Biomethane in the gas grid : over a decade of reliable gas quality : focus on some characteristics of biomethane

ENTSOG Gas Quality Workshop, November 19th 2025

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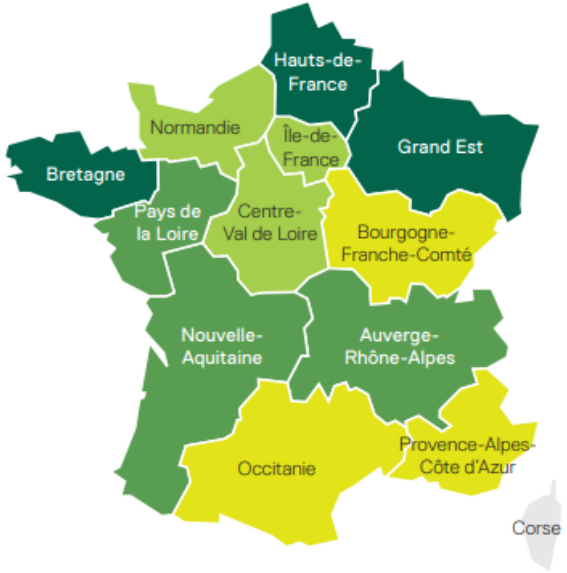
Biomethane has been injected in French gas networks for more than 10 years, with a huge development in the recent years

- **731 biomethane plants injecting into the French gas network at the end of 2024**
- **11,6 TWh of biomethane produced in 2024 ~3,2% of French gas consumption**

RÉPARTITION RÉGIONALE DU NOMBRE D'INSTALLATIONS D'INJECTION DE BIOMÉTHANE À FIN 2024

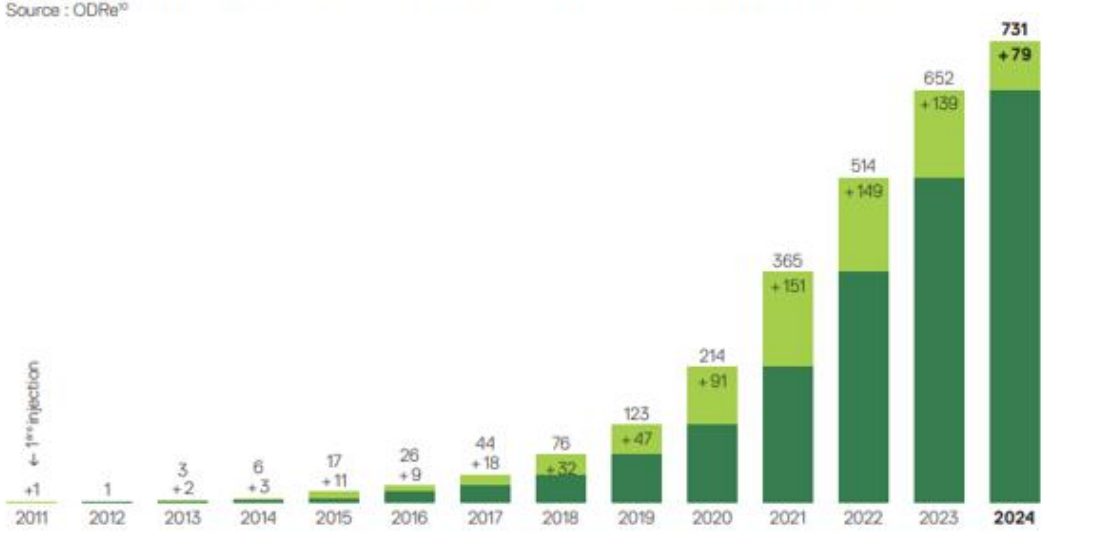
Source : ODRe à date du 31 décembre 2024

731 installations dont	
Grand Est	127
Hauts-de-France	100
Bretagne	93
Auverge-Rhône-Alpes	65
Nouvelle-Aquitaine	65
Pays de la Loire	62
Île-de-France	60
Normandie	59
Centre-Val de Loire	41
Bourgogne-Franche-Comté	26
Occitanie	26
Provence-Alpes-Côte d'Azur	7
Corse	0



NOMBRE TOTAL D'INSTALLATIONS EN SERVICE ET ÉVOLUTION ANNUELLE

Source : ODRe[10]



