



TECHNICAL ASSOCIATION
OF THE EUROPEAN GAS INDUSTRY



ANNUAL REPORT
2020 - 2021



ABOUT MARCOGAZ

Founded in 1968, MARCOGAZ is the technical association of the European gas industry. It represents 28 member organisations from 20 countries. Its mission encompasses monitoring and policy advisory activities related to European technical regulation, standardisation and certification with respect to safety and integrity of gas systems and equipment, rational use of energy as well as environment, health and safety issues. It is registered in Brussels under number BE0877 785 464.

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TABLE OF CONTENTS



1_ PRESIDENT'S MESSAGE	4
2_ SECRETARY GENERAL'S MESSAGE	6
3_ ABOUT MARCOGAZ	8
4_ VISION AND MISSION	9
5_ INTERNAL ORGANISATION	10
5.1. General Assembly	10
5.2. Executive Board	10
5.3. Reorganisation	10
5.4. Communication	12
6_ TECHNICAL ACTIVITY	15
6.1. Standing Committee Gas Infrastructure	15
6.2. Standing Committee Gas Utilisation	18
6.3. Standing Committee Sustainability	19
6.4. Standing Committee New Gases	21
7_ RESPONSES TO EU CONSULTATIONS	23
7.1. Hydrogen and Gas Market Decarbonisation Package	23
7.2. Revision of the Energy Performance of Buildings Directive 2021/031/EU	23
7.3. Legislation to measure and mitigate methane emissions in the energy sector	23
7.4. MARCOGAZ's input on the legislative act to reduce methane emissions	23
8_ TECHNICAL REPORTS & PUBLICATIONS	24
8.1. Introduction	24
8.2. Standing Committee Gas Infrastructure	25
8.3. Standing Committee Gas Utilisation	26
8.4. Standing Committee Sustainability	27
9_ STAKEHOLDER ENGAGEMENTS	31
9.1. European Clean Hydrogen Alliance	31
9.2. United Nations Economic Commission for Europe (UNECE)	31
9.3. United Nations Energy Compacts	31
9.4. International Gas Union (IGU)	33
9.5. Energy Community	33
9.6. European Committee for Standardisation (CEN)	33
9.7. ENTSOG Advisory Panel for Future Gas Grids	34
9.8. Prime-Movers' Group on Gas Quality and Handling	34
9.9. Hydrogen Europe	35
9.10. Gas Distributors for Sustainability (GD4S)	35
9.11. EASEE - GAS	35
9.12. Gas Naturally	35
9.13. Ready4H2	36
9.14. European Space Agency (ESA) Cameo Project	36
9.15. EMPIR	36
9.16. Testing Hydrogen Admixtures for Gas Appliances (THyGA)	36
10_ EVENTS	37
ANNEX	41

1 PRESIDENT'S MESSAGE



Thea Larsen
MARCOGAZ President



In these challenging times of energy transition, in which the gas industry needs to decarbonise its systems, bringing new technical and regulatory challenges for the industry, it is an honour for me to serve as President of this well reputed Association, MARCOGAZ.

MARCOGAZ is committed to facilitating the decarbonisation of the gas industry by contributing to the 2050 net-zero goals enshrined in the 2015 Paris Agreement and the European Union's climate pledges, widely referred to as the European Green Deal. Our Association is also committed to deliver on the targets set in the United Nations Sustainable Development Goals, namely on goal n° 7, which has pledged to achieve affordable and clean energy for everyone.

With a view to facilitating the European gas industry's transition to carbon neutral gas systems and the successful implementation of the necessary legislation geared towards ensuring 55% emission reduction by 2030 and the net-zero goal by 2050, it is rewarding to see how MARCOGAZ has been contributing based on our technical and scientific advice, strengthening relations with members and partners from the European gas industry, participating in the preparation of gas industry standards and their revision in line with a changing gas sector landscape that increasingly accommodates renewable and low-carbon gases.

“ The last two years have seen a comprehensive transformation of MARCOGAZ, which has closely and firmly aligned its internal strategy and technical activities with global climate goals and ensuing legislative practices. ”

Thea Larsen
MARCOGAZ President

With the full support of the Members, MARCOGAZ has engaged with the energy sector, the European Commission and international partners, including the United Nations Energy, the United Nations Environment Program, the United Nations Economic Commission for Europe (UNECE), the International Standardisation Organisation (ISO) and the European Committee for Standardization (CEN), among others. Via these liaisons with our international partners, we aim to accelerate the move towards achieving the sustainable energy goals and the decarbonisation of the global energy system.

2020 and 2021 have seen a comprehensive transformation of MARCOGAZ with the implementation of strategies adopted by the Executive Board aiming at positioning the Association to respond to the energy transformation landscape. Our strategy in-

cluded the strengthening of internal organisation, increasing the visibility of the Association, attracting new members and embracing the development of renewable and low-carbon gases.

Together with our members, partners as well as regional and international stakeholders, MARCOGAZ will continuously conduct relevant technical work to ensure the successful design and execution of the standards and pertinent legislation with appropriate technical guidance. With this wide co-operation and technical dialogue, MARCOGAZ is confident that it will contribute further to the aim of achieving a decarbonised and integrated energy system and net-zero by 2050.

2

SECRETARY GENERAL'S MESSAGE

“ By introducing a reshaped vision and a pragmatic mission in line with the climate call, our Association has enabled a stronger integration of technical activities, which are paving the way for the natural gas sector to reach net-zero by 2050. ”

Manuel Coxe
MARCOGAZ Secretary-General

Being a Secretary General of an Association which has made history over more than five decades is more than rewarding. It has been and is indeed a pleasure to serve the interests of the Members at MARCOGAZ in my privileged position.

Responding to the growing need for affordable and clean energy, in 2020 and 2021, MARCOGAZ established one new Standing Committee dedicated to new gases, including hydrogen, biomethane, synthetic gas and other low-carbon gases. Two new Working Groups that carry out technical studies on sector integration and the generation and upgrading of new gases were established as well. The creation of these crucial working elements represents a strong and voluntary commitment to be part of the solution and to put members' knowledge at the service of the industry.

As the technical reference association of the European gas sector, MARCOGAZ actively participates in different high-level discussions, including the European Gas Regulatory Forum (Madrid Forum), European Energy Infrastructure Forum (Copenhagen Forum), different Task Forces of the European Commission and the European Commission Clean Hydrogen Alliance, along with the revision of standards related to the gas sector and the technical research on standards to accommodate higher levels of new gases in the gas infrastructure.

We are equally proud to be expanding our cooperation with the organisations within the United Nations (UN), providing technical expertise and know-how on the mitigation and reduction of methane emissions and on the take-up of hydrogen. We are envisaging a more comprehensive dialogue with the relevant organisations of the UN to facilitate the achievement of Sustainable Development Goal 7, reaching climate goals by 2030 and achieving net-zero by 2050.

With the support of the President, Vice-President and the Members of the Executive Board, I believe that MARCOGAZ will continue to deliver on technical insight while increasing its visibility and credibility. Taking this into due consideration, MARCOGAZ has created an internal body for sharing technical information among all members and has developed different channels of communication, encompassing various tools such as digital media campaigns, news production and the MARCOGAZ Tech Forum – a series of webinars bringing together gas industry experts and interested stakeholders.

MARCOGAZ cherishes the unique work that has been performed over the course of 2020 and 2021 with the invaluable contribution of members and partners, particularly in terms of their major efforts to reduce methane emissions and to develop new gases technologies. By continuously sharing technical knowledge and expertise with all partners, we

are looking forward to successfully implementing the adopted strategy, with our eyes set on the decarbonisation of the gas system.

I wish to thank all the members for the support that they have provided to the Secretariat and for allowing experts to devote time for the work of the Association.



Manuel Coxe
MARCOGAZ Secretary-General



3 ABOUT MARCOGAZ

MARCOGAZ is the technical association of the European gas industry.

MARCOGAZ plays an exclusive role within the European natural gas sector by delivering science-based insights to the industry. The work conducted at MARCOGAZ is driven by the needs of our members. The work is based on sharing pertinent technical information, which supports the sustainable development of the gas industry and policy making in Europe. In a nutshell, MARCOGAZ provides its membership with technical insights on infrastructure, utilisation and sustainability for natural gas systems and new gases, including hydrogen, biomethane and low-carbon gases.

In 2020, MARCOGAZ implemented a whole new strategy in line with international commitments and environmental pledges, such as the Paris Agreement, the European Union's climate target goals underpinned by the European Green Deal, and the latest warnings from the Intergovernmental Panel on Climate Change (IPCC) report. In recognising the potential of renewable gases in the transition towards net-zero, MARCOGAZ is eager to be part of the solution, while promoting cooperation with other associations representing the European or international gas industry or manufacturers.

In response to the evolving landscape in which there has been an urgent shift towards the integration of the energy system, MARCOGAZ has created a new Standing Committee and two new Working Groups. These new Working Groups are specifically designed to support research and deliver on technical aspects that will contribute to the energy transition while securing the safety and integrity of the gas infrastructure. The new Standing Committee New Gases and the new Working Group Sector Integration were established in December 2020. Later, in 2021, MARCOGAZ created the Working Group Generation and Upgrading of New Gases, under the remit of the Standing Committee New Gases.

MARCOGAZ is committed to promoting, monitoring and advising on topics related to European regulation, standardisation and certification concerning sustainability, safety and integrity aspects of gas



systems and energy efficiency. Over the past decades, MARCOGAZ has delivered unique technical insights supporting policy making and technological development, being the reference association of the European gas industry for technical assessment in the midstream and downstream gas systems. We prepare factual insights, used as the basis for establishing trusted regulations, standardisation and legislation in Europe. We work together with stakeholders and authorities to guarantee the best possible gas quality under the strictest safety and environmental standards.

MARCOGAZ works with considerable dedication towards the development of new gases and technical innovations that will bridge the energy system integration of the future. A mix of low and zero-carbon gaseous fuels will be fundamental in the process towards reducing carbon dioxide and methane emissions. Renewable gases such as biomethane, biogas, hydrogen and synthetic methane will help to facilitate the energy transition. However, this paradigm shift will have implications for the existing gas networks and their operators. It is in this context that, in 2021, MARCOGAZ established the Standing Committee New Gases, to conduct technical assessments on the adaptation level that gas operators will face as well as on how to ensure resilience for the industry.

