



Reflections of GIE & Marcogaz' Methane leakage study

ECDSO-g Coordination Platform

marcogaz
TECHNICAL ASSOCIATION
OF THE EUROPEAN NATURAL GAS INDUSTRY

Jos Dehaeseleer

Secretary General

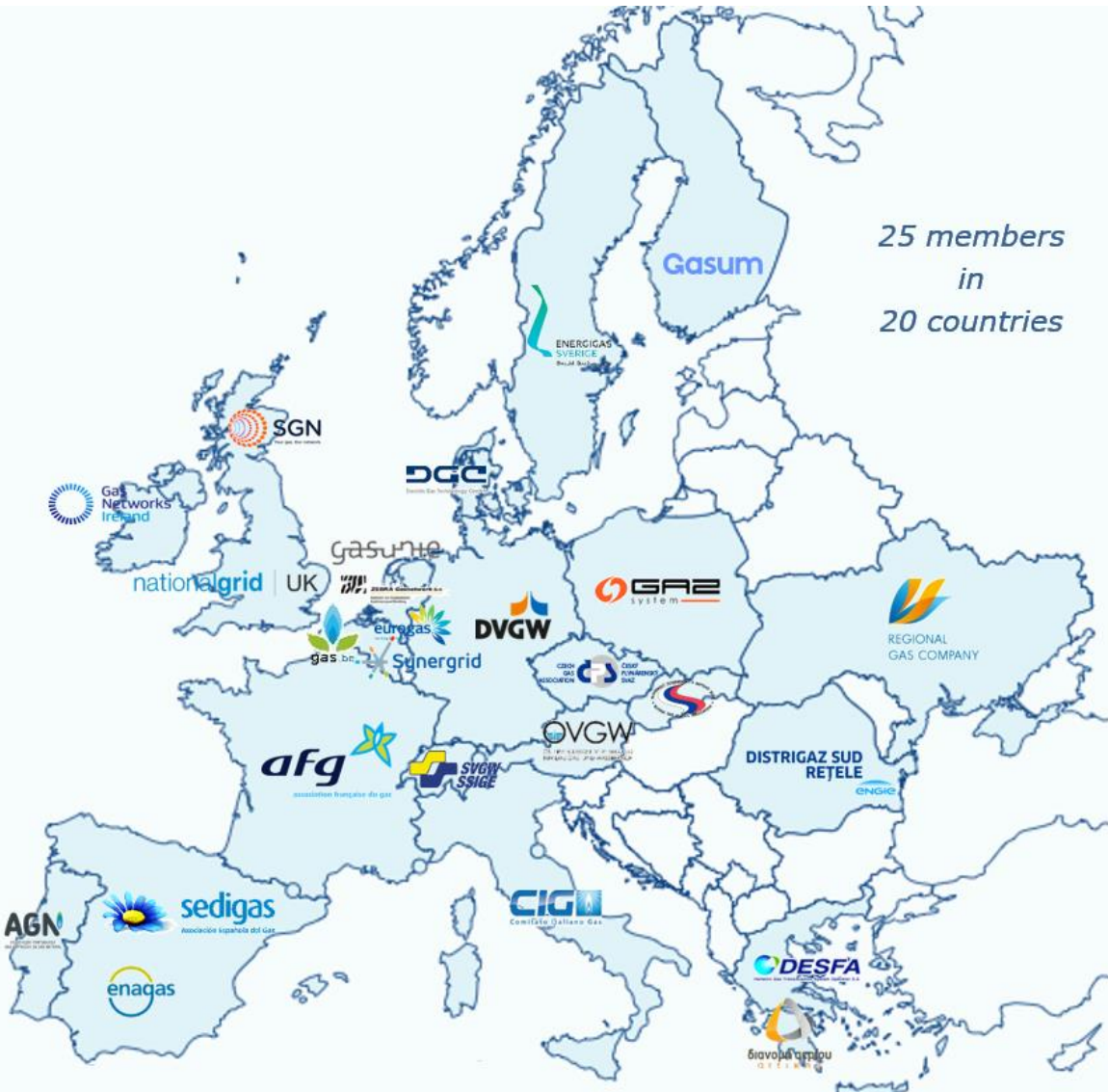


“MARCOGAZ is the competent and credible technical voice for natural and renewable gases in the field of infrastructure, utilisation and sustainability.

The EU sees MARCOGAZ as a trusted partner for a safe and reliable role of gas in the future energy mix.

MARCOGAZ supports strong cooperation between all gas organizations in Europe aiming to speak as one industry.”

MARCOGAZ members – cooperation with key organisations

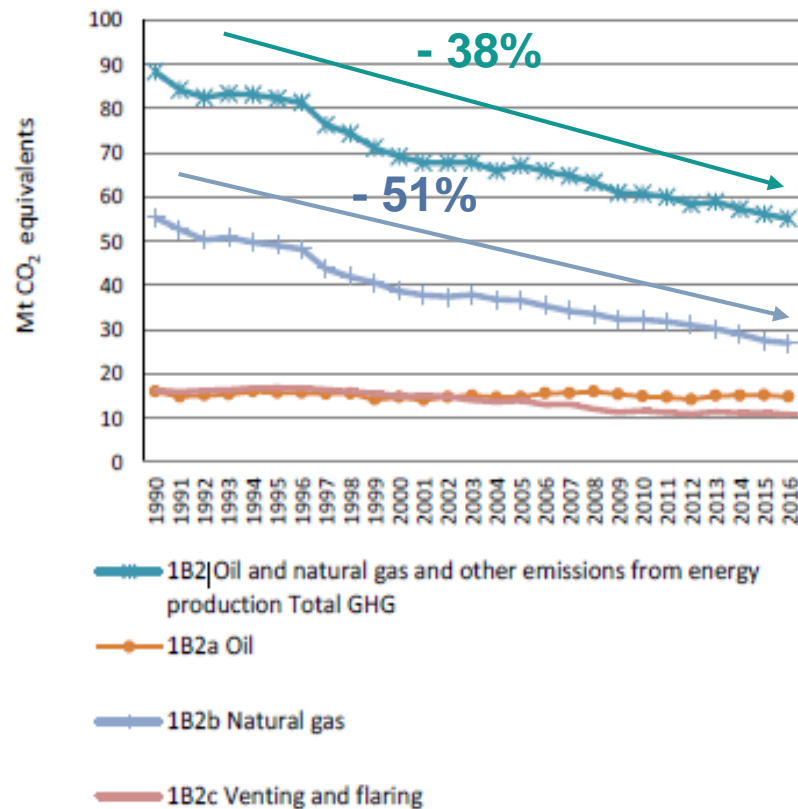


Why focus on methane emissions reduction?

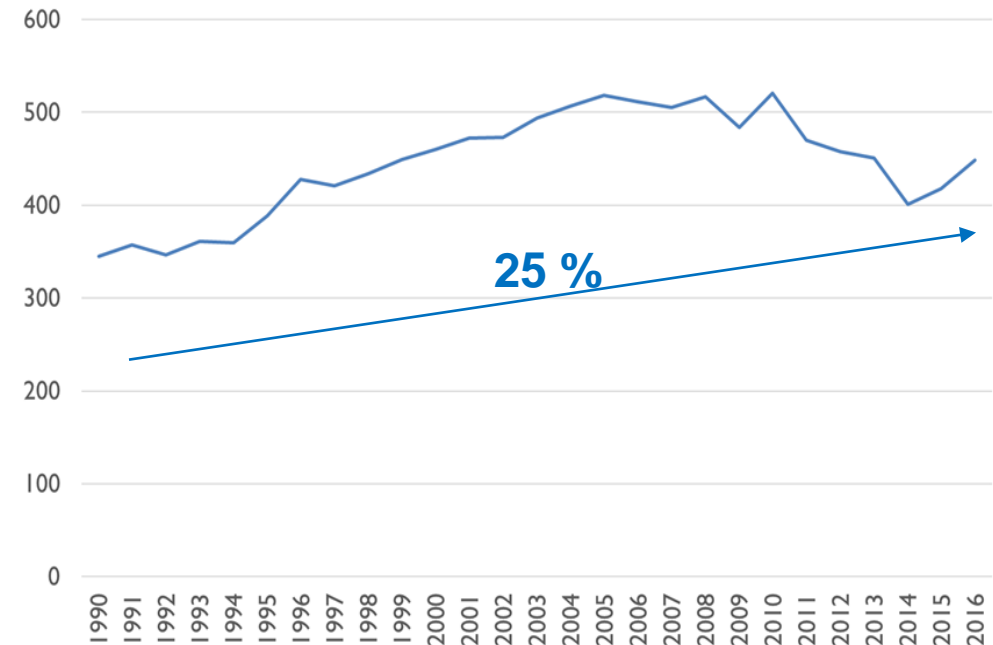
- ✓ Main reasons to reduce methane emissions:
 - Safety
 - Climate change
 - Public opinion
 - Policy developments
 - Commercial value



Emissions data trend 1B2 (oil&gas) in the EU (Mt CO_{2e})



