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Technical Association of the European Gas Industry

SESSION FILE

EXECUTIVE BOARD MEETING

ZURICH, 13 DECEMBER 2023

Rue Belliard 40
1040 Brussels | Belgium
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EXECUTIVE BOARD MEETING

EVENT PROGRAM

12TH AND 13TH DECEMBER 2023 IN ZURICH

TUESDAY 12TH DECEMBER

WELCOME DRINK AND DINNER

Location: «Zunfthaus zum Rüden»
Limmatquai 42, 8001 Zürich

18h00 Drinks and dinner

WEDNESDAY 13TH DECEMBER

EXECUTIVE BOARD MEETING

Location: SVGW offices
Grütlistrasse 44, 8002 Zurich

09h00 to 12h30 Meeting

Rue Belliard 40
1040 Brussels | Belgium
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AGENDA OF THE EXECUTIVE BOARD MEETING
13 DECEMBER 2023

Start & end of the meeting: 9h00 – 12h30

Venue: Meeting at the SVGW offices - Grütlistrasse 44, 8002 Zurich

09h00 – 11h00

Item	Subject	Presenter
I.	Opening of the Session	President
1.	Quorum and approval of the agenda	
2.	Welcome to new attendants	
3.	Approval of the minutes of the meeting of 13/09/2023	
II.	Implementation of the decisions from the last Executive Board meeting	
III.	Brief report from the Citizens Forum	
IV.	Organization of EGATEC 2024	Vice-President
V.	Presentation of SVGW	Diego Modolell
VI.	Presentations of the Standing Committees	Chairs of SCs
1.	Standing Committee Gas Infrastructure (SCGI) • Approval of technical documents • Chairmanship of WG Underground Storage	

COFFEE BREAK (11h00 – 11h20)

11h20 – 12h30

Item	Subject	Presenter
2.	Standing Committee Gas Utilisation and New Gases (SCGU&H2+) • Status of WG Sector Integration	Chairs of SCs
3.	Standing Committee Sustainability (SCS) • Chairmanship of WG HLS	
VII	MARCOSTAT Calls	Sec. General
VIII.	Administration and Secretariat • Human Resources • Status of budget of 2023 • Financial Auditor for Accounts of 2023	
IX.	Communications & Liaisons • ACER | GTI | Euramet | GIIGNL | Clean H2 Joint Undertaking	
X.	Dates of the next meetings	President
XI.	AOB	

I. Draft minutes of the last Executive Board meeting

Minutes of the Executive Board meeting

13th of September 2023

Start & end of the meeting: 09h30 – 12h00
Teams meeting only

Attendants: Liam Nolan (President), Alexander Schwanzer (Vice-President), Manuel Coxe (Secretary General), Thierry Chapuis, Daniel Czeto (replacing Rastislav Nukovic), Anne-Sophie Decaux, Abel Enriquez, Frank Graf, Sylwia Gladysz, Mattias Hanson, Stanislav Kazda, Dimitrios Kourkouraidis, Thea Larsen, Jose Miguel Tudela Olivares, Francisco José Sichar (replacing Naiara Ortiz de Mendibil), Signe Sonne, Pawel Stanczak, Ioannis Tsiblakis, Steven Vallender, Steven Van Caekenberghe, Lucia Vojtila, Uwe Wetzel and Kris de Wit.

Apologized: Alvaro Laranjo, Stefano Cagnoli, Arto Korpela, Ion Manescu, Diego Modolell, Agnieszka Ozga, and Jeroen Zanting.

Invited: Gert Müller-Syring.

1. Opening of the Session

The President welcomed the Members and opened the meeting.

1.1. Quorum and approval of the agenda

The quorum was reached as 16 Executive Board Members out of 21 were present or represented. The proposed agenda was approved without modification.

1.2. Welcome to new attendants

The President welcomed Abel Enriquez, Mathias Hanson, Steven Vallender and Lucia Vojtila for attending the Executive Board meeting for the first time.

1.3. Approval of the Minutes of 01/06/2023

The Minutes of the Executive Board Meeting of 01/06/2023 were approved without modification.

2. Implementation of the decisions from the last Executive Board meeting

The President informed the Members that the Executive Board had approved the statements of the financial accounts for 2022 and that they were submitted to the General Assembly of the Members on 1st June 2023 for approval. Likewise, the President informed that the Executive Board had approved the budget for 2024 including the exemption of the membership fees in 2024 for the two Members from Ukraine due to the war situation, and that both matters were submitted to the General Assembly of the Members. Subsequently, the General Assembly of the Members approved the financial accounts for 2022, the Audit Report performed by Deloitte, the membership fee and budget for 2024 as suggested by the Executive Board.
The President also informed the Members that the Executive Board had approved the dates (18 and 19 of June 2024) and the Atlantic Hotel in Hamburg as the venue, the ticket prices and sponsorship prices for EGATEC 2024 following the proposal of the hosting members DVGW, Gasunie and DGC.

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Finally, the President let the Members know that the document "Mine Dust and Black Powder" and the position paper "Pan-European 'boiler ban' in 2029 – another way is possible and preferable" were approved by the Executive Board and subsequently published and disseminated.

3. Status of Membership

The President informed the Members of the Executive Board that Enagas had decided to terminate its membership at the end of the year 2023 (according to Article 3.4 of the Statutes and via an official Termination Letter) due to recent internal changes and reorientation of priorities and resources. The Members were also informed that Enagas would continue contributing to MARCOGAZ's activities via the Spanish national gas association Sedigas.

The President informed the Executive Board Members that EDA Attikis was acquired by DEPA Infrastructure S.A., which decided to evaluate membership in all national, European, and international associations. Consequently, EDA Attikis will transit its MARCOGAZ Membership at the end of 2023 to DEPA Infrastructure S.A. that will become a new Member in MARCOGAZ in 2024. DEPA was still to address the formality of the transition.

Finally, the Members of the Executive Board were informed that MARCOGAZ Secretariat had met with NAFTOGAZ (Ukrtransgaz) – the gas underground storage company in Ukraine – and they had expressed interest to become a new Member. At that moment they were preparing the formal request for Corporate Membership.

4. Organisation of EGATEC 2024 & 2026

The Vice-President informed the Members of the Executive Board that the event venue approved by the MARCOGAZ Executive Board was confirmed and booked by DVGW Kongress at Atlantic Hotel Hamburg, Germany. The Executive Board Members were also informed that DVGW Kongress had drafted the Conference Agenda pending on revision by the Programme Committee. The Vice-President also presented the proposed schedules for the expected milestones both from the Programme Committee and the Paper Selection Committee. Finally, while the EGATEC 2024 Program Committee is complete and MARCOGAZ is represented by the Vice-President (Alexande Schwanzer) and Secretary General (Manuel Coxe), the Co-Chair of SCGU&H2+ and Board Member (Frank Graf) is the only representative in the Paper Selection Committee with an open vacancy where any MARCOGAZ member can propose an additional representation.

5. Implementation of Annual Work Programme 2023

The Secretary General presented statistics of the Work Plan 2023, the ongoing work, the finalised tasks, pending data collection and tasks still pending of kick off.

The Secretary General presented the status of MARCOSTAT Calls and underlined that CALL#5 on EGAS-C report on Gas Installations Safety was launched in the beginning of September with deadline end of September and the questionnaire on *"EU Taxonomy for sustainable activities"* for WG Distribution members to pave DSOs involvement in the activity has the deadline set for mid-October.

The Members of the Executive Board were invited to strengthen participation in the WG Sector Integration, WG Gas Installations and WG LNG.

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6. Presentations from Standing Committees

6.1. Standing Committee Sustainability (SCS)

The Chair gave an update on the status of the **WG HLS** and informed that no significant activities have taken place since the last Board meeting of 01 June 2023. However, the document *'Mine dust and black powder'* has been published as it has previously been approved. Two more documents are expected from the WG HLS on *'Health effects of hydrogen and natural gas'* and *'Optical and electronical radiation in the gas industry – phase 2'.* Finally, the Chair addressed that the benchmarking study on safety figures is ongoing with MARCOSTAT data Call #3.

The Chair presented the nine drafts of the Best Available Techniques documents on venting and flaring prepared by the **WG ME+** and requested their approval. The Chair informed that the document on the methane emissions regulation prepared by experts of the group of five associations (MARCOGAZ, GIE, Eurogas, GERG and ENTSOG) was sent out to policy makers in August. Subsequently, the WG ME+ will focus on the IED revision, possibly in corporation with GIE and Eurogas, as the finalization of the revision is expected early 2024. A kick off meeting is expected in the very short term for the new project related to Scope3 emissions. Interested Executive Board Members are kindly invited to suggested members for this project. Finally, the Chair addressed that the WG ME+ will start looking into the new topic of hydrogen emissions with the aim of writing a white paper.

DECISION 2023/13: The Executive Board approved the nine documents on "Best Available Technologies (BATs)" and recommended its publication.

6.2. Standing Committee Gas Infrastructure (SCGI)

The last meeting of the **SGGI** was held on the 19th of April, after which the document *"Gas Transmission Pipeline Safety"* was published. The next meeting is scheduled for the 25th of September where the Madrid Forum will be discussed with the topic of *"phase out of natural gas and decommissioning of infrastructure".*

Regarding **TF H2,** the Chair of the Task Force presented the outcome of the study on "*Cost Estimation of Hydrogen Admission into Existing Natural Gas Infrastructure and End Use*" and informed that the report is subject to SCGI approval. The final Report of the study will be shared with the Executive Board for final approval following the agreement in the SCGI meeting scheduled for 25 September 2023. Furthermore, the Chair of the SCGI presented the two high level documents previously submitted to the Executive Board, respectively entitled "*the Infographic 2023"* and "*the methodology description"*, and asked for approval their approval for publication.

The **WG LNG** has been re-activated by the newly appointed Chair *Andrzej Zero* and the WG LNG is expected to have a kick-off meeting in the short term. Possible focus areas have been identified, including a new topic on *"Adaptation of LNG terminals for Ammonia import"*.

DECISION 2023/14: The Executive Board approved the document *"Overview of available test results and regulatory limits for hydrogen admission into existing natural gas infrastructure and end use. Infographic Version 2023"* and recommended its publication.

DECISION 2023/15: The Executive Board approved the document *"Methodology description for the cost estimation of hydrogen admission into existing natural gas infrastructure and end use"*, and recommended its publication.

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6.3. Standing Committee Gas Utilisation and New Gases (SCGU&H2+)

The co-Chairs referred that the **WG H2, bioCH4 & SNG** had kicked off, with the second meeting held on the 19th of July 2023. The goal of the WG is to analyze existing studies on new gases, define topics for detailed examination and elaborate relevant items with other experts of MARCOGAZ WGs. In the most recent meeting, presentations were given on the scenarios of new gases in France (GRDF) and the ship-based import options for hydrogen and derivatives (DVGW-EBI). Moreover, a general discussion was held on further activities such as the future of LNG terminals, gas quality aspects for hydrogen pipelines and country-specific activities related to new gases. The next meeting is scheduled for the 29th of September.

The co-Chairs informed the Executive Board that the **WG Gas Quality** is liaising closely with activities at CEN/TC234/WG11 and CEN/TC408 level. Regarding the topic *"Harmonization of gas quality*", a publication from the CEN/TC234/WG11 is expected in the short term. Moreover, the WG is collecting the interest of members to provide data for a study related to LNG quality in Europe, but the WG will decide in the next meeting if there is enough interest to continue the study. Finally, the co-Chairs informed the Executive Board that the CEN/TS 17977 *"Gas infrastructure – Hydrogen used in rededicated as systems"* is approved and that publication is expected late October.

The **WG Energy Efficiency** published the position paper *"Pan-European 'boiler ban' in 2029: another way is possible and preferable"* on the revision of the Ecodesign for central heating appliances and water heaters as approved in the previous Executive Board meeting. Furthermore, the co-Chairs informed that the WG is closely following the developments regarding the EPBD recast and will monitor if MARCOGAZ involvement is required as the trialogue has started.

The co-Chairs informed the Members that the last **WG Gas Installations** (WG GI) meeting took place on 15th of March and the following will be on the 5th of October. The WG GI is collecting data for the EGAS-C study and addressing maintenance of appliances, blending of natural gas with H2 and H2 issues and actively monitoring the CLASP reports on cooking appliances.

The 1st meeting of the **WG Sector Integration** was held on the 21st of April with only Chair and 3 participants (Belgium, Spain, Ireland). The chair of the WG and the MARCOGAZ Secretariat have brainstormed possible ways to increase the participation level. As a way forward, a new study area is identified entitled *"Obstacles and opportunities to the deployment of sector integration within the European energy system"*. The co-Chairs of the SCGU&H2+ invited the Executive Board Members to propose new experts for the WGSI. Furthermore, the co-Chairs informed about the previously identified topics by the WG such as geological H2 storage at different scales, study the role of pipelines compared to electricity cables in transporting energy from offshore wind plants, analyze sector coupling of natural gas and electricity through H2, understanding the interplay between energy efficiency measures and sector coupling to mitigate costs.

Finally, the co-Chairs informed about the activities of the **SCGU&H2+.** The last meeting took place on the 24th of May 2023 and the next meeting is planned for the 9th of October 2023. Although the main takeaways were presented in the previous meeting, the co-Chairs addressed the approved and recently published position paper "*Response to the public consultation of the European Commission on the action plan on accelerated roll-out of heat pumps across the EU*". Finally, the co-Chairs underlined the ongoing liaison of SCGU&H2+ with CEN SFG-U, TC238 and TC109 and informed the Executive Board about the next scheduled meetings.

7. Administration and Secretariat

7.1. Human Resources

The Secretary General updated the Members of the Executive Board about outboarding and onboarding of personnel in the Secretariat, as well as about the fact that there would be an upcoming recruitment of technical profile.

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7.2. Status of budget for 2023

The Secretary General reported on the state of budget of 2023 as of 31/08/2023 as depicted in the table below:

	Approved Budget (15/12/2022)	Received / Paid (as of 31/08/2023)	Expected (01/09 to 31/12/2023)	TOTAL Projection
INCOME	€ 594 (000)	€ 616 (000)	€ 18 (000)	€ 634 (000)
EXPENSES	€ - 668 (000)	€ - 444 (000)	€ - 214 (000)	€ - 658 (000)
TOTAL PROFIT/LOSS	€ - 74 (000)	€ 172 (000)	€ - 196 (000)	€ - 24 (000)
AMOUNT AVAILABLE AT BANK (€ 1 618 000):	€ 117 (000) AT CURRENT ACCOUNTS € 101 (000) AT FLEXIBLE DEPOSIT € 1 400 (000) AT FIXED TERM DEPOSIT (3M & 11M)			

8. Communications & Liaisons

8.1. Communications

The Secretary General informed the Members of the Executive Board that the next Tech Forum on '*Cost of Hydrogen Admission into Existing Gas Infrastructure and End-use*', based on the document elaborated by TF H2, is aimed to take place during the European Hydrogen Week on 20-24 November 2023. The Secretary General also informed that the Annual Report 2022-2023 is being prepared and it is aimed to be published by February 2024. The Secretary General reported to the Executive Board Members that activities related to the 55th Anniversary of MARCOGAZ will continue until December 2023. Finally, the Members were informed that MARCOGAZ will continue partnering and participating in relevant energy-related events on the second half of 2023.

8.2. Liaisons

The Secretary General informed the Members of the Executive Board that MARCOGAZ will participate in the Stakeholder Council of EURAMET and strengthen its work conducted in the WG Metering. The Members were also informed that the WG Gas Metering is being represented in two technical working groups of WELMEC and that MARCOGAZ will be participating as well in the upcoming annual meeting of GIIGNL in November.

Finally, the Secretary General notified the Executive Boar Members that MARCOGAZ plans to participate in the following upcoming European Commission Forums on end use, hydrogen and CCUS.

9. Dates of the next meetings

The following dates summarize MARCOGAZ's next meetings:

- 23/12/2023: Executive Board Meeting – Zurich, Switzerland.
  Welcome dinner the night before (12 Dec. 2023).
- 13/03/2023: Executive Board Meeting – Dublin, Ireland.
  Welcome dinner the night before (12 Mar. 2023).
- 17/06/2024: Executive Board Meeting in Hamburg
- 17/06/2024: General Assembly in Hamburg.

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Welcome dinner (jointly with EGATEC 2024)

- 18-19/06/2024: EGATEC 2024 in Hamburg

10. Any other business

Nothing relevant to report.

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II. Implementation of the decisions from the last Executive Board meeting

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Item II: Implementation of the decisions from the last Executive Board meeting

Liam NOLAN, President of MARCOGAZ

MARCOGAZ Executive Board Meeting- 13 December 2023

Update on last decisions of the Executive Board

- The Executive Board approved the nine documents on "Best Available Technologies (BATs)" and recommended its publication – publication is pending on the approval of BAT0.
- The Executive Board approved the document *"Overview of available test results and regulatory limits for hydrogen admission into existing natural gas infrastructure and end use. Infographic Version 2023"*, which was published accordingly in October 2023.
- The Executive Board approved the document *"Methodology description for the cost estimation of hydrogen admission into existing natural gas infrastructure and end use"*, which was published accordingly in October 2023.
- The Executive Board approved by email the study on *"Cost Estimation of Hydrogen Admission into Existing Natural Gas Infrastructure and End Use"*, which, after editing and designing work, was published accordingly in November 2023.

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III. Brief report from the Citizens Forum

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Citizens' Energy Forum

A brief overview of MARCOGAZ Participation on
9 November 2023 in Dublin, Ireland.

Liam Nolan, Marcogaz President

Zurich, 13 December 2023.

The Citizens' Energy Forum:

Turning the energy crisis into opportunity: paving the way for a consumer-centric energy system

- 15th edition of European Commission organized event to focus on the energy crisis, citizens and the solutions that they can access or put in place.
- Sessions related to:
  - Protecting consumers this winter and beyond
  - Empowering consumers to help manage their energy bills
  - Breakout sessions about:
    - Unlocking citizen power
    - Disentangling different models of energy sharing
    - Improving energy performance of European homes
  - Sustainable energy system of the future

Findings

General agreement on:

- Investments and subsidies to fight energy poverty
- Need for regulatory framework for innovative green solutions
- Renovation of the building stock + creating financial incentive

Remarks:

- Many discussions on local renewable electricity sharing
- Green gas solutions limited in the picture
- General tendency that full electrification in residential areas is good achievable (for example ignoring congestion issues)

Multiple interventions by Marcogaz on green gas solutions, based on our recent publications and participations to EC public consultations, to ensure that these are on the agenda.

Intern/Internal

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Technical Association of the European Gas Industry

Thank you!