4

VISION AND MISSION



MARCOGAZ is the reference association of the gas industry for technical assessment in the midstream and downstream gas systems. We deliver factual insights, used as the basis for establishing trusted regulations, standardisation and legislation in Europe.

MARCOGAZ provides gas system technical insights on infrastructure, on the utilisation and sustainability for natural gas and new gases, including hydrogen, biomethane and low-carbon gases, as well as on the integration of the energy sector in Europe.



5 INTERNAL ORGANISATION



5.1. GENERAL ASSEMBLY

MARCOGAZ's General Assembly meets at least once per year and consists of all members of MARCOGAZ — national delegations representing the gas industry companies and associations as well as member organisations. Each member of MARCOGAZ has a seat and a vote in the General Assembly, regardless of the type of membership.

The General Assembly held one ordinary meeting on 2 September 2020, where, among other subjects, President Thea Larsen and Vice-President Liam Nolan were elected and Secretary General Manuel Coxe was appointed. In 2021, the General Assembly met on 26 May.

5.2. EXECUTIVE BOARD

MARCOGAZ's Executive Board comprises senior executives from charter members and the chairs of the Standing Committees. The Board must convene at least twice per year. The usual practice is to convene four times per year. During meetings, Board members define and adopt policy positions, strategy priorities and key objectives. The Executive Board

also ensures coherence on internal and external activities and decides on priorities to optimise the use of available resources.

5.3. REORGANISATION

5.3.1. Structure

Up until 2020, MARCOGAZ's technical expertise was developed across three Standing Committees - Gas Utilisation, Gas Infrastructure and Sustainability - composed of industry executives and high-level experts. In response to the EU transition to net-zero, MARCOGAZ implemented a whole new strategy under the premise that gas has a key role to play. Hence, the creation of the new Standing Committee New Gases, the new Working Group (WG) Generation and Upgrading of New Gases and the WG Sector Integration.

MARCOGAZ's broad membership is composed of transmission system operators (TSOs), distribution system operators (DSOs), end-users and research associations. By the end of 2021, we welcomed the European Research Institute for Gas and Energy Innovation (ERIG), the Polska Spółka Gazownictwa sp. z o.o, the Limited Liability Company Gas Trans-

mission System Operator of Ukraine and the European Gas Research Group (GERG).

As of 31 December 2021, MARCOGAZ had a total of 30 members spanning 20 European countries. Members of MARCOGAZ have a strong interest in and carry out work related to European gas industry markets.

On 1 January 2021, the official addresses and the premises of the Secretariat moved to Rue Belliard 40, in Brussels.

5.3.2. Secretariat

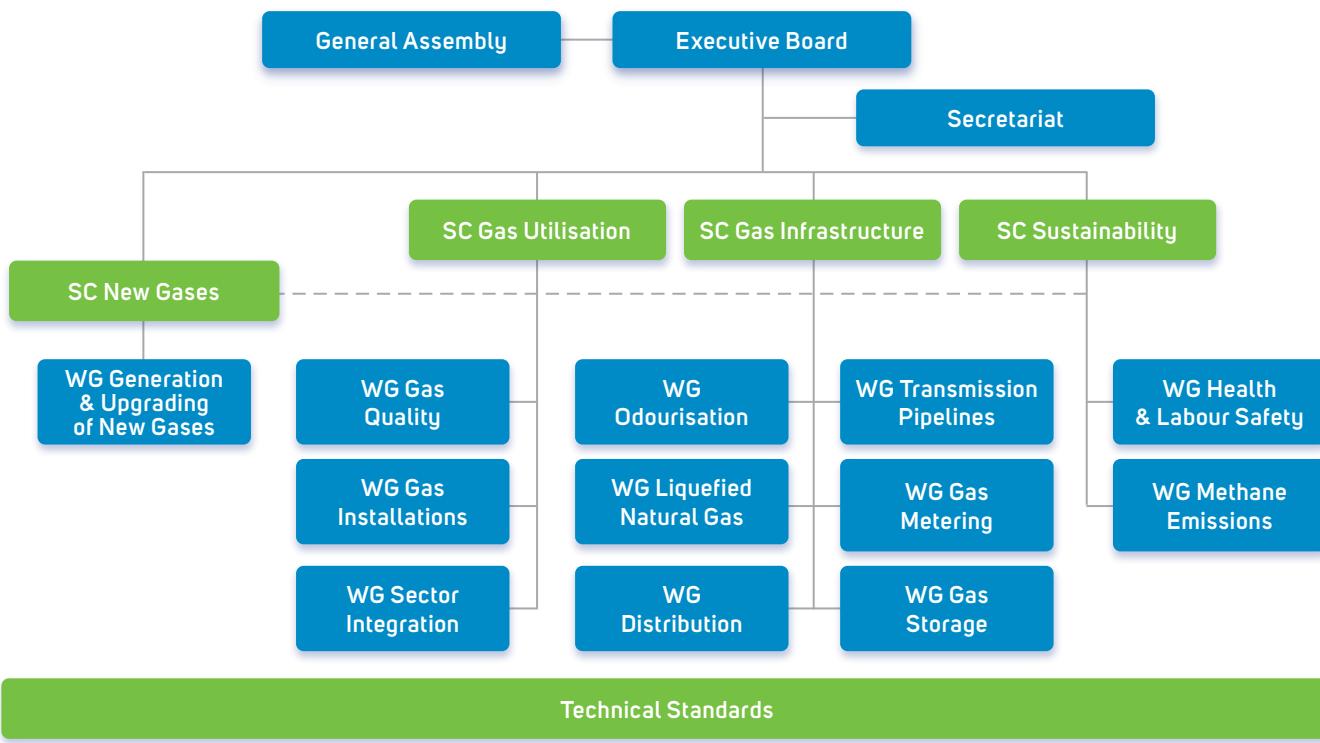
MARCOGAZ's Secretariat implements the decisions of the Executive Board in a variety of functions, including general administration concerning the different Working Groups and Standing Committees, policy strategy and technical guidance. Handling internal and external communication activities and the organisation of events, the Secretariat is also responsible for the coordination of virtual and cross-sectional Forums, notably 'Marcostat' and the recently

revamped 'Technical Standardisation' forum. The Secretariat plays an important role, smoothly executing essential tasks that contribute to the progress of the Association at Executive Board, Standing Committee and Working Group levels.

5.3.3. Virtual Forum 'Marcostat'

'Marcostat' is a virtual group of single points of contact created to respond in a timely manner to the Working Groups' demand for data and to increase the efficiency of the data collection process as well as the representativity of the data that covers the targeted data providers.

Within the operational structure of 'Marcostat', one person per country is responsible for reporting back to the Secretariat in a timely fashion to ensure the best possible collection of data, data quality for technical analysis but also data availability. MARCOGAZ completed the renewal of this cross-sectional network by enhancing its coordination process and rendering it more dynamic.



The delivery of technical studies and factual positions on different topics of interest for its members is the core activity of MARCOGAZ as a technical association. Most of these deliverables are based on technical data collected by the Secretariat and the Working Groups concerned. The creation of such a dedicated platform as 'Marcostat' has therefore been an essential part of rendering the production of technical works more efficient.

5.3.4. Virtual Forum 'Technical Standardisation'

The virtual Forum 'Technical Standardisation' was revitalised to optimise MARCOGAZ's engagement with European and international standardisation bodies. Our Association has been engaged for decades in the technical standardisation work and fully supports the activities of the European Committee for Standardization (CEN) and the International Organisation for Standardization (ISO). As an industry association, MARCOGAZ has a formal agreement with CEN, with a consultative seat in some Technical Committees (TCs). Hence, the virtual Forum 'Technical Standardisation' was reinforced to increase MARCOGAZ's contribution to and partnership with standardisation bodies.

MARCOGAZ's technical experience and deliverables are considered an essential reference. In some cases, the Association's technical work serves as the basis for discussions within CEN TCs and Working Groups (WGs) when drafting or reviewing a technical standard. In order to closely follow technical discussions on subjects of the utmost importance for the gas industry and play its role of technical stakeholder of reference, MARCOGAZ identified the need to reorganise the process internally. The goal is to increase the efficiency of internal reporting as well as its effective representativity and participation within different CEN groups. The liaison process is implemented through the nomination of several CEN Liaison Members from MARCOGAZ Working Groups.

5.4. COMMUNICATION

Communication activities are vital to enhance the connections and trust with the membership and external stakeholders. It is an essential approach to



present the result of valuable work to a wider audience and create impact. Over the last two years, MARCOGAZ developed a new visual identity built on a strong core of elements, reflecting our vision, mission and values. In February 2021, MARCOGAZ activated social media channels, namely LinkedIn and Twitter. Indicators on social media have been positive, with an organically growing audience, mirroring stakeholder engagement and interest towards the research carried out by MARCOGAZ.

In April 2021, we launched our first online campaign announcing the new website and the new logotype. This transformation goes hand in hand with MARCOGAZ's step forward, embracing a vision carved out by the targets provided for in the European Green Deal and the pathway to achieve the 2050 net-zero goal. Ever since MARCOGAZ has been an active player in the digital domain, our Association has been growing and defining an online identity, alongside our membership and other stakeholders, including Eurogas, Gas Infrastructure Europe (GIE), ENTSOG, GERC, the European Research Institute for Gas and Energy Innovation (ERIG), the International Association of Oil & Gas Producers (IOGP), Liquid Gas Europe, GasNaturally and many others.

