Côte d'Azur region, now supplies between 20 and 30% of the gas distributed to residents. The wastewater treatment plant sludge valorisation also provides a green fuel for public transport: the biomethane produced corresponds to the consumption of more than 40% of the public bus transport network.
Main project's drivers for reducing the greenhouse gas emissions	

Reduction levers	**Details on the aspects of the project**
☐ Energy and resource efficiency (including behaviour)	
☐ Energy Decarbonisation	- Substitution of natural gas by biomethane - Use of the heat from wastewater to heat the facilities - Digestates (sludge) are used as an organic amendment in substitution of mineral fertilizers, reducing the carbon impact of soil fertilisation. Digestates are also more easily assimilated and therefore more efficient.
☐ Energy efficiency improvements	
☐ Improving efficiency in non-energy resources	
☐ Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...)	
☐ Financing low-carbon producers or disinvestment from carbon assets	
☐ Reduction of other greenhouse gases emission	

Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope

	Aspects of the project contributing to the reduction of emissions by emission category	Quantification of associated GHG emissions by emission category Please follow the quantification methodology used in the Afep guidelines.
Reduction of the company's carbon dependency		
Scope 1 *Direct emissions generated by the company's activity.*	Reduction of sludge transportation (200 trucks less at 50km AR)	- 20.000km × 10L/100km × 0,835kgCO2/L = - 1,5TCO2/year
Scope 2 *Indirect emissions associated with the company's electricity and heat consumption.*	Electricity consumption of the methanization system Emissions due to methanization	15 kgCO2/MWhPCS 2000 MWh/year × 0,060tCO2/MWh = 120tCO2/year
Scope 3 *Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.*		
Increase of carbon sinks		
Emissions Absorption *Carbon sinks creation, (BECCS, CCU/S, …)*		
GHG emissions avoided by the company at third parties		
Avoided Emissions *Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.*	Substitution of natural gas by biomethane	- 1700tCO2eq/year

Clarification on the calculation or other remarks:
The methanization unit is fed with 10,000 t/year of sludge from the Reyran wastewater treatment plant.

The energy consumption of the anaerobic digestion system is about 2,000 MWh/year of electricity, i.e. about 15 kgCO2/MWhPCS (2000*60/8000).

The emission factor of natural gas is about 227 kgCO2/MWh PCI. The injection of biomethane into the network, all things being equal, avoids 212 kgCO2/MWh COD, i.e. 1700 tCO2/year for this installation.

Moreover, if the sludge had not been consumed, it would have been sent for composting. The implementation of anaerobic digestion reduces the quantity of sludge by 35%. The sludge quantity reduction reduces the carbon impact of sludge transport by the same amount (4000 tons less, i.e. 200 trucks over an average distance of 50 km).

Modality of verification of the quantification.

Calculation standard used (ADEME base, GHG protocol, etc.): Standardized metering of the renewable gas produced. Issuance of a guarantee of origin that can be used for the amount of energy produced each month

Verification of the calculation (internal or external): Internal verification based on :

- The quantities of energy actually consumed
- The associated emission factors (increased for the electricity part because 60gCO2/kWh > average given by RTE)
- The gains associated with the installation of the heat pump based on
  - Performance validated by Ademe on the ratio of energy consumption to energy production (COP)
  - The energy consumption observed

Other environmental and social benefits of the project

This project is part of a contribution to various SDGs including SDG 7 Clean and Affordable Energy, SDG 9 Industry, Innovation, Infrastructure, SDG 11 Sustainable Cities and Communities and SDG 12 Responsible Consumption and Production.
Creating renewable energy from sewage sludge both:

- Reduce sludge volumes and thus transportation costs and environmental impact,
- Recover the sludge's fatal energy to favour the production of green gas and thus improve the economic balance of the process,
- Offer a digestate used in the composting process that considerably limits the use of chemical fertilizers,

	• In addition, this project is in line with the logic of collaboration of the SDG 17 by federating the Agglomeration Community and its elected officials, Veolia, in charge of the operation of the wastewater treatment plant and the natural gas distributor for the design of this solution.
Project maturity level	☐ Prototype laboratory test (TRL 7) ☐ Real life testing (TRL 7-8) ☐ Pre-commercial prototype (TRL 9) ☐ Small-scale implementation ☒ Medium to large scale implementation **Remarks**: click here to enter the level of maturity of the project
Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential	This project is replicable worldwide. However, certain prerequisites are necessary: • A high biogas support framework and/or sludge management cost, • For sites > 1,000 tMS (ton of dry matter) = Approximately 5,000 tBH (ton of wet sludge i.e. dry matter + water) - Between 300 and and 450 tCO2eq avoided for 1,000 tMS, • Federated governance around the project.
Amount of investment made (in €)	7.3M€ have been invested. The water agency, the Region and ADEME also have financed the project.
Economic profitability of the project (ROI)	☐ ST (0-3 years) ☒ MT (4-10 years) ☐ LT (> 10 years) **Remarks:** The installation is immediately economically relevant thanks to the support rate that allows the investment. The installation is sustainable over time because the project generates savings in the long term by projecting with the gas tariffs envisaged by ADEME.
Engaged partnerships	This project is the result of a multi-actor partnership between public (Var Estérel Méditerranée Agglomeration Community) and private (Veolia, GRDF) stakeholders.
Open comments from the project owner	The project won the GreenAwards public award in 2019.
More about the project	
Contact the company carrying the project	chevalier.vincent@veolia.com alain.le-divenach@veolia.com
Project URL links	https://www.veolia.fr/gestion-leau-dechets-lenergie-solutions-veolia-territoires/produire-lenergie-verte-valorisant-eaux https://www.construction21.org/france/infrastructure/fr/production-de-gaz-vert-a-partir-de-la-step-du-reyran.html
Illustrations of the project