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IV.Organization of EGATEC 2024

V. Presentation of SVGW

SVGW

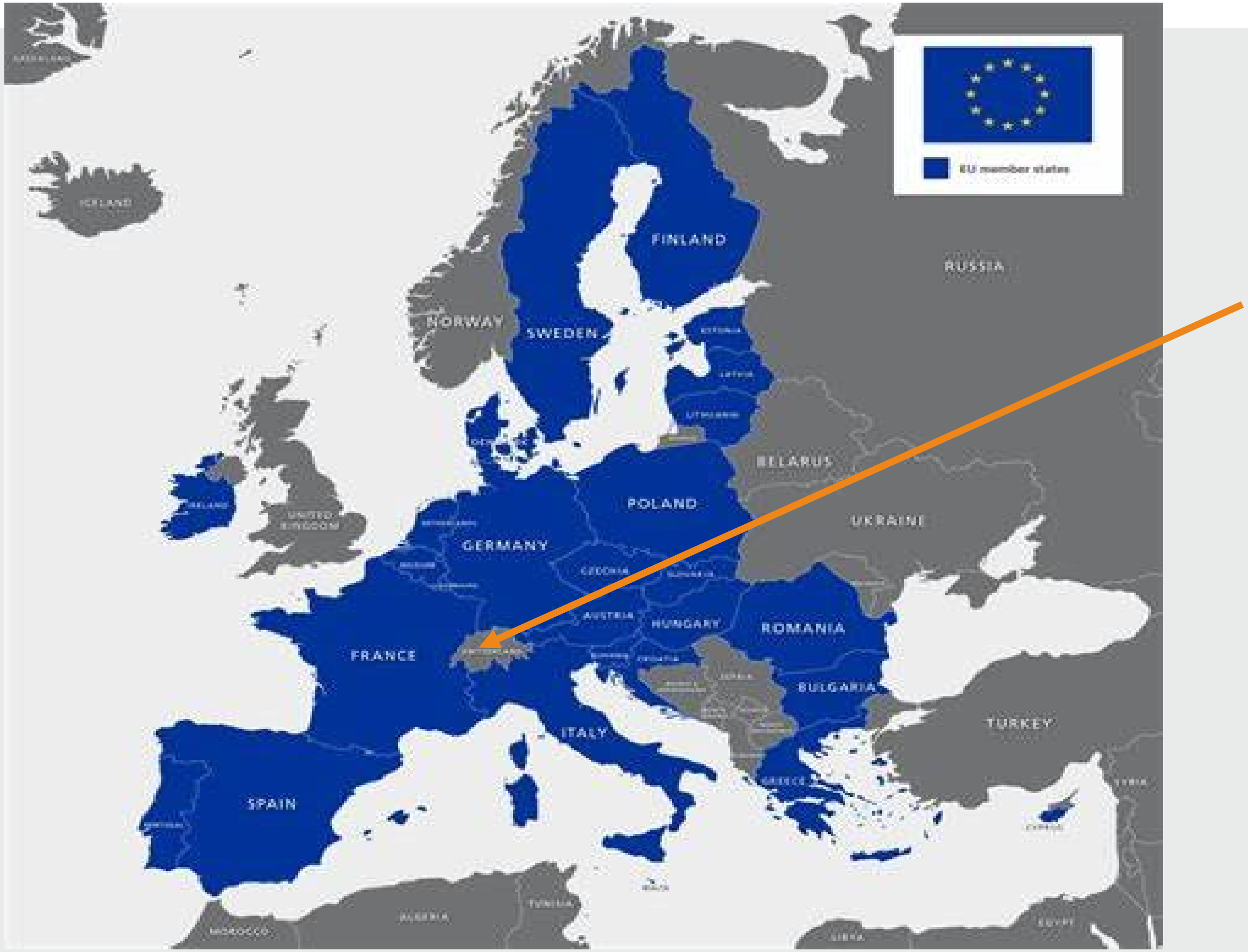
Association pour l'eau, le gaz et la chaleur
Associazione per l'acqua, il gas e il calore
Fachverband für Wasser, Gas und Wärme

SVGW ASSOCIATION FOR GAS, WATER AND DISTRICT HEATING

«The technical conscience of the industry»

Welcome!

Welcome!


EU member states
FINLAND
RUSSIA
NORWAY
SWEDEN
BELARUS
POLAND
UKRAINE
GERMANY
CZECHIA
AUSTRIA
HUNGARY
ROMANIA
FRANCE
BULGARIA
ITALY
TURKEY
SPAIN

Context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Brugg
Aarau
Lenzburg
Zofingen
Kulm
Bremgarten
Muri
Dielsdorf
Bülach
Winterthur
Dietikon
Zürich
Uster
Pfäffikon
Meilen
Hinwil
Affoltern
Horgen
Steckborn
Kreuzlingen
Weinfelden
Frauenfeld
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Wangen
Aarwangen
Bern
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Boudry
Val-de-Travers
Erlach
Sense
La Sarine
La Glâne
La Gruyère
La Veveyse
Grandson
Yverdon
Orbe
Echallens
Moudon
Oron
Cossonay
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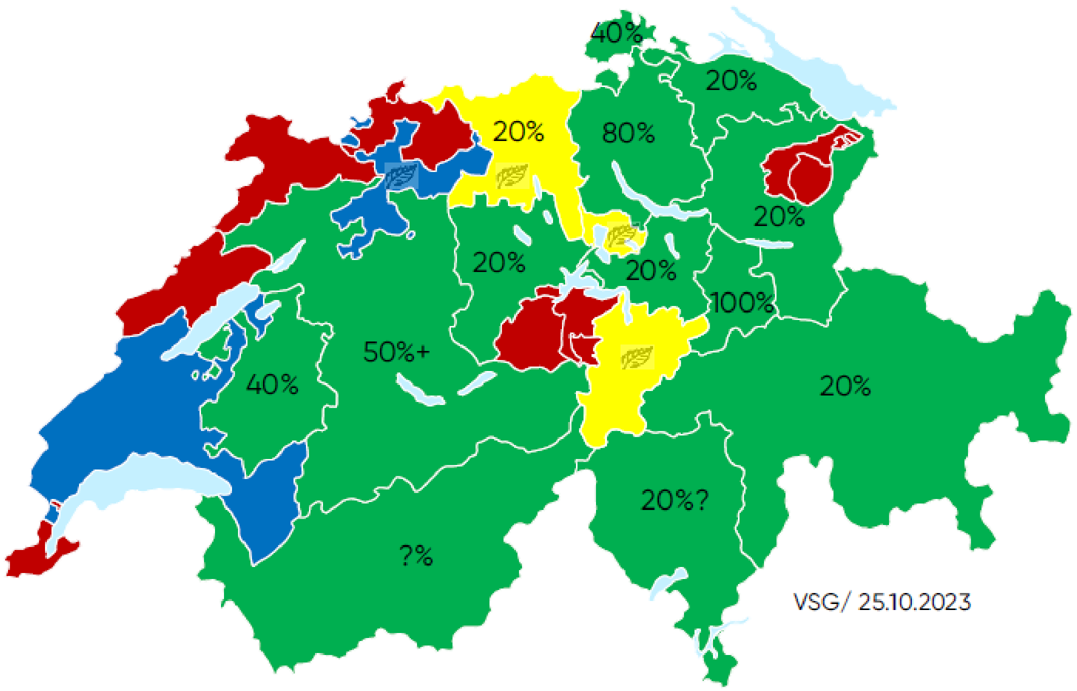
Blenio
Vallemaggia
Riviera
Locarno
Bellinzona
Lugano
Mendrisio
Moesa
Imboden
Landquart
Prättigau / Davos
Plessur
Surselva
Albula
Inn
Hinterrhein
Maloja
Bernina

Diversity within CH

Die MuKEn2014-Landschaft heute

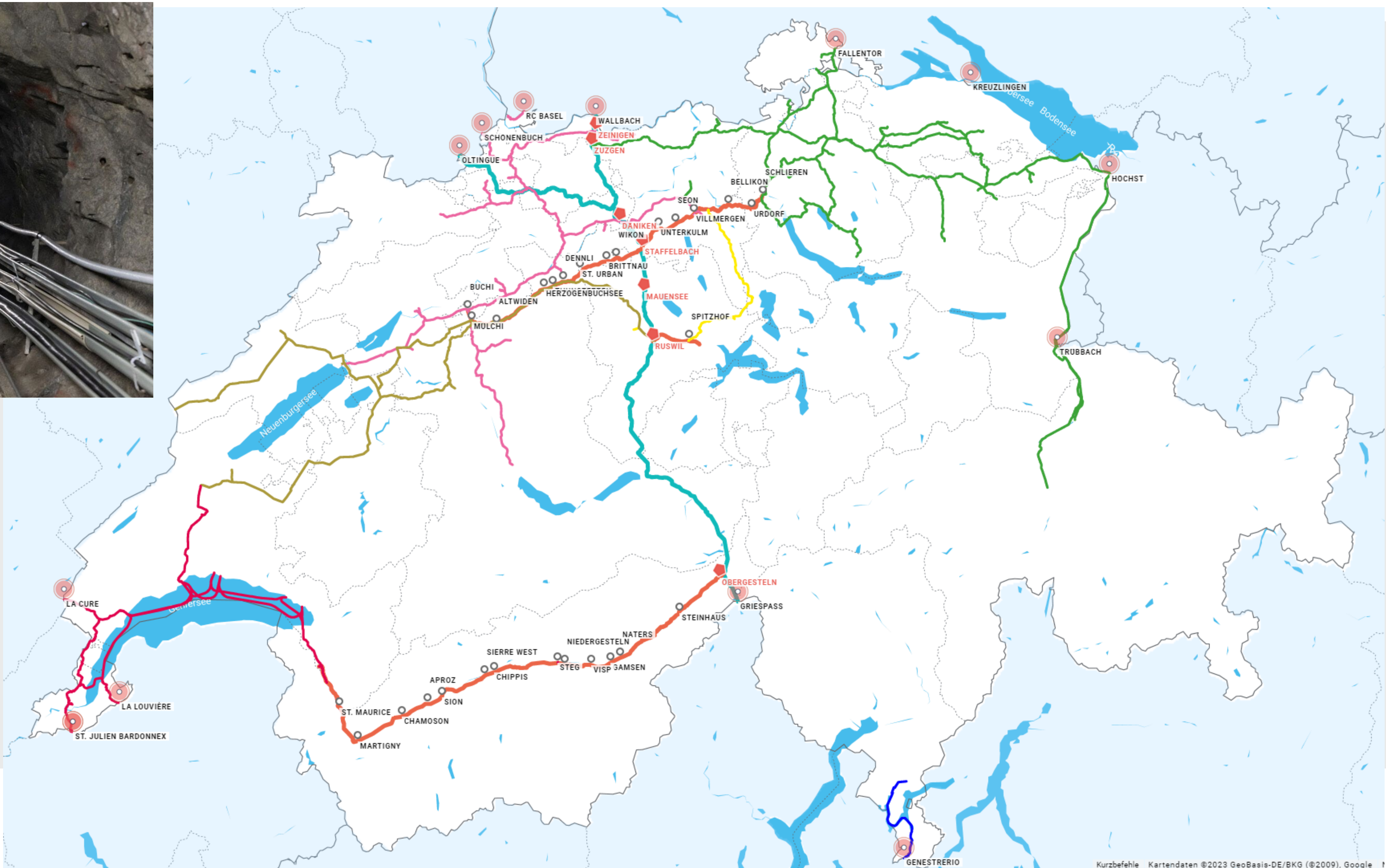


- Anpassung an MuKEn 2014 erfolgt mit Berücksichtigung der erneuerbaren Gase
- Anpassung an MuKEn 2014 erfolgt ohne Berücksichtigung der erneuerbaren Gase
- Gesetz gesamthaft zurückgewiesen
- Gesetzesrevision in der parlamentarischen Phase
  Berücksichtigung der erneuerbaren Gase ist zum gegenwärtigen Zeitpunkt vorgesehen.
- Gesetzesvorschlag in Vernehmlassung
- noch kein Gesetzesvorschlag in Vernehmlassung

XX% Mindestanteil erneuerbares Gas beim Heizungsersatz

gaz energie

Context



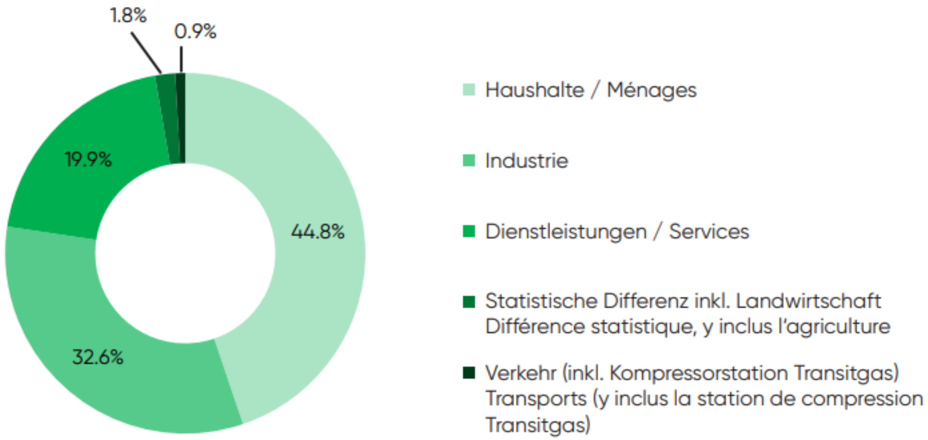
SVGW

Gas Consumption / by Sector

Tab-1b Gasabgabe nach Verbrauchssektoren
Ventes de gaz selon les secteurs de consommation

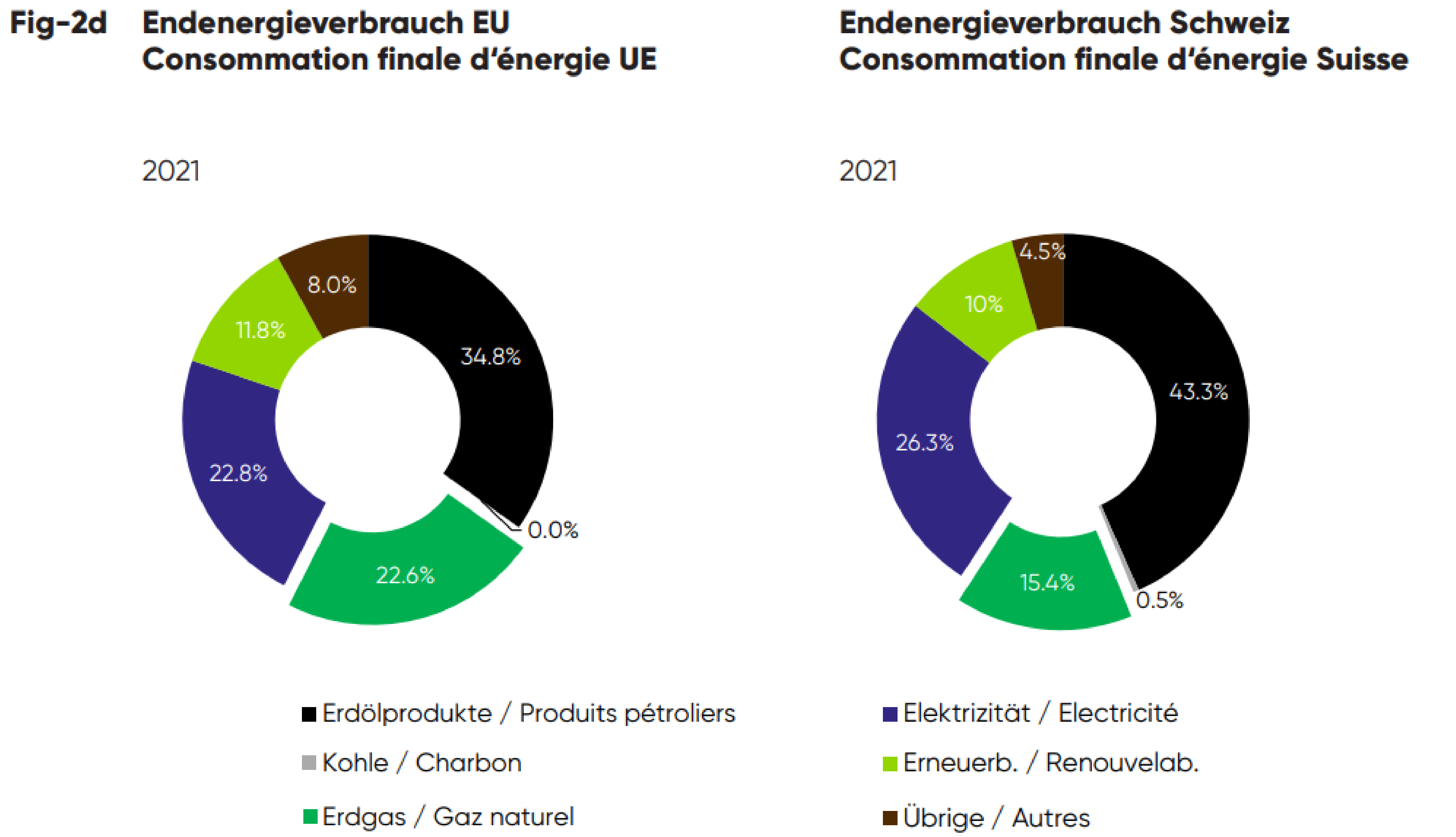
Brennwert / Pouvoir calorifique supérieur	2021 GWh	2022 GWh	2021 %	2022 %
Haushalte / Ménages	16 463	14 059	43.5	44.8
Industrie	12 250	10 216	32.4	32.6
Dienstleistungen / Services	8 127	6 250	21.5	19.9
Statistische Differenz inkl. Landwirtschaft Différence statistique, y inclus l'agriculture	765	565	2.0	1.8
Verkehr (inkl. Kompressorstation Transitgas) Transports (y inclus la station de compression Transitgas)	204	284	0.6	0.9
Total	37 809	31 373	100	100

Fig-1b Gasabgabe nach Verbrauchssektoren 2022
Ventes de gaz selon les secteurs de consommation en 2022



Quelle: Schweizerische Gesamtenergiestatistik 2022, revidierte Zahlen
Source: Statistique globale suisse de l'énergie 2022, chiffres révisés

Energy Consumption EU / CH

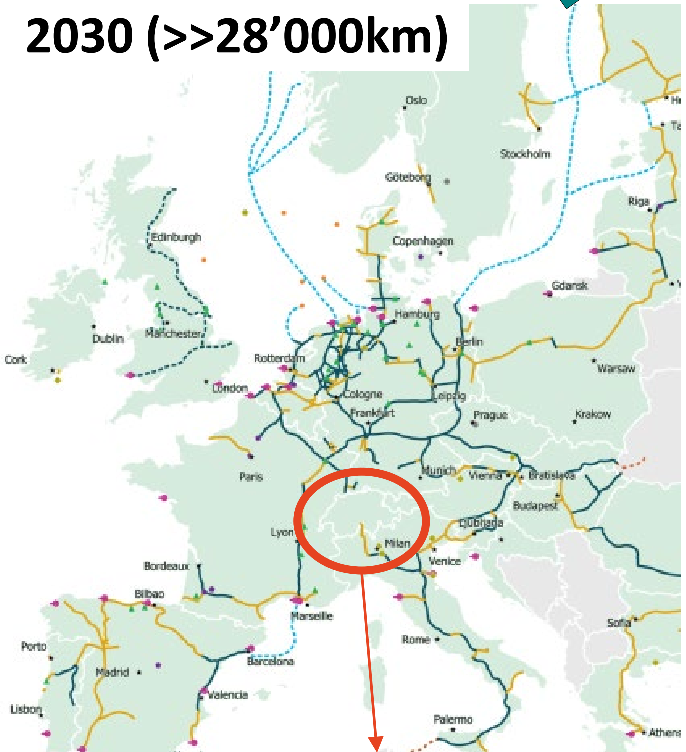


SVGW

EHB with or without CH?