MARCOGAZ's rebranding is built on a strategic communications plan intended to keep the membership involved and engaged with internal activities and communicate with external stakeholders about our latest technical publications, including related guidance and attendance at European and international events. Part of our communications plan includes

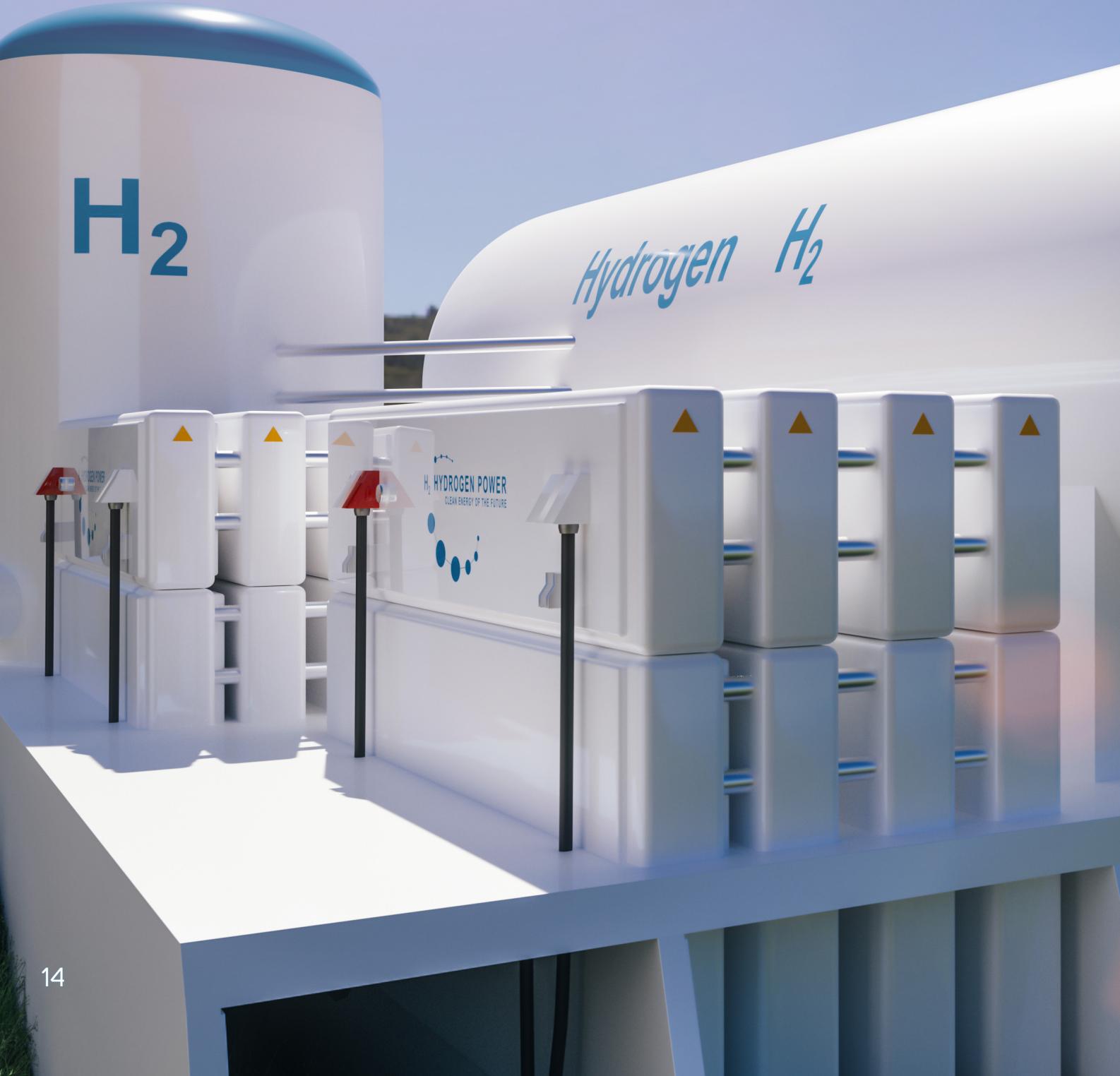
regular distribution of content on social media. Our publications are often of a technical nature, a strong reflection of our core business. With the rebranding in 2021, MARCOGAZ launched email marketing campaigns with internal and external newsletters. The Secretariat is also engaged in developing video campaigns as a meaningful way of presenting our history and our work to a wider audience, thus maintaining our reputation as a trustworthy entity.

5.4.1. MARCOGAZ Tech Forum

In order to generate discussion with external experts, MARCOGAZ developed a new concept entitled 'MARCOGAZ Tech Forum', which implies the organisation of physical events or webinars to present and discuss technical subjects of interest and to increase the visibility of the work of the committees and WGs.

MARCOGAZ MEMBERSHIP





6 TECHNICAL ACTIVITY

6.1. STANDING COMMITTEE GAS INFRASTRUCTURE

The Standing Committee Gas Infrastructure (SCGI) covers the technical assessment of all gas systems and equipment, namely all types of assets that are operated by the gas industry to deliver gas to customers in safe conditions.

The scope of the SCGI encompasses the whole life cycle of gas installations, from the design and engineering phase, until their decommissioning after decades of service. This includes construction, operation and maintenance activities, as well as the replacement of equipment.

The Committee addresses subjects where third-party activities could have a potential impact on the safety and integrity of the gas network. The SCGI also works towards ensuring that the gas network has minimal impact on its neighbourhoods and surroundings.

The SCGI monitors and actively contributes to standardisation activities related to gas infrastructure. The CEN Technical Committee Gas Infrastructure (CEN/TC234) and its sub-groups is of particular importance for the SCGI's work as it guarantees that the European gas network is operated with the latest techniques and practices throughout the whole mid-stream and downstream value chain.

The Committee leads and coordinates the activities to assess the technical acceptance of new gases (hydrogen, biogas, syngas, etc.) in the networks and supports the European Commission's energy transition ambitions.

6.1.1. Working Group Odourisation

The Working Group Odourisation focuses on the technical aspects of odourisation of distributed gases, required for safety reasons. The Working Group periodically conducts surveys among members to track the regulatory framework of odourisation, operational data and different technical methods for odourisation practices. It also keeps an eye on the impact of odourisation on interoperability across networks while delivering technical insights on international documents.

The Working Group Odourisation explores the impact of the injection of new gases - biomethane, hydrogen, and synthetic gases - into the gas network on the odourisation practices. New gases make the introduction of additional verification efforts necessary to ensure that the odourisation process remains fully effective and that the same level of safety is guaranteed. It is also important to warrant that no 'masking effect', which could potentially be triggered by other components, is present.



Anne-Sophie Decaux
Chair of the SC Gas Infrastructure

With respect to safety standards, the Working Group Odourisation brings technical and environmental answers and solutions concerning the odourisation process of the distributed natural gas and new gases.

Since the presence of additional components in new gases can generate chemical interferences with the potential masking effect of the odourant, the Working Group works to establish a common understanding and identification of critical technical questions to address the topic.

6.1.2. Working Group Transmission Pipelines

The Working Group Transmission Pipelines examines the technical operational safety and integrity of gas transmission pipelines on which third-party activities can have a potential impact given that third-party interferences are the most frequent causes of damage to the underground installations and require permanent monitoring of potential threats and hazards. It prepares guidelines for third party management and analyses general practices for external corrosion on high-pressure transmission lines.

The technical focus of the Working Group covers the full life cycle of the gas transmission infrastructure, from the study phase until the decommissioning phase. The injection of new gases into the existing natural gas transmission grid is also explored by the Working Group with a focus on technical parameters and local regulatory approval.

The Working Group Transmission Pipelines participates in the standardisation activities, including European standards (EN 1594) and quality systems such as the Safety Management System (SMS). The group supports the CEN standardisation activities since it provides clarity for the operation of the systems, including functional requirements (e.g. maximum operating pressure, etc.). Besides the standardisation, it also monitors new technologies and actively supports innovation to increase safety and efficiency, to ensure the continuity of supply and sustainable operation of assets.

6.1.3. Working Group Gas Distribution

The Working Group Distribution focuses on the technical operational efficiency, safety and integrity of distribution network installations, including pressure reducing stations, metering stations, valve stations, main lines, service lines, injection stations and blending stations.

Most of the distribution network is located in densely populated areas, such as capital cities, thus requiring a high level of safety. Near residential and commercial areas, the risk is higher, and the distribution system must be under constant inspection against potential threats with the implementation of mitigation measures, including the use of specific detection equipment.

Considering the high importance of operational safety, MARCOGAZ Working Group Gas Distribution actively participates in the relevant processes at the European standardisation organisation (CEN) to determine the technical requirements and functionalities (EN 12007) that guarantee the safe distribution of gas in Europe. Incident prevention and emergency preparedness are regularly covered in reports by the Working Group. The reports are based on disturbances that have occurred in the distribution sector as the group works towards permanently improving the safety and efficiency of the distribution activities by learning from the past.

Along with MARCOGAZ members, the Working Group Distribution monitors emerging technologies and leading innovative projects to identify technical solutions capable of addressing the biggest challenges: prevention of third-party damage, reduction

of methane emissions, continuous advancement of network safety, efficiency and sustainability. The technical implications for the safety of the distribution network, the review of technical standards, operational procedures, injection and blending processes are also examined.

6.1.4. Working Group Gas Storage

The Working Group Gas Storage produces technical work on the safety and reliability of storage activities, gas quality specifications and the storage of new gases, among others.

In Europe, underground storage operations are strictly regulated by the SEVESO III Directive (2012/18/EU) to prevent major accidents. The Working Group conducts benchmarking to assess the implementation of the SEVESO III Directive. The main challenge for the Underground Gas Storage (UGS) operator is to ensure its integrity and tightness. For that purpose, the industry contributes to the development of specific standards (EN 1918) and the Working Group has been an active participant in the standardisation processes.

Another part of the group's remit includes the exploration of the impact of the storage activity on the environment and its surroundings. In particular, the tightness of underground facilities, subsurface installations and the integrity management of the wells are regularly addressed by the experts.

Furthermore, the Working Group provides technical insights for industry-wide efforts to increase knowledge and expand experience in order to communicate the potential impact of new gases on the integrity of the storage facilities.

6.1.5. Working Group Gas Metering

Measuring gas is crucial in many ways for end-users, industry and the economy as it contributes to a fairer market with increased competition as specified in the Measurement Instruments Directive (2014/32/EU). Placed at the entrance and end point of the network, meters measure the gas that is moving across the network, entering and leaving the installation. They

are designed to measure and display the quantity of gas (volume or mass) that flows through the pipelines. This requires the conversion of the unit of volume into units of energy. The Working Group Metering works on the technical aspects of such a conversion.

Additionally, the Working Group focuses on the potential operational constraints that could block the flow of gas and regular maintenance activities to prevent those constraints.

The injection of new gases such as biomethane or hydrogen into the gas network makes the conversion process more complex given the calorific value of the gases, which changes with the blending or replacement of natural gas. Therefore, the technical activities of the Working Group investigate the effect of new gases on the operational efficiency and accuracy of metering throughout the gas value chain.

