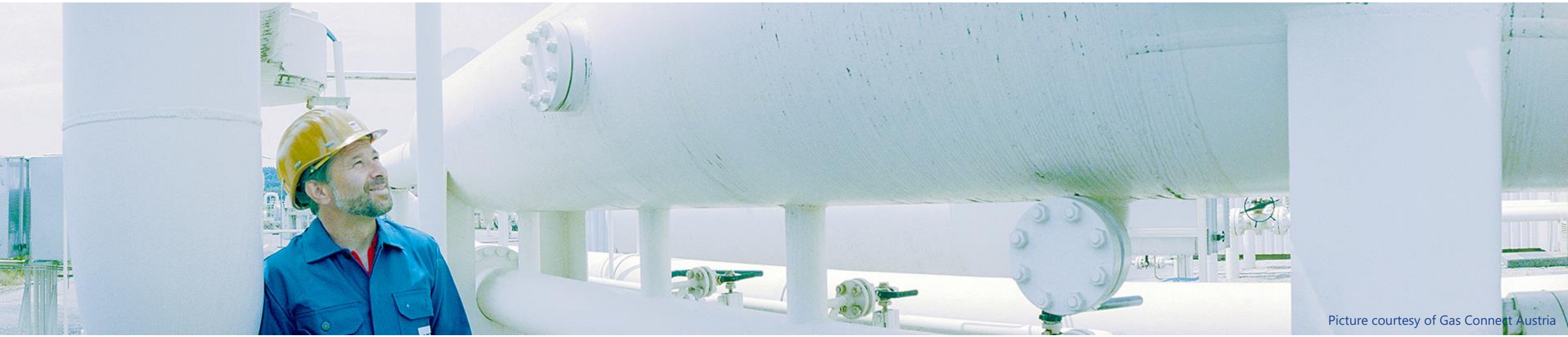


Prime movers' group on Gas Quality and H_2 handling

Kick-off meeting, 15 September 2020 (14:00 – 16:00)

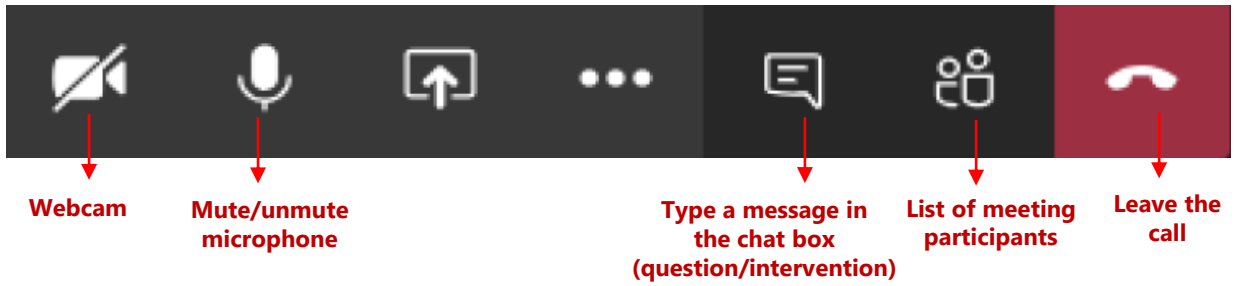
Online

Disclaimer

The information included in this presentation is subject to changes. The proposals are presented for informative purposes only since the work is still in progress.

The organisation is not liable for any consequence resulting from the reliance and/or the use of any information hereby provided.

Housekeeping



General:

- Please **mute your microphone** during the whole workshop unless asked by Chair to provide verbal intervention.
- Please **do not use the webcam** function since this can affect the stability of call.
- Please do **not connect via multiple devices**, as this will overload the Microsoft Teams tool
- If you dialled into the meeting, please **press *6 to mute/unmute**

Posing questions/interventions:

- Use the **chat box** which is visible to all meeting attendees to **pose your questions/interventions**.
- When questions are left unanswered, the meeting organisers will take note of them and answer by email to the interested parties.

But first…

- Beyond the scope of this process:

Discussion on values in the CEN standard, or

Wobbe Index

Agenda

01 Welcome and introduction
14:00 – 14:10

02 Presentation of the context, goal, and process structure
14:10 – 15:00

03 Expression of interest and suggestions from stakeholders
15:00 – 15:55

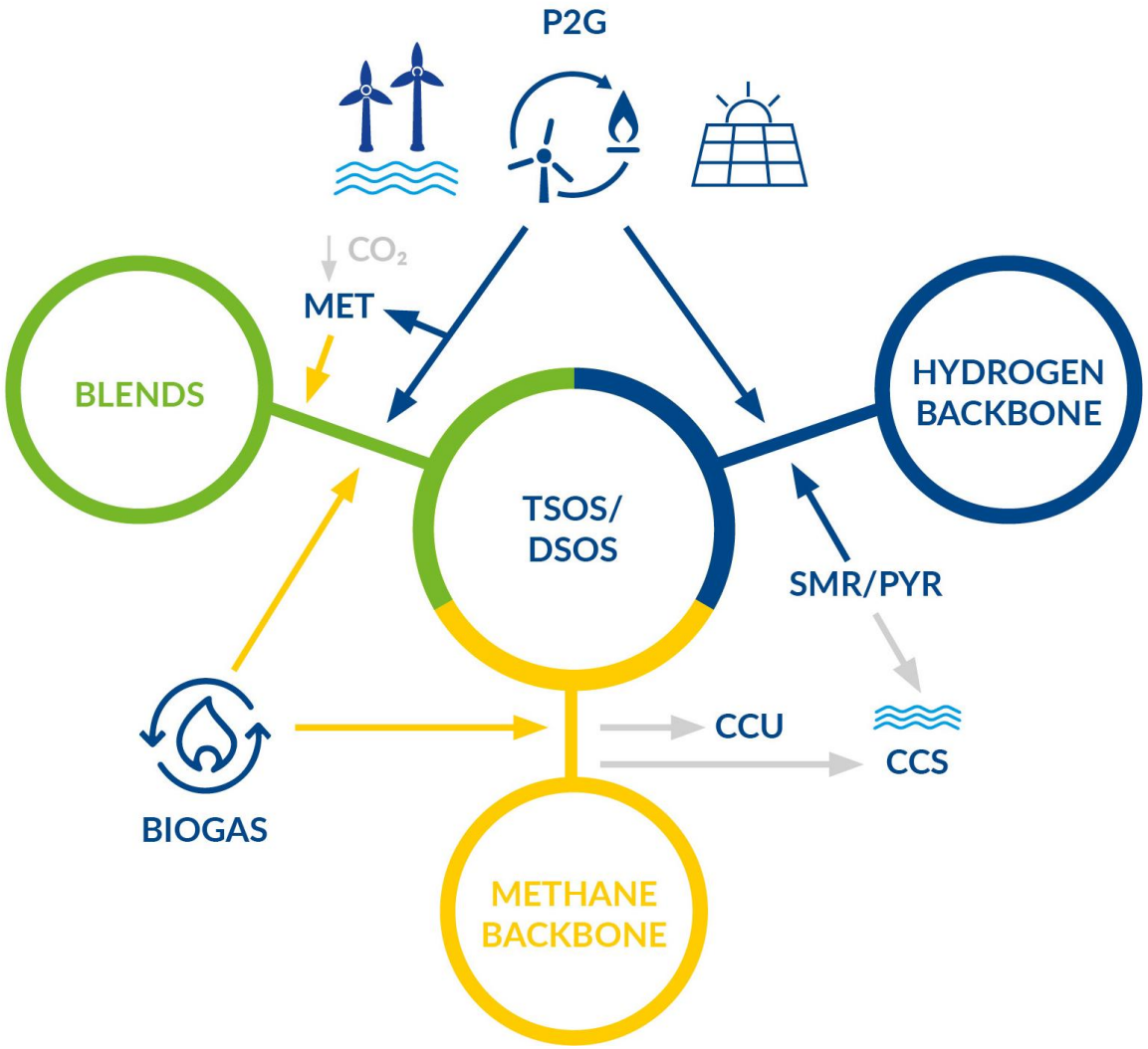
04 Concluding remarks and next steps
15:55 – 16:00

Presentation of the context, goal, and process structure

Context and background

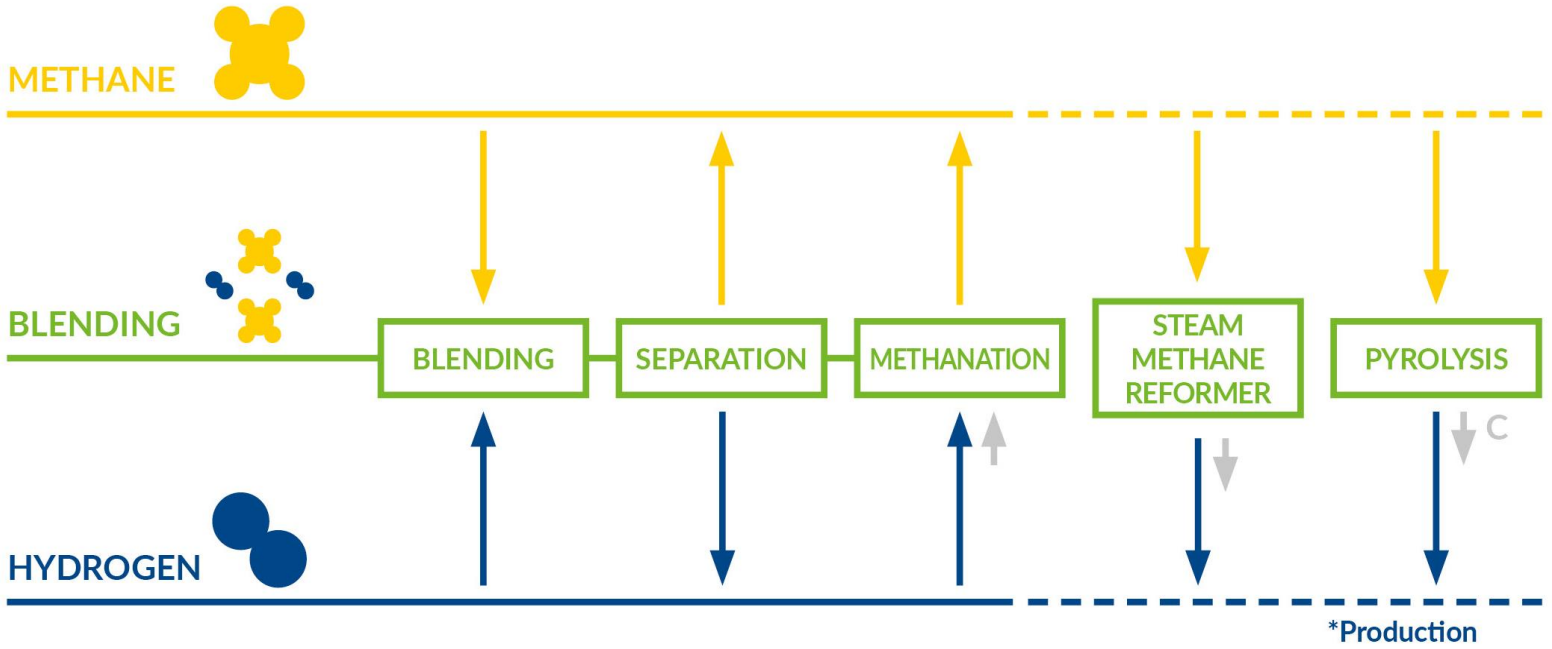
ENTSOG Roadmap - Grid configurations for new gases