- H_2 –geführt (>98%)
- 60% **umgewidmete** / 40% **neue** Leitungen

2030 (>>28’000km)



Oltingue & Griespass

ab 2030:

Oltingue &

Griespass

ab 2040:

Transitgasleitung

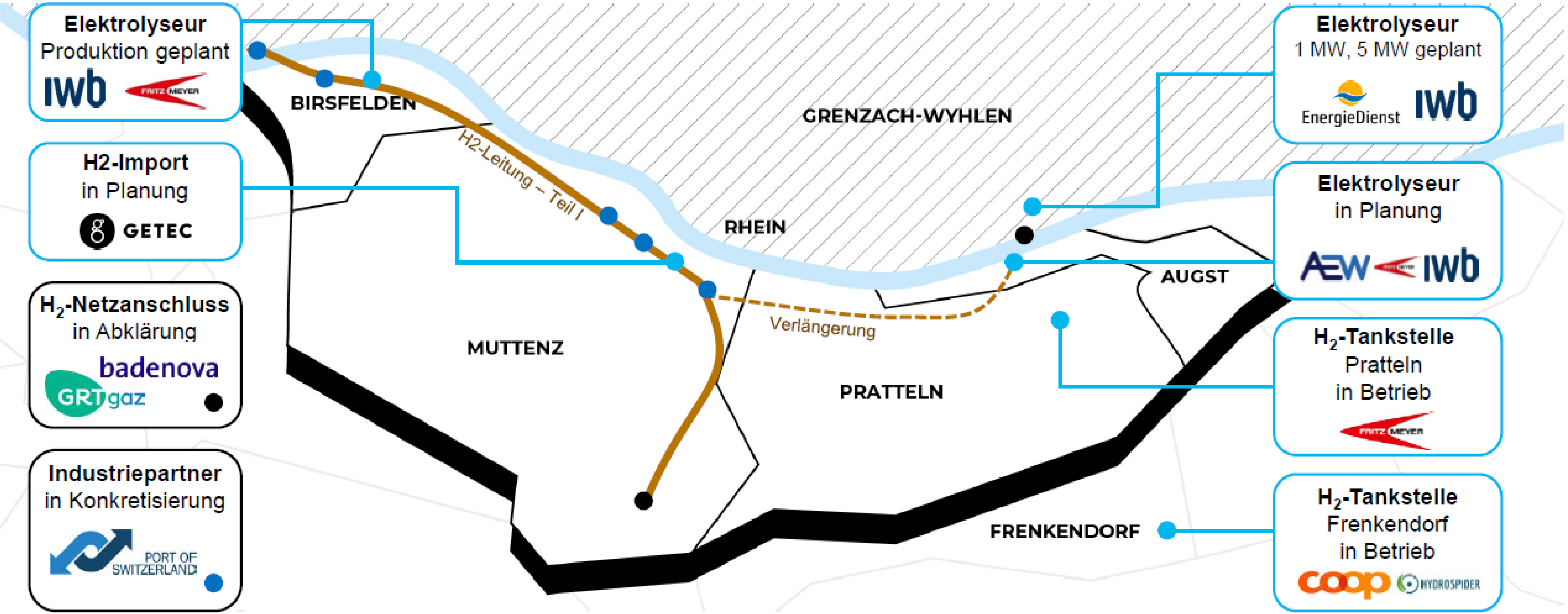
St. Margrethen

Quelle: https://ehb.eu/

Local emerging H2 Projects

2. Das Ökosystem – Überblick

In der Phase II wird das H2-Ökosystem konkret

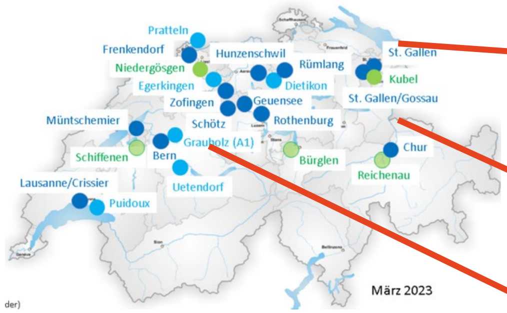


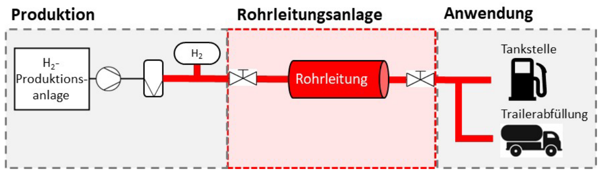
Dr. Dirk Mulzer I H2-Hub Schweiz I 05.10.2023 4

H2 Ramp- up and technical challenges

Lokale H_2-Infrastruktur:

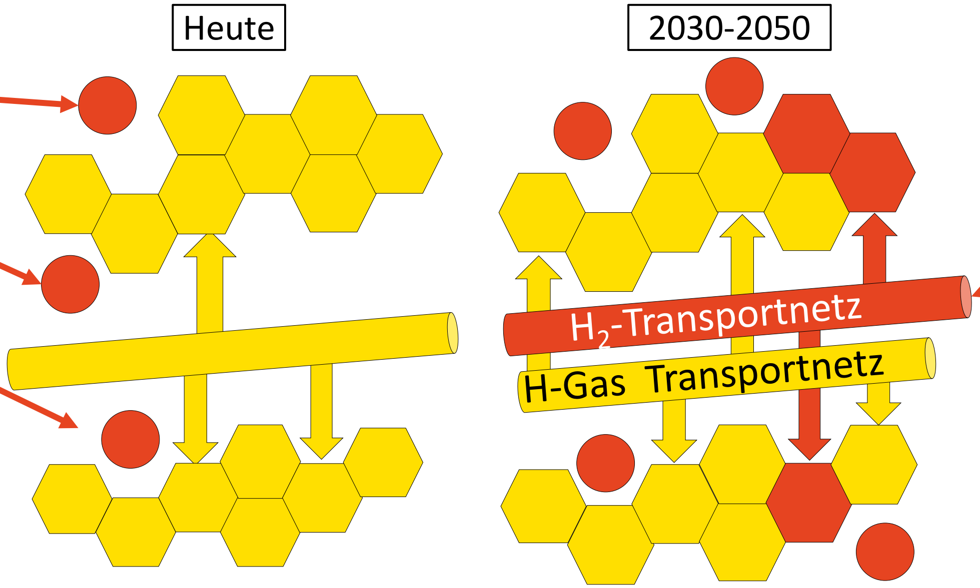
H_2 Tankstellen & Produktion





Bei Planung der H_2-Anlage allfällige Erweiterungsmöglichkeiten in Betracht ziehen

Beimischung von H_2 in H-Gasnetze nur für lokale Anwendungen oder im Rahmen der Transition empfohlen



Gasbeschaffenheit nach SVGW G18:

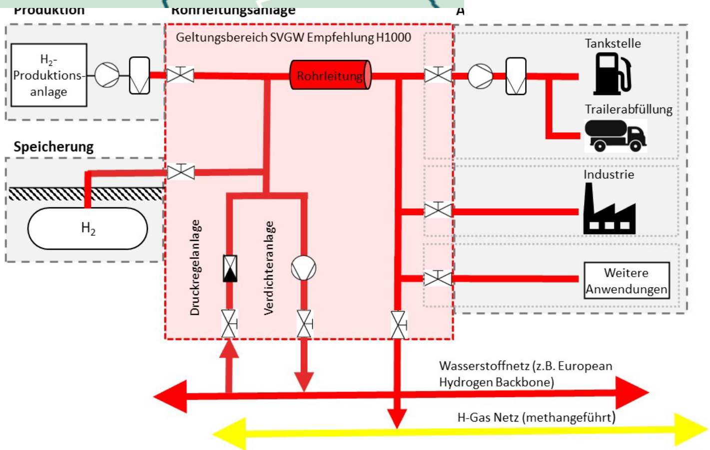
H-Gas	Erdgas, Biomethan, synthetisches Methan (max. +20% H_2)
H_2	Wasserstoff (Gruppe A oder D)

⬡ Verteilnetz

○ Wasserstoffanlage

Europäische H_2-Infrastruktur:

European Hydrogen Backbone (EHB)

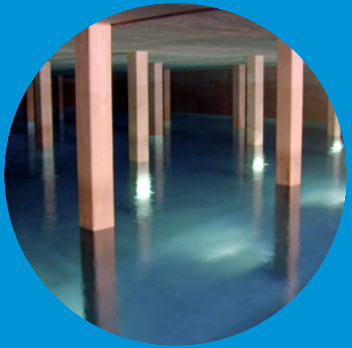


Einbettung der Rohrleitungsanlage in eine nationale und europäische H2-Infrastruktur

SVGW - who we are

«Working together for a secure and sustainable supply»

SVGW core topics



water

gas

district heating

SVGW products and services

Issue monitoring & basics

- Development of basic principles
- Research / Innovation
- Identification of hot topics (topic pipeline)
- Relevance assessment
- Determination of need for action
- Surveys
- Statistics

Framework conditions

- Statements
- Position papers
- Representation of interests
- Shaping standards

Standards & industry solution

- Rules and regulations
- Best Practice
- Industry solutions (occupational safety, insurance pool)

Training & further education

- Training courses
- Specialist conferences
- Courses
- Courses
- ERFA
- Workshops

Information & counselling

- Specialist article
- Circulars
- Print products (A+G, Wasserspiegel)
- Web
- Arguments
- Information
- Consultancy (technical, economic, legal)
- Access to experts & industry network

Quality assurance & conformity

- Inspections
- Audits
- Certifications (products, persons)
- Gas analysis
- Market surveillance of products

PR support

- Marketing tools
- Advertising platform for I+IG
- Image building TW

Office with 4 locations

SVGW - a technical association since 1873

1873 – Foundation

1883 – Water supplier

1911 – Technical Inspectorate of the Gas Industry

Trigger: Accident in Geneva in 1909

1979 – Name change

From the gas and water "Fachmänner" to the gas and water specialists

1983 – SSIGE Lausanne

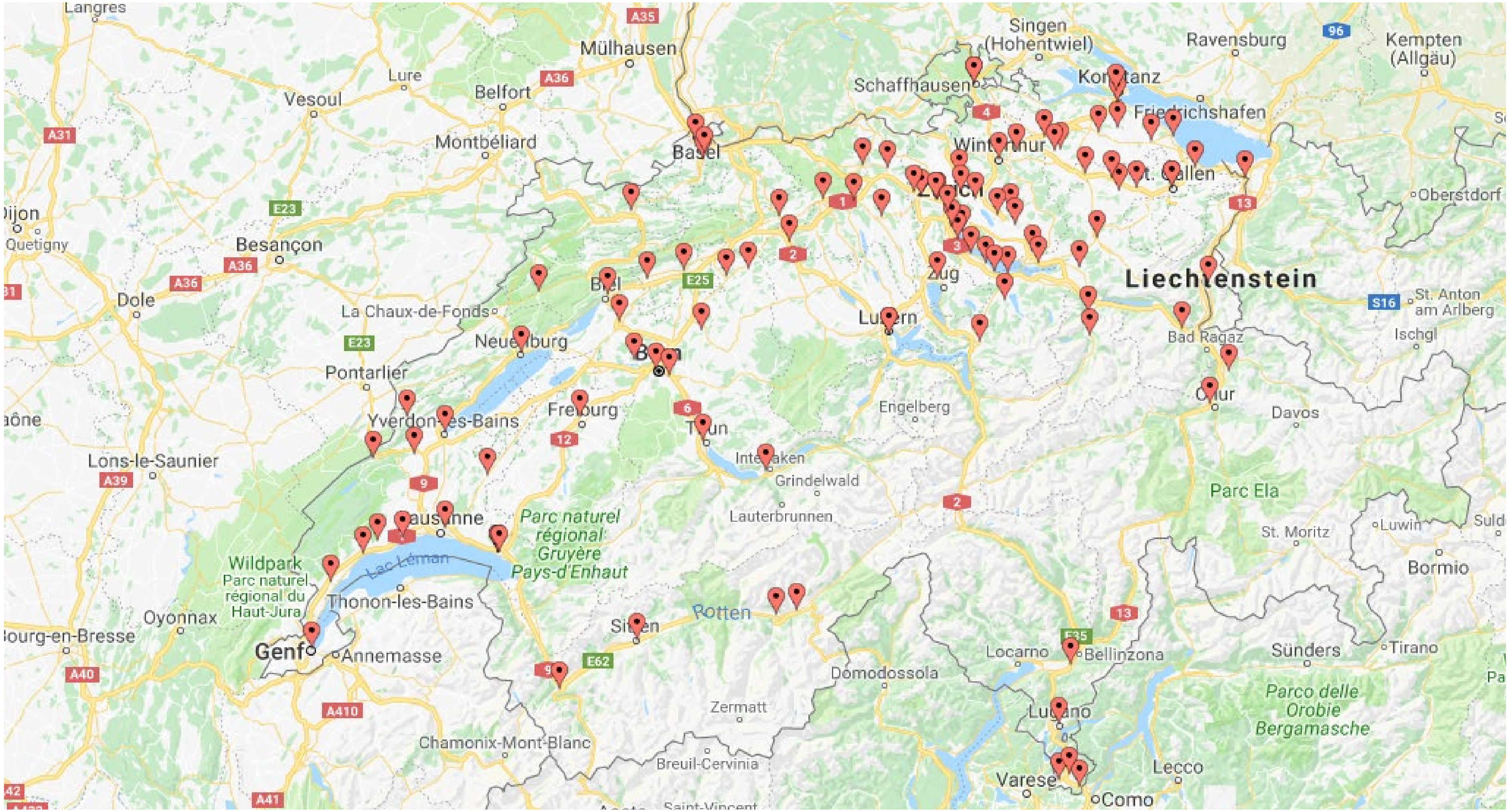
2012 – SSIGA Bellinzona

Intensified representation in the ital. Switzerland

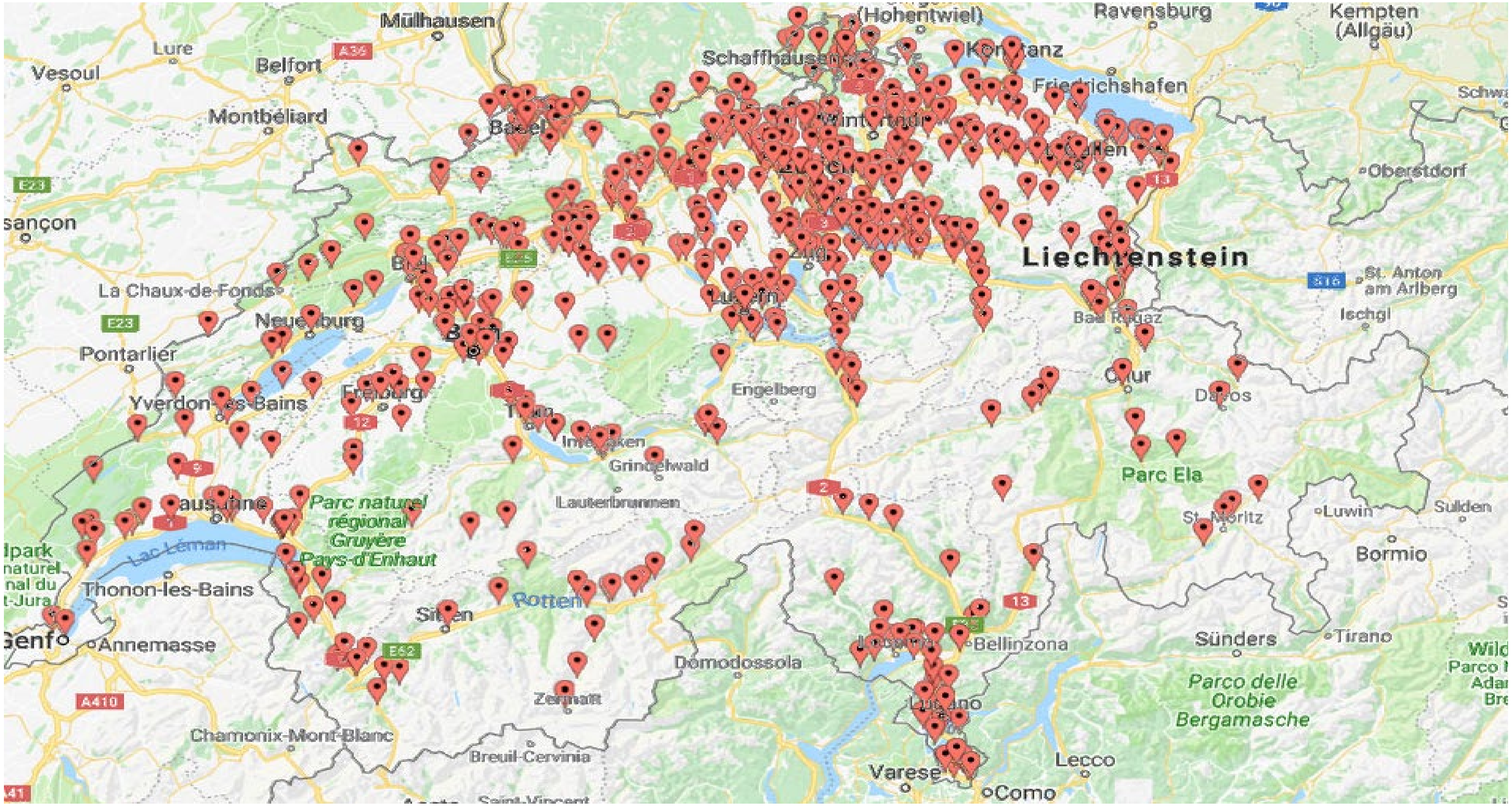
2015 – District heating

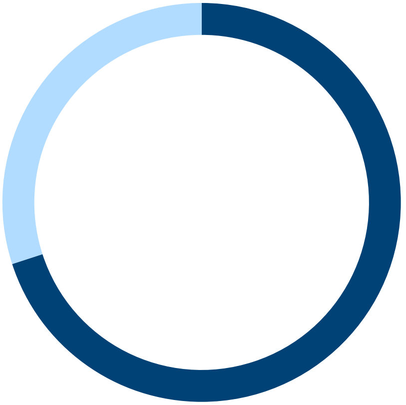
Development of technical expertise and services in the heating sector

120 gas suppliers are members of the SVGW



660 water suppliers are members of the SVGW





THANKS!

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SVGW

SVGW customer segments

Public sector

"Enforcing laws"

Examples

SUVA
SERI
Seco
Federal Offices
cantonal. Offices
Municipalities
Building insurance companies

Frame designer

"Defining laws and regulations"

Service provider

"Manufacture, install, check"

Examples

Planners, Ing.
Plumbers Chimney sweeps
Building contractors
Manufacturer/dealer

Suppliers

"Securing the energy and water supply"

Examples

Energy supplier
Water supplier
Network operators
Professionals (in factories)
Technical experts
Petrol station operators
Sibe

Influencer

"Shaping future supply"

Examples

Infrastructure owners
Municipalities
Energy consultants

Intermediary

"Imparting knowledge and information"

Examples

Training centres
Professional organisations
VSA
Sponsors

VI. Presentations of the Standing Committees

VI. 1 Standing Committee Gas Infrastructure (SCGI)

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Technical Association of the European Gas Industry

SCGI report to the Executive Board

13/12/2023

Anne-Sophie DECAUX, SCGI Chairwoman

SCGI update

- Last meetings 25th September (Teams) and 23rd November 2023 (Brussels+Teams with 24 participants from 12 countries)
  - Presentation by GRTgaz of the report of French regulator on future of gas infrastructure
  - Documents for approval by EB for external publication:
    - "Odorization-of-natural-gas-hydrogen-mixtures-and-pure-hydrogen"
    - "Natural-gas-odorization-practices-in-Europe"
  - Successful Tech Forum "Cost Estimation of Hydrogen Admission into Existing Natural Gas Infrastructure and End Use" on 23rd November with 200 participants and lot of exchanges
  - TF H2 closed after accomplishment of mission and Tech Forum

- Next meeting 13th February 2024 (Teams)

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Update on WGs

- WG Transmission Pipelines
  - Invitation will be sent for a meeting of C02 experts (to be forwarded in each company to relevant CO2 expert): brainstorm for work topics
  - Invitation to share work at national level on H2 safety

- WG Odorization
  - “Natural-gas-odorization-practices-in-Europe” approved in Sept
  - “Odorization-of-natural-gas-hydrogen-mixtures-and-pure-hydrogen” approved in Nov
  - Call for new chair (November 2024)

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Update on WGs

- WG Gas Metering
  - Report on measurement of non-conventional gases expected for next meeting
- WG LNG
  - Document on requirements for competence of drivers expected for next meeting
  - Questionnaire via MARCOSTAT to identify projects on new molecules (C02, ammonia, methanol, hydrogen)

Work programme: published in 2023

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	Document title	Expected delivery time	Standing Committee Gas Infrastructure (SCGI)	WG Odorisation (WG ODO)	WG LNG (WG LNG)	WG Distribution (WG DIS)	WG Transmission Pipelines (WG TP)	WG Gas Metering (WG GM)	WG Gas Storage (WG STO)	TF Hydrogen (TF H2)
General	Information on standardization works and their impact	ongoing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hydrogen	[Update] "Natural Gas odorisation practices in Europe" with pure hydrogen	Approved		Yes						
	Odorisation of natural gas and hydrogen mixtures including hydrogen	Approved		Yes						
	Cost Estimation of Hydrogen Admission into Existing Natural Gas Infrastructure and End Use	Published								Yes
Safety	Gas transmission pipeline safety	Published					Yes			
	Benchmark on SEVESO III Directive	Published							Yes	

Work programme: planned in 2024

	Document title	Expected delivery time	Standing Committee Gas Infrastructure (SCGI)	WG Odorisation (WG ODO)	WG LNG (WG LNG)	WG Distribution (WG DIS)	WG Transmission Pipelines (WG TP)	WG Gas Metering (WG GM)	WG Gas Storage (WG STO)	TF Hydrogen (TF H2)
General	Information on standardization works and their impact	ongoing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Methane emissions	Best practices on methane emissions to answer new regulation (BAT in WG methane emissons+)	WG ME+				Yes	Yes		Yes	
Hydrogen	Policy on leakages in hydrogen infrastructure (new or converted)	WG ME+	Yes			Yes	Yes		Yes	
	[Update] "Natural Gas odorisation practices in Europe" with pure hydrogen	Approved		Yes						
	Odorisation of natural gas and hydrogen mixtures including hydrogen	Approved		Yes						
	Experiences in different countries with the measurement of non-conventional gases	2024						Yes		
	List all the initiatives and research projects on impact of metering non-convential gases (national, EU, intl.)	no deliverable						Yes		
CO2	CO2 transport	2024+	Yes				Yes			
	CO2 measurement (gaseous? liquid?)	2024+	Yes					Yes		
	Experiences in different countries with the measurement of non-conventional gases	2024						Yes		
	List all the initiatives and research projects on impact of metering non-convential gases (national, EU, intl.)	no deliverable						Yes		
Environment	Monitor Large Combustion Plants (LCP) Best Available Techniques (BAT) related to last Reference Document revision (BREF) and last BAT	no deliverable					Yes		Yes	
	Monitoring the decreasing level of turbine emissions for existing turbines (WG methane emissions+?)	WG ME+					Yes			
Safety	LNG contractors / operators / drivers qualification	2024			Yes					
	Report on safety of distribution grid	2024				Yes				

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Technical Association of the European Gas Industry

Thank you!