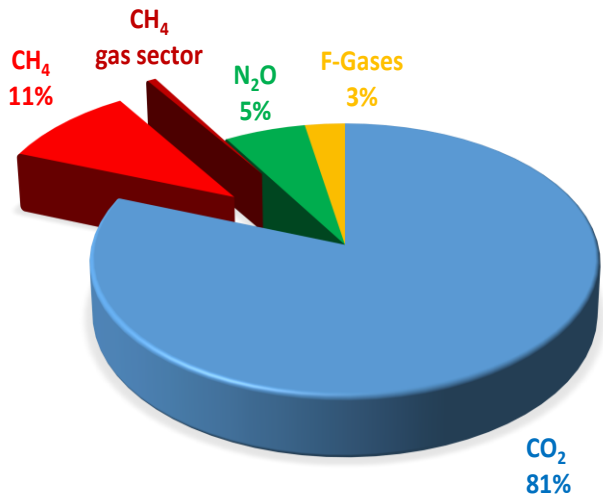
EU gas consumption (bcm)



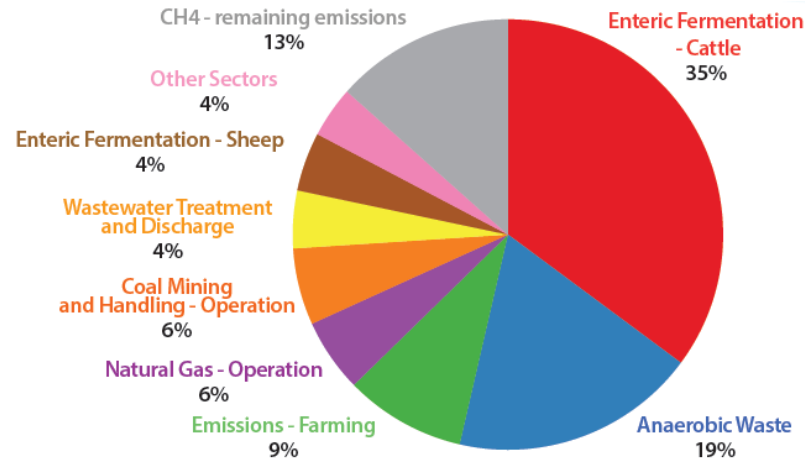
Source: Data from EEA - Annual EU GHG inventory 1990–2016 and inventory report 2018

Current status of EU CH₄ emissions (data 2016)

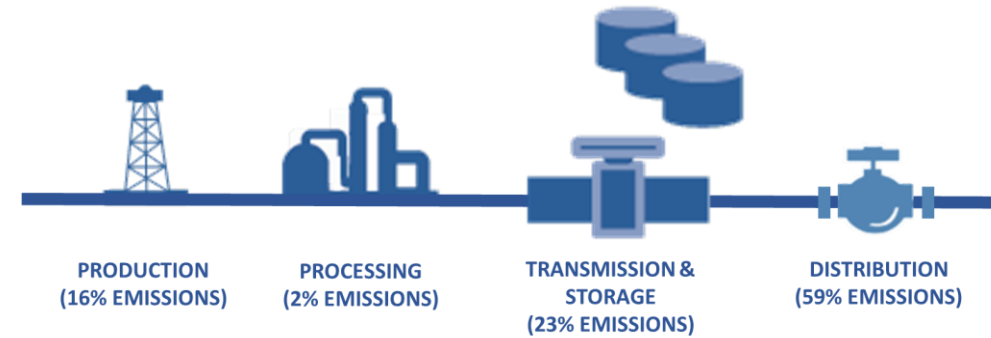
Total EU GHG emissions (in CO₂-eq)



CH₄ emissions per source



CH₄ emissions from EU natural gas operations



Source: Elaborated by the authors based on European European Environment Agency GHG report

European “Green Deal”

European Commission - Speech

[Check Against Delivery]

Opening Statement in the European Parliament Plenary Session by Ursula von der Leyen, Candidate for President of the European Commission

Strasbourg, 16 July 2019

“I want a Europe to strive for more being the first climate-neutral continent”

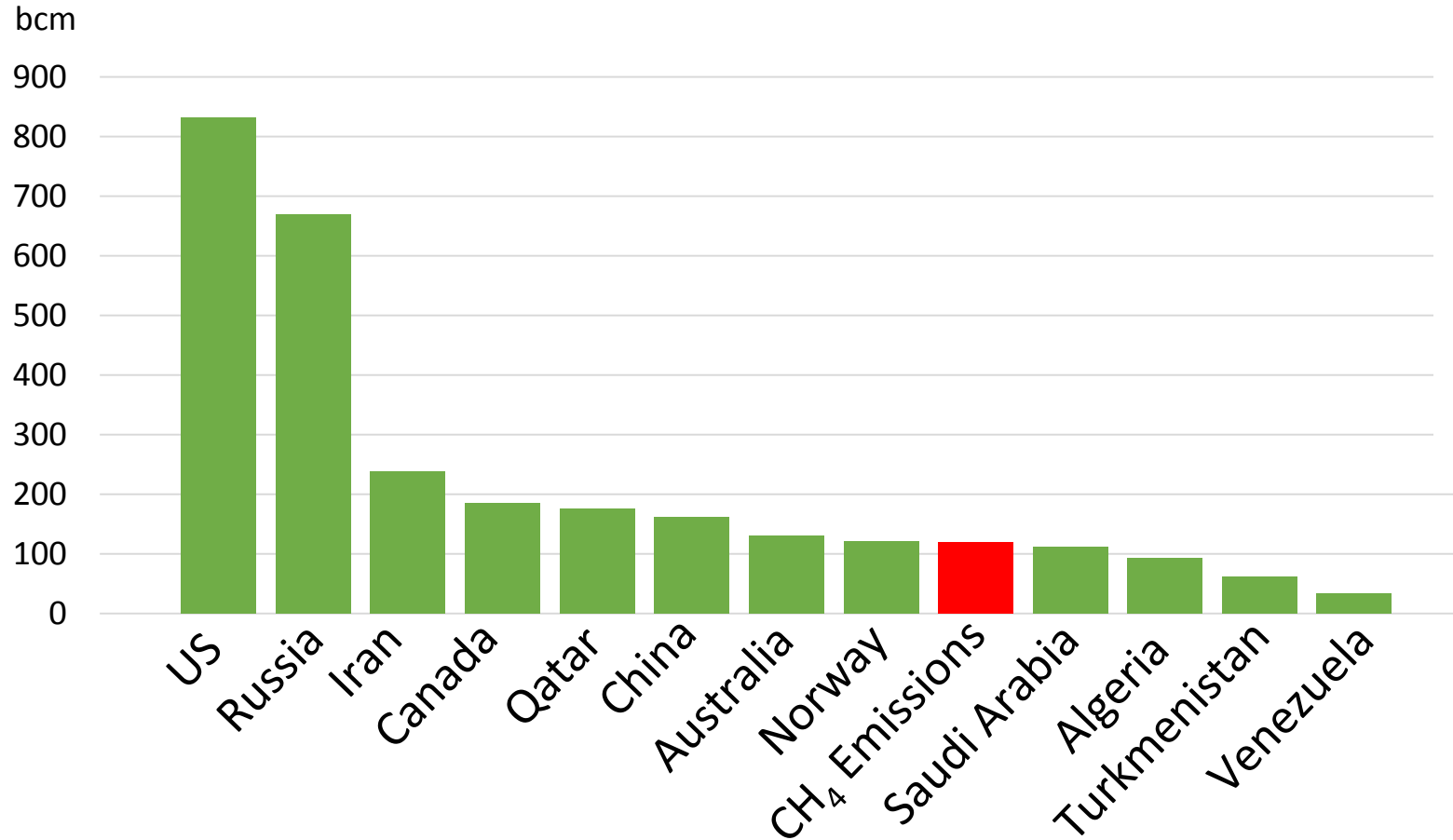


ACER - The Bridge Beyond 2025 - Conclusions Paper (19/11/19)



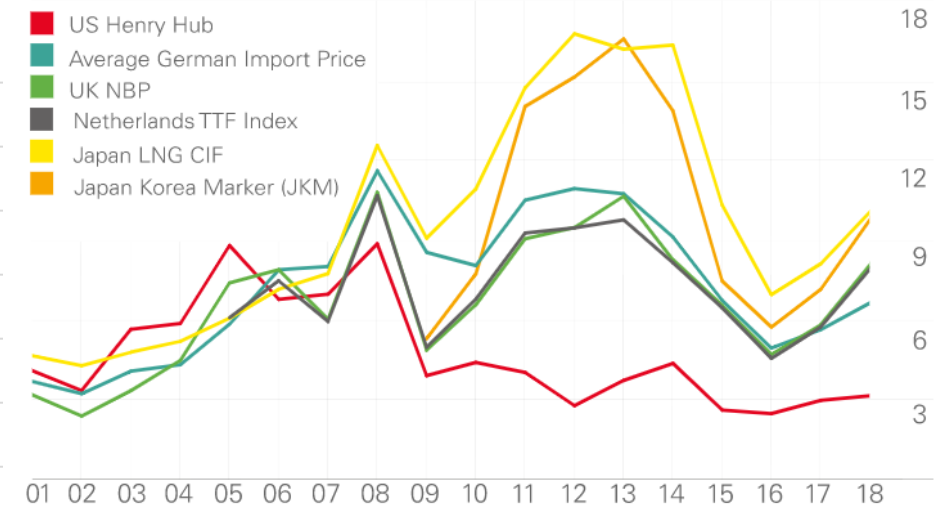
TSOs, storage operators and LNG operators, as well as DSOs above a size threshold, should be **obliged to measure and report their methane emissions** according to a standard methodology, with sufficient granularity to allow the identification of the highest emitters. The data should be publicly available through a **European Methane Emissions Observatory**, as well as in the audited annual reports of the operators, which should also cover other sources of methane emissions. The measurements should be followed by an action plan at system operator level to address emissions. NRAs should recognise efficiently incurred costs for regulated entities. Once emission data are sufficiently robust, tradeable permits or taxes on actual emissions could be introduced.

