Gas Infrastructure Europe

marcogaz

Monthly Methane Mondays:
MARCOGAZ methodology and data analysis

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Marcogaz methodology

Marcogaz developed and published (2005) a methodology using the existing knowledge available within the group of European gas infrastructure operators. Marcogaz already shared the template and the methodology

Basis equation for the calculation of emissions:

Emissions = Σ (Activity Factor x Emission Factor)

e.g.:

= (number of valves x average emission per valve)

+ (km length of pipe x average emission per km)

+ …

Development of an Excel sheet containing a number of emission sources to combine their activity factors with the respective emission factors

Data required for the use of the Methodology:

- Activity Factors
- Emission Factors
- Emissions from vents (engineering calculations)
- Average methane content of natural gas

Marcogaz methodology

Activity factors AF are the population of emitting equipment. The methodology indicate the most relevant AF of the different parts of the natural gas system (e.g. Length of transmission pipes, Number of valves with pneumatic operations, Mechanical power of gas turbines, Number of blow down valves, Fuel gas consumption..)

Emission factors EF are the quantity of methane emitted from each emitting source / emitting event. Some EF can be evaluated on the basis of the characteristic of components or by using measurement techniques. The EF are dependent on pipeline material, type of components, pressure level, maintenance, pipeline ageing…

Vented emissions of natural gas are calculated case by case taking into account the geometrical volume of the section that is discharged and the pressure of the gas released (engineering calculations)

Marcogaz methodology

Important: distinguish between natural gas and Methane emissions, therefore consider the composition of natural gas and the conversion factor.

Natural Gas Composition		
Average Methane Content of Natural Gas:	88,8%	% (Vol.)
Density of Methane:	0,7175	kg/m³
Conversion Factor from m³ Nat.gas to g CH	637,14	g CH4 / m³ Gas

It is recommended to indicate the source for the choice of the emission factor

- Measurement
- Literature
- Estimation

- Venting at the pipeline system cannot be calculated with activity and emission factor, but due to:

  Vtotal = Σ (Vsingle volume of sector x p)

i.e. multiplication of volume of the vented piping sector x pressure before venting

Calculation							
		Activity Factors		Emission Factors		Total Emissions	
				Company		Nat.Gas	Methane
No.	Material	Data	Unit	Data	Unit	m³/a	g/a
1.3.	**Vents**						
1.3.1.	**Maintenance vents**						
	Total emission caused by maintenance incl. Pigs, deviations, commissioning etc.					2,9E+06	1,8E+09
1.3.2.	**Incident vents**						
	Total emission caused by incidents						0,0E+00
1.3.3.	**Flares**						
	Total emission caused by flares						0,0E+00

Marcogaz data analysis (2017)

In 2017 Marcogaz, performed a technical study to **estimate** the **methane emissions from the midstream and downstream activities** for the year 2015

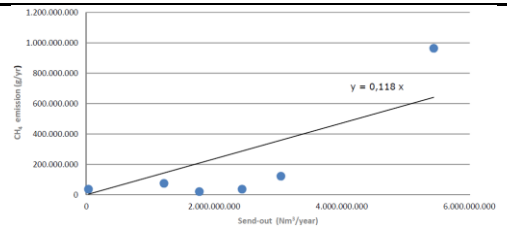
- ✓ updated with new emission data resulting from measurements and evaluations
- ✓ with an enlarged scope to cover the methane emissions from LNG terminals, Underground Gas Storages facilities and Distribution grid.

Marcogaz data analysis

For every step of the gas value chain MARCOGAZ analysed the methane emissions of the industry to define a "macro" **Emission Factor** based on a relevant **Activity Factor.** These **EF** can then be applied at the global EU28 level