In order to improve the efficiency of consumption through smart gas grids, the Working Group Metering continuously evaluates the performance and impact of smart meters for possible deployment in different locations in Europe.

6.1.6. Working Group Liquefied Natural Gas

Liquefied Natural Gas (LNG) can be used in different ways, including in an evaporated state, injected in a high-pressure transmission gas network. It can

also be used as fuel in vessels, trains and trucks. It proves to be an efficient solution to transport large quantities of energy on very long distances and without high pressure. With a view to ensuring the technical progress of LNG's development, shipping and storage, MARCOGAZ LNG Working Group monitors standardisation activities on relevant LNG operations. The group also collects and shares data, information and technical concerns on LNG application processes in different end-use sectors.

The scope of the technical activities mainly includes the application of the LNG in the transport sector. The reports of the group explore the potential of the LNG to reduce greenhouse gas emissions in the transport sector, which is responsible for one third of GHG emissions globally. The Working Group also analyses the technical potential for mixing LNG with the liquid form of new gases.



6.2. STANDING COMMITTEE GAS UTILISATION

The Standing Committee Gas Utilisation (SCGU) fosters the use of renewable energy through power to gas and use of efficient gas appliances while ensuring that they continue to play a key role in the decarbonisation of the EU energy sector. By focusing on the technical opportunities for the improvement of the energy efficiency of appliances and for emission reductions and by analysing the impact of regulations, the Committee works to support the gas industry's decarbonisation efforts.

The SCGU provides the EU authorities with technical expertise and views on different regulations that have an impact on the coupling of electricity and gas sectors and on the use of gas, including the Energy Labelling Directive or the Eco-design Directive, among others.

The Committee deals with the coupling of the energy sectors such as heating, cooling and transport industries as well as with the power generation sector through smart infrastructure, increasing the penetration of renewable energy and thus decarbonising the economy. In particular, it develops synergies with other sectors to support the development and use of hybrid systems.

6.2.1. Working Group Gas Quality

Gas quality is characterised by a large set of parameters allowing the safe and efficient transmission, storage, distribution and utilisation of gas in Europe. The origin of gas can have a significant impact on its calorific value (energy), on its Wobbe Index (quality indicator of the combustion) and on the presence of additional components such as carbon dioxide (CO₂), hydrocarbon, water vapour (H₂O), sulphur, etc.

MARCOGAZ's Working Group Gas Quality works on the operational solutions to monitor gas quality. Once the gas arrives at the European market, its quality must be properly analysed and adapted, if needed, to be in full compliance with European standards (EN 16726).

New gases such as biomethane continue to gain prominence as efforts to decarbonise the gas sector expand across Europe and the injection of these

gases into the gas network triggers gas quality changes. Accordingly, it is important to ensure compatibility in terms of the quality of new gases and natural gas. In this respect, the Working Group analyses the changes in gas quality with the injection of renewable and low-carbon gases while actively participating in related standardisation processes and technical studies exploring the acceptable range of new gases in the grid across Europe.

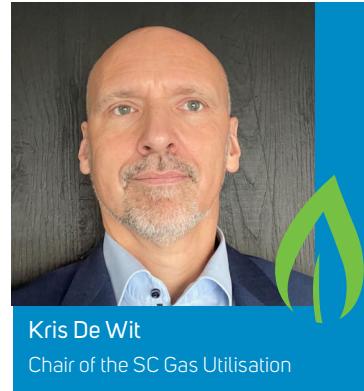
The Working Group provides technical support for the industry initiatives that cooperate with the European Committee for Standardisation (CEN) on the development of gas quality standards to ensure good coordination and acceptance among stakeholders.

6.2.2. Working Group Gas Installations

The Working Group essentially deals with domestic and small commercial gas installations. These refer to the appliances and instruments placed at the end-use installations of the gas distribution system. Gas installations must be aligned with technical, safety and environmental regulations. From a technical standpoint, gas installations are required to operate with high levels of efficiency and a high level of reliability. MARCOGAZ's Working Group Gas Installations exchanges technical expertise and know-how on topics covering the use of appropriate materials, the inspections and maintenance of the installations, and operational competence.

The installations are not under the responsibility of the distribution system operators; customers are responsible for the maintenance of their gas appliances. However, the Working Group pro-actively supports the constant improvement of safe and efficient use of gas in diverse appliances/systems, to provide additional safety to customers.

The Working Group Gas Installations develops reporting (EGAS C) on European gas safety installa-



Kris De Wit

Chair of the SC Gas Utilisation

tions to provide and encourage better communication on the safety performance of gas installations. It engages in the data collection processes — accident, injury, fatalities, etc. — related to domestic, residential, commercial and tertiary installations. Statistical analysis of the collected data supports the technical work in the production of trends, conclusions and recommendations. The experts in the group also exchange views on research projects led by MARCOGAZ members and assess the possible uses of their results.

6.2.3. Working Group Sector Integration

Energy transition requires energy system integration by planning and operating the energy system “as a whole”, across multiple energy carriers like electricity and low-carbon gas, infrastructure and consumption sectors.

However, in the current design of the system, electricity and gas networks are planned and managed independently from each other, which hampers delivery towards a climate neutral economy. It is technically and economically inefficient and leads to substantial losses in the form of wasted heat and low energy efficiency. The Working Group Sector Integration therefore promotes and supports the use of electricity and low-carbon gas systems in order to improve the efficiency, flexibility and stability of the energy system as a whole. It finds hybrid end-use solutions that use both electricity and gas and allow for the optimisation of total energy efficiency. It is actively involved in concrete initiatives and programmes to ensure the sustainable, safe and efficient development of coupled electricity and gas systems (with natural gas, hydrogen, biomethane and other renewable and low-carbon gases).

The activities focusing on sector integration are dedicated to finding technical solutions to increase energy efficiency and improve security of energy supply, grounded on gaseous fuels. The group also evaluates the use of renewable and low-carbon fuels for end-use applications where direct heating or electrification is not feasible. Additionally, the group explores power-to-gas systems to ease transport and storage of energy in the form of gaseous fuel.

6.3. STANDING COMMITTEE SUSTAINABILITY

The Standing Committee Sustainability (SCS) is responsible for addressing and delivering on cross-cutting topics on the sustainability of the gas supply chain. The Committee covers subjects that have or could have an impact on safety, wellbeing, climate and the environment while anticipating and identifying key challenges in the field of sustainability.



José Miguel Tudela
Chair of the SC Sustainability

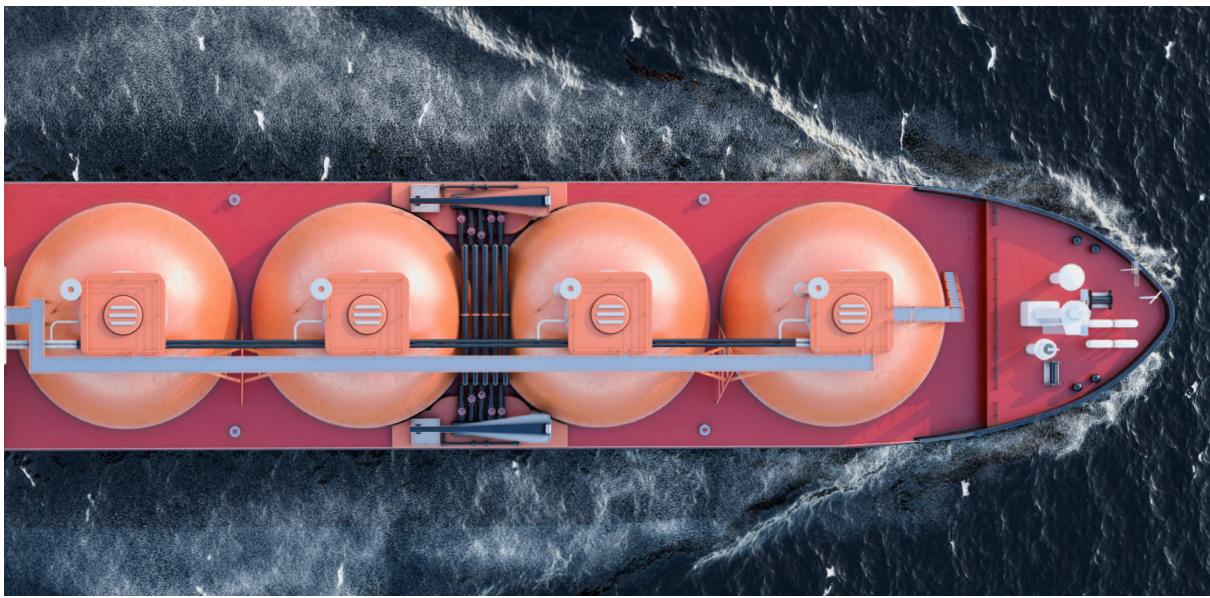
The SCS integrates the acceptance of new gases in its work plan and develops contents, taking into account how these gases will impact the sustainability of the network.

The SCS collects industry data and views related to environment, health and safety as well as data regarding the emission of methane and new gases, with a view to supporting studies and policy proposals, and thus contributing to tackling sustainability challenges which may affect installations and operations of gas supply and utilisation.

The SCS has been very active in the field of emissions, particularly in methane emissions. The Committee also contributes to the Industrial Emissions Directive Article 13 Forum and actively supports the development and review of best reference available techniques (BREF) related to the gas sector.

6.3.1. Working Group Health & Labour Safety

Safety is a sine qua non for each segment of the gas supply chain, an essential condition and a pre-requisite for operations to unfold. The gas industry must ensure an outstanding level of health and safety for its employees but also for the contractors. The Working Group Health & Labour Safety's focus covers health and labour safety in the mid-stream and downstream sectors on a variety of dimensions such as construction projects, operations and maintenance, purchasing activities, emergency preparedness, etc.



Through its Working Group Health & Labour Safety, MARCOGAZ monitors and improves the safety and wellbeing of the workers by regularly identifying topics of common interest. The group collects data on accidents, sharing experiences and figures. Each accident/incident is different and MARCOGAZ highlights similarities to increase capacities to reduce the likelihood of them happening again. In order to reduce the numbers of accidents/incidents, it is important to understand what happened and identify the root cause in each accident/incident. Technical solutions are discussed and are frequently identified by the experts as best practices.