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ODORISATION OF NATURAL GAS/HYDROGEN MIXTURES AND PURE HYDROGEN

December 2023

Contact

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ABOUT MARCOGAZ

Founded in 1968, MARCOGAZ represents 29 member organisations from 20 countries. Its mission encompasses monitoring and policy advisory activities related to the 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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Contents

1. Introduction

This document was prepared by the MARCOGAZ to present what is the available information on odorisation of hydrogen and natural gas (H_2-NG) mixtures and pure hydrogen. The aim is to help defining what are the most important data to be considered when a gas containing hydrogen must be odorised.

The document is divided into a first part dealing with the theoretical interactions between hydrogen and odorants, and following parts on available data on the topic. In the conclusions, some considerations are presented.

2. Theoretical interactions between hydrogen and odorants

Hydrogen was one of the major components of the town gas (cracking treatment produced around 10-20% of hydrogen, while reforming produced up to 60%). In this case however, odorisation wasn't required because of the self-odour of the town gas.

The addition of hydrogen modifies the natural gas composition and – consequently – the physical properties, so a question could be raised if odorisation is affected by these changes. Also pure hydrogen should be odorised for domestic and other uses.

The effects of hydrogen on odorisation can be investigated through different potential impacts:

- Possibility of chemical reactions between hydrogen and odorants,
- Physical effects in the grid,
- Possibility of odorant masking by hydrogen

2.1. Possible chemical reactions between hydrogen and odorants

The information listed below was obtained from the gas odorant suppliers. More information is given in Annex A.

Sulfur odorants are, from the chemical point of view, reduced compounds, so a reaction with hydrogen is not expected. Usually, problems with odorants are produced by oxidation (more with mercaptans than sulphides), mainly in the presence of iron oxides. The common reaction of hydrogen with organic compounds is hydrogenation, which typically is the addition of pairs of hydrogen atoms to an unsaturated bond. Sulfur-based odorants (like THT, mercaptans) are all saturated and, therefore no reaction with elemental hydrogen seems to be likely at the conditions typically found in the gas distribution systems.

Sulfur-free odorants (such as acrylates) exhibit a C=C double bond which makes them prone to addition reactions. Addition of hydrogen however requires a metal catalyst with an active surface. Nevertheless, it is known that in steel pipelines corrosions products and solid deposits may contain some pyrophoric iron, which exhibits an extremely reactive surface due to its fine granularity. These deposits may be able to catalyze an electrophilic addition of hydrogen to the C=C double bond. This may lead to depletion of the odorant as a consequence of a reaction. Although it considered unlikely, it is theoretically possible.

2.2. Physical effect of hydrogen addition in natural gas

2.2.1. Density and vapour pressure

Care must be taken in the choice of the odorant if the amount of hydrogen in the H_2-NG mixture affects significantly the density and vapour pressure of the gas. If the gas density is reduced, the odorant, which is liquid, should be chosen according to the properties of the H_2-NG mixture. Odorants with lower density and higher vapour pressure could better fit for higher amounts of hydrogen in the H_2-NG mixture. Caution should also be taken when the odorant itself is a blend, due to the possible differences in the physical properties of the components of the blend.

2.2.2. Lower Explosion Limits (LEL) of H_2–NG mixtures

Gas odorisation is, in most countries, a legal or regulatory requirement that specifies that natural gas in air has to be readily detectable by odor at a concentration of 20-25 % of the LEL (Lower Explosion Limits).

Hydrogen and natural gas have almost similar LEL values, so the LEL of the mixture doesn't change significantly when hydrogen is injected.

Simulations[1] were done to calculate the LEL of mixtures of two natural gases (Russian-type and Algerian-type) at increasing concentrations of hydrogen. The results are given in Figure 1.

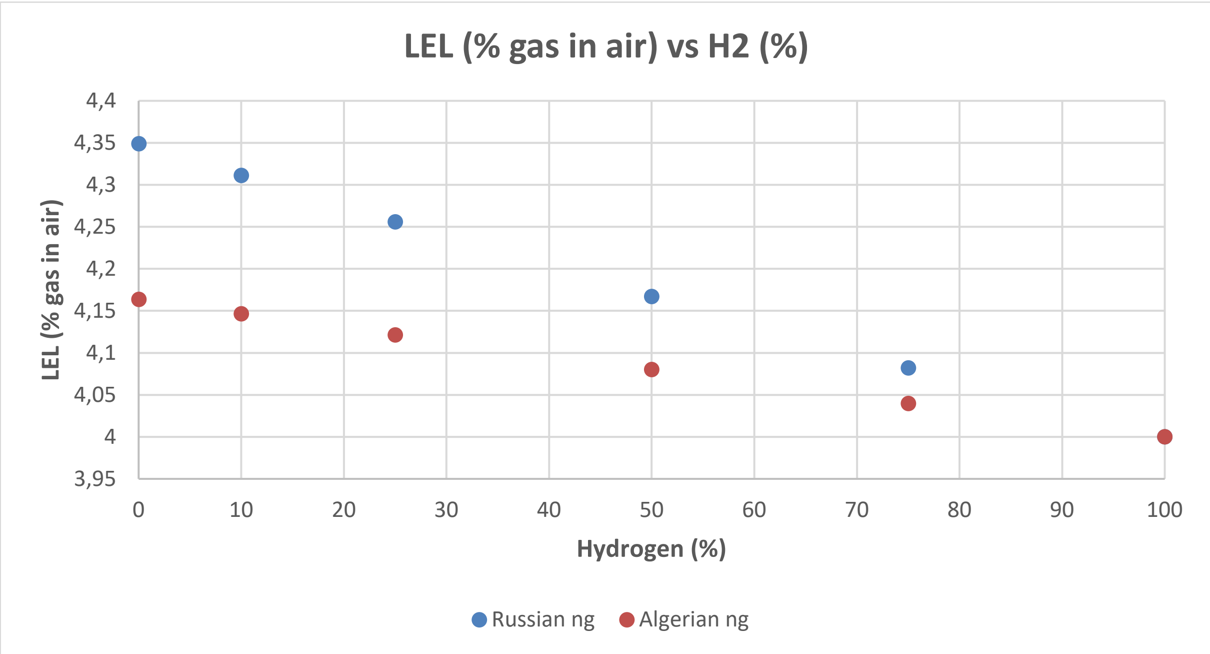

Figure 1: Lower Explosion Limits with different hydrogen concentrations for both Russian and Algerian natural gas. Data calculated in reference to atmospheric conditions: pressure of 101,3 kPa and temperature of 20°C.

[1] Using the method in Schroeder V. "Calculation of flammability and lower flammability limits of gas mixtures for classification purposes" (BAM Berlin, 09-09-2016) and using the values of Li and Kk from EN ISO 10156:2010,

2.3. Odorant masking by hydrogen in H_2–NG mixtures

No evidence of masking effects are available up to now.

2.4. Measurement of odorant in H_2–NG mixtures

Although no problems were reported with gas chromatographs, odorant measurement with chemical sensors could be influenced by hydrogen.

3. Preliminary works

The Final Report of CEN/CENELEC Sector Forum Energy Management / Working Group Hydrogen (2016) deals, in a dedicated chapter, about odorisation of hydrogen injected into natural gas. The final report recommends "*the standardization in order to harmonize the performance indicators for odorants used for H_2-NG*". Two standards are to be considered: ISO TR 16922:2013, which specifies the principles for the odorisation technique and the control of odorisation of natural gas, and ISO 13734:2013, which specifies general requirements for odorants and the physical and chemical properties of commonly used odorants[2]. Odorisation is recalled in other chapters of the same document. It is written: "*Also performance tests on the propagation of smell depending on hydrogen concentrations for new odorants are recommended in the near term and should be addressed before 10 vol% is injected into the natural gas grid.*" It is also mentioned that "*Performance tests to determine the suitability of odorants for different H_2-NG mixtures are recommended in the near term*". Another proposal is to "*investigate the propagation of smell for new odorants in presence of hydrogen*".

GERG identified in its Hydrogen Research Roadmap gaps in the use of hydrogen in the gas grid. Table 1 gives an overview of the gaps related to odorisation:

#	Research topic	Description	Priority
1	**Assess existing odorants compatibility with various H_2 %.**	Evaluate current odorants used in European gas networks (THT, TBM, DMS…), as well as sulfur-free odorants (Gasodor S-Free, 2-Hexyne…) to determine best odorant for H_2 and H_2-NG blends, constrained by factors such as possible chemical reactions, end-use limitations (fuel cells), impact of trace components, public perception, etc. Comparison properties among odorants may include olfactory power, low boiling point,, low toxicity, etc. Also, hydrogen properties must be taken into account for odorant selection, especially flammability and detonation limits, auto-ignition temperature, diffusion in air, etc.	**H**
2	**Study odorants for 100% H_2 and removal techniques for end-use**	Some large users need high purity H_2, (sulfur-free), the choice of a new odorant will need to be done also according to a removal method. It is important to anticipate the	**H**

[2] The ISO TC 193 / WG 5 "Odorization" is in charge to review the current ISO standards.

#	Research topic	Description	Priority
	applications requiring pure H_2.	odorant selection considering first particular end-uses such as fuel-cells, in which sulfur poisons catalysts (filter-some fuel cells are not sensible to sulfur but probably more expensive). Hence, certain removal techniques as well as H_2 identification methods shall be recommended for this type of applications.	
3	**Study if the possible stratification phenome-non in H_2-NG may cause an impact on odorisa-tion.**	Evaluate if during the eventual occurrence of fluids strat-ification in H_2-NG admixtures, the impact on odorisation would be significant for leak detection. In summer no consumption (static stratification), but both static and dynamic approaches shall be considered.	**M**
4	**Assess diffusion rate of hydrogen in a leak, ver-sus odorant.**	Evaluate if leak rates for CH_4, H_2-NG & H_2 differ signifi-cantly in comparison to the odorant, considering the dif-fusion rate. It may be useful to distinguish between un-derground and above-ground leaks, and also to verify possible reactions between the odorant and the soil, de-pending on the type of odorant.	**M**
5	**Develop new odorants for H_2-NG/H_2**	Due to the expected growth of hydrogen presence in the European gas networks, for safety reasons, it may be nec-essary to develop an odorant that complies with some critical conditions including smell, water insolubility, chemical & physical characteristics, end-use applications, impact on steel & other materials properties and public perception. This, only if concluded that odorants cur-rently in use are not compatible or not sufficiently relia-ble for H_2 leakage detection.	**M**
6	**Assess the occurrence of odour fading, due to trace components.**	Odour fading may occur for several reasons such as gas quality problems causing masking phenomena and it is important to evaluate if certain trace components may cause these problems, mainly depending on the H_2 source of production. Hydrogen produced by electrolysis may have negligible trace components compared to gas-ification processes.	**M**

Table 1: Odorisation related gaps for the use of hydrogen in the GERG Hydrogen Research Roadmap.

4. Experimental tests

4.1. GTS and NN - The Netherlands

During 2019-2020, a research was organized by Gasunie Transport Services (GTS) and Netbeheer Nederland (NN) in order to investigate if increasing hydrogen concentrations can affect the effectiveness of odorisation. DNV GL and SGS Nederland prepared 12 different mixtures of Groningen natural gas (L-gas) at four different concentrations of Hydrogen (0%, 15%, 85% and 100%) and three different odorants: THT (18 mg/m^3), Spotleak 1001® (TBM+DMS 80:20) (6 mg/m^3) and Gasodor ® S-Free (10 mg/m^3).

The different samples were anonymously assessed by a panel of smellers of the Odor Laboratory Bureau Blauw B.V using NEN-EN 13725 "Determination of odor concentration by dynamic olfactometry". It was concluded that mixtures of natural gas and hydrogen and pure hydrogen can be sufficiently odorised with the tested odorants.

No significant effects caused by hydrogen addition were found.

4.2. HY4HEAT - UK

In October 2019, Hy4Heat published a report on "Hydrogen Odorant" (Project Closure Report - Hydrogen Odorant and Leak Detection - Part 1 - Hydrogen Odorant", from SGN), the aim of which was to identify a suitable odorant for use in a 100% hydrogen gas grid for domestic use such as boilers and cookers.

The research involved a selection of five odorants to be tested about the effects of the mixtures on pipeline (metal and plastic), appliances (a hydrogen boiler provided by Worcester Bosch) and PEM fuel cells. For the olfactory test, each odorant was evaluated by 6 panelists. The odorants considered are given in Table 2Table 2:

	Odorant name (including alternative names)	Compound	Rationale
1	Odorant NB, NB	78% 2-methyl-propanethiol, 22% dimethyl Sulphide	Primary odorant used by Scotia Gas Network and other UK gas networks
2	Standby Odorant 2, NB Dilute	34% Odorant NB, 64% Hexane	Diluted form of Odorant NB used by SGN if supply of Odorant NB is compromised
3	Odorant THT, THT	100% tetrahydrothiophene	Most commonly used odorant within European gas networks
4	GASODOR-S-FREE, Acrylates	37.4% ethyl acrylate, 60.1% methyl acrylate, 2.5% 2-ethyl-3methylpyrazine	Sulphur-free gas odorant in use within some German gas networks
5	5-ethylidene-2-norbornene, Norbornene	5-ethylidene-2-norbornene	Odorant with an unpleasant odour that is suitable for fuel cell applications

Table 2: Details of the five odorants considered in the HY4HEAT project.

The results of the study (green: suitable, red: not suitable, orange: to be more investigated) are given in Table 3:

	Odorant NB	Standby odorant 2	Odorant THT	GASODOR-SFREE	5-ethylidene-2-norbornene
Health/environment	green	green	green	green	green
Olfactory	green	green	green	green	orange
Pipeline	green	green	green	green	green
Flame boiler	green	green	green	green	green
Fuel cell	red	orange	red	orange	orange
Economic (*)	green	orange	orange	orange	orange

Table 3: Results of five odorant experiment in the HY4HEAT project.

(*) Please note that the economic evaluation is referred to UK conditions and cannot be considered applicable as it is to all Europe.

All the odorants were judged suitable for use in a 100% hydrogen gas grid for combustion applications, but further research would be required if the intention fo the grid is to supply hydrogen to stationery fuel cells or fuel cell vehicles.

The olfactory testing suitability was based on odour concentration (how easily the odorant could be detected), the intensity (on the Sales scale) and character (whether it would be distinguishable from other possible odours such as food). All odorants met the testing criteria for odour concentration and intensity. All odorants except 5-ethylidene-2-norbornene met the requirements for character testing, as they were perceived as unpleasant and gave smells that could be characterised as sulphur or oil. The 5-ethylidene-2-norbornene was perceived as fruity (as well as sulphur and oil), which indicated that some customers would not immediately recognise a gas leak if this odorant was used in the gas grid.

4.3. PRCI state of the art on hydrogen

In this study by the Pipeline Research Council International (PRCI), done with the overall goal to develop a concrete path forward to define the necessary projects that need to be completed for companies to safely and reliably inject hydrogen into their pipelines at certain blend levels, there is the following table (Table 4) regarding odorisation:

Topic	**Key results, knowledge is available**	**Gaps, ongoing research or needs further investigation**
Odorants	• At this time, there is no known odorant suitable for hydrogen that is light enough to "travel with" hydrogen at an equal dispersion rate. • Existing projects for hydrogen blending in natural gas, up to 20%, generally	• Evaluation of typical odorants for natural gas and their effectiveness under situations of hydrogen blending at various blend percentages, for practical situations such as pipeline leaks and leaks in buildings where hydrogen may separate from the natural gas and odorant.

Topic	Key results, knowledge is available	Gaps, ongoing research or needs further investigation
	use the standard odorisation for natural gas. • A recent study of common odorants THT, Spot-leak® 1001, and Gasodor® S-Free concluded that all odorants were detectable in a range of hydrogen blending in natural gas (from 0% to 100%), however the experimental set up did not allow for consideration of hydrogen separation from the natural gas. • (NOTE: the last sentence is referred to the work described in chapter 4.2 of the present document).	• Particularly for situations of pipeline leaks, the stratification of hydrogen from natural gas, and therefore from the odorant, needs to be better understood to advise safety protocols during leaks and repairs. It would be useful to be able to evaluate a timescale for gas separation/concentration gradient at ambient pressure (i.e., does it take hours/days for hydrogen to separate from the natural gas and odorant?). • Assessment of alternative options for identifying leaks and specifically hydrogen gas when blending hydrogen at higher percentages. • Conflicting data exists regarding the effectiveness of common natural gas odorants for detecting pure hydrogen; further investigation is required to assess if hydrogen separated from natural gas following leakage could be effectively identified.

Table 4: PRCI state of the art on hydrogen regarding odorisation

4.4. HYDROGEN 100 project – UK.

The Hydrogen 100 project SGN (Scotia Gas Networks Limited) aims to deliver 100% hydrogen to 300 homes in the UK via a purpose-built distribution network.

A second study, described in the paper "A comparative study of odorants for gas escape detection of natural gas and hydrogen" (Julien Mouli-Castillo, Georgina Orr, James Thomas, Nikhil Hardy, Mark Crowther, R. Stuart Haszeldine, Mark Wheeldon, Angus McIntosh), available online from 20 February 2021, refers of the tests performed at the KIWA laboratories, to study the physical and olfactory properties of high purity hydrogen and odorant mixtures. Three of the four odorants of the first study were tested during 2021:

- New Blend (NB) (78% tert-Butylthiol, 22% Dimethyl Sulfide).
- Standby Odorant 2 (34% Odorant NB, 64% Hexane).
- THT.

The concentrations of the odorants were 500 ppm, 1000 ppm and 10.000 ppm, both in hydrogen and natural gas; the gas was considered detectable when 50% or more of the trial participants detected a smell on a given sample line.
Firstly, the work provides evidence that odorants currently used within natural gas have similar effectiveness in allowing escape detections as when used with hydrogen. Secondly, the study shows that small escapes of hydrogen are detectable in a comparable way to a natural gas escape in an equivalent room volume. Both studies conclude that odorant in hydrogen will induce an equivalent olfactory response to odorant in natural gas. These conclusions can be considered robust as they were demonstrated by two different methodologies using very different approaches.

In particular, the results indicated that stratification of the gases within an enclosure 3 m high does not negatively affect the detection potential of a gas escape. Both hydrogen and methane escapes can be detected at equivalent Gas in Air (GIA) concentrations and both at the required value of 1% GIA.
The study found that odorants appeared to remain with the hydrogen gas as it moves through an enclosed space. In literature it is reported that the molecular weight and dispersion properties of hydrogen, relative to odorant compounds, were likely to lead to the odorant not remaining within the gas stream in a stagnant environment; however, they also suggested that in a domestic dwelling, ventilation could be sufficient to drive dispersion and to keep the odorant mixed with the gas stream. The finding of the study (mimicking a real new dwelling environment with natural ventilation) supports this for hydrogen, natural gas and methane.

4.5. INiG—PIB (Poland)

The INiG—PIB's project studies the stability of the THT concentration in gaseous mixtures with the addition of hydrogen, taking into account the conditions of the Polish gas network. The results of the research (presented in the paper "Studies of the Impact of Hydrogen on the Stability of Gaseous Mixtures of THT", Authors: Anna Huszal and Jacek Jaworski - Energies 2020, 13, 6441) are a basis for forecasting the impact of hydrogen on the quality of odorisation of gas using THT.