Gas production in some countries in 2018 (bcm)



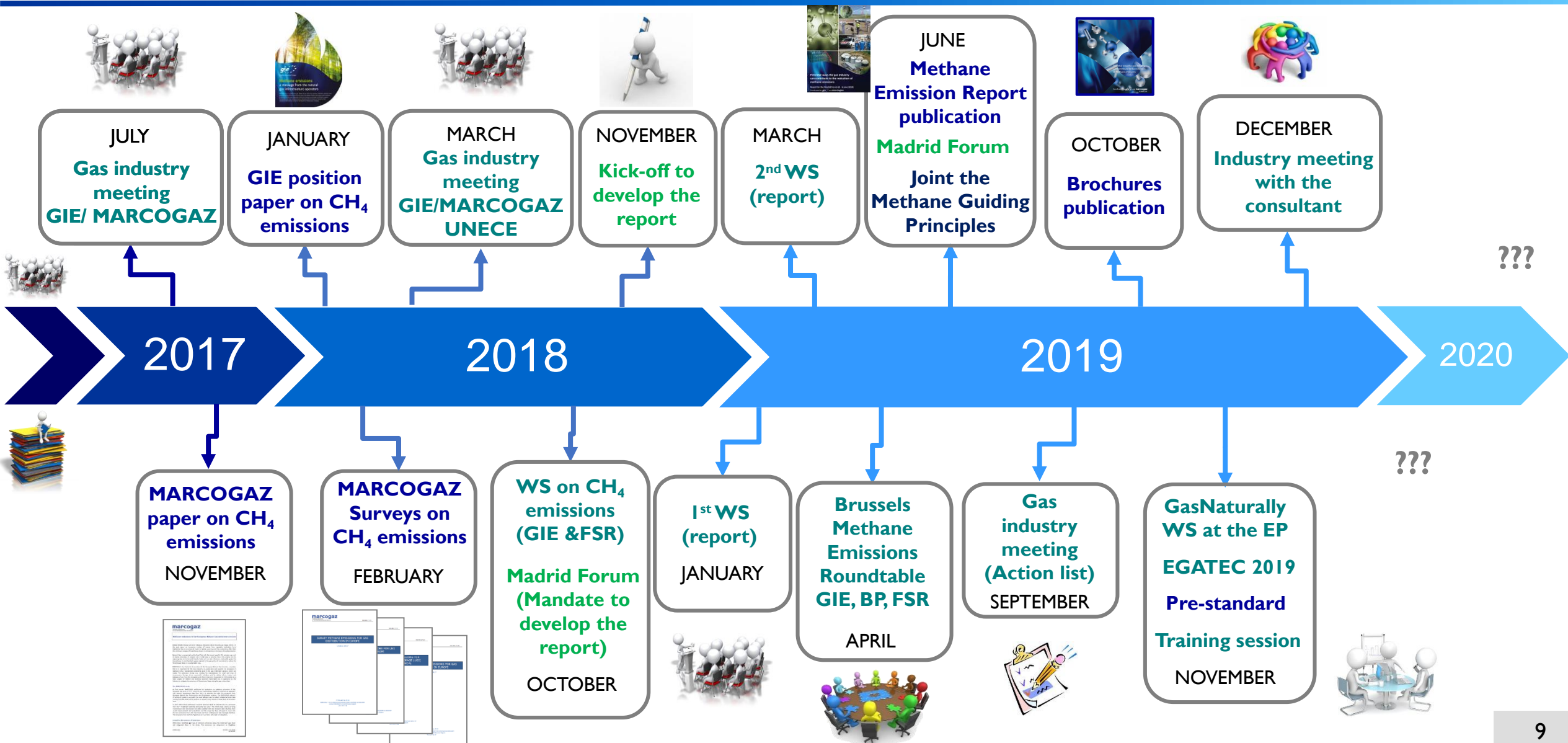
Source: Based on the IEA and BP Statistical Review of World Energy

Natural gas prices (\$/mmBtu)

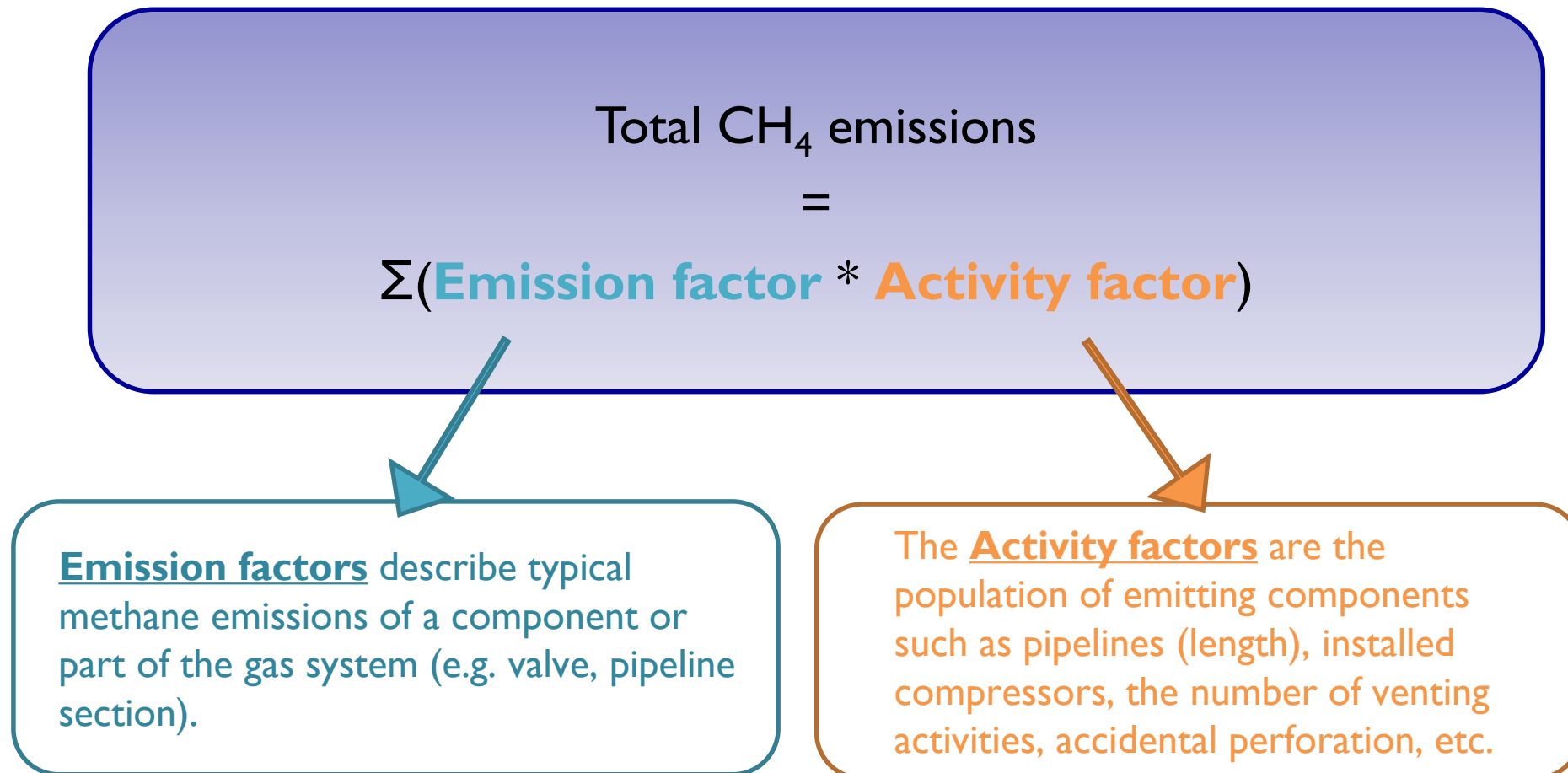


Source: BP, Statistical Review of World Energy

GIE & MARCOGAZ recent activities on CH₄ emissions



“**Bottom > Up**” methodology: based on an aggregation of collected data from the field (>< “Top > Down”)



1) To **collect data** from different european companies

- Included emissions
- ✓ Fugitive emissions
 - ✓ Vented emissions (maintenance + incidents + operations)
 - ✓ Unburned CH₄ in combustion processes

2) To check the **correlation** between CH₄ emissions and Activity Factor

3) Conclusion on **representative dataset**

Marcogaz Reporting Methodology (III)