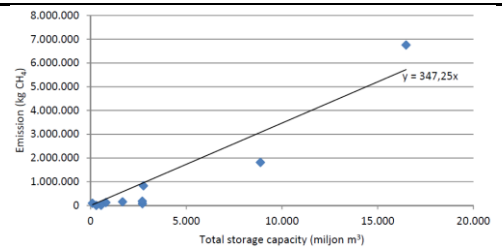
LNG terminals

0,12 gCH_4/m^3 send-out



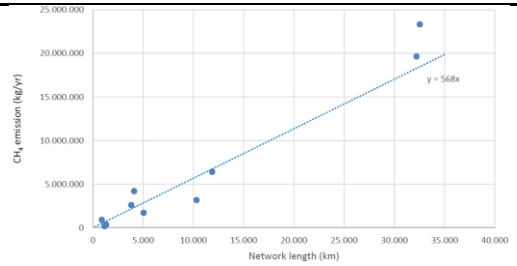
Underground Storage

347 $kgCH_4$/ million m^3 storage capacity



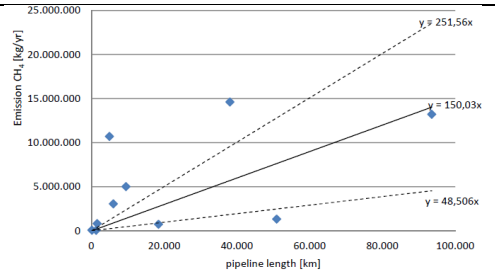
Transport (>16 bar)

568 $kgCH_4$/km



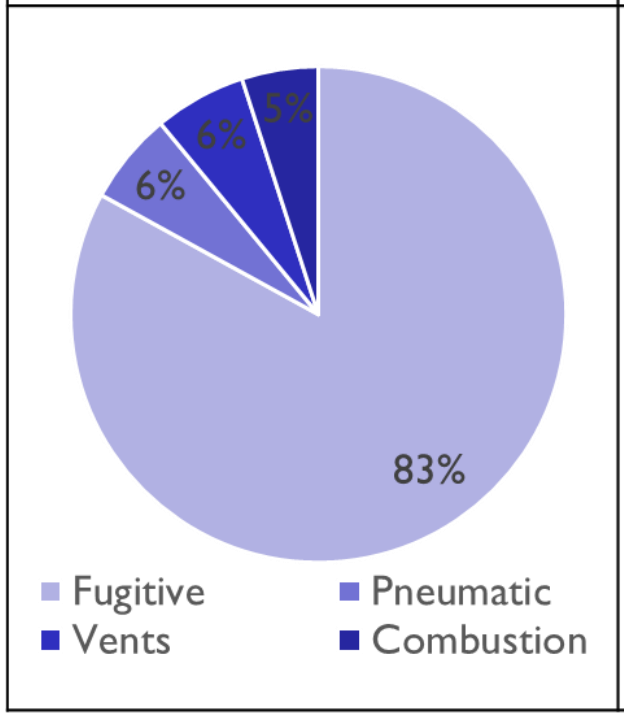
Distribution (<5 bar)

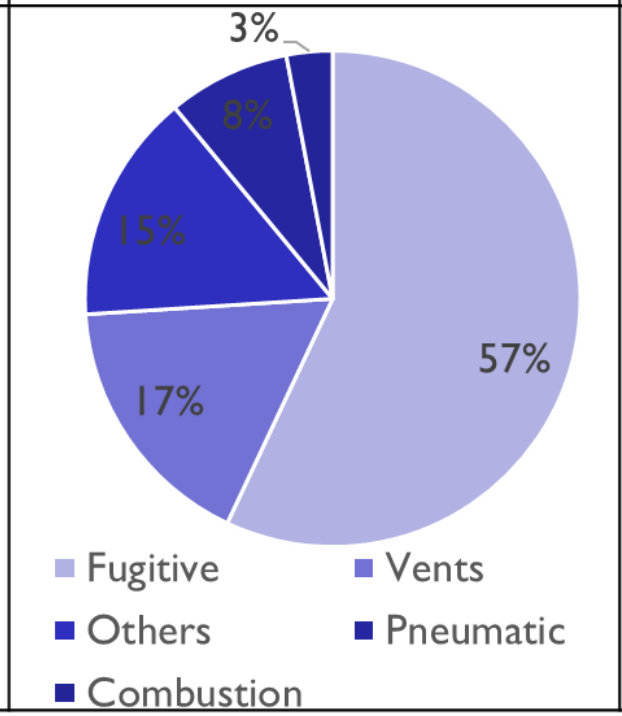
Pipeline material	Maximal emission rate	Share of the EU28 grid
Cast iron	1.388 kg CH_4 / km	2,5 %
Steel	198 kg CH_4 / km	39 %
Polyethylene	61 kg CH_4 / km	51 %
P.V.C.	34 kg CH_4 / km	5 %
Service lines	1,52 kg CH_4 / customer	