The mixtures of methane and hydrogen, as well as methane-rich natural gas and hydrogen, used as reference gases for tests were made up of the following compositions:

- methane with the addition of hydrogen with an amount of 8% (V/V),
- methane with the addition of hydrogen with an amount of 10% (V/V),
- methane with the addition of hydrogen with an amount of 15% (V/V),
- methane-rich natural gas of group 2E with a hydrogen content of 2% (V/V),
- methane-rich natural gas of group 2E with a hydrogen content of 15% (V/V).

The tests were limited to just THT, as this was the one used most frequently in European practice and the only one used in Poland; the THT concentration should correspond to its average values in the distribution network, i.e., fall within a range of 15.0–30.0 mg/m3 (approx. 4.0–8.0 ppm).

Compositions of tested gaseous mixtures:

1) M/H8: THT 92% Methane + 8% H_2 (V/V) + 5.07 ppm THT
2) M/H10: THT 90% Methane + 10% H_2 (V/V) + 7.44 ppm THT
3) M/H15: THT 85% Methane + 15% H_2 (V/V) + 6.70 ppm THT
4) 2E/H2: THT 98% Natural gas of group 2E + 2% H_2 (V/V) + 5.23 ppm THT
5) 2E/H15: THT 85% Natural gas of group 2E + 15% H_2 V/V) + 7.41 ppm THT

The mixtures, prepared by means of static volumetric techniques, were contained in 10 L aluminum pressure bottles. The tests involved reference mixtures of N_2 + THT, considered as a point of reference for the stability of mixtures of THT with gases containing the addition of hydrogen. The studied time interval was 126 days.

The results of the tests confirm that a hydrogen content up to 15% in gas will not interact with THT; these results determine the probable lack of a need to change the odorant for mixtures of natural gas with hydrogen.

Such promising results of preliminary tests point to a need to test the long-term stability of THT mixtures, taking into account changes in the parameters when performing the experiment (pressure and temperature). Based on previous experience, it can be concluded that it is highly likely that THT mixtures with the studied compositions will remain stable even for several years, since most of the reactive components begin to exhibit losses immediately after the preparation of the mixture.

4.6. HyDelta WP2 on odorisation

Work Package 2 of HyDelta was meant to fill some of the knowledge gaps in order to pave the way for the introduction of a hydrogen odorant. Two candidate odorants already have been chosen:

- Tetrahydrothiophene (THT): sulphur containing odorant, used in Dutch natural gas.
- Gasodor© S-Free: sulphur free alternative. Have been used in the past in natural gas.

The research identified new goals and timing are given in Table 5:

Project	Goal	Deadline
D2.1	Choice for a sulphur free odorant	11-10-2021
D2.2	Influence of sulphur containing odorant on end use appliances	25-01-2022
D2.3	Stability of odorants in hydrogen	29-04-2022
D2.4	Report on the risks of not odorising hydrogen (to be published alongside the end of project summary)	tbd
D2.5	Report with advice over odorising hydrogen including a possible choice for a defined type of odorant and its dosing	tbd

Table 5: Overview of research projects in WP2 of HyDelta.

The study has shown that no insurmountable problems are to be expected for combustion equipment such as central heating and hot water boilers, kitchen appliances, ornamental fireplaces, outdoor heaters and patio heaters and gas engines when using hydrogen that has been odorised with sulfur-containing odorant, such as THT.

While these applications are relatively robust for low concentrations of sulfur (<14,5 mg $S/m^3(n)$) in hydrogen, fuel cells are very sensitive to these impurities. The presence of sulfur in hydrogen leads to irreversible damage to the fuel cell[3]. This is an accumulating process, which already occurs at sulfur concentrations of 1 ppm (1,4 mg $S/m^3(n)$).

The development of hydrogen-driven gas turbines is still in full swing, little is therefore currently known about the hydrogen specification ultimately required for gas turbines. In principle, gas turbines fall under ISO 14687 gradation B, with a specified sulfur concentration of 10 molppm corresponding to approximately 14 mg $S/m^3(n)$. This concentration corresponds to the maximum specification that currently applies to natural gas distributed in the Netherlands. It has been known from the past that natural gas-fired turbines are suitable for this sulfur load. It is up to the suppliers to make the gas turbines still to be developed suitable for this sulfur load.

For feedstock applications, where the hydrogen is used directly in the production process, impurities such as sulfur are highly relevant. These processes are so specific that no statements can be made in general terms about the maximum permissible sulfur content in the hydrogen, but it is expected, however, that additional cleaning will have to be applied, as is now also the case for odorised natural gas. It should be noted that almost all feedstock processes are connected to the unodorised high-pressure transport system (HTL). It is expected that, in accordance with the current HTL network in The Netherlands, the hydrogen backbone will also not be odorised and the sulfur impact will not be increased. The impact of sulphur-containing hydrogen will therefore not be an issue for such applications.

4.6.1. Report D2.3 on Stability of odorants in hydrogen (June 2022):

The Report D2.3 refers to three different activities:

- The candidate odorants, at different concentrations of hydrogen, were tested for chemical stability in an atmosphere of 100 bar hydrogen over a three-month test period by gas chromatographic analysis. The influence of materials such as the cylinder wall and the pipeline material has not been investigated and falls outside the scope.
- A literature study on how an odorant-hydrogen mixture spreads in the air.
- The diffusion of a mixture of odorant and hydrogen in the soil, by a simulated gas leak, measuring the gas composition when the gas escapes from the soil with a gas chromatograph.

The stability tests show that the three odorants THT, Gasodor® S-Free and 2-hexyn are all stable for three months in a 100 bar hydrogen mixture for three distinct levels of the odorant, allowing them to exert their effect for a longer period of time.
From literature experiments on a simulated gas leak consisting of natural gas, hydrogen or a mixture of hydrogen and natural gas, it appears that the gas mixtures behave like a cloud and that no spontaneous separation of gases from the cloud takes place. This behavior is also supported by theoretical considerations. The difference between distribution in air of natural gas and hydrogen is negligible.
In the case of an odorant/hydrogen gas leak, it also behaves as one gas cloud, and no separation of the odorant and hydrogen takes place. It is possible that the concentration in space is not the same everywhere due to stratification, but this effect also applies to natural gas. Regarding the distribution of gas in a room and the smell of a gas leak, odorisation of hydrogen is just as effective as odorisation of natural gas.

[3] For more information about fuel cells and Hydrogen, see the web site of the PACE project (see bibliography for link), which has the scope of deploying a competitive European fuel cell micro-cogeneration market.

With regard to the behaviour of an odorant in hydrogen in the soil, which is important for examining gas leak behaviour, it appears that THT in a clean sandy soil is detected later at the surface than THT in natural gas. It is recommended to repeat these measurements in more humus-rich soil, so that the practical conditions are more closely approximated.

4.7. Pre-normative tests performed in Italy

In Italy, the Ministerial Decree of 3 June 2022 allows the distribution of up to 2% of Hydrogen. In order to develop adequate standards for the new allowed gas composition, two distribution companies performed tests to see if the presence of Hydrogen will affect the odorisation, using the odorants in use in Italy, at the minimum concentration stated for natural gas (THT at 32 mg/m^3 and TBM (as major component of the mixture with IPM and NPM) at 9,3 mg/m^3).

Italgas Reti performed tests with methane and 20 % of hydrogen, in presence of DMS, a sulphur compound that is present in some of the natural gas that are extracted in Italy and can give interferences with THT. The results confirms that there is no need to change odorants or modify the minimum concentrations. The presence of DMS is due to perform the test at the same conditions in which they were performed for the emission of the national standard UNI 7133-2.

Hera performed test with natural gas with 30% of hydrogen added, with the two odorants in use; also, these results confirm that there is no need to change odorisation process.
The results will be included into the new revision of the national standard UNI 7133-2 “Gas odorisation for domestic and similar uses – Part 2: requirements, check and management”, under discussion.

5. Field tests

These data were collected by MARCOGAZ members, based on available information at the time of the report was made.

5.1. Hydrogen injection into natural gas at Maximum Operating Pressure (MOP) ≤ 16 bar

5.1.1. France

An experimental project (called GRHYD, coordinated by ENGIE from 2014 until 2020) is injecting progressively hydrogen, up to 20% in concentration, into natural gas in a local, new and dedicated odorised natural gas grid. The decision is to not odorise hydrogen, because the dilution factor used (even the maximum one) and the concentration of the THT of the mixed natural gas are still in adequacy with the technical requirement of the distribution operators. A µGC (micro-Gas Chromatograph) will measure on-line the concentration of THT before the injection of hydrogen.

5.1.2. Germany

Several injections of hydrogen (with a concentration up to 2%) into natural gas grids are operated, but, so far, no effect of the hydrogen onto the odorisation has been reported:

- Near Hamburg, hydrogen is injected into the grid of HanseGas which is odorised with the odorant mercaptan mixture based on TBM (Tert-butyl-Mercaptan). No report on odorisation problems raised, too.
- In Frankfurt, hydrogen is injected into the local grid, which is odorised with a mercaptan mixture based on TBM. In that grid, there were severe problems with the odorisation, but those could be identified not being caused by the hydrogen injection. The source of the problem was two biogas plants feeding their biomethane into the gas grid. The biomethane was conditioned with LPG to achieve the Wobbe-index of the natural gas, and the trouble came from interferences with the odorant in the LPG.
- There are some more injections of hydrogen in Germany, but at the moment there is no information about that.
- At Dortmund from 2022, distribution of pure hydrogen started in a local grid; the gas is odorised with THT with good results, but there was the necessity to increase the concentration of the odorant of about 20%, stated by olfactory tests, probably due to the higher speed of hydrogen, which needs a higher odorant concentration for flux saturation.

The German National Committee on odorisation gives the following indications:

- To odorise natural gas/hydrogen mixtures, the odorants specified in (EN) ISO 13734 will suffice.
- To odorise “pure” hydrogen grids, there will only be the need for odorisation if the hydrogen replaces the natural gas delivered to “ordinary” customers. So far, all existing or future pro-

jected hydrogen grids for the chemical or other industrial plants e.g. power stations, are foreseen without the need for odorisation. However, there may be grids reaching normal "tariff" customers in some years and given the option that also some fuel cells will be connected, odorants without sulphur may need to be developed and adapted.

- Hydrogen odorants may be demanded in the near future, probably raising the need for standardization.

5.1.3. Italy

Up to now in Italy there is no injection of hydrogen into the natural gas grids, so there is no direct experience on a possible interference between odorant and hydrogen. Anyway, there were experiences with odorisation of manufactured gases. A confidential study dated 1983 refers on rhino-analytical controls of grids distributing natural gas and manufactured gas containing hydrogen, both odorised with mercaptans: no differences were noted.

The composition of manufactured gas was roughly the following:

- Methane: 45 %;
- Hydrogen: 28 %;
- Carbon Monoxide: 8 %;
- Carbon Dioxide: 8 %;
- Oxygen: 2 %;
- Nitrogen: rest.

5.2. Hydrogen injection into natural gas at MOP > 16 bar

5.2.1. The Netherlands

At the moment there is a single part of the grid where refinery gas, containing up to 15% of hydrogen, is odorised with THT at 18 mg/m^3(n). Every 3 weeks the degree of odorisation is measured with a µGC, without any reported failure in odorant concentration. No olfactory test can be performed due to the presence of CO in the gas.

So far, no other data is available on odorisation effect from the injection of hydrogen in gas network at MOP > 16 bar.

5.2.2. France

The Jupiter 1000 project (coordinated by GRTgaz since 2014) is the first industrial demonstrator of Power-to-Gas (P2G) in France with a power rating of 1 MWe for electrolysis and a methanation process with carbon capture. The scope is to convert renewable power surplus into green hydrogen and syngas, injecting it into the gas grid. On the Jupiter 1000 platform, pipelines are made of stainless steel, similar to the transmission network. A maximum 6% of hydrogen will be injected in transmission pipelines containing natural gas. No odorisation addition is performed due to the low level of dilution of hydrogen in natural gas. Also, no control of the level of THT after the hydrogen injection in natural gas are scheduled.

6. Conclusions and actions

No evidence of problems in odorisation after addition of hydrogen to natural gas were found yet, although experiences are small, up to now. The available olfactory results show that the odorisation of natural gas - hydrogen mixtures could be performed with the same odorants and concentrations as for natural gas. Results have demonstrated that an odorant is equally distributed in a leak, both in confined and open space, besides the possibility of separation of natural gas and hydrogen due to the differences in physical properties. Some differences can be found when a leak of odorised gas crosses the soil, where the odorant could be easily adsorbed when mixed in hydrogen (experiences only on THT). This behavior is related to the physical properties of hydrogen, so it could be limited using odorant with the most similar physical properties with hydrogen.

Data are usually related to conditions of distribution grids, so it is not easy to extend the information to higher pressures as common in transmission grids (when odorised), even if the hydrogenation is not expected in the absence of catalysts.

Taking into account what was previously reported, MARCOGAZ suggests to consider a safe concentration of hydrogen in the natural gas – for odorisation with traditional odorants – up to 20% of hydrogen. Pilot projects demonstrate that odorisation of blends up to pure hydrogen using natural gas odorants give promising results, but more evidence is needed, particularly on the amount to be used when taking into account the differences in flow rates. MARCOGAZ is awaiting new data on the topic, as more information is needed regarding the following items:

- Possible effects on odorisation due to differences in physical properties of the mixture of gas and odorant (density, vapour pressure, …), at the actual condition of the distribution and transmission grids.
- Possible chemical reaction between hydrogen and odorant at high pressure condition.
- Influences from possible impurities from hydrogen production.

In particular uses, that can be encouraged in the case of the use of pure hydrogen (for instance fuel cells), the presence of the odorants may have a negative effect. A solution could be the removal of sulfur (and the other poisoning agents) for the sensitive users, by means of filtering. A second possibility will be the use of sulfur free odorants, already available or now under development, which have to be tested for the effectiveness in avoiding the issues with the final utilization by the customers.

In the case of fuel cells for instance, the use of some kind of filter would be needed to remove the odorant (even if sulfur free) due to the high purity hydrogen that is needed for this kind of application.

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8. Annex A: Information on odorants for hydrogen received by odorants producers

Physical data from Producer 1:

Odorant	density at 273K (kg/m^3)	density at 288K (kg/m^3)	vap pressure at 273K (mbar)	vap pressure at 288K (mbar)
THT+ EA (Ethyl Acrylate)	950	910	11	27
THT	1016	1003	5,8	13
TBM+IPM+NPM	825	810	82	169
TBM+MES	828	813	71	152
TBM+DMS (UK+IE)	830	814	114	230
TBM+DMS (CZ)	837	817	140	246
EM	861	844	246	486

Physical data from Producer 2

Name	density at 273K (kg/m^3)	density at 288K (kg/m^3)	vapour pressure at 273K (bara)	vapour pressure at 288K (bara)
THT (SCT)	1015,73	1002,78	0,00554	0,014
TBM-IPM-NPM (SC E)	824,33	810,8	0,00842	0,17
TBM-DMS (SC F20)	830,09	814,36	0,1226	0,23
THT-TBM (SC TB5)	907,83	893,1	0,0406	0,084
EM (SC A)	861,32	844,31	0,246	0,474

Regarding sulphur free odorant based on acrylates, there are no experience concerning the effect of minor concentrations of H_2 (up to 20%). This will have to be tested in further investigations.

On the other side, already in the year 2014, a product was developed which purpose is to be used with pure hydrogen. This new product, however, is not yet being used anywhere in the world, therefore is not yet commercially available and not yet approved.

NATURAL GAS ODORISATION PRACTICES IN EUROPE

October 2023

GI-OD-306

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ABOUT MARCOGAZ

Founded in 1968, MARCOGAZ is the technical association of the European gas industry. It represents 30 member organizations from 20 countries. Its mission encompasses monitoring and policy advisory activities related to the European technical regulation, standardization 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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Contents

Executive summary

At early stages of the industry, manufactured gas (town gas) had a characteristic odour, which helped customers identify possible dangers such as leaks during distribution and transport, while improving safety during the entire process. As odorless natural gas replaced the town gas and its usage increased, odorisation practices become essential to prevent accidents.

With a view to tracking and monitoring operational data, MARCOGAZ periodically collects information from its members with respect of odorisation practices across Europe. As such, all the collected figures, numbers, and records, are summarized in tables and further categorized as follows: legal regulations, odorisation controls, odorisation plants, gas chromatographic analysis at odorisation plants, injection points at odorisation plants, biomethane injection, olfactory levels, and odorants concentrations.

With regards to legal national regulations, the information shows that each country has its own mandate for odorisation, including information on the points where odorisation is mandatory (transit, transport, or distribution). Due to the development of the gas industry rules, different approaches to odorisation (olfactory levels vs odorant concentration levels) exist. Depending on the country-specific practices, three types of documents (standards, technical codes, and national laws) can specify odorisation requirements.

Olfactory tests, odorant concentration analysis (gas chromatography and chemical sensor), and control by odorant consumption are the three main methodologies used for the odorisation control. Each country performs at least one of these practices and, in some cases, several of them per requirements by their national regulations and legal requirements. It is important to observe that odorant consumption control is often used as a cross-check method.

Control can take place at different parts of the gas system: transit, transport, and distribution. In this document, the different frequency of controls (periodical or continuous) is described per country, and a list of the odorisation plants in each country is also provided. This information highlights the type of structure (centralized or decentralized) for odorisation processes while the technology in use (type of pumps, use of bypass) shows that even though injection is mainly done at city gate, several countries also odorise at transport or transit. In some cases, several injection points exist at different levels.

Another important highlight is that the distribution of odorised gas across European countries follows unique and diversified pathways, which can lead to complex situations fully handled by the interoperability network codes.

Two basic groups are observed in most used odorising substances in Europe: sulfur-based (mainly used) and sulfur-free odorants. The document provides a list of odorants, their compositions (blends), and physical and chemical characteristics, all of which are some of the factors taken into consideration for choosing odorants. The level of odorant concentration accepted by each country is variable since too low or too high odorant concentration can cause safety or operational problems. The typical minimum and maximum odorant concentration [mg/m^3_N] information is listed in the document.

As a general conclusion, the document highlights that odorisation practices and methodologies often vary depending on the country, however the same levels of safety across Europe are pursued. This technical report provides all the operators with the opportunity to learn different methodologies and techniques for odorisation and exchange knowledge and expertise. Moreover, understanding various practices in gas odorisation across Europe, coupled with the peculiarity of the different gas chains, is important for a continuous improvement of the odorisation processes.

The present document is intended to be read by anyone with an interest of gas odorisation processes and practices.

1. Legal section

Country	Odorisation required on Transit	Transit Pressure (bar)	Odorisation required on Transport[1]?	Transport Pressure (bar)	Odorisation required on distribution	Distribution pressure (bar)	Is a Level of concentration/ olfactory sensation Required? (Yes or Not)	If yes, please specify the requirement (i.e.: minimum concentration or olfactory degree at 1% natural gas in air)	Control required	Requirements specified standards or codes
AT	No		No		Yes		Yes	Minimum concentration	Yes	ÖVGW-Guideline G B230, G B310 & G E530 EN ISO 13734
BE	No	-	No	14,7 bar ≤ p ≤80 bar	Yes	P < 14,7 bar	No	-	Yes	Synergrid recommendation 2000.50.32
CH	No	> 5 bar	No	20 to 70 bar	Yes	< 5 bar	Yes	Minimum concentration	Yes	SVGW G 11
CZ	No	≥40bar	No		Yes	See note [2]	Yes	See note [3]	Yes	Technical rule GAS TPG 918 01 and TPG 905 01
DE	No		No[4]	> 16 bar	Yes	< 16 bar	Yes	Minimum concentration	Yes	DVGW G 280 EN ISO 13734
DK	No	< 80 bar	No	< 80 bar	Yes	<50 bar	Yes	Minimum concentration	Yes	DVGW G 280 BEK. 230 Order on gas quality
ES	Yes	80 bar	Yes	>16 bar	Yes	<16 bar	Yes	Minimum concentration	Yes	NGTS Code and R.D. 919/2006
FI										
FR	Not defined	Not defined	No[5]	16 to 95 bars	Yes	< 25 bar	No	-	Yes	Arrêté 13 juillet 2000 (law), RSDG 10 (Industry requirement), Article R.555-10-1 du code de l'environnement (law)
GB	No	<85bar	No	<85bar	Yes	<35bar	Yes	Olfactory degree 2 on Sales Scale	Yes	Gas Safety (Management) Regulations 1996
GR	No	>55 bar	Yes	>16 bar-80 bar	Yes	19 bar (DP) 16 bar (OP)	Yes	Minimum concentration	Yes	National Regulation 1712/06
IE	Yes	70	Yes	70	Yes	<4 bar	Yes	Olfactory degree	Yes	Code of Operations

[1] For the purpose of this document, and although the terms may relate to different notion in EU countries, Distribution network is the network delivering gas to domestic customers, transit network is the network transmitting gas (generally connected to other big network or infrastructure as storages), transport network is the network transmitting gas to distribution network, sometime identified as regional transport.