Example

METHANE EMISSION Calculation for Distribution															
Organisation						Natural Gas Composition									
Company:						Average Methane Content of Natural Gas:					% (Vol.)				
Emissions for the Year:						Density of Methane:		0,7175			kg/m ³				
Responsible Person:						Conversion Factor from m ³ Nat.gas to g CH ₄		0			g CH ₄ / m ³ Gas				
Calculation															
No.	System Category	Pressure	Activity Factors		Emission Factors				Total Emissions		Source for own factor				
			Data	Unit	Marcogaz Range*		Company		Nat.Gas	Methane	Measurement	Literature	Estimation	Remark (please specify, if possible)	
					Minimum	Maximum	Data	Unit	m ³ /a	g/a					
1.	Distribution Lines														
1.1	Grey cast iron with lead joint	Low		km	M			M	m ³ /km						
		Medium		km	M			L	m ³ /km						
		(1)		km					m ³ /km						
1.2	Ductile cast iron	Low		km	L			L	m ³ /km						
		Medium		km	M			L	m ³ /km						
		(1)		km					m ³ /km						
1.3	Steel	Low		km	L			L	m ³ /km						
		Medium		km	L			L	m ³ /km						
		(1)		km					m ³ /km						
1.4	Steel with cathodic protection	Low		km	L			L	m ³ /km						
		Medium		km	L			L	m ³ /km						
		(1)		km					m ³ /km						
1.5	Steel without cathodic protection	Low		km	L			M	m ³ /km						
		Medium		km	M			M	m ³ /km						
		(1)		km					m ³ /km						
1.6	Plastic Polyethylene PE	Low		km	L			M	m ³ /km						
		Medium		km	M			L	m ³ /km						
		(1)		km					m ³ /km						
1.7	Plastic PVC	Low		km					m ³ /km						
		Medium		km					m ³ /km						
		(1)		km					m ³ /km						

Marcogaz Results

LNG	<ul style="list-style-type: none">• 4,700 ton CH₄• 0.002 % compared to the EU28 sales• 0.003% of anthropogenic CO_{2eq}
UGS	<ul style="list-style-type: none">• 38,000 ton CH₄• 0.01% compared to the EU28 sales• 0.02% of anthropogenic CO_{2eq}
TSO	<ul style="list-style-type: none">• 133,000 ton CH₄• 0.05% compared to the EU28 sales• 0.08% of anthropogenic CO_{2eq}
DSO	<ul style="list-style-type: none">• 339,000* ton CH₄• 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 (<https://www.marcogaz.org>).

Terms of Reference

Terms of Reference

Joint proposal on potential way industry can contribute to the reduction of methane emissions

Background

During the last European Gas Regulatory Forum held in October 2018 in Madrid, the Forum invited GIE and MARCOGAZ to co-lead, with the support of the gas industry, the development on the way industry can contribute to the reduction of methane emissions in the gas sector.

Conclusion of 31st meeting of the European Gas Regulatory Forum, 16 - 17 October 2018, Madrid

The reduction of fugitive methane emissions in the energy sector is a prerequisite for the sustainable use of gases in the future energy mix. Therefore, the development of a common, robust measurement methodology and life-cycle based reporting of net methane emissions are necessary. The Forum invites GIE and Marcogaz to develop further on the potential way industry can contribute to these objectives and report back to the next Madrid Forum.

Over the last years the gas industry has recognized the importance of understanding methane emissions along the gas value chain. Several initiatives and studies have been undertaken to better understand the scale of losses, potential sources and opportunities for reductions.

In addition, the gas industry is striving to further reduce methane emissions from their gas infrastructure, to implement good industry practices to achieve this goal and to improve transparency of emissions data.

However, there is work to do to better understand losses in the gas value chain, standardize methodologies and improve transparency. This is important to support the future role of gas in a decarbonized future energy mix.

Objective

A report on current understanding within the gas industry to be presented during the next Madrid Forum that will take place on 5th and 6th June 2019.

The entire gas chain (from production to utilization) and all the types of methane emissions will be covered.

The document will reflect the work done on this topic, the ongoing initiatives and projects (including next steps and timelines) and the identified gaps (proposals and recommendations will be included when possible) along the gas value chain.

The work will be divided in 2 parts:

- Current understanding and initiatives**
 - This first phase will describe the current situation of the gas sector, and particularly of the gas industry, regarding methane emissions. This will include:
 - Introduction to methane emissions

business cases and developments by and relevant stakeholders.

Reducing methane emissions

methane emissions in the gas value chain and main stakeholders are

between GIE and MARCOGAZ, while members will be created to carry out in both organizations has been taken place on 6th November in

ations to gather proposals, ideas and different stakeholders. Organisations are MARCOGAZ before 20th November CO2. Ensure that all the stakeholders are aware and on time, at the progress of the report and

during the workshops, submitted to be peer reviewed, May 2019.

CEDEC, CERFC, EASEE-gas, EBA, IGGP, IPECA, GEODI, GD4S, etc, Methane Guiding Principles

IA, FSR, IEA, UNECE, UNEP, NGOs,

methane emissions

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Project plan

	22/10/2018	29/10/2018	05/11/2018	12/11/2018	19/11/2018	26/11/2018	03/12/2018	10/12/2018	17/12/2018	24/12/2018	31/12/2018	07/01/2019	14/01/2019	21/01/2019	28/01/2019	04/02/2019	11/02/2019	18/02/2019	25/02/2019	04/03/2019	11/03/2019	18/03/2019	25/03/2019	01/04/2019	08/04/2019	15/04/2019	22/04/2019	29/04/2019	06/05/2019	13/05/2019	20/05/2019	27/05/2019	03/06/2019	
Presentation of the draft ToR	█																																	
Draft ToR to be circulated for comments																																		
Creation of a joint Task Force - Call for participants																																		
Kick-off meeting of the TF (8 November - 14:00-17:00)																																		
Approval of the ToR (GIE&MARGOZ)																																		
Structure and first version of the document with the main contents																																		
First workshop (17 January - Brussels)																																		
Preparation of a second version of the document based on the feedback received																																		
Second workshop (27 March - Geneva)																																		
Preparation of the third version of the document based on the feedback																																		
Peer review																																		
Approval of the document																																		
Final document and presentation																																		
Madrid Forum (5-6 June - Madrid)																																		