7. Le wattheure (Wh) est une unité de mesure de la production ou de la consommation d'énergie. 1 kilowattheure (kWh) = 1000 Wh / 1 mégawattheure (MWh) = 1000 kWh / 1 gigawattheure (GWh) = 1000 MWh / 1 térawattheure (TWh) = 1000 GW
8. Énergie injectée dans le réseau de gaz naturel en 2024 ; soit l'équivalent de la consommation d'environ 756 000 foyers ou 40 000 camions/bus.
9. Fin 2023, 2,4 % de la consommation de gaz naturel totale de la France était d'origine renouvelable.
10. Source : Observatoire de la filière biométhane (ODRe) - https://odre.opendatasoft.com/pages/observatoire-biomethane-v2/#implantation-des-sites. À noter que l'une des installations mise en service avant 2023 a été ôtée du total dans la mesure où celle-ci a définitivement fermé.

Source : Panorama du Gaz Renouvelables 2024, SER, Gaz et Territoires, GRDF, NaTran, Terega (syndicat-energies-renouvelables.fr/wp-content/uploads/2025/10/PANORAMAGAZRENOUVELABLES2024-1.pdf)

A very positive feedback on gas quality : a very stable composition that meets gas quality specifications

- **A very stable composition over time, typically :**

  CH_4 : 97,5%

  CO_2 : 1,6%

  O_2 : 0,3%

  N_2 : 0,6%

  Higher Heating Value 10,82 kWh/m³(n) (1 atm, 0°C, 0°C) *(eq. 36,84 MJ/m³ (1 atm, 15°C, 15°C)*

  Wobbe index 14,27 kWh/m³(n) (1 atm 0°C, 0°C) *(eq. 48,60 MJ/m³ (1 atm, 15°C, 15°C)*

  < 10 ppm water

- **Very little variations in gas quality**

- **Consistently meets gas quality specifications**

  "Prescriptions Techniques du Distributeur GRDF"

Parameter	Requirement
HHV	10,7 to 12,8 kWh/m³(n) (1atm, 0°C, 0°C)
Wobbe index	13,64 to 15,70 kWh/m³(n) (1 atm, 0°C, 0°C)
H_2S+COS	< 5 mgS/m³(n)
CO_2	< 2,5% ; exemption up to 3,5%
O_2	< 100 ppm ; exemption up to 0,75%
Water dew point	< -5°C at the maxima operating pressure of the network

Extract from « Prescriptions Techniques du Distributeur GRDF » (Source : prescriptions techniques GRDF_Vdef03012017)

Near absence of trace compounds that are periodically measured

- **Trace compounds measured periodically as being part of GRDF gas quality specifications (« *Prescriptions Techniques du Distributeur GRDF* ») : Cl, F, NH_3, Hg, mercaptic S, total S, CO, H_2**

- **Current frequency of measurement (as stated in the injection contract):**

  Every 3 months the first year after commissioning

  Every 6 months afterwards (twice a year)

- **GRDF's feedback on these trace-compounds over more than 5 000 analysis:**

  ⇒ **almost no off-spec analysis !**

- **About 400 measurements also carried out on siloxanes :**

  ⇒ **No siloxanes quantified (for the vast majority of sites)**

Parameter	Requirement
Total S	30 mgS/m^3(n)
Mercaptic S	6 mgS/m^3(n)
Hg	1 µg/m^3(n)
Cl	1 mg/m^3(n)
F	10 mg/m^3(n)
NH_3	3 mg/m^3(n)

Extract from « Prescriptions Techniques du Distributeur GRDF »

Very low water content, ensuring a proper working of reverse flow stations

- **36 reverse flow stations currently in service (October 2025)**

  Allowing to compress gas from the distribution gas network to the transmission gas network (NaTran or Terega network)

  Useful when biomethane production exceeds consumption on a given gas network : in 2024, about 5% of biomethane injected into GRDF network transited through these reverse flow stations

- **Requirement for a very dry gas : < 53 mg/m³(n) (corresponding to a water dew point of -5°C at 67,7 bar)**

  A very low water content of biomethane, thanks to efficient treatment & upgrading processes

  Water requirement of 53 mg/m³(n) put in the injection contract (without imposing real additional constraint to biomethane producer)