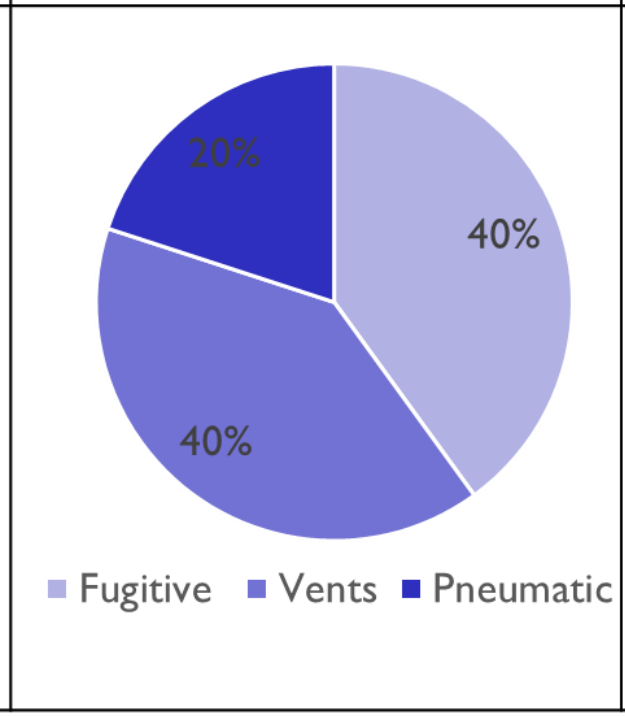


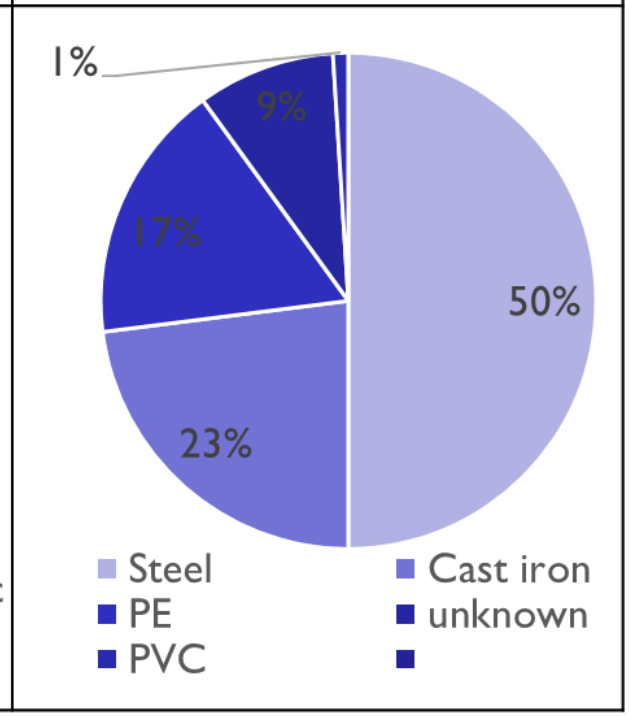
Marcogaz data analysis

LNG terminals	Underground Storage	Transport (>16 bar)	Distribution (<5 bar)
0,9% with 4.700 tonsCH4	7,4% with 38.000 tonsCH4	25,8% with 133.000 tonsCH4	65,9% with 339.000 tonsCH4









Marcogaz data analysis

LNG	• 4,700 ton CH_4 • 0.002 % compared to the EU28 sales • 0.003% of anthropogenic CO_{2eq}
UGS	• 38,000 ton CH_4 • 0.01% compared to the EU28 sales • 0.02% of anthropogenic CO_{2eq}
TSO	• 133,000 ton CH_4 •0.05% compared to the EU28 sales • 0.08% of anthropogenic CO_{2eq}
DSO	• 339,000* ton CH_4 • 0.12% compared to the EU28 sales • 0.21% of anthropogenic CO_{2eq}

Remarks

- ✓ *Results valid at global European level and not for an individual country.*
- ✓ *(*) 553,000 with 95% confidence level as mentioned in the report.*

Conclusion

- ✓ Marcogaz developed a methodology and technical studies starting from 2005 to estimate CH_4 emissions from EU gas infrastructure (Mid-Downstream). The data are similar to those provided by National Inventories -> some gaps need to be filled.
- ✓ Starting from these activities, a more detailed data reporting was developed to comply with OGMP 2.0 and the different Levels.
- ✓ The new templates and guide were published in November 2020.

https://www.marcogaz.org/app/download/8297774463/WG_ME-710.pdf?t=1614356848

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