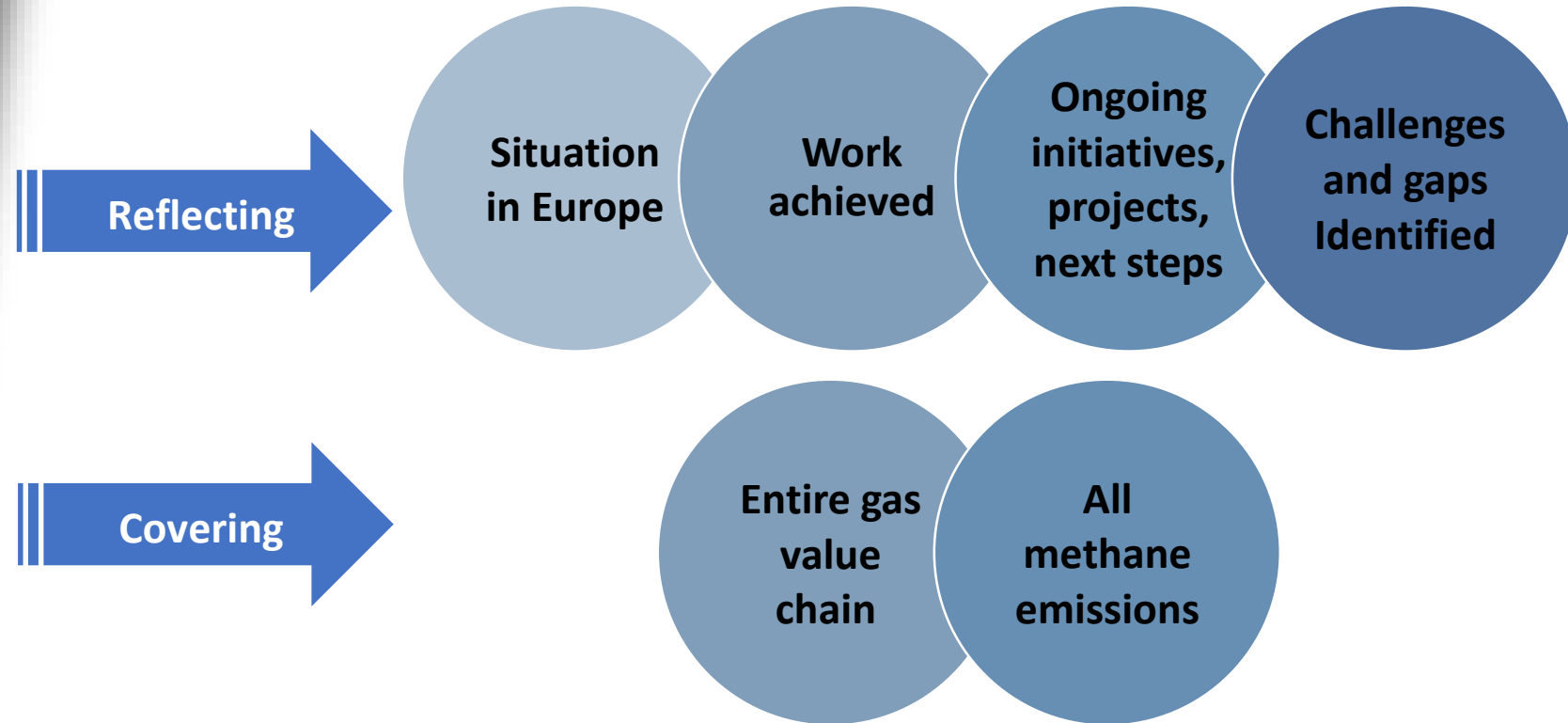
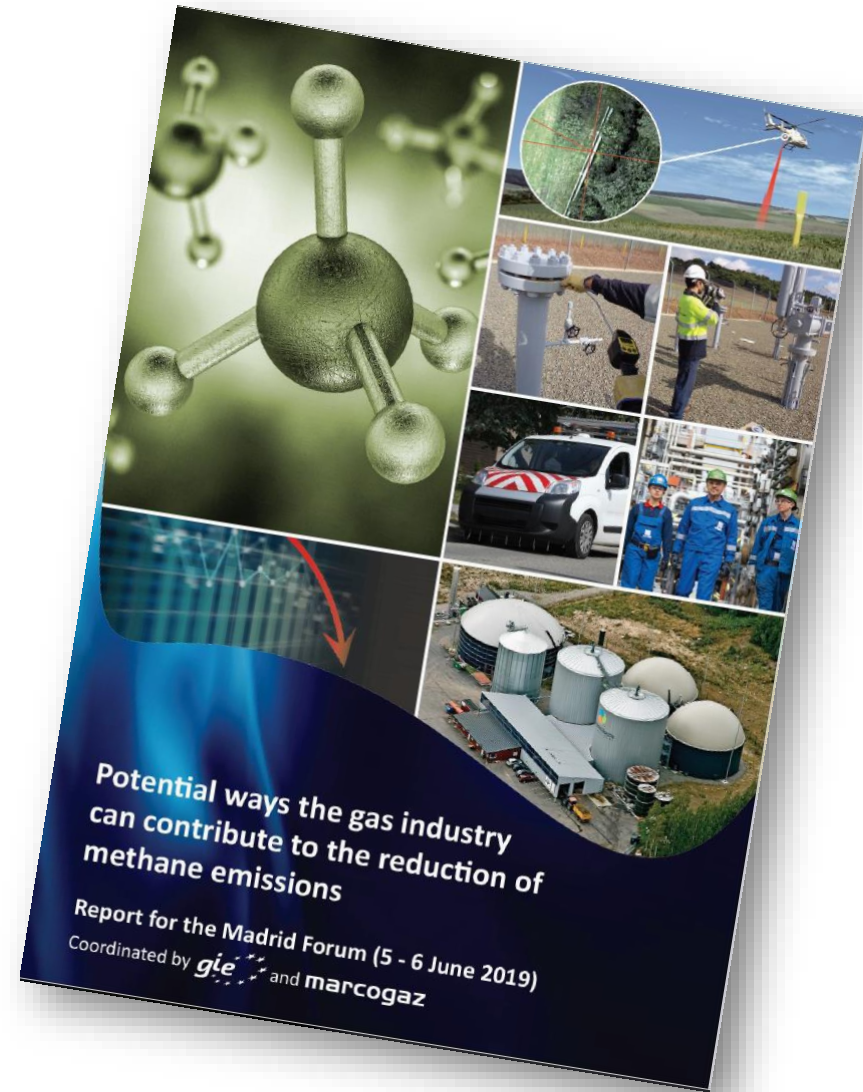
Peer review panel



1st WS (Brussels) - Almost 50 participants representing 37 organizations covering the entire gas chain, from production to utilization, the EC and NGOs

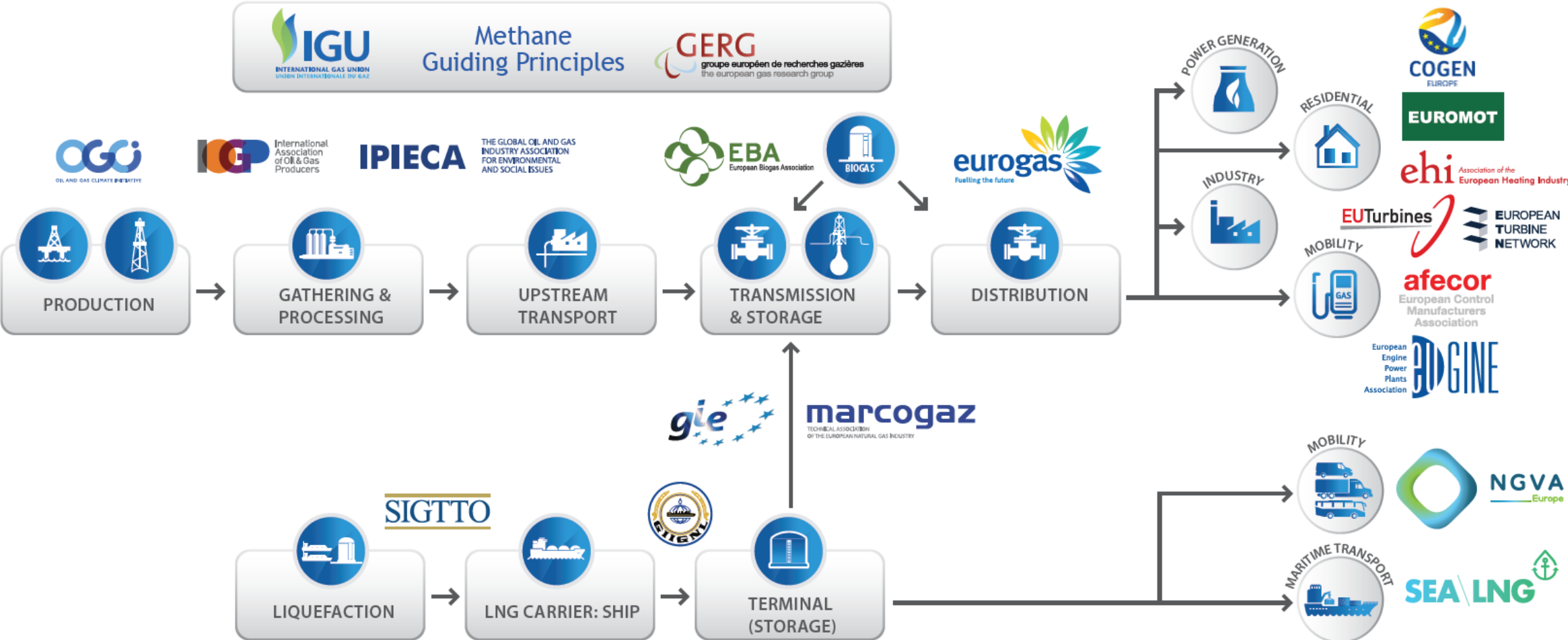
2nd WS (Geneva) – More than 90 participants representing gas industry, the EC, international institutions, NGOs and academics. Representatives from Third Countries