Pathways materialise differently and co-exist depending on local/regional framework



ENTSOG Roadmap - European Gas Quality & Hydrogen Handling

TSOs and DSOs are well placed with relevant technical expertise and experience to actively participate in managing interfaces between electricity and gas and between gases



ENTSOG roadmap – Workshop conclusions

A **'system approach'** where the whole value chain works cooperatively is essential

Blending of hydrogen in the gas grid presents several benefits such as the overall **energy system optimisation** and reduction of costs

Consumers concerns on blending regarding the **composition, predictability and stability** of the gas quality still to be addressed

Hydrogen blends are already being **field tested** in several European countries

Hydrogen backbone offers the opportunity to contribute significantly to a cost-efficient energy transition

Gas quality should not be a limitation for **cross-border trade, security of supply, and for end-users'** appliances safety and performance

The combination of the different **available resources and grid possibilities** is a way to guarantee the security of supply

New technologies and **smart grid services** could help in addressing these issues but need further development

DSO cooperation

1. Use of **existing distribution networks** for managing H_2 blends seems the optimal way to increase the share of renewable and decarbonised gas with limited change in consumers habits and end-user appliances
2. Help develop a more structured approach **building on best practices** across Europe to facilitate dealing with hydrogen injection by
   - ensuring adequate involvement of end-users
   - ensuring adequate coordination between infrastructure operators
   - identifying sensitive customers
   - help develop ideas and safety nets for adaptions
3. Digitalisation and **smart grids** are being rolled out and will help track the H_2, Wobbe and Calorific Value throughout the grids and will help to manage gas quality also in case variable blending of methane and hydrogen

Gas Quality & hydrogen showcases

Some examples…

Jupiter 1000 (FR)

1MWe installed. Injecting hydrogen and synthetic methane into the natural gas transmission network since 2020.

Testing of the H2NG supply in Contursi Terme (IT)

10% hydrogen and natural gas blend into the Italian gas transmission network. Supplying to two industrial companies: a pasta factory and a mineral water bottling company.

mySMARTLife project in Hamburg (DE)

Blending of up to 30% of H2 into the gas distribution network with the purpose of operating a climate-friendly heating system and supplying 273 apartments with heating energy and hot water.

Power-to-gas project in Sardinia (IT)

Creation of a P2G plant to produce hydrogen or renewable methane. These "green" gases are to be injected and blended in the gas distribution grid to contribute to the decarbonisation of consumption by domestic users.

GHRYD project in Cappelle-la-Grande (FR)

A 3-year project finalised in March 2020, which tested the injection of 20% of hydrogen in the natural gas network to deliver energy for an entire new neighbourhood, and in a NGV refuelling station for buses.

H2 powered buses in Vienna (AT)

Wiener Stadtwerke is working on a comprehensive hydrogen strategy for Vienna: as from 2023, Wiener Linien will deploy 10 hydrogen buses, refuelled by Wiener Netze infrastructure with H2 produced by Wien Energie.

Where are we?

As the gas industry is gearing up its efforts to rollout increasing levels of **renewable, decarbonised and low-carbon gases**, the European gas system will have to be able to **adapt and deal with diverse gas mixes** which need to be handled technically

Progress in EU harmonisation of gas quality

EASEE-gas
Streamlining the gas business

Common Business Practice on H-gas Quality at cross-border points (2005)

cen

EU standard EN 16726:2015

EU standards EN 16723-1/2

SFGas GQS on Wobbe index

European Commission

EC mandate M/400 (2007)

INT NC (2015)

EU strategy for Energy System Integration (2020)

EU hydrogen strategy (2020)

