

Methane emissions in the European Natural Gas midstream sectors

Global climate change led to an intensive discussion about Greenhouse Gases (GHG). In the past years, an increasing number of reports from reputable institutions have highlighted the environmental impact of global warming and the accelerating effect that the continued release of Greenhouse Gases to atmosphere is having on this phenomenon.

Natural Gas is recognized as the fossil fuel with the lowest specific CO₂ emission per unit of energy provided. It explains why it shall play a growing role in the energy mix by replacing less environmental friendly fuels such as coal. Moreover, renewable gases like biomethane, H₂ and Synthetic gases injected in the gas grids will contribute to reduce the Greenhouse Gases in a sustainable way.

MARCOGAZ, the Technical Association of the European Natural Gas Industry, considers that it is important for the Gas Industry to understand and quantify its emissions of methane (CH₄). Operational constraints exist in the gas midstream sectors, which can create CH₄ emissions during e.g. venting for maintenance, by start and stop of compressors, by gas driven pneumatic actuators and by safety valves. Losses and leakages of gas from the European grids have long been recognized by MARCOGAZ as a main subject of interest and technical solutions have been put in operation by the Industry to mitigate its emissions of Greenhouse Gases along the gas value chain.

The MARCOGAZ study

As first mover, MARCOGAZ performed an evaluation on methane emissions of the European gas grids in 2015, using its own methodology based on a bottom-up approach with network operational data from 2013, to estimate the total CH₄ emissions from European Natural Gas Transmission and Distribution systems. The MARCOGAZ network of technical experts is currently the most efficient way to collect reliable technical data coming from the field and to perform an expert study based on these data at European level.

In 2017, MARCOGAZ performed a second technical study to estimate the CH₄ emissions from the 4 midstream activities along the year 2015. The initial study (2015) covering Transmission and Distribution has been updated with new emission data resulting from recent measurements and evaluations and the scope has been enlarged to cover also the CH₄ emissions from LNG Terminals and from Underground Gas Storages facilities. The emissions from End-Use Appliances are currently still under investigation.

A word on the sources of emissions

MARCOGAZ identified **all** types of methane emissions along the midstream gas chain and integrated them in the study. The emissions are categorized as **Fugitive**,

Pneumatic, Vented (due to maintenance tasks, incidents and operational activities) and **Incomplete combustion** emissions.

Results

The table below summarizes the emissions calculated by MARCOGAZ in its 2017 study covering the emissions of the year 2015. The "average" statistical scenario has been retained.

CH ₄ emissions in 2015 from the EU28 grid	... expressed in CO ₂ equivalent	... related to the EU28 gas sales ¹	... related to the total of anthropogenic ² GHG emissions in EU28
	[Tons CH ₄]	[Tons CO _{2equi}]	[Tons CH ₄ / Tons NG sold]	[Tons CO _{2equi} / Tons CO _{2equi}]
LNG Terminals	4.700	131.600	0,002 %	0,003 %
Underground Gas Storages	38.000	1.064.000	0,01 %	0,02 %
Transmission	133.000	3.724.000	0,05 %	0,08 %
Distribution	339.000 ³	9.492.000	0,12 %	0,21 %
Total	514.700	14.411.600	0,18 %	0,32 %

Expressing the methane emissions into *CO₂ equivalent* allows a comparison of the global warming impact of CH₄ with other GHG on a 100 years duration. Because of its general use and the necessity to take into account the very long lifetime of the main GHG – CO₂ – the GWP₁₀₀⁴ of CH₄ has been used to convert the quantities (in mass) of methane emitted into *CO₂ equivalent*:

$$\text{Mass of CH}_4 \times \text{GWP}_{100} = \text{Mass of CO}_{2\text{equivalent}}$$

The total amount of methane emitted from Natural Gas midstream grids is estimated to be **0,2 %** of the total gas sales in Europe (EU28). The ratio "*CH₄ emitted / EU28 gas sales*" is representative at European level only and does not apply for an individual country.

The total amount of GHG emissions caused by the methane emissions from Natural Gas midstream grids is estimated to be **0,3 %** of the total of anthropogenic GHG emission (CO₂ equivalent) in Europe (EU28)⁵.

¹ Source: EU28 inland gas sales: EUROGAS Statistical report 2015

² Anthropogenic emissions: emissions originating in human activity

³ 553.000 with 95% confidence level as mentioned in the report.

⁴ GWP: Global Warming Potential; GWP₁₀₀ of CH₄ (= 28) is used according to the Fifth Assessment Report (AR5) - IPCC.

⁵ Approximated European Union greenhouse gas inventory: Proxy GHG emission estimates for 2015, EEA report No 23/2016, page 76

Conclusions

The conclusion of the MARCOGAZ 2017 study is that CH₄ emitted by the Natural Gas midstream sectors in Europe has **a very limited impact on the climate** in comparison with all the anthropogenic and non-anthropogenic GHG emissions.

Despite its relatively low emissions of GHG, the Gas Industry continuously develops a proactive and sustainable approach to manage adequately the gas infrastructure to provide its contribution to the challenge of limiting climate change.

Methane emissions management is no longer exclusively a safety issue, but also became a contribution to the climate policy by the Gas Industry.

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