Existing operational procedures, equipment and safety measures implemented for natural gas need to be assessed. The Working Group examines their applicability for the acceptance of new gases or if modifications or replacements are requested. It proposes alternative solutions to guarantee the safety of the workers who are in charge of operating installations delivering new gases while complying with legislation. Benchmarking on health and labour safety regulations and common practices are another part of the Working Group's activities as it develops technical guidance based on the outcomes of the benchmarking for MARCOGAZ's members.

6.3.2. Working Group Methane Emissions

Gas installations emit methane for different reasons and several actions have been taken by the industry, for decades, to reduce its emissions, mainly for safety reasons. In light of environmental concerns, the gas industry continues to develop mitigation procedures to further reduce methane emissions.

The gas industry is strongly committed to accelerating methane emissions reduction and supporting the European Union's goal to reduce greenhouse gas emissions by 55% by 2030 as well as its 2050 climate neutrality objective.

MARCOGAZ is recognised as a technical reference by such international organisations as the European Commission, the United Nations, OGMP 2.0, Methane Guiding Principles, among others, and actively contributes to identifying and categorising methane emissions from different sources.

MARCOGAZ's Working Group Methane Emissions developed a 'bottom-up' methodology to quantify methane emissions. This methodology is currently being translated by the relevant CEN working group (CEN/TC234/WG14) into a CEN Technical Specification. Following the establishment of methodology as a technical standard, the industry will be able to report reliable figures to the authorities. The Working Group actively contributes to the implementation of a well structured, fit for purpose measurement, reporting and verification (MRV) system in the EU.

The Working Group Methane Emissions provides constant support for industry-wide efforts to detect and implement best practices to reduce methane emissions, including the definition of reduction targets at industry level. With the technical support of the Working Group, MARCOGAZ fosters innovation and monitors technological solutions to detect, quantify, report and mitigate methane emissions arising from Transmission, Storage, LNG and Distribution activities.

6.4. STANDING COMMITTEE NEW GASES

The Standing Committee New Gases (SCH2+) coordinates existing topics with the three other MARCOGAZ Standing Committees (Gas Utilisation, Gas Infrastructure and Sustainability) and focuses on promoting the energy transition through new gases – hydrogen, biomethane and syngas.

SCH2+ targets the implementation of the European Hydrogen Strategy presented by the European Commission and it strives to develop technical expertise on gas transmission and distribution systems and related equipment, gas storage and end-use as well as environment and safety.

The Committee's work includes the development of technical references to assess the readiness of existing infrastructure to accept hydrogen and other low-carbon gases and the evaluation of retrofitting and repurposing the existing natural gas infrastructure. The Committee also evaluates the right level of mixtures between hydrogen and natural gas, the implication of new gases on safety aspects, legislation and standards behind hydrogen injections and blending.

Identification of gaps, challenges and opportunities on infrastructure, sustainability, and end-use works on new gases and recommendations of implementation at relevant working groups of MARCOGAZ make up a significant part of the Committee's activities.

The SCH2+ fosters collaboration with external initiatives — projects and organisations — to jointly contribute to enhanced knowledge and the development of new gases activities.

6.4.1. Working Group Generation and Upgrading of Renewable Gases

New gases are essential for the decarbonisation of the energy sector and consequently for the gas supply in Europe. Therefore, the market take-up of renewable and low-carbon gases is one of the main challenges for the gas industry in the coming decades.

Given the importance of the generation of new gases and upgrading new gases to scale up their use, MARCOGAZ decided to establish a new Working Group with the name 'Generation and Upgrading of Renewable Gases'.

The main objective of the new Working Group is to increase knowledge within MARCOGAZ about the production and upgrading of new gases, including hydrogen (biomass, power to gas, natural gas), biogas (biomethane, augmentation gas, biogas grids), synthetic natural gas (thermochemical from biomass, power to gas), CO₂ management.

The scope of the Working Group's activities includes the collection and analysis of technical information on generation and upgrading processes and concepts in addition to conducting questionnaires on national action plans, projects and production potentials. Accordingly, the main output of the Working Group is to deliver information and data about gas quality aspects of the new gases (e.g. tracing components from different sources and for different production processes) as well as process parameters like plant sizes, efficiencies, emissions and production costs.



Frank Graf

Chair of the SC New Gases



7 RESPONSES TO EU CONSULTATIONS

7.1. HYDROGEN AND GAS MARKET DECARBONISATION PACKAGE

In response to the European Commission consultation on the Hydrogen and Gas Market Decarbonisation Package^[1] in June 2021, MARCOGAZ strongly emphasised the essential quality of renewable gases for the European climate goals and for reaching net-zero. The organisation suggested that transmission systems, distribution systems and storage infrastructure be positioned as the most valuable existing assets for achieving cost-effective hydrogen infrastructure via both retrofitting and repurposing. Furthermore, MARCOGAZ highlighted that renewable and low-carbon gases should be integrated into the energy system without discrimination in terms of technology.

7.2. REVISION OF THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE 2010/31/EU

MARCOGAZ recommended that measures to establish mechanisms for the production of renewable gases in local environments be defined and required in the revised Energy Performance of Buildings Directive 2010/31/EU in response to the consultation in June 2021^[2]. A label to indicate, according to different levels, how easy it is to work with renewable gases, including hydrogen, should be included on appliances, the response noted. MARCOGAZ stressed that a mandatory minimum energy performance should be introduced given its potential to contribute to reducing emissions in the short and medium term, its ability to decarbonise in the long term and other factors such as climatic availability and economic efficiency.



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7.3. LEGISLATION TO MEASURE AND MITIGATE METHANE EMISSIONS IN THE ENERGY SECTOR

Having produced a significant number of technical guidance and documents for the reduction of methane emissions, MARCOGAZ prepared a comprehensive response to the European Commission consultation on the legislation to measure and mitigate methane emissions in the energy sector in April 2021^[3]. The response drew attention to the requirement to have a well-structured and robust methane reporting and verification (MRV) system for better management and more accurate detection and quantification of methane emissions. MARCOGAZ underscored that the MRV system should be in parallel to the setting of individual targets by companies and the definition of their methane emissions mitigation strategies while noting that the legislation should give the operators the flexibility to choose among the most-cost effective measures available for mitigation. Additionally, MARCOGAZ also recommended having a coherent and aligned set of terms with comprehensible definitions and referred to the methane emissions glossary that it had developed for the industry.

7.4. MARCOGAZ'S INPUT ON THE LEGISLATIVE ACT TO REDUCE METHANE EMISSIONS

Together with industry stakeholders GIE and the European Network of Transmission Operators for Gas (ENTSOG), MARCOGAZ prepared an input document^[4] on the European Commission consultation on the combined evaluation roadmap/inception impact assessment for a legislative act to reduce methane emissions. MARCOGAZ, GIE and ENTSOG welcomed the possibility to provide feedback for the public consultation concerning a legislative act on the reduction of methane emissions and acknowledged the efforts of the European Commission to support the EU's greater climate ambition for 2030 and its 2050 climate neutrality objective.

8

TECHNICAL REPORTS & PUBLICATIONS

8.1. INTRODUCTION

MARCOGAZ Standing Committees and Working Groups prepared and published technical reports on significant topics related to gas infrastructure in the course of 2020 and 2021, including but not limited to methane emissions, odourisation of hydrogen and natural gas mixtures, liquefied natural gas as a transport fuel, energy labelling, injection of renewable gases into the grid and adaptation of gas appliances to a carbon neutral future.

Technical reports are available on MARCOGАЗ's website: www.marcogaz.org/knowledge-hub/#publications

The next sections of this chapter elaborate on the technical reports prepared by each working group.



8.2. STANDING COMMITTEE GAS INFRASTRUCTURE

8.2.1. Working Group Odourisation

Odourisation of natural gas and hydrogen mixtures
The report, entitled 'Odourisation of natural gas and hydrogen mixtures'^[5], explores odourisation issues related to the addition of hydrogen into natural gas. More specifically, possible chemical and physical reactions of hydrogen with the odourants as well as potential masking of odourants by hydrogen are investigated. Additionally, the report analyses the odourisation-related consequences of hydrogen injection into the transmission and distribution grids with different pressures at fluctuating concentrations.

Natural gas odourisation practices in Europe

The technical survey on the natural gas odourisation practices in Europe^[6] explores these practices from different aspects: legislation, odourisation controls, odourisation plants, gaschromatographic analysis at odourisation plants, odourisation plants after biomethane injection, olfactory levels and odourants' concentration. This survey sheds light on the efforts to streamline odourisation practices across Europe for safety and regulatory purposes.

8.2.2. Working Group LNG

LNG as transport fuel and LNG and hydrogen as transport fuel

The technical reports entitled 'Liquefied Natural Gas as Transport Fuel'^[7] and 'Liquefied Natural Gas and Hydrogen as Transport Fuel'^[8] highlight that LNG, a low-carbon energy, performs well towards achieving the decarbonisation ambitions of the European Union in the transport sector.

MARCOGAZ finds that LNG has a significant potential to reduce greenhouse gas emissions in maritime, railway, road and aviation transport with quantitative analysis.

The findings also reveal that hydrogen and LNG cannot be blended technically given that they liquefy at different temperatures. At atmospheric pressure, LNG turns into liquid between -162°C and -182°C while, in this temperature range, hydrogen is gaseous.

Exploring the potential of bio-LNG, the report underscores that the increase in the share of Bio-LNG in transport will mark the achievement of another major milestone for the market and the environment, making almost GHG neutral operation possible for long-distance heavy-duty trucks, or by achieving Well-to-Wheel (WTW) GHG emissions reduction by at least 80% compared with diesel, depending on the bio-methane source.

8.2.3. Working Group Distribution

Report on European gas safety, gas distribution

The report on European gas safety, gas distribution (EGAS B) (2006-2015)^[9] gives an overview of accidents, fatalities and injuries based on the EGAS Distribution data with statistical analyses and results. The accident parameters represent a set of safety performance indicators used in the European Natural Gas Industry. Drawing on the statistical data, the report analyses that the European gas industry can display excellent safety performance indicators in the field of distribution, but it must maintain technical measures at a safety level that is as high as possible and improve technical measures towards a safety level that is as high as possible.