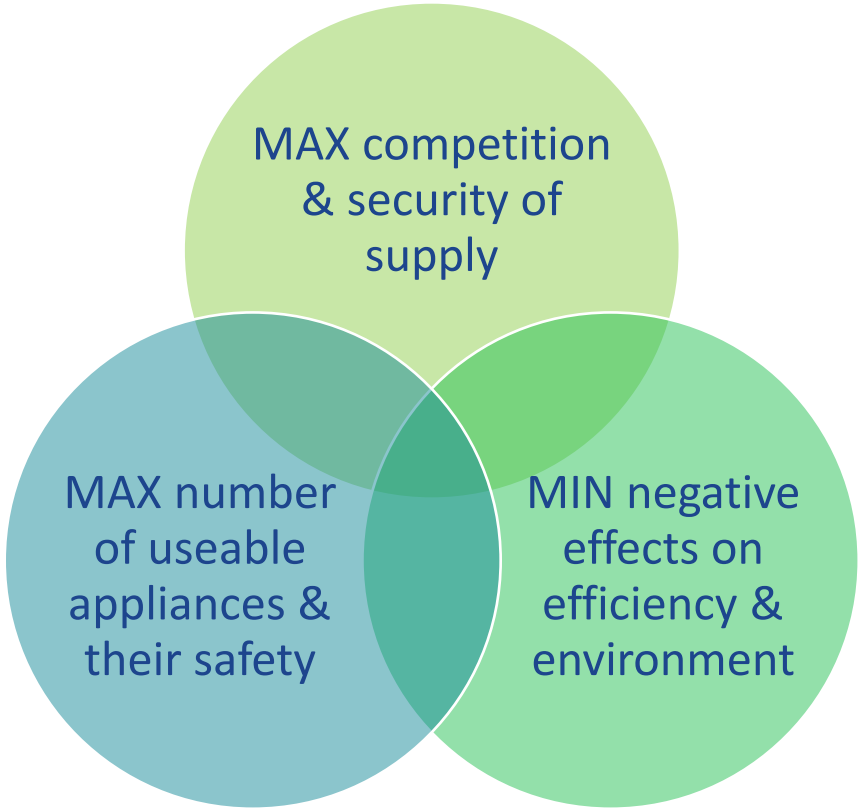
entsog

Interoperability & Data Exchange Network Code (2015)

Impact analysis of reference to EN16726:2015 in INT NC (2016)

EC Mandate M/400 (2007)

- CEN to draw up standards for gas quality parameters for H-gas as wide as possible within reasonable costs



Interoperability Network Code

- Facilitate cross-border gas transports and effective market integration through the application of a number of harmonised principles and common rules for:
  - the establishment and/or amendment of Interconnection Agreements
  - a common set of units to be applied
  - the managing of gas quality differences & the monitoring of gas quality
  - odorisation
  - common data exchange solutions
  - dispute resolution

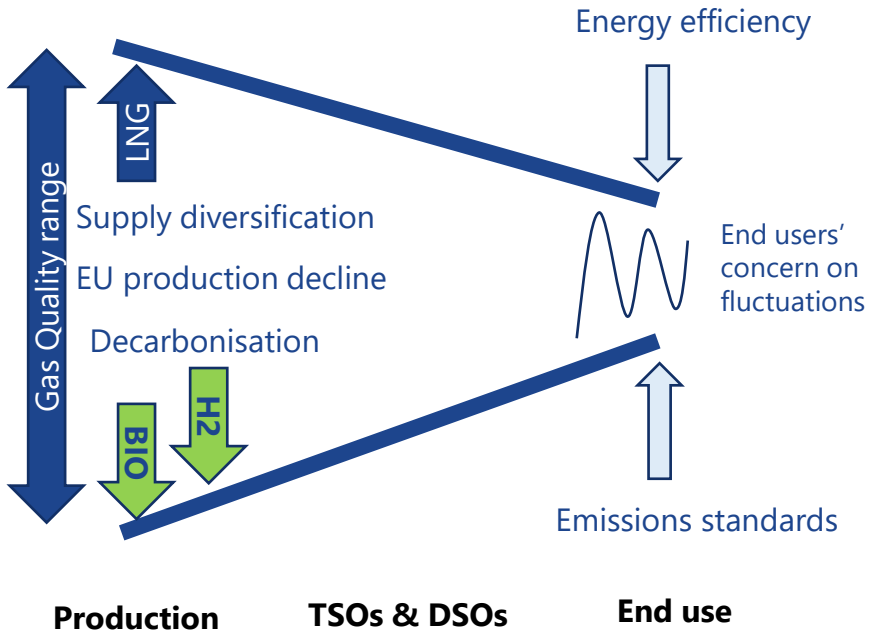
CEN SFGas GQS: Recommendations and considerations on Wobbe index aspects related to H-gas

29th Madrid Forum:

- "encouraged CEN to carry on the work on finding an agreement on a band for the Wobbe Index, (…) to be included in an **updated CEN** while ensuring its integrity of the existing standard and calls on **market participants** to be **constructively engaged** in this process"
- "The Commission will reconsider further harmonisation activities in light of the outcome of the CEN revision work."