  No dehydration needed at the reverse flow stations

  NB : only the commissioning phase may be tricky if special attention is not paid to the drying of the pipes during the network installation work

Source : [Observatoire du biométhane - Nouvelle version — Open Data Réseaux Énergies (ODRÉ)]

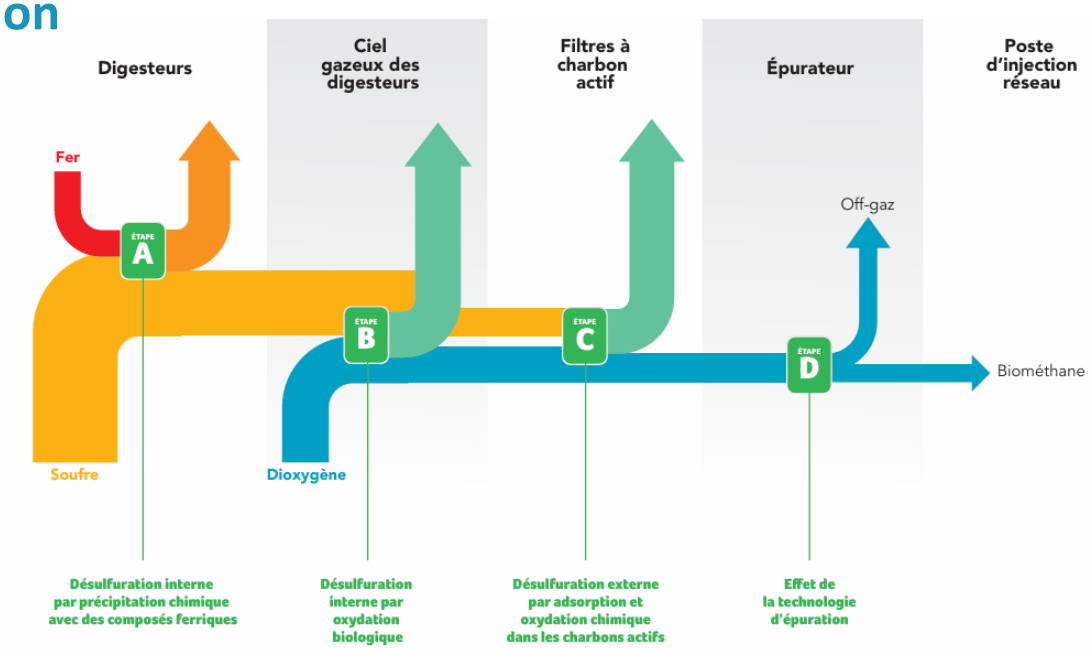
Biomethane is ready for continued growth and large-scale deployment
Oxygen content is one of the last remaining technical challenges

- **All indicators are green - continued growth of biomethane is expected. Target : 60 TWh of green gases injected in 2030, representing 20% of French gas consumption**
- **Oxygen content is one of the last remaining challenges**
- **Why is O_2 content an issue?**

  Exemptions up to 7500 ppm O_2 given to biomethane producers to ease the biogas desulfurization step

  Some installations (underground gas storages UGS, some industrial customers) are sensitive to O_2 (mainly connected to transmission network)

  Development of reverse flow plants



- **On-going work with French gas infrastructures operators (NaTran, Terega, Storengy) to define the best technical and economic compromise to solve this O_2 content issue**

  Several on-going R&D project to assess the feasibility of alternative biogas desulfurization pathways and the feasibility of removing O_2 from gas

  O_2 maximal threshold decreased from 7 500 ppm to 4 000 ppm in 2023. Goal : to send a first message to biomethane stakeholders on this issue

Synthetic methane injection has begun—now we must deepen our understanding of emerging green gas pathways

- **First power-to-methane project is injecting into the GRDF distribution gas network since July 2025 : Denobio project**

  Using CO_2 coming from the off-gas of an existing biomethane plant to produce CH_4 through methanation process

  Goal in the coming months : to use biogas (and not only CO_2) in the methanation process

- **Other synthetic methane injections are expected in the coming months, for instance Pau'wer-two-gas project.**

- **Support to innovative green gases project to expand the portfolio of green gases, aiming at :**

  Deepen our knowledge on the gas quality reached

  Deepen our understanding of these emerging green gas pathways

  Ensure the development of these new gases while guaranteeing the safety of gas infrastructure and customers.