[2] Distribution operated at 3 different pressure levels: Low pressure (2,1 – 5 kPa), Middle pressure (0,05 – 4 bar) and High pressure (4 – 40 bar).

[3] THT: minimum conc. 10 mg/m^3; Mercaptan mixtures: minimum conc. 3,6 mg/m^3; GASODOR S-free: minimum conc. 8,8 mg/m^3; 70% THT and 30% TBM mixture: minimum conc. 12 mg/m3. Olfactory degree for all kind of odorants is the same: 3 warn smell intensity (by 20 % of LEL NG in air).

[4] DE: The German law refers to DVGW codes or equivalent; odorisation in only a few transport systems, mostly based on sulfur free odorant.

[5] FR: The law requires that transmission companies deliver odorised gas to all customers (industrial and distributors), not to odorise network. However, the current practice is to odorise the transported gas (historical decision to simplify the management and the control of the odorisation).

Country	Odorisation required on Transit	Transit Pressure (bar)	Odorisation required on Transport[1]?	Transport Pressure (bar)	Odorisation required on distribution	Distribution pressure (bar)	Is a Level of concentration/ olfactory sensation Required? (Yes or Not)	If yes, please specify the requirement (i.e.: minimum concentration or olfactory degree at 1% natural gas in air)	Control required	Requirements specified standards or codes
IT	No		No[6]	> 5 > 24 from the fields 12-24 outside cities < 12 inside the cities	Yes	0,004-5 bar	Yes[7]	Both: olfactory control is the primary requirement and it is legally accepted, but ARERA (Regulatory Body), for economic incentives purpose, takes into account only determinations of the level of concentration by gas chromatography[8]	Yes	UNI CIG 7133 [(6)] UNI CIG 9463 Dir ARG/Gas569/2019
NL	No	>40	No	40-80 bar	Yes	<8bar	Yes	Minimum concentration	Yes	National Regulation Regeling gaskwaliteit (WJZ/13196684)
PL	No	-	No	5<p<84 (DSO p<84)	Yes	<5	Yes	Both: the olfactory control is a legal requirement, but the predetermined dependence of the odour perception on the odorant concentration allows for concentration control.	Yes	National Regulation Dz.U. 2018, No 1158, Polish technical standards.
PT	No	84 bar MAOP	No	84 bar MAOP	Yes but injection at the transport side	20 bar / 4 bar	Yes	Minimum ambient concentration 1/5th of the flammability limit detection (8mg/Nm^3)	No	National Law
RO	No		Yes		No		Yes	Olfactory degree	Yes	SR 13406 (Natural Gas Odorisation), SR 3317 (Natural Gas Quality Requirements) EN ISO 13734
SE	N/A	N/A	Yes	80	Yes	4 or 10	Yes, however not a quantitative requirement but a qualitative requirement	Gas shall be odorised so that a person with a normal sense of smell can perceive a gas mixture with air amounting to 20 percent of the lower explosion limit (LEL). In these concentrations, the odorant must not harm people or the pipeline system for natural gas.	No	Swedish Gas Distribution Code (EGN 2020) recommends at least 11 mg THT / Nm^3
SK	No	73,5	No	25 to 63 bar	Yes	< 4 bar	Yes	Olfactory degree + Minimum concentration	Yes	TPP 918 01
UA										

[6] IT: The gas transmission network is not odorised except for the gas delivered to the domestic customers and premises directly connected with them.

[7] IT: Directive ARG/Gas 569/2019 from ARERA (Regulatory Body) considers only "positive controls" referred to UNI 7133.

[8] IT: UNI 7133 states the odorant concentrations that assure level 4 of Odorisation on DecaSales scale in natural gas.

2. Odorisation control section

Country	Control on Transit	Control on Transport	Control on Distribution	Control location (end point of the pipe[9], entry point of the pipe, odorisation station,...)	Frequency: continuous (CI) or periodical inspection (P)	Who asks for the control (regulation, voluntary)	Who does work the control (third part or not)	What is controlled (odorant concentration, smell, etc.)	Controlled by Olfaction	Controlled by gas chromatography	Controlled by chemical sensor	Controlled by odorant consumption
AT	No	No	Yes	Representative points in the distribution grid	P: yearly	Legal requirement	Grid operator / third party	Odorant concentration	No	Yes	Yes	Yes
BE	No	No	Yes	Pressure station MP/LP & LP grid (End point of pipe)	P: min. 3 months	Legal requirement (Royal Decree 28.06.1971)	Third party	Odorant concentration	No	Yes	No	Yes: visual inspection and calculation of odorant concentration
CH	Yes	No	Yes	Before the entry in distribution system	P: min. 4 times/ year	Technical rules (SVGW G11)	Third party	Odorant concentration	No	Yes	No	No
CZ	No		Yes	All of the above.	Periodically, each 6th month. At some transit stations continuously.	Technical rule TPG 905 01. Voluntary too.	Partly by DSO staff and partly by metrological authority and other third parties.	Both	Yes	Yes	Yes	Yes, it is dependent on gas flow.
DE	No	No	Yes	End point of pipe / furthest point from injection	P: 2 times/year, one control must between May and September *Sometime CI near injection*	Legal requirement and technical rules (DVGW G 280)	Grid operator	Smell and odorant concentration	Yes	Yes (legal)	Yes	Yes
DK	No	No	Yes	At fixed strategic points. They are located far from the dosing plants	P: 2 times per year	Regulation (Danish Safety Technology Authority)	Grid Operator	Odorant concentration	No	Yes	No	Yes (odorant consumption continuously monitored)
ES	Yes	Yes	Yes	In Transport: downstream of injection point. In distribution: city gate and end point of the pipe	CI: near injection P: min. every 2/3 months	Legal requirement (Government)	Grid operator	Odorant concentration	No	Yes	Only for portable devices	Yes: visual inspection and calculation of odorant concentration
FI												

[9] It means the furthest location from injection point

Country	Control on Transit	Control on Transport	Control on Distribution	Control location (end point of the pipe[9], entry point of the pipe, odorisation station,...)	Frequency: continuous (CI) or periodical inspection (P)	Who asks for the control (regulation, voluntary)	Who does work the control (third part or not)	What is controlled (odorant concentration, smell, etc.)	Controlled by Olfaction	Controlled by gas chromatography	Controlled by chemical sensor	Controlled by odorant consumption
FR	Not defined	Yes	Yes	Transport: At odorisation station (entry points and some node of the network) Distribution: Random locations on network	CI (Transport): ≈ 70 locations on network P (Distribution): several controls per year	Regulation (Transport) Voluntary (Distribution)	Grid operator	Odorant concentration	No	Yes	Yes	No
GB	No	No	Yes	At entry to and across distribution network	P: Monthly and CI	Regulation	The relevant distribution network	Smell	Yes	No	No	Yes
GR	No	No	Yes	City gates and network points at random (especially the most remote ones from the odorant injection points)	P	Regulation	DSO	Odorant concentration	No	Yes	No	No
IE	Yes	Yes	Yes	Primary test point for each Entry point and secondary test-points across the distribution system	CI of odorant injection rate at each plant + P: Monthly samples at TX and DX points	Technical rules (Code of Operations) only require gas to be odorised	TSO/Third Party	Odorant concentration	No	No	No	Yes
IT	No	Yes (domestic uses)[10]	Yes	End point of the pipe, and odorisation station	P: 6 months	Legal requirement (Law 1083/71) Regulation (ARG/Gas 569/2019)	Grid operator	Odorant concentration (see note 7 and 8), smell	Yes (see note 7)	Yes	No[11]	No (only for odorisation plants check, as option)
NL	No	No	Yes	City gate station, Odorisation station	P: 3 weeks	Regulation	Grid operator	Odorant concentration	No	Yes	No	Yes
PL	No	No	Yes	Selected endpoints of the distribution system, pressure stations MP/LP	P: 2 weeks and CI	Technical rules (Dz.U. 2018, No 1158, Polish technical standards.)	Grid operator	Odorant concentration	No	Yes	Yes	No
PT	Yes on custody transfer station	Yes	Yes by DSO	Odorisation station at the exit of transport pipe	Periodical (monthly)	Voluntary	Own operator personnel	Odorant concentration	no	Yes THT and sulfur content concentration measured on specific equipment	no	no

[10] IT: The gas transmission network is not odorised except for the gas delivered to the domestic customers and premises directly connected with them.

[11] IT: Sensors sometimes are used as indicators.

Country	Control on Transit	Control on Transport	Control on Distribution	Control location (end point of the pipe[9], entry point of the pipe, odorisation station,...)	Frequency: continuous (CI) or periodical inspection (P)	Who asks for the control (regulation, voluntary)	Who does work the control (third part or not)	What is controlled (odorant concentration, smell, etc.)	Controlled by Olfaction	Controlled by gas chromatography	Controlled by chemical sensor	Controlled by odorant consumption
RO	No	Yes	Yes	-	P: 3 months	Technical rules (SR 13406 SR3317)	Grid operator	Smell and odorant concentration	Yes (olfactory is the primary method)	Yes	Yes	No
SE	N/A	Yes, according to industry practice	Yes, according to industry practice	Entry point of the pipe	Periodical inspection	Voluntary by the Swedish gas industry	The Swedish gas industry itself	Odorant vessel and injection pumps (concentration)	N/A	N/A	N/A	N/A
SK	No	Yes	Yes	Selected points of transport pipes and end point of the distribution system	P: 3 months (local odorisation) 6 months (central odorisation) + CI	Legal requirement (State legislation)	DSO	Smell and odorant concentration	Yes (olfactory is the primary method)	No	Yes	Yes
UA												

3. Odorisation plants section

Country	Injection on transit	Injection on Transport	Injection on City Gate	Injection on other	Number of plants	Use of Electronic pump	Use of Pneumatic pump	Use of Bypass	Can odorised gas be received from outside the Country?
AT	No	No	Yes	Yes	About 250	Yes	No	Yes	Yes
BE	No	No	Yes	Biomethane injection plant	~ 150	Yes	No	No	No
CH	No	No	No	No	Not communicated	Yes	Yes	Yes	Yes (from France)
CZ	No	No	Yes, odorisation plants are on other sites as well.	On inlet from transit into the distribution grid behind regulating station	109	Yes, electromagnetic also.	No	No	Yes, but small volumes only (regulated by contracts DSO x DSO)
DE	No	No	Yes	Yes (HP 16-70 bar pipelines)	Not communicated	Yes	No[12]	No[16]	Yes[13]
DK	No	No	Yes	No	45	Yes	No	No	No
ES	No	Yes	Yes	Yes (biomethane injection points, underground storages, LNG terminals)	Transport: 12 City Gates: 300	Yes	No	No	Yes
FI									
FR	Yes[14]	No	No	Yes (biomethane, underground storage, operating only when emitting)	11 (Transit)[15] 10 (underground storage)	Yes	No	No	Yes (from Spain and Switzerland)
GB	No	No	Yes – on Leaving Transmission System	Yes – Direct connect Bio Sites into Distribution System	>150	No	Yes	No	Not currently - there are interconnectors which are currently unodorised
GR	No	No	Yes	No	Not communicated	Yes	No	No	No
IE	Yes - Gas transiting to NI and IOM is also odorised	Yes at system Entry Points	No	At DX Bio-methane injection points	4 x plants, 3 x plants at 2 x Entry Points + 1 x plant at Bio-methane injection site	Yes (LEWA system)	Yes (Orbital system)	No	Yes (from UK), National Grid is contractually required to odorise gas entering GNI system (even though UK TX system is not odorised)
IT	No	Yes[10]	Yes	Bio-methane injection points	> 1250	Yes	Yes	Yes	Yes (from France)
NL	No	Yes (up to 40 bar transmission pipeline)	Yes	No	80 (Transport) 50 (City Gate)	Yes	No	No	No
PL	No	Yes	Yes	No	≈1500	Yes	Yes	Yes	No
PT	Yes	No	yes	Industrial clients but not on some CCGTs	84	All	None	yes	Yes
RO	No	No	No	Yes (0 – 10 bar pipeline)	Not communicated	Yes	No	Yes	No

[12] DE: Generally not, but exceptions, e.g. LNG stations, may exist.

[13] DE: Possible only, if gas odorisation is guaranteed by contract to be contained in accordance with DVGW-G 280, gas to comply with DVGW-G 260

[14] FR: Except in the North of France where a 30 km pipeline is not odorised.

[15] FR: At the entry points of transmission network (including LNG terminals), operating continuously.

Country	Injection on transit	Injection on Transport	Injection on City Gate	Injection on other	Number of plants	Use of Electronic pump	Use of Pneumatic pump	Use of Bypass	Can odorised gas be received from outside the Country?
SE	N/A	Yes	No, already odorised for transport	Yes, all injection point for biomethane – both for transport and for distribution	+10	Yes	No	No	Yes, but will almost never be.
SK	No	Yes	Yes	No	1400	Yes	Yes	Yes	No
UA									

4. Gas chromatographic analysis at odorisation plants

Countries/ Questions	Are odorisation control measurements performed in your country?	Are they requested by laws or standards? (Please give references)	Continuous or spot analysis?	Type of gas chromatographs/ detectors	Prescriptions on location of the sampling point and instrumentation (distance from the injection point, grid layout between injection and measurement, etc.)	Any other point of concern
AT	Yes	No	Both	All types of detectors	No	-
BE	No	No	-	-	-	Continuous control between odorant consumption and amount of odorised gas by Lewa controller and ODO-check program
CH	No stationary GCs at the odorisation plants. However, DSOs make analyses of the odorised gas with them.	No				
CZ	No	No	-	-	-	The relationship between odorant consumption (kg) and the amount of odorised gas (m^3) is compared to the working setting value of the injection pump.
DE	Yes	gas chromatographic methods are not mandatory according to DVGW G 260 but common practice	usually spot, continuous is possible (see Table: ODORISATION CONTROL SECTION)	no special design is compulsory, (micro-)gc equipped with ECD, AED or SCD are common practice. As reference method for calibration gas chromatographic methods (i.e. DIN 51855) are mandated For S-Free control measurements a FID or TCD are suitable	End point of pipe / furthest point from injection (see Table: ODORISATION CONTROL SECTION) Sampling point must be representative for the grid in question	before sampling an adequate amount of gas shall be blown off. The rinsing volume shall exceed three times the dead volumes of the sampling facility
DK	Yes	No	Spot	Portable MicroGC type Agilent 490 CP to onsite analysis	End point of pipe	

Countries/ Questions	Are odorisation control measurements performed in your country?	Are they requested by laws or standards? (Please give references)	Continuous or spot analysis?	Type of gas chromatographs/ detectors	Prescriptions on location of the sampling point and instrumentation (distance from the injection point, grid layout between injection and measurement, etc.)	Any other point of concern
ES	Yes	Spanish Technical Management of the Gas System Regulations establish the requirements of minimum concentration of odorant in the gas, but not the method of measuring it.	Continuous, spot analysis in order to contrast with laboratory or when required	Instruments: Varian CP 2002; Varian CP 4900; Agilent 490 CP Detector: MicroTCD On site gas chromatographic analysis.	Enough distance to ensure odorant is mixed within the gas for a representative sample	
FI						
FR	Yes	No standard or law. Technical specification	Continuous	Micro chromatography	The sampling point is usually at 80-100D to the injection point (Natural Gas). For biomethane the distance is shorter, a static mixer is added to improve the odorant blending	/
GB	No	No	-	-	-	-
GR						
IE	Yes as back-up control at some entry points	No	Continuous	Chromatograph (Encal 3000)	Must be at least 60D downstream of injection point	
IT	Yes, at least two times per year	Standard: UNI 9463	Spot (usually)	Portable micro gc	No particular prescriptions: the sampling point must be as close as possible to the odorisation plant	Periodical check can be done by comparison between odorant consumption and gas volume
NL	Yes, once every 3 weeks	Yes (Meet-code gas LNB)	Spot	Portable	In case of odorisation on transport: at the first City gate station; In case of odorisation on City Gate station: in the grid of the DSO or industry	
PL	Yes	Yes, National Regulation Dz.U. 2018, No 1158, Polish technical standards.	Usually spot, continuous is possible in selected places	Laboratory gas chromatographs with FPD or PFPD detector, process and portable devices with electrochemical sensors	End point of pipe. Sampling point must be representative for the grid in question	-
PT	Yes	No	Continuous	Specific odorant and sulfur	Sampling 10 m downstream the injection point	No
RO						
SE	Only by manual supervision of odorisation unit, eg operation of odorisation pumps etcetera	Industry practice	Industry practice (SPOT)	N/A	N/A	N/A
SK	Yes	Yes, standard TPP 918 01	Spot and selected places continuous	Electrochemical sensors	Grid representative points, the length of the respective network.	
UA						

5. Injection points at odorisation plants

Countries	Company/ Association	Type (DSO/TSO/ Other)	Type of odorant used (THT, TBM, Gasodor S-Free, ect.)	Description of the injection system used (design, size (length, height and width), material used, compatibility with gas odorant, pictures) and how to be sure that the exchange surface between gas and odorant is optimum. Any standard/regulation and/or requirement/technical specification to follow	Location of the injection point, any recommendations about the location and/or the position (vertical, tilted (45°) etc.) in the pipeline (at the top of the pipeline, at the bottom of the pipeline, in the middle of the pipeline), possible difference between natural gas and biomethane. Any standard/regulation and/or requirement/technical specification to follow	Choice of the injection system (injection nozzle): based on the size of the pipeline, the speed of gas, the pressure, the flow rate, any other considerations, etc.
AT	General	DSO	THT, TBM, S-Free	ÖVGW Guideline G 530	ÖVGW Guideline G E530	ÖVGW Guideline G E530
BE	Fluxys - Synergrid	TSO	TSO uses only THT (to odorise the distributed gas as instructed by the DSO)	One injection point in outgoing station collector. See standard P&ID. Internal Fluxys technical specification. See standard piping assembly plan.	Check valve position: AS-IS: Check valve situated above ground – two meters upstream of injection nozzle in gaspipe TO-BE: Check valve situated at the extremity of the injection point (just before nozzle) in gas pipe	Purpose: make sure that every injected THT drop is directly in contact with the gas stream. Modified injector with larger exposure area.
	Sibelga-Synergrid	DSO	THT	LEWA injector, made of stainless steel, consisting of a perforated pipe ("vaporiser") at the injection point. A 3/4" NPT connection is welded onto the pipe and the injector is fixed in it. Upstream of the injection, two valves are separated by a non-return valve. The length of the "valves" part is about 20 cm, the length of the connection and vaporizer side varies according to the pipe diameter (between 85 and 450 mm for diameters from DN 50 to DN 700).	Injection is always done after the meter; vertical or 45° positioning depending on the location on our network (two different backgrounds); the end of the injector arrives about halfway up the pipe. Note that the vaporization is done over the whole injection height (not a single point).	Injection is done through a pump adapted by line (not globalized for the station, each line has its injection according to its metering); a line giving ideally between 20 000 and 30 000 m³/h. The design remains valid up to 100 bar, so we do not have different designs per pressure level (we only operate up to 14.7 bar)
	Fluvius-Synergrid	DSO	THT and Scentinel E	Two different injection methods. The sieve has a larger exchange surface. However, there is no noticeable difference in the odour level checks at the end of the gas network.		Based on the size of the pipeline
CH						
CZ	GasNet	DSO	TBM/DMS THT GASODOR S-free	Specific designed plants, based on pressure less stationary Odor-tank and high-pressure electric pump. Details can be seen on: Odorisation stations | GasNet	Injection point is located on horizontal oriented pipeline. The orientation of injection nozzle is vertical only. Size of injection nozzle depends on power of odorisation plant.	Based on the flow rate of gas.
	EG.D.		Mixture containing 70% of THT and 30% TBM.	Stainless steel injection system. Design and size are dependent on the projected flow of gas of the device.	Position of the injection nozzles is horizontal to the evaporating element. No biomethane in our DSO.	
	PPD		THT	Stainless steel.	Injection point is located on horizontal oriented pipeline. The orientation of injection nozzle is vertical only.	
DE						
DK	Energinet-Evida	TSO-DSO	THT	Odorising systems from Lewa (metering pumps)	The odorant injection point is at M/R stations outlet.	The injection nozzle can be in vertical (most common) or horizontal position. The injection muzzle can be extracted when the section for injection is depressurized.