The role of the industry in reducing methane emissions



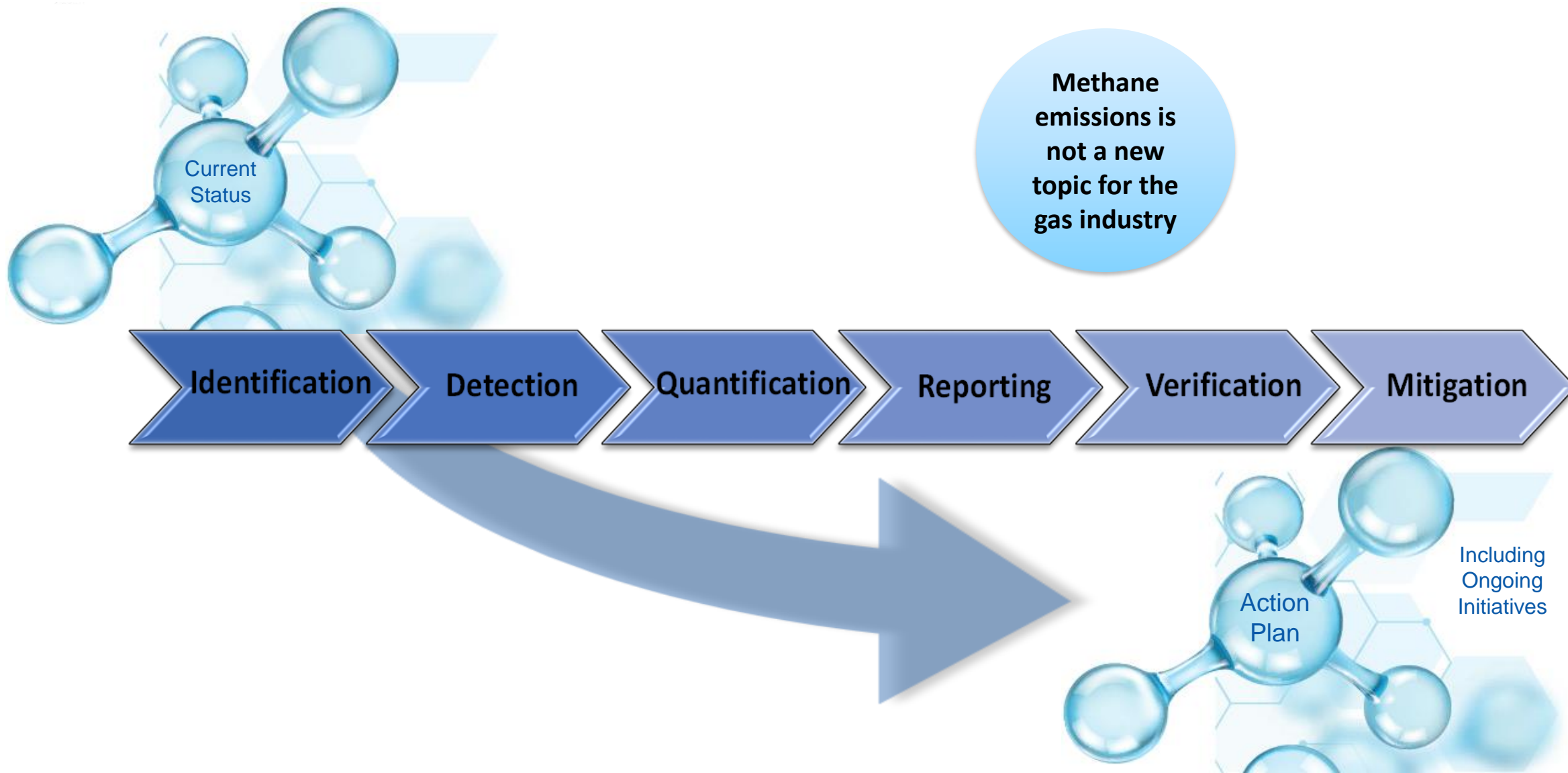
Contributions from representatives of the entire gas chain

From production to utilisation, including biomethane plants



Actions undertaken to reduce methane emissions

marcogaz



Methane emissions		
Types of emissions		Examples
Fugitives	Leaks due to connexions	
	Permeation	
Vented	Operational emissions	Purging/venting for works, commissioning and decommissioning
		Regular emissions of technical devices
		Starts & stops
	Incidents	Third party, corrosion, construction defect/material failure, ground movement, failure of installation
Incomplete combustion		Unburned methane in exhaust gases from combustion installations.

Summary of existing activities

Production, transmission, LNG terminals, UGS and distribution	Type of emission		
	Fugitive	Venting	Incomplete combustion
Identification / Detection	LDAR-type programs involving use of IR cameras, sniffers, etc.	Equipment/process mapping	Equipment/process mapping
Quantification	Measured, calculated and/or modelled	Measured, calculated and/or modelled	Calculated and/or modelled
Mitigation	LDAR programs	Implementation of BAT	
Reporting	<ul style="list-style-type: none"> - Sustainability and carbon footprint reports (based on company inventories) - National Inventory Reports (to national authorities) - Partnership and associations methodologies (e.g. CCAC OGMP, OGCI, IOGP, IPIECA, MARCOGAZ) - Reporting initiatives (e.g. CDP, EDF) 		
Validation / Verification	According to GHG Protocol, EN 15446, ISO 14064, ISO 14001, ISO 50001, ISAE 3000. Verification of emissions often done by a third party		

- ✓ The systematic approach to identify, detect, quantify, report and verify emissions is essential to close the current knowledge gap and enable gas industry to prioritise and allocate capital and human resources to efficiently target methane emissions at the lowest abatement cost.

The key elements

- ✓ **The bottom-up approach is source specific, which allow the industry to efficiently spot and tackle its emissions, the difficulty being to properly quantify when estimations are necessary and to exhaustively account for all the potential sources.**
- ✓ **The top-down approach is global as it relies on atmospheric concentration measurement but the modeling process used to quantify the emissions based on the concentration is challenging, as well as the complementary analysis necessary to differentiate the sources.**
- ✓ **Reconciliation studies ongoing in Europe.**

Regulatory requirements to report methane emissions

According to Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC) members are required to create “a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases”

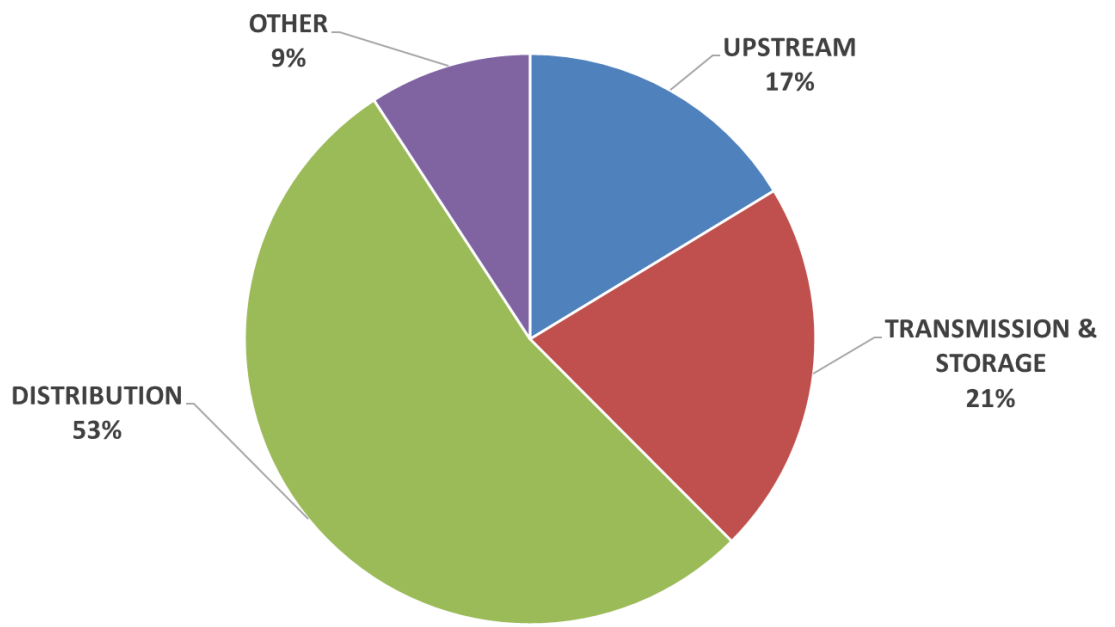
Although the framework for reporting is fixed by the UNFCCC, the method of emission estimation can differ from country to country, and even between several data providers within one country, as long as this method can be scientifically justified

GHG Inventories – Tier approach

- ✓ All EU Member States are required to monitor and report their methane emissions under the EU GHG monitoring mechanism, which sets the EU's own internal reporting rules on the basis of internationally agreed obligations (IPCC Guidelines).
- ✓ The IPCC Guidelines distinguish between three methodological tiers for quantification of emissions:
 1. Tier 1: It is the simplest approach; it comprises the application of appropriate default emissions factor to a representative activity factor (usually throughput). Default emission factors for a set of activity data are listed in the IPCC Guidelines.
 2. Tier 2: Similar to Tier 1 approach. However, instead of default emissions factors, country-specific emission factors (developed from external studies, analysis measurement campaigns) are used.
 3. Tier 3: The most detailed approach based on a rigorous bottom-up assessment at the facility level, involving identification of equipment-specific emission sources, equipment inventory, measurement of emission rates per equipment type, etc.