31st Madrid Forum conclusions:

- Invitation to CEN to **integrate renewable and low-carbon gases** in European standard for H-gas quality
- Assessment of effects and refurbishment costs of increasing hydrogen shares on
  - Gas grids, storage facilities, end-user appliances
- Emphasis on the importance of
  - First experiences, sharing of best practices, digitalisation



EU H_2 and ESI Strategies

- To ensure interoperability of markets for **pure hydrogen**, it may be necessary:
  - common quality standards (e.g. for purity and thresholds for contaminants) or
  - cross-border operational rules
- The **blending of hydrogen** in the natural gas network at a limited percentage may enable decentralised renewable hydrogen production in local networks in a transitional phase
  - Technical feasibility of adjusting quality & cost of handling the differences in gas quality need to be assessed
  - Current gas quality standards – national and CEN – would need to be updated
  - Reinforcement of instruments may be needed to secure cross-border coordination and system interoperability for an unhindered flow of gases across Member States

Open issues

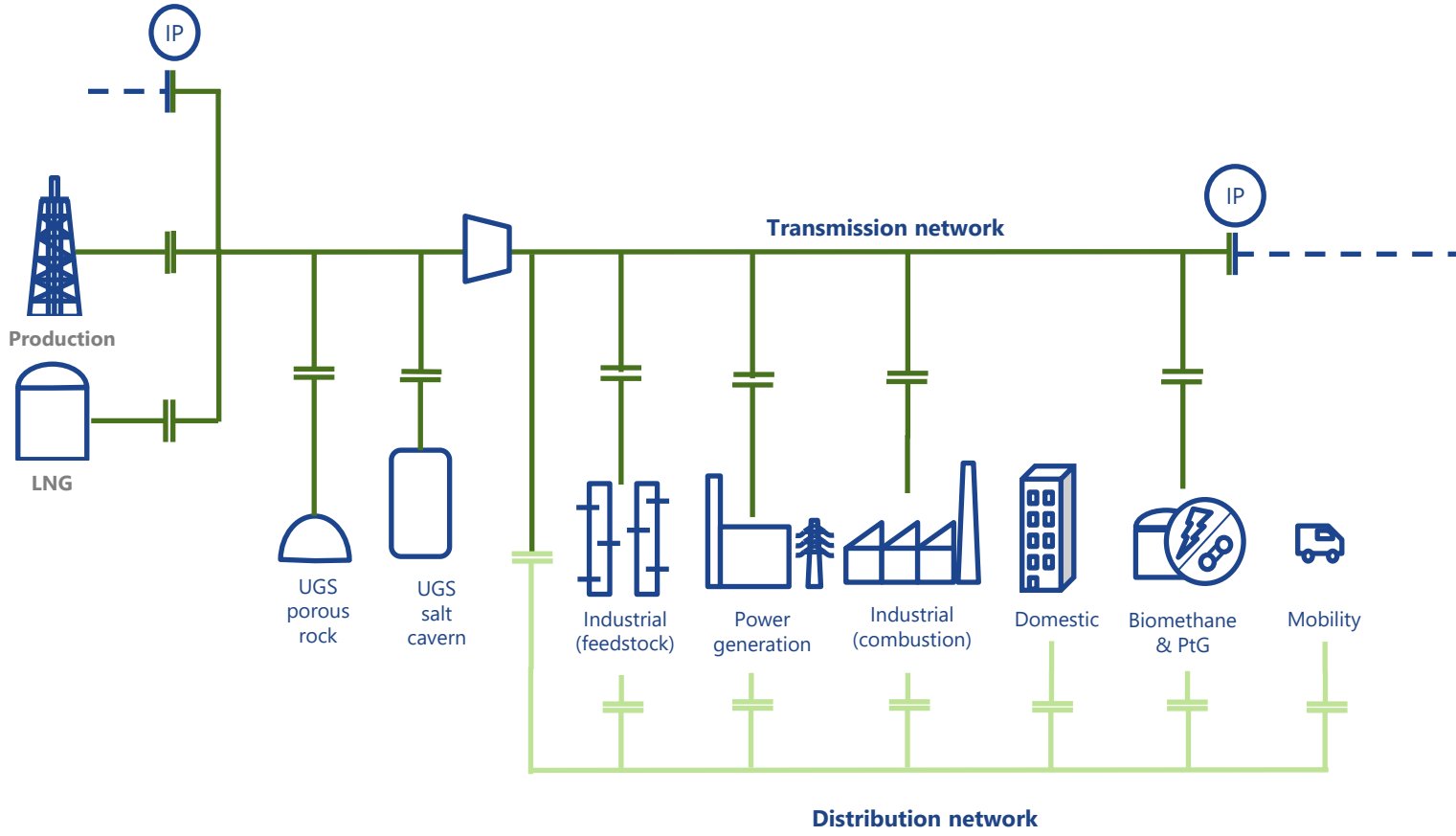
- Set of principles for **managing consumer gas quality needs** and requirements, and information flows
- Common **agreement along gas value chain** on practical implementation of different hydrogen concentrations
- Cost-benefit **analysis for potential solutions** along the gas value chain, including proposals for injection management
- Adaptation of current framework and practices of **gas quality measurement, monitoring and management**
- Retrofitting/**repurposing of existing pipelines** for H_2 blends and case scenarios for building dedicated network
- With an increasing number of connections at a local level, it will be crucial to ensure the physical flow of gas, and the set of **technical rules for DSO/TSO connection, interaction**, gas quality managing principles and information flow in either ways
- Increased **coordination and planning** of TSO/DSO grids will be crucial to ensure maximum exploitation on renewable gas potential

Currently unconsidered aspects – your engagement is required!