Countries	Company/ Association	Type (DSO/TSO/ Other)	Type of odorant used (THT, TBM, Gasodor S-Free, ect.)	Description of the injection system used (design, size (length, height and width), material used, compatibility with gas odorant, pictures) and how to be sure that the exchange surface between gas and odorant is optimum. Any standard/regulation and/or requirement/technical specification to follow	Location of the injection point, any recommendations about the location and/or the position (vertical, tilted (45°) etc.) in the pipeline (at the top of the pipeline, at the bottom of the pipeline, in the middle of the pipeline), possible difference between natural gas and biomethane. Any standard/regulation and/or requirement/technical specification to follow	Choice of the injection system (injection nozzle): based on the size of the pipeline, the speed of gas, the pressure, the flow rate, any other considerations, etc.
ES	Enagas	TSO	THT	• Enagas Technical Specification for the supply of odorisation systems (EV-204). • Only injection systems are approved. • No specific dimensions of the injection point. Design is based on the installation and the volume of odorant to be injected. • Materials: stainless steel or copper-free alloys for components in contact with the odorant. • Types and sizing of the odorant supply tank according to the size of the entry/delivery station. • Control Unit is in charge of the correct operation of the odorisation system, controlling the dosing pumps and ensuring correct dosing. • Odorant injector must be a stainless-steel nozzle retractable in operation. Injection of odorant is done by nebulisation or impregnation.	• Although it is not defined in the Technical Specification, injection point is normally installed in a vertical position. The insertion length is determined by the provider, in order to ensure the required odorant concentration. • Complex systems for Interconnection Points, LNG terminals or Underground Storages are studied in detail by the Engineering Department.	• The choice of the injection point is done according to the size of the station, maximum flow of natural gas and operating pressure. • Consumption of odorant is determined based on the above, and the injection system designed accordingly. It is very important to define: 1. Type and volume of the odorant supply tank according to the odorant consumption. 2. Signal alarms in case of odorisation fault or maintenance notification. 3. All the fittings of the odorisation system, which shall include: - Odorant filters in suction of dosing pumps. - Insulating valves of the auxiliary tank. - Retention and/or safety valves. - Vent and active carbon filter of venting and fill connection. - Flow meter in the injection line.
FI						
FR	GRTgaz Teréga	TSO	THT	Use of injection probe. THT is normally injected at the top of the pipeline. No standard or regulation in France.	The injection probe is vertical in the pipeline normally located at the top of the pipeline for maintenance facilities, but some construction can lead to a location at the bottom. No standard or regulation in France	Use of spray or impregnator. The choice is mainly based on the flow rate and the speed of gas, and on the THT concentration upstream of the injection.
GB	Company	TSO (Direct Connect)/DSO	TBM+DMS	IGEM/SR/16 Edition 2	-	-
GR						
IE	GNI	TSO & DSO	NB (TBM/DMS)	Determined by OEM (Original Equipment Manufacturer)	Determined by OEM	DETERMINED BY OEM
IT	Italian Gas Committee	Italian National Technical Committee	THT TBM+IPM+NPM	Requirements are listed in the relevant effective Italian technical standards series UNI CIG 9463 “Odorisation plants and odorant depots for combustible gases employed in domestic or similar uses”: • Part 1: “Terms and definitions” • Part 2: “Design, construction, testing and surveillance” • Part 3: “Odorant storages - Design, construction and operating criteria” • Part 4: “Odorant storages - Odorant supply conditions” Injection points characteristics are decided by Manufacturers and are part of their know-how.	Position of the injection points in the pipeline is decided by Manufacturers according to their technology and it is part of their know-how.	• When injection odorising system is associated at a gas pressure control/measuring station, injection points are generally located downstream control and measurement systems. • When injection odorising system is located in the grid, injection points are installed directly on the pipework. Gas velocity in the downstream pipelines is fixed by Italian technical standards and it shall be not higher than 25 m/sec. Size of the pipeline is the key parameter to be considered for injection nozzle sizing. Pressure is generally not relevant for injection nozzle sizing.

Countries	Company/ Association	Type (DSO/TSO/ Other)	Type of odorant used (THT, TBM, Gasodor S-Free, ect.)	Description of the injection system used (design, size (length, height and width), material used, compatibility with gas odorant, pictures) and how to be sure that the exchange surface between gas and odorant is optimum. Any standard/regulation and/or requirement/technical specification to follow	Location of the injection point, any recommendations about the location and/or the position (vertical, tilted (45°) etc.) in the pipeline (at the top of the pipeline, at the bottom of the pipeline, in the middle of the pipeline), possible difference between natural gas and biomethane. Any standard/regulation and/or requirement/technical specification to follow	Choice of the injection system (injection nozzle): based on the size of the pipeline, the speed of gas, the pressure, the flow rate, any other considerations, etc.
NL	Gasunie	TSO	THT	Use of Interchangeable injection probe. THT is normally injected at the top of the pipeline. Length of the probe depends on the pipe diameter (between 80 and 240 mm) No standard or regulation in the Netherlands.	THT is normally vertical injected at the top of the pipeline. No standard or regulation in the Netherlands.	Length of the probe depends on the pipe diameter: DN100 -80 mm injection probe DN150 – 130 mm injection probe DN200 – 190 mm injection probe DN250-500 – 240 mm injection probe no difference in injection point between high pressure odorisation (40 bar) or low pressure odorisation (8-4 bar)
PL	PSG	DSO	THT	Injection point on outgoing gas pipeline. Polish technical standards.	Manufacturers technical requirements.	Manufacturers technical requirements.
PT	Company	TSO	THT	Detail not available in this format	Detail not available in this format	Flow rate
RO						
SE	Swedegas	TSO	THT	According to manufacturer's instructions	According to manufacturer's instructions	According to manufacturer's instructions
SK	SPP-distribúcia	DSO	THT, TBM (80%)+MES(20%)	Injection points are usually on outgoing gas pipeline (there are exceptions) and on top.		From our experience no nozzle is needed.
UA						

6. Odorisation plants section (biomethane injection)

Country	Biomethane injection on Transport?	Number of biomethane injections on Transport (if known)	Number of Odorisation plants on Transport (if known)	Biomethane injection on Distribution?	Number of biomethane injections on Distribution (if known)	Number of Odorisation plants on Distribution (if known)	Specific requirement for biomethane Odorisation?	Standards for biomethane Odorisation
AT	No	-	-	Yes	About 15	About 13	No	ÖVGW-Guideline G B230, G B310 & G E530 EN ISO 13734
BE	No	0	0	Yes	6	6	Synergrid G8/01 (Odorants and odorant concentrations are the same as in natural gas.)	No
CH	No			No				No
CZ	No	0	0	Yes	1	1	Same technical rules: TPG 918 01, TPG 905 01	TPG 918 01, TPG 905 01
DE	Yes	~20[16]	0[17]	Yes	~185	185	No	DVGW G 280[18]
DK	Yes	1	1	Yes	55	55	No	DVGW G 280
ES	Yes	2	2	Yes	4	4	No (the same requirement for Odorisation in natural gas)	Same as for natural gas
FI								
FR	Yes	~70	~70	Yes	~450	~450	The requirements for Odorisation are the same as for natural gas. No specific requirements. Injection of THT and control of Odorisation by gas chromatography	No
GB	Yes	1	0	Yes		Matches number of sites	NTS is unodorised and so any biomethane plant connected to NTS would not require odorisation. For local transmission distribution systems there are no specific requirements.	IGEM/SR/16 Edition 2
GR	No			No				No
IE	No but planned for future	0	0	Yes	1	1	Requirements are very similar to Natural Gas specification except for modification to permit higher oxygen content	IGEM/SR/16 & IGEM/TD/16
IT	Yes	10	If injected in TSO grid, biomethane is not odorised	Yes	3	If injected in DSO grid, biomethane must be odorised	Before injection, both on TSO and DSO grids, biomethane must be proven to be odorisable giving, after odorant addition, the same warning as odorised natural gas. Only when injected in DSO grid it must be odorised. Odorants and odorant concentrations are the same as for natural gas.	UNI TS 11537/2019 UNI 7133-2/20
NL	No	3 (Transport < 40 bar)	3 (Transport < 40 bar)	Yes	~40	~40	Before injection, both on odorised TSO (< 40 bar) and DSO grids, biomethane must be proven to be odorised giving the same warning as odorised natural gas. Odorants and odorant concentrations are the same as for natural gas.	Same as natural gas
PL	No	-	-	No	-	-	-	No
PT	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
RO	No			No				No
SE	Yes	2	3 (in total)	Yes	~10	~10	Same as for natural gas	Same as for natural gas
SK	Yes	1	32	No	0	0	No	No
UA								

[16] DE: 204 biomethane plants (+6 injections of hydrogen or syngas) end of 2017. Thereof around 20 biomethane plants inject in transmission grids.
[17] DE: no odorisation of natural gas/biomethane on transport grid.
[18] DE: German technical rule for odorisation of natural gas, no specific requirements or a separate standard for odorisation of biomethane.

7. Olfactory level section

Country	Minimum required olfactory degree	Control required	Requirements specified standards or codes
AT	Not required	No	-
BE	Not required	No	-
CH	Not required	No	-
CZ	3 (warn intensity smell) DVGW scale (Table 1, A 3, TPG 918 01)	Yes	Technical rule TPG 918 01
DE	Not required	No	-
DK	Not required	No	-
ES	Not required	No	-
FI			
FR	Not required	No	-
GB	2 (Sales scale)	Yes	Gas Safety Management Regulations, GS(M)R1996
GR	Not required	No	-
IE	2 (Sales scale)	Yes	Code of Operations
IT	4 (DecaSales scale [19])	No: National Authority take into account only gas chromatographic analyses.	UNI CIG 7133 Dir ARG/Gas 569/2019
NL	Not required	Yes	-
PL	2 degrees	Yes	National Regulation Dz.U. 2018, No 1158 Polish technical standards.
PT	Capable to detect 1/5th of the lower flammability limit	no	National Law
RO	2 (Sales scale)	Yes	SR 13406 (Natural Gas Odorisation), SR 3317 (Natural Gas. Quality Requirements),
SE	N/A	N/A	N/A
SK	2 degrees	Yes	TPP 918 01
UA			

[19] The new DecaSales scale was introduced in UNI 7133-1: 2019, doubling the Sales Scale and using only integer from 0 to 10 olfactory degrees.

8. Odorants concentrations section

Country	Odorant	Percent consumption	Minimum concentration (mg/m³)	Maximum concentration (mg/m³)	Typical concentration (mg/m³)	Unit reference (Standard or Normal)	Customers receiving non-odorised gas: specify what type of industry is receiving non odorised gas	Odorised gas in Salt cavern?	Odorised gas in lined cavern?	Odorised gas in aquifer storage?	Odorised gas in depleted field?
AT	THT Other odorants Sulfur Free Odorant	94% 5% <1%	9,0 - 8,0	As required at representative points in the distribution grid	12-14 - 10	Normal	Industry: glass, ceramics, chemical, power plants	No	No	No	No
BE	THT TBM+IPM+NPM	-	17 5,4	34 7,1	20 6	Normal	Chemical Industry & power plants	No	No	No	No
CH	THT S-Free Acrylate	100% -	10 8,8	30 -	15-30 12 14	Normal	some Industry	No	No	No	No
CZ	TBM+DMS THT GASODOR S-free (not as a mixture)	60% 37% 3% (Of GasNet amount of distributed natural gas)	3,6 10 8,8	8 12 8,8	5 10 8,8	Standard	Chemical and petrochemical industry	No	No	No	No
	Mixture contains 70% of THT and 30% TBM.	100% (Of EG.D. amount of distributed natural gas)	12	40	20						
	THT	100% (Of PPD amount of distributed natural gas)	12	24	12						
DE	THT Other odorants mixt THT + EA Sulfur Free Odorant TBM+IPM+NPM	59 – 74% 2% - 21% 15-17%	10 Not specified 6 8 3	According to DVGW G 260 the total sulfur concentration shall not exceed 10 mg/m³	15–18 - 11-15 11-15 5-8	Normal	Industries: glass, ceramics, chemical	No	No	No	No
DK	THT	100%	10,0 (at consumer location)	Not specified	11-17	Normal	Not allowed in Denmark. All gas is odorised	No	No	No	No
ES	THT	100%	15 (TSO) 18 (DSO)	-	22	Normal	None	Not apply: there is not any salt cavern	Not apply: there is not any lined cavern	Yes	Yes
FI											
FR	THT	100%	15	40	25	Normal	None	Yes	No	Yes	Yes
GB	TBM+DMS	100%	Not specified	As required, but must not exceed total sulfur limit of GS(M)R regulation	6	Standard	Industrial but typically Power Stations	No	No	No	No
GR	THT	100%	15	35	20	Normal					

Country	Odorant	Percent consumption	Minimum concentration (mg/m³)	Maximum concentration (mg/m³)	Typical concentration (mg/m³)	Unit reference (Standard or Normal)	Customers receiving non-odorised gas: specify what type of industry is receiving non odorised gas	Odorised gas in Salt cavern?	Odorised gas in lined cavern?	Odorised gas in aquifer storage?	Odorised gas in depleted field?
IE	TBM+DMS	100%	3	10	6	Standard	Every customer receives odorised gas	No	No	No	Yes
IT	THT TBM+IPM+NPM ([20])	40% 60%	32 9,3[21]	80 27	-	Standard	Industry	No	No	No	Yes
NL	THT	100%	10	40	18	Normal	Industry; Power plant; dedicated Pipe	No	No	No	No
PL	THT	100 %	Not specified	Not specified	15- 25	Normal	Industry	No	No	No	No
PT	THT		Required to ensure the detection anywhere after the city gate	Not defined	24	Normal	Some CCGTs only and some feedstock users	Yes	Not applicable	Not applicable	Not applicable
RO	EM	100%	3	30	8	Not known	Some Industry	No	No	No	No
SE	THT (Mercaptans for LPG)	N/A	11 mg/Nm3	N/A	>11 mg/Nm3	Normal	None that are attached to a transport or distribution gas grid	N/A	Yes	N/A	N/A
SK	THT TBM(80%)+MES(20%)	59 % 41 %	8 5	40 15	18 10	Normal	Chemical industry and some technological customers	No	No	No	No
UA											

NOTE: The unit can be expressed in reference to normal or standard conditions: the difference is related to the temperature to which the volume is expressed; the following definitions are taken from the EN ISO 14532:

- **Normal reference conditions**: reference conditions of pressure, temperature and humidity (state of saturation) equal to: 101,325 kPa and 273,15 K for a dry, real gas.
- **Standard reference conditions**: reference conditions of pressure, temperature and humidity (state of saturation) equal to: 101,325 kPa and 288,15 K for a dry, real gas.

[20] IT: The 2019 revision of UNI 7133 – Part 2, has an annex in which a concentration of 24,1 mg/m³ is given as basis for further studies for usage of odorant without sulfur with a composition of 32% of methyl acrylate, 66% of ethyl acrylate and 2% of 2-ethyl-3-methylpyrazin.

[21] IT: the concentration is expressed as TBM, because it is the only compound of the mixture that can be analysed on the field at the lower concentration. This concentration of TBM alone reach 4 olfactory degrees at 1% of natural gas in air even in absence of the other two mercaptans of the odorant mixture (IPM and NPM are more reactive, and can be easily lost in the grid).

ODORANTS TABLE															
Odorant	**Composition %**										**%S**	**Density at 273K (kg/m3)**	**Vapour Pressure at 273K (mbar)**	**Density (kg/m³ at 15°C)**	**Vapour Pressure bara at 15°C**
	THT Tetrahydro thiophene	**TBM Tertiary Butyl Mercaptan**	**IPM Isopropyl Mercaptan**	**NPM Normal Propyl Mercaptan**	**MES Methyl Ethyl sulfide**	**DMS DiMethyl sulfide**	**EM Ethyl Mercaptan**	**Ethyl Acrylate**	**Methyl Acrylate**	**2-Ethyl-3-Methylpyrazin**					
Formula	C_4H_8S	$C_4H_{10}S$	C_3H_8S	C_3H_8S	C_3H_8S	C_2H_6S	C_2H_6S	$C_5H_8O_2$	$C_4H_6O_2$	$C_7H_{10}N_2$					
Molecular weight	88,2	90,2	76,2	76,2	76,2	62,1	62,1	100,1	86,1	122,2					
Sulfur Free								66 %	32 %	2 %	0,0	Note[22]	Note[23]		
THT+ EA (Ethyl Acrylate)	12 %							88 %			4,4	950	11		
THT+TBM	70 %	30 %									36,1			893,1	0,084
THT	100 %										36,4	1016	5,8	1002,8	0,014
TBM+IPM+NPM		76 %	16 %	8 %							37,1	825	82	810,8	0,17
TBM+MES		80 %			20 %						36,9	828	71		
TBM+DMS (UK+IE)		80 %				20 %					38,8	830	114	814,4	0,23
TBM+DMS (CZ)		65 %				35 %					41,2	837	140		
EM							100 %				51,6	861	246	844,3	0,474

NOTE: The information and data included in this document have been compiled by MARCOGAZ from a variety of sources from its Members. MARCOGAZ will not accept any liability for the data accuracy and completeness.

[22] From the Safety Data Sheet: 0,9300 - 0,9400 at 20 °C (relative density).

[23] From the Safety Data Sheet: 83 mbar (at 25 °C).

9. Updating references

Country	Data of updating	Comments
AT	08/09/2022	From Marcostat member
BE	06/10/2022	From Marcostat member
CH	02/10/2012	
CZ	27/09/2022	From Marcostat member
DE	16/05/2023	DVGW code of practice G 280 is under revision, new version expected 2023-2024
DK	30/05/2022	From Marcostat member
ES	10/01/2023	From Marcostat member
FI		
FR	06/02/2023	From WG member (Update of the number of odorisation plants (TSO & DSO) including biomethane)
GB	15/06/2022	Data supplied by company's Engineering Manager – Gas Quality, Metering, Telemetry & Policy.
GR	02/10/2012	
IE	16/01/2023	From WG member
IT	25/11/2023	From CIG (Italian National Gas Committee)
NL	09/01/2020	From MARCOSTAT member
PL	18/08/2022	From WG member
PT	30/09/2022	From MARCOSTAT member
RO	02/10/2012	
SE	29/09/2022	From MARCOSTAT member
SK	12/09/2022	From MARCOSTAT member
UA		

*

* *

COFFEE BREAK

VI. 2 Standing Committee Gas Utilisation and New Gases (SCGU&H2+)

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Technical Association of the European Gas Industry

Executive Board

Reporting on activities

Frank Graf and Kris De Wit, Co-chairs of the SCGU/NG

EB – 13th of Dec 2023

Gas Utilization & New Gases : WG H_2, $BioCH_4$ & SNG

Scope of project

- Study on technological and gas infrastructure related aspects as well as the climate impact of new gases

Structure

- Analysis of existing studies on new gases (e.g. IRENA)
- Definition of topics for detailed examination (e.g. terminals, gas infrastructure, gas quality)
- Elaboration of Marcogaz related work items with experts from different WGs

Meetings

- 25th May
- 19th July
- 29th September
- 1st December

Gas Utilization & New Gases : WG H_2, $BioCH_4$ & SNG

STATUS

- Country-specific presentations of new gases → ongoing activity
  - Belgium, Denmark, France, Germany, Netherlands, Spain, Germany
- Questionnaire on new gases → Circulation in 01/24
  - Existing injection capacities
  - Strategies on production, import and utilization
  - Infrastructure aspects
- Fact sheets of new gases processes → Q1/24
  - Fundamental information on technologies
  - Gas quality aspects
  - TRL, plant sizes

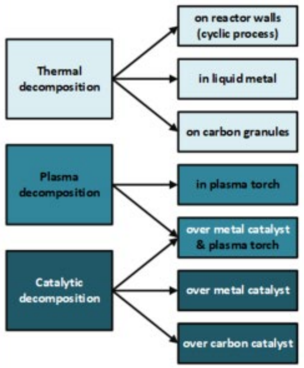
Large-scale hydrogen production from methane pyrolysis (TRL 3 - 8)[3]

Methane pyrolysis is the splitting of methane (CH_4) into solid carbon (C) and hydrogen (H_2) with the exclusion of oxygen.