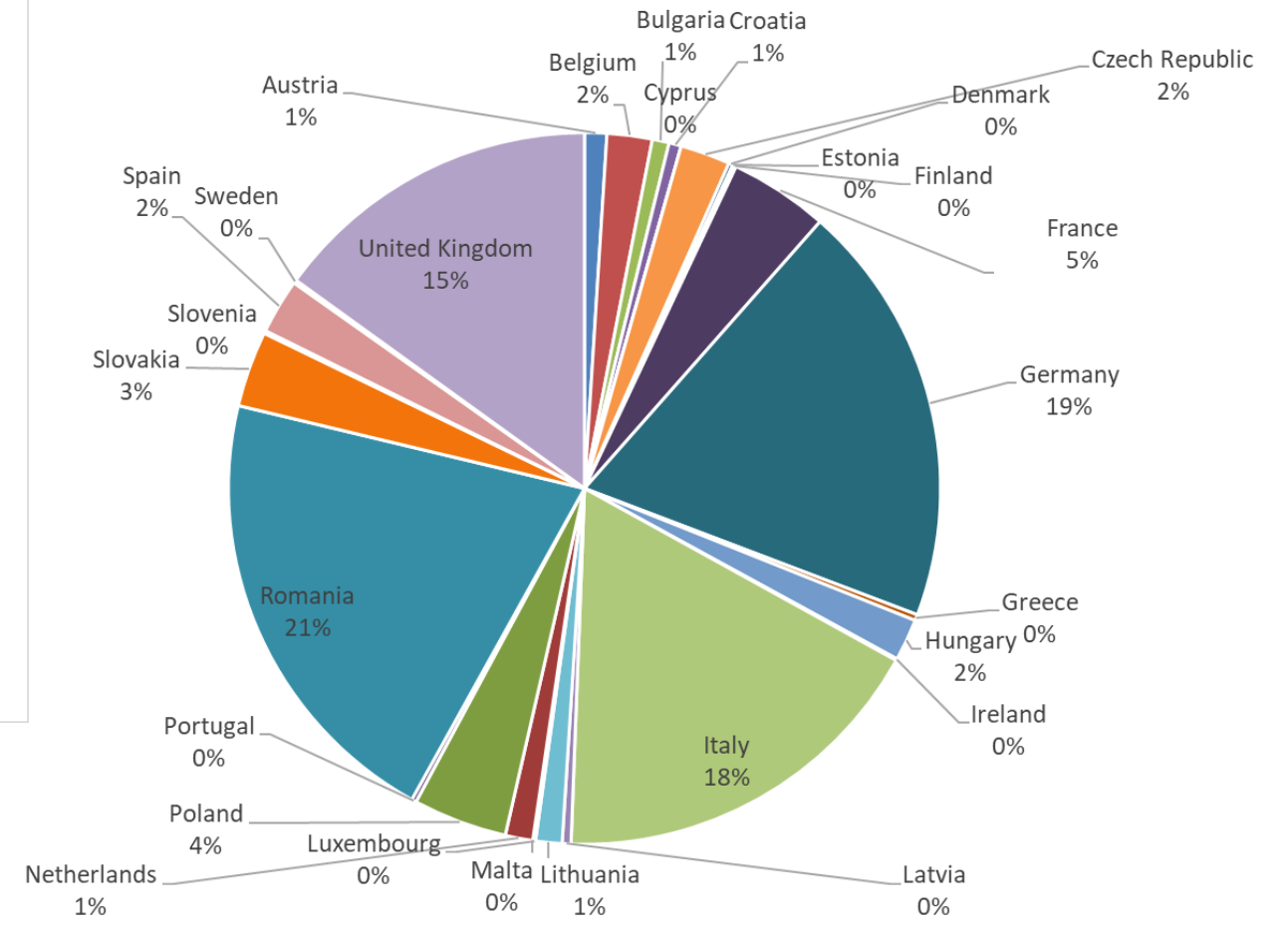
Fugitive Emissions from natural gas operations

EU GHG - METHANE EMISSIONS FROM NATURAL GAS OPERATIONS 2016

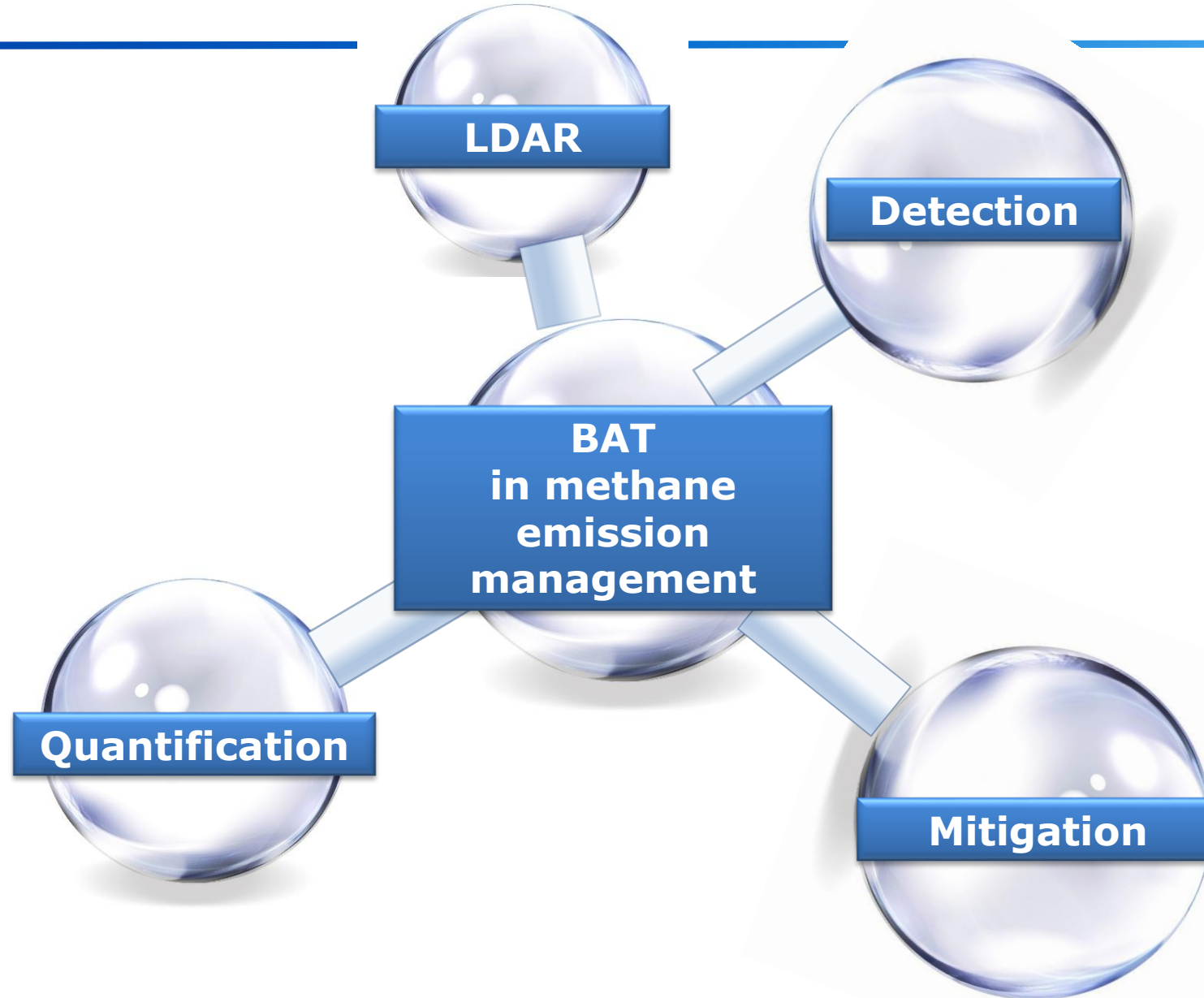


Contribution vs. gas chain & countries

EU GHG - METHANE EMISSIONS FROM NATURAL GAS OPERATIONS 2016



Standard / Protocol	PROS	CONS
<u>ISO 14064</u>	<ul style="list-style-type: none"> • Methodical approach to identifying sources and sinks; provides framework for emissions inventory system • Requires collection of direct and indirect emissions (through boundary setting) • Requires organisations to record activities to reduce emissions • Outlines requirements to state uncertainty • Total organisational emissions inventory 	<ul style="list-style-type: none"> • GHG emissions must be expressed as CO₂e • Organisations can establish own boundaries for emissions capture, however these must be stated (transparency issues) • Organisations can identify the CO₂e conversion factors, rather than using a single point source (consistency for comparison)
<u>GHG Protocol: Corporate Standard</u>	<ul style="list-style-type: none"> • Identifies a methodical approach to identifying, quantifying, assuring, reporting, verifying and target setting. • Outlines requirements for external verification and reporting • Identifies tools for calculating emissions • Provides examples 	<ul style="list-style-type: none"> • Large standard, labour and cost intensive (however thorough)
<u>EPA 21</u>	<ul style="list-style-type: none"> • Identifies the specific equipment and methodologies for detecting and quantifying emissions • Point source emission identification and quantification 	<ul style="list-style-type: none"> • Aimed at individual asset's emissions; no framework for organisations. • No detail provided for verification • Minimal detail for quality control
<u>EN 15446</u>	<ul style="list-style-type: none"> • Identifies the specific equipment and methodologies for detecting and quantifying emissions • Detailed methodology for report writing and data capture • Point source emission identification and quantification 	<ul style="list-style-type: none"> • Aimed at site or point source emission; doesn't provide framework for organisation emissions inventory • Not necessarily verifiable but is supported by third party accreditation





AROUND 60 MAIN ACTIONS



GIE and MARCOGAZ encourage the gas industry to support the next steps and to join the action!