Process goal and structure

Concept

- ✓ Decarbonisation of the grid in a cost-effective manner demands a **'whole system approach'** where the gas value chain works cooperatively together
- ✓ A **genuine collaborative** effort is needed to identify approaches that deliver on the policy objectives
- ✓ The **commitment** of at least a small but diverse group of stakeholders will be critical



Consensus on the main principles to handle Gas Quality and Hydrogen to optimize

- **supply diversification,**
- **decarbonization, and**
- **guarantee safe usage**

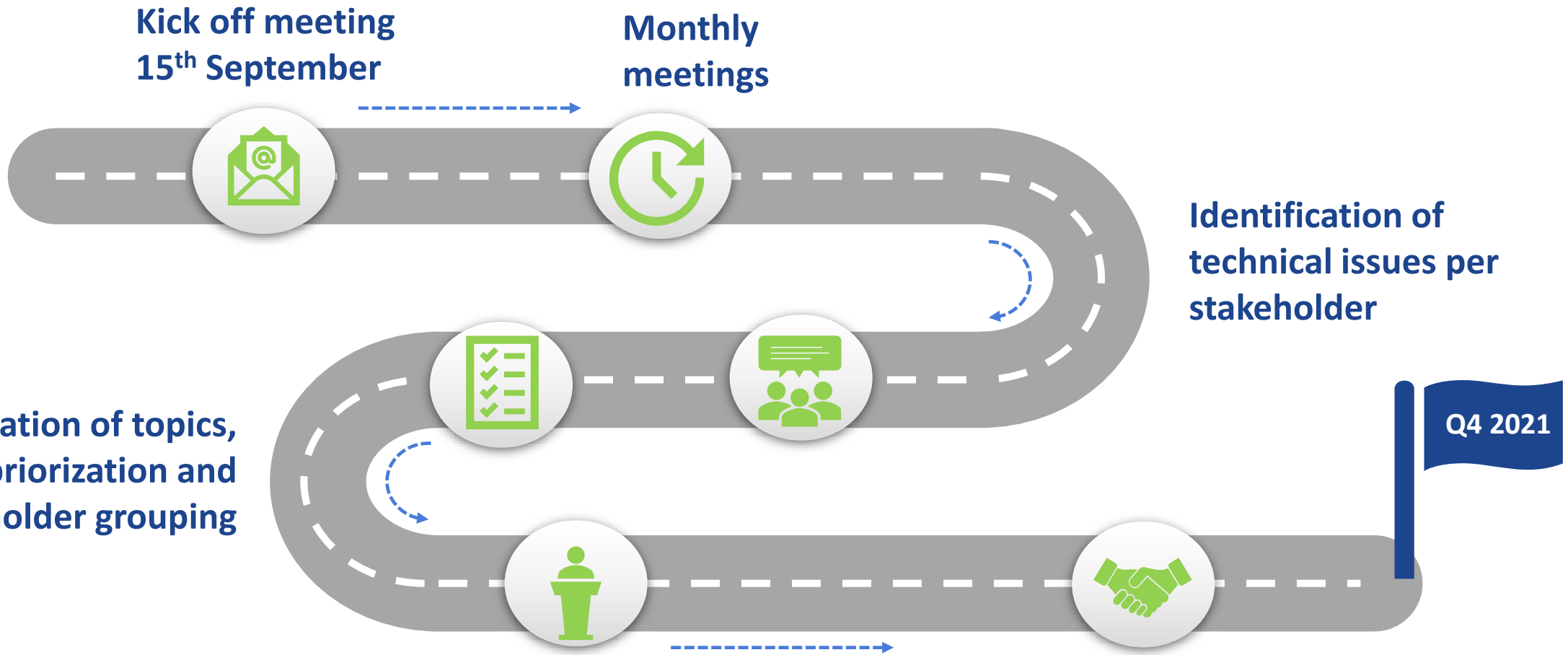
Concept

Assess the need for **new or upgraded tools** to ensure system interoperability, security of supply and **meet end-users' needs and safety requirements**

Promote a fact-based, technology-neutral, and **fair discussion** among stakeholder of the whole gas value chain

Facilitate the development of **innovative and cost-efficient ways** to handle gas quality

Proposed process - Overview



Proposed process - Structure

- Striving to have a balanced distribution of the representatives from each part of the gas value chain, it is envisaged a **maximum 2 participants (1 representative + 1 expert)** per organisation
- Frequency of meetings will be **monthly**
- **Public page** with meeting agendas, public information and deliverables, when applicable [link]
- Private **SharePoint** to facilitate the exchange of documents, organisation of meetings and follow-up by the participants – to be provided once final email distribution list is confirmed

First work deliverable

1. An excel template has been developed for this purpose. It will be distributed by email to all attendees as well as it will be uploaded to the SharePoint*
2. Each organisation is encouraged to **assess the relevant interfaces** for their business:
    1. **identifying** the main problems foreseen related to variable gas quality in the short and long-term
    2. **listing the main technical issues** and challenges that need to be tackled at first
    3. **assessing possible solutions** for each area of concern, considering the main barriers preventing the implementation of the proposed solutions

*SharePoint to be created once final participants' list is confirmed (end September)