CH_4 (g) → C (s) + 2 H_2 (g) $\Delta_R H$ = 76 kJ/mol

Without catalyst, the endothermic decomposition reaction starts at temperatures above 700 °C. With catalyst, decomposition is observed from 500 °C.[1]
So far, methane pyrolysis has only been implemented on a large scale for carbon black production[2]. Various processes are being researched for large-scale application of hydrogen production. For example, BASF is developing a process that could be ready snfor large-scale implementation by 2030.

Categories of methane pyrolysis processes[1]:



Operating parameters[1]:
Temperature: 750 – 2100 °C (cat. – plasma)
Methane conversion depending on the process:
Plasma: 33 – 94 %
- Thermal: 80 %
- Catalytic: 90 – 92 %

Challenges:
Without Catalyst: Heat supply at temperatures higher than 1000 °C and solid deposits (C) in the reactor
Catalyzed pyrolysis: solid deposits (C) in reactor or on catalyst

Pilot plants in test operation[3,4]:
- Up to144 m^3/h (NTP)

1: Schneider et al. 2020, State of the Art of Hydrogen Production via Pyrolysis of Natural Gas
2: Muradov 2017: Low to near-zero CO2 production of hydrogen from fossil fuels. USA
3: R. Hanson, Special Use Permit Application For Construction And Operation Of A Carbon Black Manufacturing Plant By Monolith Nebraska, LLC, Village of Hallam, NE 2018. www.lincoln.ne.gov/cnty/clerk/agenda/2018sm/180927/hallamextraterritorialzoning%20.pdf
4: 41 N. J. Hardman et al., Patent , 2017. WO2017048621 A1

Gas Utilization & New Gases : WG Gas Quality

STATUS

- *Last meeting on 26/09/2023, next one on 23/01/2024*
- *CEN-MARCOGAZ liaison*
  - J. Lana participating in CEN/TC234 WG11 & CEN/TC408 meetings
- *Harmonization of gas quality*
  - Standard EN16726:2015: Gas quality H-gas
    - First draft for public consultation ready in August 2023
      - Public enquiry will be launched to NSB in 21st December, with 12 weeks for comments.
    - Proposal included for all the quality parameters, although several of them are still under discussion in WG11.
      - It is expected that comments received during public consultation will help to close the gaps and will improve the standard.
      - Wobbe index: inclusion of class system proposed by CEN SFGas GQS WG
        - Different views for TSO/DSO and some end users organizations
      - Oxygen: 1 %mol by default, 0.01/0.001 %mol (to decide) if sensitive users in case by case assessment → still under discussion
      - Hydrogen: 2 %mol, with with the option to allow higher concentrations in certain grid areas based on bilateral and grid assessment
        - Gas & H2 packages: 2, 3 & 5 %mol still under discussion
- *Hydrogen*
  - *CEN/TS 17977 Gas infrastructure – Hydrogen used in rededicated gas system* approved by 91.7 %
    - Published on 15th November 2023
  - Follow up of EASEE-gas Gas Quality Harmonization WG activities
    - CBP on H2 Energy units in market processes.

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Gas Utilization & New Gases : WG Gas Quality

Projects 2024

- *MARCOGAZ LNG quality in Europe data base (WG_GQ-477)*
  - Template sent to WG members asking for information (WG_GQ-489)
    - Deadline 22nd December
  - Depending the number of answer, WG will decide if build the database
- *Biomethane*
  - Update of document *Quality values required by legislation in some countries in Europe for biomethane injection into natural gas network* (WG_GQ-187)
    - Deadline for new information 22nd December
- *Hydrogen*
  - Update of document *Hydrogen regulation/standards survey* (WG_GQ-405)
    - Deadline for new information 22nd December
- *CO_2 quality standard/specification*
  - Request from SCGI
  - Collection of available information on-going
    - Deadline 22nd December

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Gas Utilization & New Gases : WG Energy Efficiency

STATUS (1)

- Last WG EE meetings since the last SCGU on May 25, 2023.
  - May 12th 2023 : ad hoc meeting dedicated to the development of a position paper on the revision of Ecodesign : link to publication
- Several ongoing topics regarding energy efficiency at the European level through the revision of several directives (EED, EPBD, and Ecodesign)
- FK : Participation in the weekly heating meetings organized by Eurogas
- *Ecodesign recast*
  - EcoDesign would be published after the EU elections in June 2024 (or before not certain) - under discussion at the Commission
- *EPBD recast*
  - The trialogue discussions have begun the 6th of June
  - Final trialogue meeting : 07/12/23
  - The final text is expected for the end of the year or the beginning of 2024
  - 3 main points “in the conditional”: from 2040 it would be forbidden to install in buildings boilers running on fossil fuels, Hybrid Heat Pumps and Gas Heat Pumps would be allowed beyond 2040, the differentiation “devices certified to operate with a renewable gas” or not would be removed.

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Gas Utilization & New Gases : WG Energy Efficiency

STATUS (2)

- *EED recast*
  - The directive has been formally adopted at Parliament 11th July (Link) and has been published in the EU's Official Journal (Link) the 20th of september 2023 The final trialogue meeting : 07/12/23
  - The Member states will benefit from flexibilities in reaching the target
  - The Council adopted new rules to reduce final energy consumption at EU level by 11.7% in 2030.

- *Informative value 1.4 for PEF of biogas in Annex B in 52 000-1 standard on the energy performance for building*
  - PEF value for gas, biogas, and biomethane further degraded in favor of electricity in the ISO for EPDB
  - The primary energy factor (PEF) for gas is currently at 1.1. If it increases to 1.4 for biogas and likely even higher for biomethane (around 1.6), it would automatically undermine the competitiveness of biogas solutions compared to electricity, whose PEF is continually decreasing (currently at 1.9)

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Gas Utilization & New Gases : WG Gas Installations

STATUS

- Last meeting : 10/5/23 (Teams) – Next meeting : 03/8/24 (BXL)
- 5 Countries represented: DE, BE, DK, NL, FR + 2 Marcogaz representatives
- EGAS C data (accidentology)
  - Help of Marcostat to collect data for EGAS-C (8 countries/6 data) up to now – we decided to extend the deadline for CALL#5 until end of December 2023
  - Fair competition between energies – Domestic sector – will be the step after – we need public data concerning electricity/biomass accidentology (public data are not easy to find …)
- Maintenance of appliances – Methane Emissions
  - 2 answers up to now – we discussed the benefits of having (defensive) data

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Gas Utilization & New Gases : WG Gas Installations

STATUS

- Blends **GN/H2** and **H2** issue – **Safety** aspects/impacts
  - The different national strategies in Europe are not in line: no mixture H2GN into the grid in France for the time being, goal to 20% under discussion in Germany, experiments in Netherlands and UK, …
  - **Overview** of the **pilot projects** in Europe: to be shared for the next meeting (projects x% H2 and 100%H2, safety aspects, …).
- Existing liaisons : with the **WG ”Heating”** of **EUROGAS** (main items : EPDB and EcoD) and CEN (Technical Committees on gas appliances and test gases

Gas Utilization & New Gases: Standing Committee

STATUS

- last meeting on 9th of Oct // next meeting on 22nd of Jan
- ad-hoc meeting 5th of Dec to discuss and define 2024 approach (chairs of SC and WGs)
- meeting with ACER on 27/11 on gas quality
- proposal to have an official Marcogaz liaison with WG Heating of Eurogas

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VI. 3 Standing Committee Sustainability (SCS)

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Technical Association of the European Gas Industry

Standing Committee Sustainability Report to the Executive Board

13th of December 2023

José TUDELA, SCS Chairman

Executive Board meeting – 13/12/2023

WG Health & Labour Safety Activity

Activity

Outputs

- 2023: Finalization of technical note on “Black Powder, Mine Dust” ✓
- 2023: “Health effects of hydrogen and natural gas” (concept ready)
- 2023: “Optical and Electronical Radiation - Phase 2”
- 2023: “Benchmark report on safety” (report on safety statistical indicators, 2022 data) (*)

Current Situation

- Due to the current unavailability of the WG Chairman, the workgroup has not been active during the last months.
- A Call for an interim Chair was sent (end of October) but **no candidates** have been identified.
- A Proposal for **next steps** have been sent by the polish representative (end of November):
  - **Online meeting in February**, in order to manage the key topics that are currently on progress and receive feedback from the group members about a “face to face“ meeting to be organized in Poland (end of April/May)
  - **A 2-day meeting in Wrocław** - combined with a short tour of the infrastructure, including installations on active coke oven gas transmission pipelines. (Last document was related to coal dust present in gas pipelines that previously transported coke oven gas).

(*) **Call #3 in MARCOSTAT circulated**

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WG Methane Emissions+ Activity

Methane Emissions+

- BAT ON VENTING AND FLARING


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BEST AVAILABLE TECHNIQUE [BAT]

to reduce methane emissions from venting and flaring activities in mid/downstream gas sector

BAT 1 – Reduce pressure before venting

version 0.0, 08/12/2022

- ALL BATs already finished (9 documents):

•	BAT 1 – Reduce pressure before venting	WG-ME-899
•	BAT 2 – Mobile recompression	WG-ME-900
•	BAT 3 – Stationary recompression	WG-ME-901
•	BAT 4 – Flaring as replacement of venting	WG-ME-902
•	BAT 5 – High bleed continuous pneumatics mitigation	WG-ME-903
•	BAT 6 – Electrical or pneumatic air starters	WG-ME-904
•	BAT 7 – Use of nitrogen to purge LNG pipes	WG-ME-905
•	BAT 8 – LNG truck loading – dry coupling connectors	WG-ME-906
•	BAT 9 – Excess flow valves in new service lines	WG-ME-907

Documents approved in last Board Meeting

- An **introductory document for the BATs (BAT0)** has been finished and circulated for ME+ and SCS approval:
  - Some comments have been received.
  - A small group is currently working on addressing the comments that have been received.

BAT0 will be circulated for Board approval when finished (*)

(*) If the document is finished before the 13th of December it will be presented for Board approval during the Board Meeting.

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Methane Emissions+

- SCOPE 3 EMISSIONS
  - **1ST PHASE - FINISHED:** 11 Companies have shared their scope 3 strategy in four qualitative benchmarking meetings.
  - **2ND PHASE – DATA CAPTURE:**
    - Data capture form has been validated in the group.
    - Call #8 in MARCOSTAT for data capture was circulated (4th Dec.)
    - Deadline for data submission has been set for the 22nd of December 2023.

- HYDROGEN EMISSIONS
  - First draft of the White paper structure on "**Differences between NG & H2**" has been shared in the group.
  - The next step would be to discuss in more detail the final focus of the paper.

Content

Methane Emissions+

ON GOING KEY TOPICS

- CEN STANDARDISATION

CEN/TC 234/WG 14 Gas Infrastructure - Assessment of ME for gas transmission and distribution systems

- EC having the possibility to produce a delegated act on Methane
- CEN TC 234 is preparing three standards (assessment, LDAR, venting and flaring)
- The timeline is approximately 3 years for having the standards finalized, yet the first drafts can be available within around 6 months.

CEN/TC 264/WG 38 Determination of fugitive VOC emissions

- Two texts are still in the drafting phase.

- ISO STANDARDISATION

ISO/TC 197/ SC 1/ WG 1 “Hydrogen Technologies”

- A short presentation on the reorganization of ISO/TC197 on Hydrogen technologies is shared in the group although it is remarked that it is still at proposal stage WG-ME-990.

  WG1 - WD 19870 GHG Hydrogen. Work on monitoring and reporting of Hydrogen as a Green House Gas (GHG)

  - The work is nearly finished and the main open points are on the annexes. WG-ME-955
  - The explanatory note for CIB Annes Consultation can be found here: WG-ME-986

GHG Supply Chain Emissions Measurement, Monitoring, Reporting and Verification (MMRV) – Initiative WG-ME-985

Methane Emissions+

ON GOING KEY TOPICS

- EUROPEAN INSTITUTIONS

Methane Emissions Regulation

- The Council and the Parliament reached a provisional political agreement
- The final text has not been published and a first draft is expected around the COP28

Industrial Emissions Directive (IED)

- Finalization of IED revision is expected by early 2024. (Now Trialogue)
- The position paper has been published and is now available on the website of MARCOGAZ.
- The document has been cosigned by ENSTO-G and GIE link.

- METHANE EMISSIONS ASSESSMENT

New MARCOGAZ analysis of the emissions data (years 2021-2022)

- The status of the work is presented by an Excel file to introduce the data collection of the project.
- This shows how LDAR and quantification are different between the TSOs and how the emissions are related to the operational parameters.
- Call for data is still open WG-ME-926

- CORRELATION FACTORS

- Data from 10 companies in different segments of the value chain are received.
- It is agreed to give members and data providers a reminder to submit more data with a deadline of 3 weeks. (since 21st Nov.)

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Methane Emissions+

ON GOING KEY TOPICS

- GERG PROJECT

"Top-Down Challenge"

- A board meeting was organized where a new version of the report was discussed with support of University of Utrecht.
- Now they are waiting feedback from the board and stakeholders and the final report is expected by the end of this year.
- It was already shared that there were no differences found between source and site level measurements, although other studies suggested so.

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VII. MARCOSTAT Calls

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Technical Association of the European Gas Industry

MARCOSTAT Calls status overview

Manuel Coxe – Secretary General

MARCOGAZ – Executive Board meeting – 13 December 2023

MARCOSTAT Calls for data overview (1/3)

- CALL#2: Natural Gas Odorization Practices in Europe – **Closed** – *Report for approval is available*

Countries/members that provided data	Countries/members that did not contribute
AT, BE, CZ, DK, FR, DE, IT, IE, NL, PL, PT, SK, ES, SE, UK	FI, GR, RO, CH, UA

- CALL #3 Occupational Health and Safety Performance of the European Gas Industry

Countries/members that provided data	Countries/members that have not contributed yet
BE, FR, PT, SK, ES	AT, CZ, DK, FI, DE, GR, IE, IT, NL, PL, RO, SE, UK, CH, UA

MARCOSTAT Calls for data overview (2/3)

- CALL#4: EGAS B new report on Gas Distribution Safety – **call is closed**

Countries/members that provided data	Countries/members that did not contribute
AT, BE, CZ, FR, DE, GR, IT, NL, PL, PT, RO, SK, ES, SE (no data available)	DK, FI, IE, CH, UA, UK

- CALL#5: EGAS C report on Gas Installations Safety – **deadline extended to end of December**

Countries/members that provided data	Countries/members that have not contributed yet
IT, NL, PL, DE, DK, CZ, BE (no data available), ES	IE, GR, FR, AT, PT, RO, SK, FI, SE, CH, UA, UK

MARCOSTAT Calls for data overview (3/3)

- CALL#6: Customer Experience Metrics – **deadline mid-February**

Countries/members that answered	Countries/members that have not contributed yet
DK, NL, SE, IE, IT, PT, CZ	GR, FR, AT, RO, SK, FI, CH, UA, UK, DE, ES, PL, BE,

- CALL#7: Data collection on new molecules in LNG terminals – **deadline end of December**

Countries/members that answered	Countries/members that have not contributed yet
SK, CH	GR, FR, AT, PT, RO, FI, UA, UK, DE, IT, ES, PL, BE, CZ, DK, NL, SE, IE

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VIII. Administration and Secretariat

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Technical Association of the European Gas Industry

Item VIII: Administration and Secretariat

Manuel Coxe - Secretary General

Executive Board Meeting of 13 December 2023

I - Human Resources

I. Eleonora Diakoumi

- Eleonora will start with MARCOGAZ in January 2024 for 6 months traineeship and with the aim of transiting to full-time permanent contract.
- She has MSc in Chemical Engineering (Aristotle University of Thessaloniki).

II. Friso Resink

- Is seconded for 8 months traineeship, since 01/05/2023 and will end on 31/012/2023, returning to Gasunie. He will be replaced by Eleonora.

III. Alma Maria Puente Moreno

- Alma is trainee since 11/09/2023 and her traineeship is expected to transit to a full-time permanent contract.
- She has MA in International Political Economy (King's College London) and BA in International Relations and Modern Languages (University of Essex & University of Saint-Louis).

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II – State of Budget of 2023 as of 30/11/2023

	Approved Budget (15/12/2022)	Received / Paid (as of 30/11/2023)	Expected (by 31/12/2023)	TOTAL Projection
INCOME	€ 594 (000)	€ 616 (000)	€ 18 (000) Membership € 5 (000) Bank Interest	€ 639 (000)
EXPENSES	€ - 668 (000)	€ - 537 (000)	€ - 118 (000)	€ - 655 (000)
TOTAL PROFIT/LOSS	€ - 74 (000)	€ 79 (000)	€ - 95 (000)	€ - 16 (000)

AMOUNT AVAILABLE AT BANK (€ 1 477 000):

€ 76 (000) AT CURRENT ACCOUNTS
€ 101 (000) AT FLEXIBLE DEPOSIT
€ 1 300 (000) AT FIXED TERM DEPOSIT (3M & 11M)

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III – Situation with Financial Auditors

- Deloitte has audited MARCOGAZ financial accounts for more than 10 years.
  - In November 2023, Deloitte informed about their difficulty to continue with MARCOGAZ due to shortage on their resources.
  - Exceptionally, they can still do the financial audit of the accounts of 2023 for a payment of fee of **13.000 €** instead of 3.500 € paid last years.
- KPMG and PwC were contacted to make offers, but both denied due shortage on their resources.
- Ernst & Young (www.ey.com/en_be) was contacted and provided an offer at **5.000 €.**
- BST (www.bst.net) was contacted and provided an offer at **4.200 €**.
- The Executive Board is invited to decide on the financial auditor (Deloitte, E&Y or BST)

IX. Communications & Liaisons

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Technical Association of the European Gas Industry

Item IX: Communications & Liaisons

Manuel COXE, Secretary General of MARCOGAZ

MARCOGAZ Executive Board Meeting- 13 December 2023

Communications

- The MARCOGAZ Tech Forum on *'Cost Estimation of Hydrogen Admission into Existing Natural Gas Infrastructure and End-Use'*, which presented the main results and findings of the recently published MARCOGAZ study and explored the efforts of Fluxys and Floene in decarbonising the gas grid, took place last 23rd November 2023, with a record of 203 participants attending the event.
- The new Annual Report 2022-2023 is being finalised and it is aimed to be published in January 2024 for distribution.
- All Communications related to the MARCOGAZ 55 years in 2023 will end this month of December.
- MARCOGAZ partnership agreements with relevant energy-related events in 2024 are currently being discussed and signed.

Liaisons

- Ukrtransgaz (NAFTOGAZ), the Underground Gas Storage of Ukraine, expressed interest in becoming a Member. Official request has not been received yet.
- REN, the Portuguese gas TSO, expressed interest in becoming a Member. Official request has not been received yet.
- MARCOGAZ Secretariat held a meeting on 1st December 2023 with the Bulgarian Gas Association regarding potential future Membership.
- MARCOGAZ participated in the meetings of EURAMET, WELMEC, GIIGNL and OIML, among others, strengthening its partnership and liaison with these key stakeholders.
- MARCOGAZ participated in the last 3 months in the following European Commission Forums on energy and gas:
  - Citizen’s Forum, Dublin – 9th November 2023
  - CCUS Forum, Aalborg – 27-28 November 2023

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X. Dates of the next meetings

Dates of Next Meetings/Events

13 Mar. 2024:	Executive Board Meeting in Dublin, Ireland.
	Welcome dinner the night before (12 Mar. 2023).
17 June 2024:	Executive Board Meeting in Hamburg
17 June 2024:	General Assembly in Hamburg
	Welcome dinner (jointly with EGATEC 2024)
18-19 June 2024:	EGATEC 2024 in Hamburg

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XI. AOB

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