Standardisation & Measurement

Challenges and gaps	Actions (timing)
Awareness and knowledge on the methane emissions topic	<ul style="list-style-type: none"> Educational toolkit under development by Methane Guiding Principles (<i>by the end of 2019</i>) Educational Outreach Programme under development by Methane Guiding Principles (<i>by the end of 2019</i>) OGCI outreach to national oil & gas companies (NOCs) on BAT implementation with (<i>ongoing</i>) OGCI engagement in downstream activities (<i>ongoing</i>) Organisation of workshops for EU gas industry to share information on the main findings of the (present) GIE and MARCOGAZ report, ensuring involvement of all EU countries and utilisation (<i>end of 2019 / beginning 2020</i>) IPIECA Methane mapping tool (<i>2019</i>)
Fragmented initiatives along the gas value chain	<ul style="list-style-type: none"> Gas operators seeking guidance to address methane emission reduction and urge the associations to take an active role in the global initiatives (<i>ongoing</i>)
Aggregation of methane emission data along the EU gas value chain	<ul style="list-style-type: none"> EU gas associations to work jointly on a proposal, including units (<i>TBD¹⁰</i>)
Proper allocation of methane emissions to oil & gas chains	<ul style="list-style-type: none"> Oil & gas producers to explore possible methodologies related to the allocation of methane emissions (<i>TBD</i>)
Harmonised definitions along the EU gas value chain	<ul style="list-style-type: none"> EU gas associations to collaborate based on the IPIECA Glossary (<i>TBD</i>)

Awareness

Challenges and gaps	Actions (timing)
Reporting	<ul style="list-style-type: none"> Harmonised reporting <ul style="list-style-type: none"> Methane common reporting template developed by Methane Guiding Principles (2019-2020) European voluntary system for control of methane emissions will be developed by EBA (<i>TBD</i>) Improve accuracy and transparency of national inventories <ul style="list-style-type: none"> Coordination between the gas industry and national authorities to improve quality of data. NIR should be based on Tier 3 approach for the entire gas chain in the future. (<i>TBD</i>) Improvement of harmonised quantification methodologies and gathering measured data <ul style="list-style-type: none"> CCAC Methane Science Studies, in collaboration with UNECE, EDF and OGCI (<i>ongoing</i>) MARCOGAZ pre-standard for transmission and distribution related to identification and quantification (<i>2019</i>) Reconciliation of bottom-up and top-down approaches <ul style="list-style-type: none"> Collaboration between NGOs, industry and academia will lead to further reduction of uncertainty between methodologies (some ongoing CCAC Methane Science Studies, but more work in this area is required) (<i>TBD</i>) Improvement of companies' inventory data <ul style="list-style-type: none"> Verification and validation of emissions according to reference standards (<i>TBD</i>) Knowledge and data on utilisation <ul style="list-style-type: none"> Ongoing projects (<i>2019 & 2020</i>)

Challenges and gaps	Actions (timing)
Mitigation	<ul style="list-style-type: none"> Limited financial and economic incentives (in some cases) to put in place mitigation measures <ul style="list-style-type: none"> Gas industry to do cost/benefit analysis Incentives from Authorities Establishment of methane emission reduction targets at company level <ul style="list-style-type: none"> Gas companies, who don't have it yet, to consider the establishment of reduction targets Employees engagement on methane emission reduction <ul style="list-style-type: none"> Once gas companies establish reduction targets, to evaluate the possibility to set up performance remuneration for the employees Dissemination of BAT information <ul style="list-style-type: none"> Analysis of the most efficient BATs Gas industry to take part of the outreach programmes and participate in GIE and MARCOGAZ workshops Innovation on technologies <ul style="list-style-type: none"> OGCI (Climate Investments) initiative "Towards zero methane emissions"
Missing cross sectoral opportunities and exchange of views (i.e. innovative technologies, BATs) aimed at the reduction of methane emissions	<ul style="list-style-type: none"> Creation of an industry/cross-sectorial Forum/Platform bringing together different EU sectors responsible for methane emissions and representatives of non-EU companies/organisations.
Methane emissions data of natural gas imports	<ul style="list-style-type: none"> Enhance the collaboration with non-EU companies (suppliers)
Potential overlapping with existing EU and national regulation on methane emissions	<ul style="list-style-type: none"> Analysis of EU and national regulation, including its impact (gas industry to support this action). (<i>TBD</i>)

Mitigation & Reporting



Dissemination activities and training programmes organise between GIE and MARCOGAZ based on the report

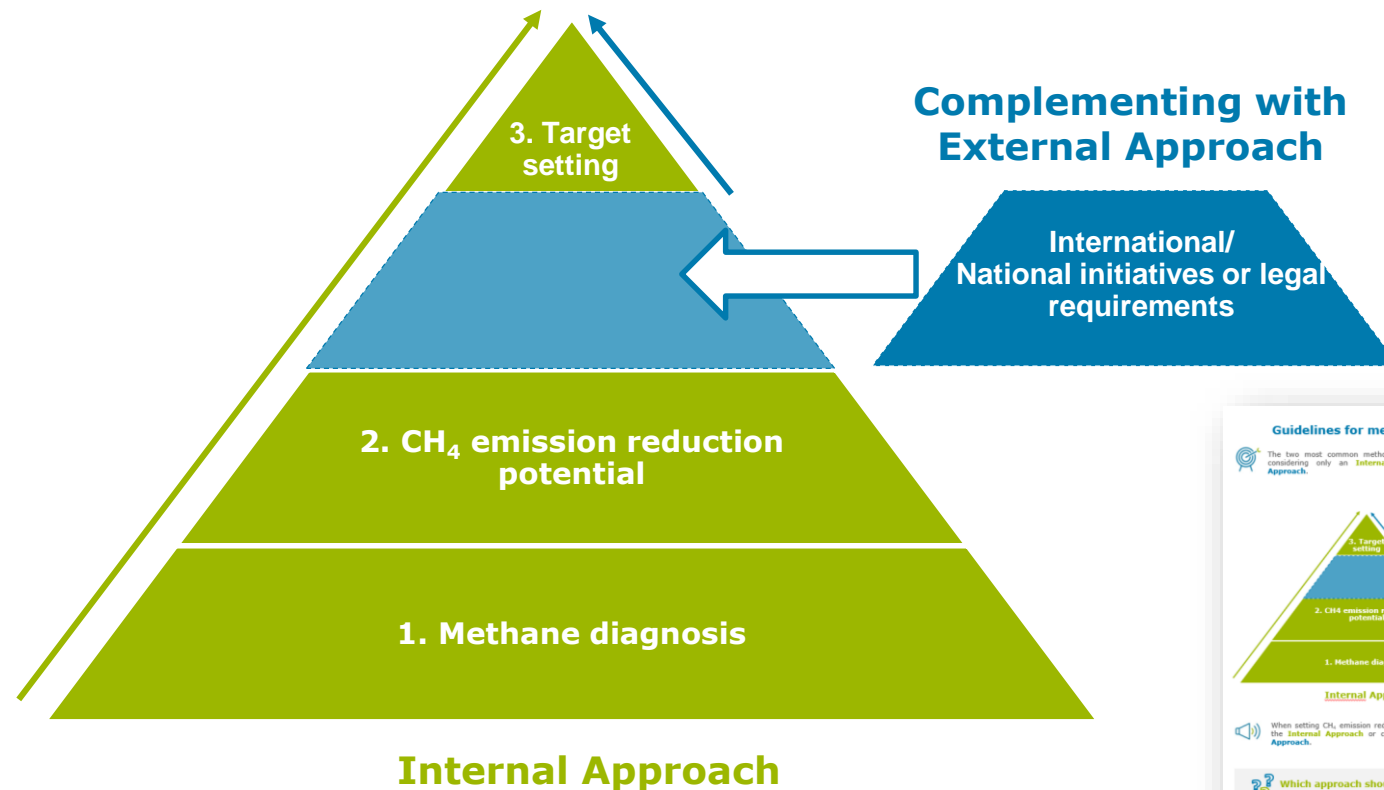
Brochure already published



Dissemination activities:


- ✓ Madrid Forum
- ✓ IGU Committees
- ✓ GasNaturally WS
- ✓ EGATEC 2019
- ✓ First training programme (Vienna)
- ✓ ...

The two most common methodologies used for CH₄ target setting are considering only an Internal Approach and adding an External Approach.



A Guide for Methane target setting is under elaboration, expected to be released in December 2019. A draft has been already prepared including main contents.

Assessment of methane emissions for TSO & DSO

 <small>TECHNICAL ASSOCIATION OF THE EUROPEAN NATURAL GAS INDUSTRY</small>		Types of emissions						
		Fugitives		Vented			Incomplete combustion	
		Permeation	Leaks due to connections	Operational emissions				Incidents
				Purging/venting for works, commissioning and de-commissioning	Regular emissions of technical devices (e.g. pneumatic)	Start & Stop		
Groups of assets	Main lines & service lines	§ 6.4.1	§ 6.4.2	§ 6.5.2.1			§ 6.6	
	Connections (flanges, seals, joints)		§ 6.4.2					
	Measurement devices (chromatographs, analysers ...)		§ 6.4.2		§ 6.5.2.2			
	Valves ² (regul. stations, blending stations, compressor stations, block valve stations)		§ 6.4.2	§ 6.5.2.1	§ 6.5.2.2			
	Pressure / Flow regulators		§ 6.4.2		§ 6.5.2.2			
	Safety valves		§ 6.4.2				§ 6.6	
	Combustion devices (turbines, engines, boilers...)		§ 6.4.2	§ 6.5.2.1		§ 6.5.2.3		§ 6.7
	Compressors & compressor seals		§ 6.4.2	§ 6.5.2.1	§ 6.5.2.2	§ 6.5.2.3		§ 6.6
	Flares					§ 6.5.2.3		§ 6.7

Collaborative initiatives

✓ Several collaboration initiatives (on voluntary basis)

✓ Gas industry contributes to increasing transparency via studies, research, analysis and initiatives, in order to overcome the uncertainty about CH₄ emissions.