First Work deliverable

3. Inputs

- **Interface type**
- **Conversion** between energy carriers
- **Type of issue**: market, technical, regulatory
- **Potential barriers** or problems identified
- **Criticality** of the problem
- **Potential solutions** that could be implemented, regulatory changes needed, type of research needed, etc.
- **Expected implementation time** of the proposed solution (if applicable)
- **Expected costs** of the proposed solution (if applicable)

Interface Type	Conversion	Type of issue	Critical
P2G - TSO	H2NG => Hydrogen	Technical	High
TSO - TSO (IPs)	H2NG <=> Hydrogen	Regulatory	Medium
TSO - Separation Station	H2NG <= Hydrogen	Market	Low
TSO - DSO	Hydrogen => H2NG	Technical & Market	
DSO - Industry	Hydrogen <=> H2NG	Technical & Regulatory	
DSO - Filling Station	Hydrogen <= H2NG	Technical, Regulatory & Market	
DSO - Residential	H2NG => Methane	Regulatory & Market	
TSO - G2P	H2NG <=> Methane	Other	
SSO - TSO	H2NG <= Methane		
TSO - SSO	Methane => H2NG		
NP - TSO	Methane <=> H2NG		
TSO - Industry	Methane <= H2NG		
P2G - DSO	Hydrogen => Methane		
NP - DSO	Hydrogen <=> Methane		
TSO - Blending Station	Hydrogen <= Methane		

Detailed information about the inputs is provided in Annex I

… more interfaces and conversion types are provided

First work deliverable

4. Fill-in example – Part 1

Organisation name	Interface Type	Conversion	Type of issue	Potential barriers	Criticality	Potential solutions	Expected implementation time (in days)	Expected Cost (CAPEX + OPEX)	Comments
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Technical, Regulatory & Market	Different regulatory frameworks	High	xx	xx	xx	
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Technical, Regulatory & Market	Interconnection agreements	Medium	xy	xy	xy	
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Technical, Regulatory & Market	Different readiness for H2 blends	High	xz	xz	xz	Risk for SoS
Example: EUROGAS	DSO - Industry	H2NG <=> H2NG	Technical & Regulatory	Right blend for chemical processes	High	xw	xw	xw	

High These issues are real barriers for cross-border trade, market integrity, security of supply, performance, efficiency or sustainability of the processes or appliances. These barriers should be avoided wherever possible

Medium May lead to sub-optimal gas market and/or end-users' appliances performance. However, the effect does not impose a barrier and/or can be overcome with existing solutions and at reasonable costs

Low Is not necessarily a barrier, but can affect the efficient functioning of the gas market, and/or end-users' appliances

Disclaimer: Examples are provided for informative purposes only and do not necessarily reflect organisations' views on the matter

First work deliverable

4. Fill-in example – Part 2

Organisation name	Interface Type	Conversion	Type of issue	Potential barriers	Criticality	Potential solutions	Expected implementation time (in days)	Expected Cost (CAPEX + OPEX)	Comments
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Regulatory	Different regulatory frameworks	High	xx	xx	xx	
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Regulatory & Market	Interconnection agreements	Medium	xy	xy	xy	
Example: ENTSOG	TSO - TSO (IPs)	H2NG <=> H2NG	Technical	Different readiness for H2 blends	High	xz	xz	xz	Risk for SoS
Example: EUROGAS	DSO - Industry	H2NG <=> H2NG	Technical	Right blend for chemical processes	High	xw	xw	xw	

Same party and gas type on both sides of the interface

Different types of barriers

Disclaimer: Examples are provided for informative purposes only and do not necessarily reflect organisations' views on the matter

First work deliverable

5. Filled-in templates should be sent by 19th October to*:

CEDEC	monica.dipinti@cedec.com
ENTSOG	rosa.puentes@entsog.eu
ENTSOG	thilo.gruen@entsog.eu
EUROGAS	njen@eurogas.org
GD4S	leonardo.dacquisto@italgas.it
GEODE	heklund@geode-eu.org

*Please, add all email addresses to your answer submission in order to facilitate the process

First work deliverable - Next steps

19th October

Submission deadline for filled-in templates

20th - 26th October

Processing of submissions by CEDEC, ENTSOG, Eurogas, GD4S, and GEODE

Second meeting: 27th October

Issues' overview and recommended stakeholder grouping

28th October – 24th November

Work on relevant issues in groups

Third meeting: 25th November

Presentation of first findings and recommendations by representatives of each group

Expression of interest and suggestions from stakeholders

Stakeholders*

Appliances/applications & Industrial/commercial/residential users

- EUROMOT
- EU Turbines
- EU Turbine Network GERG
- CECOF
- Marcogaz
- GWI
- Figawa
- Euramet
- Eugine
- Farecogaz
- EASEE-gas
- Eurofer
- CEMBUREAU
- Cerame-Unie
- EFET
- Eurelectric
- EU Turbine Network
- IFIEC
- NGVA
- ELVHIS
- Afecor
- Hydrogen Europe

System operators

- Eurogas DIST
- CEDEC
- GD4S
- GEODE
- GIE
- Hydrogen Europe
- EASEE-gas
- Marcogaz
- GERG
- ENTSOG

Shippers/gas producers

- EBA
- EFET
- IOGP
- Landwärme
- Eurogas
- Eurelectric
- Hydrogen Europe
- EASEE-gas

*Please note that the list is not exhaustive. More stakeholders have joined the process since the kick-off meeting