8.2.4. Working Group Transmission

General practices for managing external corrosion on above ground gas facilities

Based on the fact that corrosion is the main threat to material degradation in aboveground facilities, the paper entitled 'General practices for managing external corrosion on above ground gas facilities'^[10] gives a high-level overview of legislation in Europe on managing the integrity of pipelines in general and on the threat of external corrosion in particular. It focuses on the measures taken by transmission system operators (TSOs) to prevent corrosion leading to leakage as well as the consequences of pipeline failure in general, providing an outline of regulation, technical rules, standards and measures to manage the probability and consequences of failure due to external corrosion in natural gas above ground facilities.

Evaluation strategies for managing external corrosion on hard-to-pig pipelines

The technical document on the evaluation strategies for managing external corrosion on hard-to-pig pipelines^[11] provides a high-level synopsis of how external corrosion can be managed on underground pipelines. The document highlights that in-line inspection (ILI) is an important tool for managing the impact of external corrosion when it can be used. However, many gas transmission system operators (TSOs) have 'hard to pig' pipelines, which makes the use of ILI costly and difficult to use for external corrosion management. Therefore, other inspection techniques, including the inspection of wall thickness, coating condition, cathodic protection and leak detection, can be deployed.

General practices for managing external corrosion on underground pipelines

The paper examining the general practices for managing external corrosion on underground pipelines^[12] provides a high-level overview of legislation, technical rules, standards and measures to manage the probability and consequences of pipeline failure due to external corrosion. It concludes that legislation, technical rules and standards differ among European countries and are influenced by cultural, historical and geographical factors. All legislative and technical practices, however, focus on preventing unacceptable risks for health, safety and the environment during the construction and operation of gas transmission assets.

8.2.5. Task Force for Conversion of m3 to kWh

Guidance Note on energy determination for the injection of non-conventional gases

The 'Guidance Note on Energy Determination when Non-Conventional Gases are Injected into the Gas Network'^[13] provides possible solutions to determine the energy for fair billing when renewable gases are injected into different types of network configurations since having non-conventional gases in the natural gas grid increases variations in gas quality. By demonstrating the applicability of several measures on distinct use cases, the evaluation of use cases requires grid simulation software and a computational model of the specific grid.

8.3. STANDING COMMITTEE GAS UTILISATION

8.3.1. Working Group Installations

Primary Energy Factor, Ecodesign Directive and Energy Labelling Regulation

The Working Group Installations prepared a technical assessment on the direct utilisation of the revised Primary Energy Factor (PEF), which could be challenging for the Ecodesign implementation measures and energy labelling. According to the report entitled 'Primary Energy Factor, Ecodesign Directive and Energy Labelling Regulation – Technical Note'^[14], the PEF revision from 2.5 to 2.1 means that the energy efficiency limit values of all forms of electricity consumption in the scope must be converted – all things being equal – by a factor (2.5/2.1). MARCOGAZ reveals that this change requires adjustment of the minimum space heating efficiency value (?s), the Ecodesign lot1 revision, and the energy labelling classes to take into account the increase in electric appliances.

Ener Lot 1 and Ener Lot 2 review

With a view to highlighting the importance of decarbonising the domestic boilers' sector, MARCOGAZ prepared a proposal for the launch of an investigation on the labelling design of these devices to facilitate the comparison of various technologies with very different energy performances. The proposal entitled 'Ener Lot 1 and Ener Lot 2 review'^[15] (Ener Lot 1: space and combination heaters; Ener Lot 2: water heaters) proposes that the classification of a condensing boiler in 'A Class' in terms of energy labelling must be kept to avoid any negative signal to the consumer in application of the EU Regulation 2017/1369 of the European Parliament and of the Council of July 4, 2017.

Gas Appliances: Robust technologies for a carbon neutral future

The report entitled 'Gas Appliances: Robust technologies for a carbon neutral future'^[16] analyses the impact of renewable and low-carbon gases on different gas appliances in residential, commercial and industrial sectors. It particularly examines the operational structure of condensing boilers in pri-

vate residences, heat pumps, industrial standard boilers, combined heat and power systems (CHP), adiabatic rooftop units and process efficiency solutions.

8.3.2. Working Group Gas Quality

Hydrogen regulations/standards survey

MARCOGAZ carried out a survey on hydrogen regulations and standards^[17] that are currently in place across European transmission and distribution networks in 10 European countries. The document lays out the regulatory practices and standards with regard to pure hydrogen injection, hydrogen/methane mixtures in transmission and distribution grids in the survey countries.

8.4. STANDING COMMITTEE SUSTAINABILITY

8.4.1. Working Group Health and Labour Safety

Detection and measuring of pure hydrogen and blends with natural gas

The Working Group Health and Labour Safety examined the safety properties of natural gas and hydrogen in a technical report entitled 'Detection and measuring of pure hydrogen and blends of natural gas with hydrogen'^[18]. Mixtures of hydrogen and natural gas raises the question on specific safety topics related to the existing natural gas infrastructure and end-use equipment for utilising such mixtures and explores hydrogen detection systems.



Impact of hydrogen on existing ATEX equipment and zones

Another technical report of the Working Group Health and Labour Safety analysed the safety implications of hydrogen mixture with natural gas for 'Atmosphere Explosible' with reference to the safety obligations enshrined in the European Commission Directives. The report entitled 'Impact of hydrogen on existing ATEX equipment and zones'^[19] contains an identification and assessment of the risks of explosions while emphasising that hazard zonings and measures must be indicated to achieve a safe working environment given that the explosion limit and gravity of hydrogen and methane are different.

Hexavalent chromium compounds risks and handling

The report about hexavalent chromium compounds examines the seriousness of the health-related repercussions of the existence of hexavalent chromium with a view to raising awareness about the hazards related to chromium VI and lists the preventive

safety measures. Entitled 'Hexavalent chromium compounds risks and handling'^[20], the report states that the presence of chromium VI can be detected by statements from suppliers, by material safety data sheets, laboratory tests of materials, field test of materials, analysis of particles in the air and a comparison with a threshold limit value. Mitigation of risks stemming from chromium VI presence can include treatment of waste containing chromium VI as a chemical waste according to national/local legislation, face masks with a P3 filter, among others.

8.4.2. Working Group Methane Emissions

Recommendations on venting and flaring

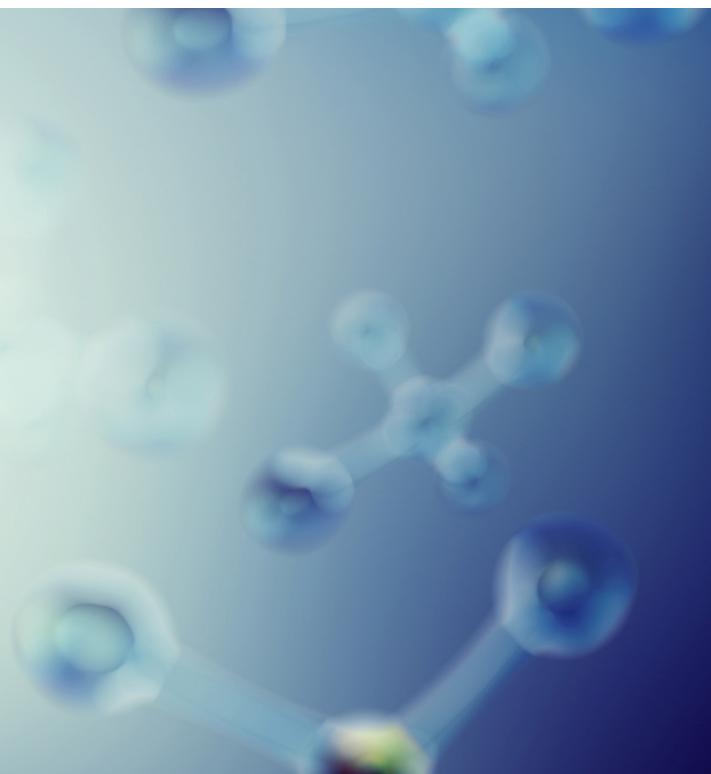
The findings of MARCOGAZ in the technical report entitled 'Recommendations on Venting and Flaring'^[21] provide definitions for the five most prevalent methane emission types to draw a precise scope of possible reductions. The definitions include vented emission, flaring, routine venting/flaring, safety



venting/flaring and non-routine venting/flaring. The report identifies which venting and flaring methane emissions are avoidable or non-avoidable in the midstream and downstream European gas industry. It also lays out the extent and technical conditions for the avoidable emissions with reference to best available technologies (BAT).

Recommendations on leak detection and repair campaigns

MARCOGAZ developed a recommendation document on Leak Detection and Repair (LDAR)^[22] programmes for the midstream and downstream gas segments, taking into consideration the best practices applied by European gas system operators. The documentation reveals that the effectiveness of LDAR campaigns depends on know-how, quality of criteria for both survey and repairs and the extent to which the analysis of the results of the previous LDAR campaigns contributes to the improvement of the process.



Methane emissions glossary

MARCOGAZ methane emissions experts prepared a methane emissions glossary^[23] to support the gas industry and other stakeholders in the use of consistent terminology. The terminology in the document is based on the frequent references used by the gas industry, including International Petroleum Industry Environmental Conservation Association (IPIECA), Methane Glossary and CEN standards. The aim of this study is to facilitate the improvement of confidence in understanding and managing methane sources and to reduce their emissions through common definitions.

Guidance for the MARCOGAZ methane emissions reporting template

MARCOGAZ experts prepared guidance for the methane emissions reporting template^{[24] [25]} based on the methodology of a bottom-up approach: 'Assessment of methane emissions for gas Transmission and Distribution system operators'^[26]. This method is currently being converted into a CEN Technical Report (CEN\TC234\WG14). The guidance provides a set of definitions of the technical equipment in the gas infrastructure, distinct levels of reporting that are based on reporting granularity, quantification methodology, confidence and verification levels as well as a detailed explanation of how to fill in the template.

Guidelines for methane emissions target setting

The report entitled 'Guidelines for Methane Emissions Target Setting'^[27] analyses the current situation in Europe based on answers to a questionnaire circulated among the members of MARCOGAZ, GIE and the International Association of Oil and Gas Producers (IOGP). The document gives some insights into the key elements to be considered when setting a target as well as the guidelines to be followed by companies across the value chain, which will implement emissions reduction targets. According to the guidelines, the companies willing to set a methane emissions target should take into account several factors to ensure that the target is aligned with their strategies and, at the same time, is realistic and feasible.



9

STAKEHOLDER ENGAGEMENTS

In the course of 2020 and 2021, MARCOGAZ welcomed new members and partners while expanding dialogue with stakeholders in the gas sector and beyond. Dedicated to expanding technical dialogue with stakeholders in the European and international gas industry, MARCOGAZ engaged with various partners across the sector with a view to exchanging technical expertise and sharing knowledge.

9.1. EUROPEAN CLEAN HYDROGEN ALLIANCE

MARCOGAZ was invited to be part of a restricted group of representatives in the European Clean Hydrogen Alliance Roundtable Transmission and Distribution.

MARCOGAZ participated in several CEO and high-level Sherpa meetings of the European Clean Hydrogen Alliance (ECH2A) Transmission and Distribution Round Table and exchanged views with partners from the industry on technical opportunities and challenges relating to the transmission and distribution of hydrogen through the existing gas infrastructure.

Set up in July 2020, ECH2A is part of EU efforts to ensure industrial leadership and to accelerate the decarbonisation of industry in line with its climate change objectives. Six roundtables cover the entire value chain of hydrogen from production to transmission, distribution and end use. The Alliance supports the large-scale deployment of clean hydrogen technologies by 2030 by bringing together renewable and low-carbon hydrogen production, demand in industry, mobility and other sectors, and hydrogen transmission and distribution.

9.2. UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)

On 22 September 2021, MARCOGAZ addressed the Sustainable Energy Week and the 30th Session of the Committee on Sustainable Energy. MARCOGAZ delivered a presentation on methane emissions. Subsequently, MARCOGAZ participated in the Committee Bureau of the United Nations Econom-

ic Commission for Europe (UNECE) Committee on Sustainable Energy (CSE), which consists of a group of experts preparing the sustainable energy subprogramme of the UNECE.

MARCOGAZ had already been cooperating with UNECE in the reduction and mitigation of methane emissions, providing technical support for the relevant initiatives. With the recently strengthened dialogue, the Committee and MARCOGAZ agreed to expand technical dialogue to hydrogen and its deployment as well as guarantees of origin for new gases.

9.3. UNITED NATIONS ENERGY COMPACTS

In September 2021, MARCOGAZ developed two energy compacts, which were included in the Energy Compacts of the United Nations Energy as part of the High-Level Dialogue on Energy organised during the 76th Session of the United Nations General Assembly.

MARCOGAZ's Energy Compact^[28] highlights the Association's commitments to the energy transition and climate neutrality. With a view to executing those commitments, MARCOGAZ works to expand cooperation with European and global partners by exchanging knowledge and technical expertise on the decarbonised midstream and downstream gas network. The Association maintains continued technical evaluation of the technology readiness level of the existing gas infrastructure for new gases at different concentrations in the grid, 100% decarbonised network and impact on end-use gas appliances. To achieve the stated goals and targets, the Energy Compact notes that collecting data on the generation of new gases, sector integration projects, power-to-gas installations to create road maps for greater integration of renewables and the role of gas infrastructure is at the core of the overall activities.

The catalogue of the Green Hydrogen Compact^[29] includes the commitments and targets of countries, companies and associations on the development and take-up of green hydrogen. In its compact, MARCOGAZ elaborates on the solutions that the Association en-

MARCOGAZ PARTNERS



counters in its endeavour to promote and support the development of green hydrogen and the challenges that it encounters. Evaluation of the technical readiness of the existing gas network and providing a technical basis for the standards, regulations and safety-related processes are an essential part of the solutions MARCOGAZ develops for the green hydrogen injection into the gas system at different concentrations.

9.4. INTERNATIONAL GAS UNION (IGU)

International Gas Union (IGU), a worldwide non-profit organisation, advocates gas as an integral part of a sustainable global energy system, and promotes the political, technical, and economic progress of the gas industry.

MARCOGAZ, an associate partner of IGU, had been maintaining dialogue with IGU on various platforms. In 2021, the organisations took the initiative to strengthen their partnership and expand the scope of the dialogue with a view to mutually benefitting from technical expertise and competence. At a meeting in October 2021, the two organisations decided to broaden the scope of the technical dialogue to include new gases and sustainability. The production of new gases as well as the potential use of these gases in end-use sectors in pure form or in mixtures with natural gas will be the focus of technical dialogue as MARCOGAZ is invited to contribute to the committees and task forces at IGU.

9.5. ENERGY COMMUNITY

MARCOGAZ and the Energy Community have a long-standing partnership in technical matters related to gas, particularly in the reduction and mitigation of methane emissions. The guidelines and assessment methodologies MARCOGAZ prepared on the topic reporting, verification, mitigation and reduction of methane emissions have become a technical reference for the related activities of the Energy Community.

MARCOGAZ organised, in cooperation with GIE and the Energy Community, a total of seven webinars in 2021. The webinars improved gas stakeholders' knowledge about the importance of tackling meth-

ane leakage by the gas industry and best practices in their assessment, measurement and reporting, as well as reduction.

In addition to Monthly Methane Mondays, MARCOGAZ and the Energy Community, together with GIE, organised a technical meeting on mitigating methane emissions.

9.6. EUROPEAN COMMITTEE FOR STANDARDISATION (CEN)

Standardisation is an essential part of the entire gas value chain and, as the technical association of the European gas industry, MARCOGAZ has actively contributed to the standardisation processes of the gas industry. Continued cooperation with CEN has featured important technical guidelines and reports that MARCOGAZ has produced over the years.

MARCOGAZ's involvement in the technical discussions regarding the standardisation processes of the gas industry in topics related to methane emissions, gas quality, hydrogen/natural gas systems, biomethane injection, was maintained without interruption in 2020 and 2021. The experts from MARCOGAZ's Working Group Gas Quality participated in the CEN Sector Forum Gas Pre-normative study of H-gas quality parameters. This study provided the technical basis for the revision of the gas quality standard, a process in which MARCOGAZ has been actively engaged.

Moreover, the bottom-up methodology that MARCOGAZ developed for the quantification of the methane emissions was considered for translation by the CEN Working Group on methane emissions into a CEN Technical Specification. With regard to hydrogen, MARCOGAZ also provides technical support for the pre-normative research and standardisation activities on hydrogen/natural gas mixtures and power-to-hydrogen processes.

Furthermore, MARCOGAZ continued to participate in the ongoing gas quality standardisation activity at CEN's Working Group Domestic Central Heating Boilers Using Gaseous Fuels and the CEN standard on the forced draught burners for gaseous fuels.



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9.7. ENTSOG ADVISORY PANEL FOR FUTURE GAS GRIDS

Since its inception in late 2020, MARCOGAZ has been an active participant in the ENTSOG Advisory Panel for Future Gas Grids. The Advisory Panel aims to ensure transparency and coordination across the entire value chain and support gas transmission system operators (TSOs) and stakeholders in identifying practical challenges and solutions for the transition of gas grids. These challenges and solutions may include retrofitting and repurposing the existing gas infrastructure, development of an EU Hydrogen backbone, analysis on the role of blending and work on an EU-wide approach for CO₂ infrastructure. MARCOGAZ is represented by its Secretary General at the Advisory Panel meetings, which took place four times in 2021.

9.8. PRIME-MOVERS' GROUP ON GAS QUALITY AND HANDLING

The technical contribution of MARCOGAZ to the Prime Movers' Group on Gas Quality and Handling, which brought together European actors across the gas value chain and was facilitated by gas transmission and distribution system operators, was appreciated by all stakeholders who actively participated in the group. Across a series of meetings that had been held since September 2020, the experts laid out scenarios for innovative and cost-efficient ways to handle gas quality in fluctuating blends. Discussions over pure hydrogen grids as part of the future gas system also featured.

MARCOGAZ's contribution has been an added value to the analysis of the Prime Movers Group. The group's work was supported by MARCOGAZ experts on gas quality, sector integration and hydrogen handling. Among the different technical material supplied is the MARCOGAZ publication entitled 'Overview of test results and regulatory limits for hydrogen

admission into existing natural gas infrastructure and end use^[30]. The infographic prepared as part of this report identifies gaps in knowledge and areas where research and development (R&D) is required to remove barriers limiting hydrogen take-up in the supply chain and enabling new applications for hydrogen and hydrogen/natural gas mixtures.

9.9. HYDROGEN EUROPE

MARCOGAZ and Hydrogen Europe launched a cooperation initiative in early 2021 to expand technical dialogue and bring together the experts from the two organisations.

As the technical association of the European gas industry, MARCOGAZ works on the acceptance of hydrogen in the existing European gas infrastructure along with Hydrogen Europe (as the industry association bringing together diverse players enabling the adoption of hydrogen in the European market). The cooperative dialogue between the two organisations will therefore pave the way for better exchanges of technical expertise among European stakeholders operating in the gas industry.

At the inaugural meeting in September 2021, the experts from MARCOGAZ and Hydrogen Europe decided to cooperate on a number of significant topics related to the take-up of hydrogen. These topics include, but are not limited to, hydrogen quality, safety, acceptance of hydrogen by the gas infrastructure, data collection, knowledge sharing and utilisation of hydrogen in end-use sectors. Both organisations aim to share the results of the joint work with European stakeholders to facilitate the decarbonisation efforts of the gas industry.

9.10. GAS DISTRIBUTORS FOR SUSTAINABILITY (GD4S)

In July 2021, MARCOGAZ and Gas Distributors for Sustainability (GD4S) took the first step to establish dialogue on a sustainability charter and road map along with other stakeholders in the European gas industry. The Sustainability Charter features the

shared commitments of the gas associations and distributors that contribute to the realisation of the European Green Deal by 2050 and of the Sustainable Development Goals (SDGs). The commitments are separated into material topics on Environment, Social and Governance (ESG) aspects. MARCOGAZ provided feedback regarding the sustainability commitments under the environmental topic of the charter. The feedback was considered for adoption by the GD4S and included in the future deliberations on the commitments.

9.11. EASEE - GAS

MARCOGAZ maintained its continued cooperation with EASEE – Gas, the European Association for the Streamlining of Energy Exchange, in the course of 2020 and 2021, participating in the Advisory Panel.

Experts from MARCOGAZ were involved in the design of EASEE – Gas Common Business Practices (CBP) on hydrogen. This CBP defines the recommended quality specification for hydrogen (non-blended with natural gas) flowing through dedicated systems. In other words, it focuses on the networks that were originally designed and used for natural gas transmission and, after a safety and reliability assessment, were found to be suited for conveying hydrogen and for newly built hydrogen pipeline systems. The CBP is valid for both the entry as well as the exit points of these dedicated systems.