Concluding remarks & Next steps

Next steps

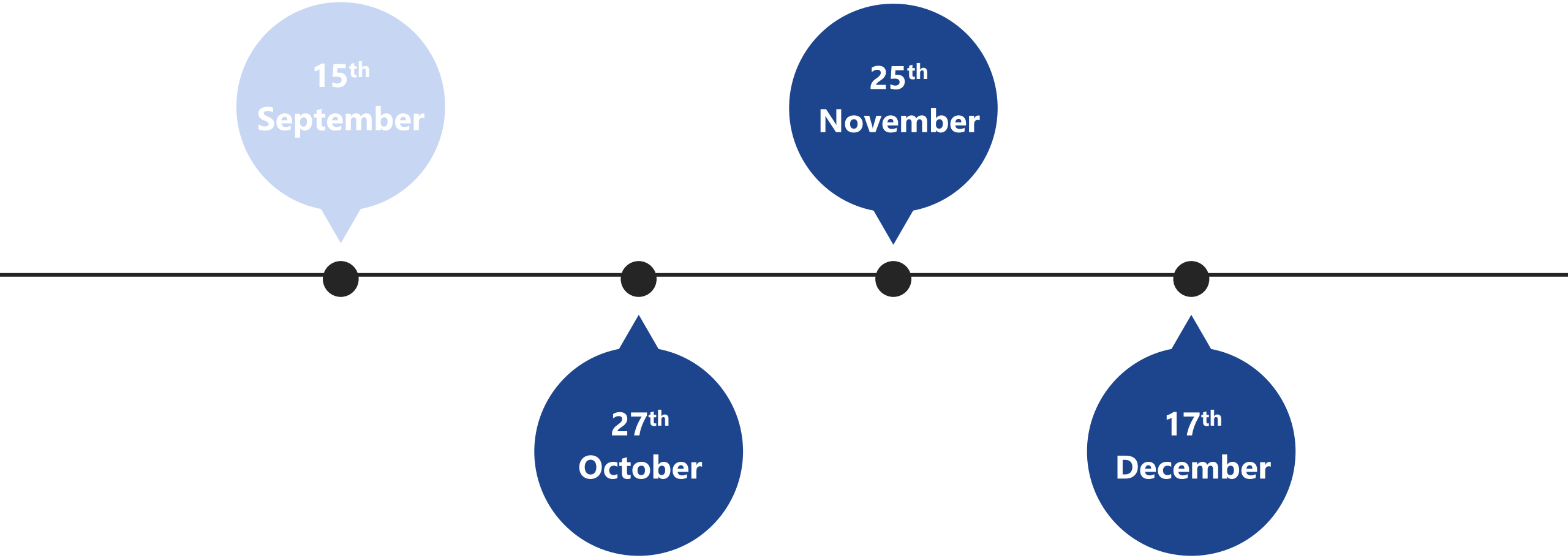
– Confirmation of participation and contact details of organisations' representatives (max. 2) by **29th September**

– Deadline for template submission: **19th October**

– Next meeting **27th October** from 10:00 to 13:30 CET

SAVE THE DATE!

Meetings outlook proposal



Thank you for your attention

Back

Annex I – First work deliverable instructions

Interface Type

The whole list of technical interfaces identified is provided in the sheet **"Inputs"**. For each row, select the interface from the "dropdown" list provided. One interface should be addressed for each row (e.g. TSO-DSO). The same interface can be addressed in several rows if different type of issues are identified (see definition of "type of issue" below)

Conversion

Select the type of conversion that happens at the chosen interface (e.g. from H2NG blend to H2, or from CH4 to H2NG). Conversions between different carriers are presented in a "dropdown" list. The whole list can be consulted in the sheet **"Inputs"**

Type of issue

Type of issues has been classified in technical, regulatory, and/or market. Choose one of them or a combination from the "dropdown" list for each interface. In the case that an interface can present several types of issues, repeat the exercise for that interface in different rows

Potential issues

Each stakeholder should provide a brief description of the issues that may arise at that particular interface within that particular type of issue. No "dropdown" list is provided, therefore, there is freedom in what can be written

Criticality

The identified issue should be classified depending on its criticality. Definition of each criticality level is provided below:

High These issues are real barriers for cross-border trade, market integrity, security of supply, performance, efficiency or sustainability of the processes or appliances. These barriers should be avoided wherever possible

Medium May lead to sub-optimal gas market and/or end-users' appliances performance. However, the effect does not impose a barrier and/or can be overcome with existing solutions and at reasonable costs

Low Is not necessarily a barrier, but they can affect the efficient functioning of the gas market, and/or end-users' appliances

Potential solutions

Each stakeholder should provide at least an example of a possible solution that may help to solve the aforementioned issue. There is no limitation by a "dropdown" list. Answers could include: adaptation of regulatory framework, use of new technologies, information provision, GQ measurement, etc.

Expected implementation time

If applicable, an approximation of the expected time that it would take to implement such solution should be provided

Expected Cost

If applicable, an approximation of the expected cost to implement such solution should be provided

Comments

If "Other" option has been selected in any of the answers above, please indicate what it refers to here.
Any other relevant aspect that has not been covered before but could be relevant for the purpose of this exercise, should be also mentioned here.