9.12. GAS NATURALLY

MARCOGAZ maintained its privileged position of working together with seven other gas associations under the umbrella of GasNaturally. In the course of 2020 and 2021, MARCOGAZ contributed to various initiatives, including the dissemination of the work of the industry on mitigation of methane emission, the role of gas infrastructure to accommodate the new gases and on legislative files relating to the gas decarbonisation package and the revision of the Renewable Energy Directive.

9.13. READY4H2

Ready4H2 is a project launched by gas associations and gas system distributors (DSOs) from 13 countries in Europe with a view to combining hydrogen expertise and experiences across the European DSOs and creating a common European understanding of how the DSOs and distribution networks can facilitate the injection for hydrogen producers and deliver hydrogen to consumers.

Since the conceptualisation phase of the project, MARCOGAZ had been involved and mobilised its resources to share its technical experience and know-how with all the other partners. Believing in the potential of DSOs to unlock hydrogen development in Europe, MARCOGAZ capitalised on its decades of experience of working with DSOs around Europe to deliver the commitments of the Ready4H2 project.

9.14. EUROPEAN SPACE AGENCY (ESA) CAMEO PROJECT

Corridor and Asset Monitoring Using Earth Observation (CAMEO) is a project launched by the European Space Agency (ESA) in 2020. The project aims to boost the understanding and integration of satellite Earth Observation (EO) services by companies and agencies managing pipeline and energy transmission corridors.

In early 2021, MARCOGAZ and CAMEO signed an agreement of cooperation to establish a programme of exchange and collaboration on developing and using Earth Observation-based services to support security and integrity management for pipeline and energy corridors. This collaboration was a further milestone for MARCOGAZ in helping the gas industry mitigate methane emissions through observation from the satellites.

9.15. EMPIR

MARCOGAZ Working Group Gas Metering continued to follow the ongoing technical research within the framework of the 'NewGasMet' project coordi-

nated by the European Metrology Programme for Innovation and Research (EMPIR) and the activities at the CEN Technical Committee on Gas Meters.

The overall objective of the project is to increase knowledge about the accuracy and durability of commercially available gas meters after exposure to renewable gases. This should lead to the improvement of existing meter designs and flow calibration standards. MARCOGAZ's engagement with the 'NewGasMet' project aims to contribute to the revision of standards and to ensure that outputs from the project are communicated quickly to those who develop and revise the standards and who will use the outputs in a form that can be incorporated into standards.

9.16. TESTING HYDROGEN ADMIXTURES FOR GAS APPLIANCES (THYGA)

MARCOGAZ continued to provide support for the Testing Hydrogen Admixtures for Gas Appliances (THyGA) project as a member of its advisory panel in 2020 and 2021. The project, coordinated by GERG, kicked off in 2020 and received funding from the EU's Research and Innovation programme Horizon 2020 under the Fuel Cell and Hydrogen Joint Undertaking (FCH JU). The main goal of the three-year project is to facilitate the wide adoption of hydrogen and natural gas blends by closing knowledge gaps regarding technical impacts on residential and commercial gas appliances. Project partners work on the identification and recommendation of appropriate codes and standards that should be adapted to respond to needs. In accordance with the project outcomes, a strategy for addressing the challenges for new and existing appliances will be adopted.

10 EVENTS



2021

November Energy Infrastructure Forum, European Commission

The 7th edition of the Energy Infrastructure Forum analysed energy system integration and interlinkages. The Forum discussed the opportunities for the coupling of gas and electricity and planning at the distribution and transmission levels.

The sessions elaborated on coordinated onshore and offshore infrastructure planning, including an exploratory discussion on sharing costs and benefits among onshore and offshore grids.

November Gas Quality and Hydrogen Handling Prime Movers' group, ENTSOG

The Prime Movers' Group on Gas Quality and Hydrogen Handling workshop, which took place on 25 November 2021, assessed the development of innovative and feasible ways to handle gas quality in fluctuating blends, as well as pure hydrogen grids in our future gas system, and the main technical challenges foreseen. The prime movers' group provided necessary technical inputs to the drafting proposal of the European Commission on Hydrogen and Gas Markets Decarbonisation Package.

The Chairman of the MARCOGAZ Working Group Gas Quality presented the Association's past and present work on hydrogen. He elaborated on MARCOGAZ's mission and vision with regard to hydrogen development in the European gas sector.

October MARCOGAZ presented power-to-gas and energy storage systems in the system integration process at the EU's Sustainable Energy Week

MARCOGAZ presented the significant role of power-to-gas technologies and gas storage systems in the system integration process at the EU's Sustainable Energy Week 2021 on 28 October 2021. The presentation drew attention to the need for storage systems that ensure security of energy supply and the stability of the power system while explaining the benefits of system integration through power-to-gas technologies that provide large-scale energy storage.

October MARCOGAZ Tech Forum - The role of LNG in decarbonising gas systems

The first of MARCOGAZ's Tech Forum series, the webinar entitled 'The role of LNG in decarbonising the gas system', took place on 22 October 2021 and highlighted the technical opportunities and potential of Bio-LNG and Synthetic LNG in decarbonising the transport sector. The opportunities that the existing European LNG infrastructure offers for the decarbonisation of the gas industry were elaborated from a technical perspective, taking into account that the share of LNG in transport is projected to rise according to the European Commission's latest proposal on the regulatory revision of the alternative fuels' infrastructure Directive.

October MARCOGAZ addresses the World Hydrogen Congress

On 6 October 2021, MARCOGAZ's Secretary General addressed the World Hydrogen Congress, elaborating on the opportunities and constraints of converting 100% ultra-low hydrogen, associated regulatory hurdles and retrofitting pipelines. The agenda of the panel featured discussions on the strategic day to day impact of moving away from business-as-usual in network planning and market design, overcoming crossborder challenges, and the inclusion of gas distribution as part of the hydrogen economy.

September Presentation at the UNECE Sustainable Energy Week - Importance of methane management for the gas industry

MARCOGAZ addressed the issue of methane emissions' management at the Sustainable Energy Week organised by the United Nations Economic Commission for Europe (UNECE), featuring the 30th Jubilee session of the Committee on Sustainable Energy, on 22 September 2021.

The Secretary General's speech addressed some of the crucial issues on the mitigation and reduction of methane emissions. The messages conveyed elaborated on the concerted European and global actions and initiatives to mitigate methane emissions, costs of reduction vs. inaction and the benefits of reducing methane emissions for the gas industry.

June Meeting on methane emissions in the gas sector, organised by MARCOGAZ, GIE and the Energy Community

During this event, which took place on 28 June 2021, the current challenges and developments in methane emissions were set out by a group of experts discussing ongoing activities to tackle methane emissions. The event brought together members of the European Parliament, representatives from international organisations and research associations, who presented the latest developments in methane emissions' reductions from a legislative, technical and scientific perspective. Representatives from the European Commission also attended the event, presenting the EU's legislative proposal and what the Copernicus programme is doing to monitor and limit methane emissions.

June MARCOGAZ attended the Hydrogen European Forum

The EU Hydrogen Forum is the plenary assembly of the European Clean Hydrogen Alliance. It brings together all the ECH2A participants, at least once per year, to enhance collaboration, discuss the different perspectives of stakeholders and maintain dialogue with the European institutions. MARCOGAZ was represented by the President and the Secretary General at the EU Hydrogen Forum, which enabled an exchange of views with industry leaders and stakeholders.

May MARCOGAZ moderated GIE event - Energy Days

On 21 May 2021, MARCOGAZ's Secretary-General moderated session 5 of the Gas Infrastructure Europe Energy Days, addressing methane emissions' management under system operation development.

April Madrid Forum

MARCOGAZ's President presented the role of gas infrastructure for the energy transition and underlined the technical challenges of retrofitting and repurposing the transmission and distribution gas grids.

The 35th European Gas Regulatory Forum was held in April 2021. Also known as the Madrid Forum, the European Gas Regulatory Forum gathers key stakeholders from across the European energy sector to discuss opportunities and challenges related to the further development and decarbonisation of the internal EU gas market and to its integration with other energy sectors.

March Kick-off of 'Methane Monthly Mondays'

Since March 2021, MARCOGAZ, the Energy Community Secretariat, GIE and Methane Guiding Principles (MGP) have been organising an event entitled 'Methane Mondays' — a series of webinars taking place on the first Monday of each month. As methane is only second to carbon dioxide in its impact on the climate, addressing methane emissions in the energy sector is critical. The webinars attracted a wide range of audience participants and speakers, including gas transmission, distribution and storage system operators, national energy regulatory authorities, energy companies as well as all other interested stakeholders.



2020

November Workshop on the 'Future for Gas Appliances'

MARCOGAZ organised a workshop on the 'Future for Gas Appliances' to promote discussion among manufacturers, engineers, designers, installers, technicians and all those interested in the evolution of gas appliances due to decarbonisation policies and the application of the European Energy Efficiency Directive (EED).

October Madrid Forum

The 34th European Gas Regulatory Forum was held on 14-15 October 2021. Also known as the Madrid Forum, the European Gas Regulatory Forum brings together key stakeholders from across the European energy sector to discuss opportunities and challenges related to the further development and decarbonisation of the EU's internal gas market and to its integration with other energy sectors.



ANNEX

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MARCOGAZ is looking forward to welcoming all stakeholders from the European gas industry to the **5th European Gas Technology Conference 2022** (EGATEC 2022) in Hamburg on 14-15 June 2022.



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EGATEC is organised by MARCOGAZ and GERG in coordination with DVGW Kongress and with the support of the European Research Institute for Gas and Energy Innovation (ERIG).

The Conference brings together high-level representatives from the European gas industry, universities, companies and many other stakeholders. It provides a platform to exchange knowledge and experiences on the challenges and opportunities that the energy transition and decarbonisation efforts associated with such a shift deliver for the gas industry.

EGATEC 2022 will consider and discuss new strategies and innovative ideas to facilitate the gas industry's contribution to net-zero goals and upscaling state-of-the-art technologies, including new gases and power-to-gas.

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MARCOGAZ

MARCOGAZ AISBL

Rue Belliard, 40
1040 Brussels
Belgium

marcogaz@marcogaz.org