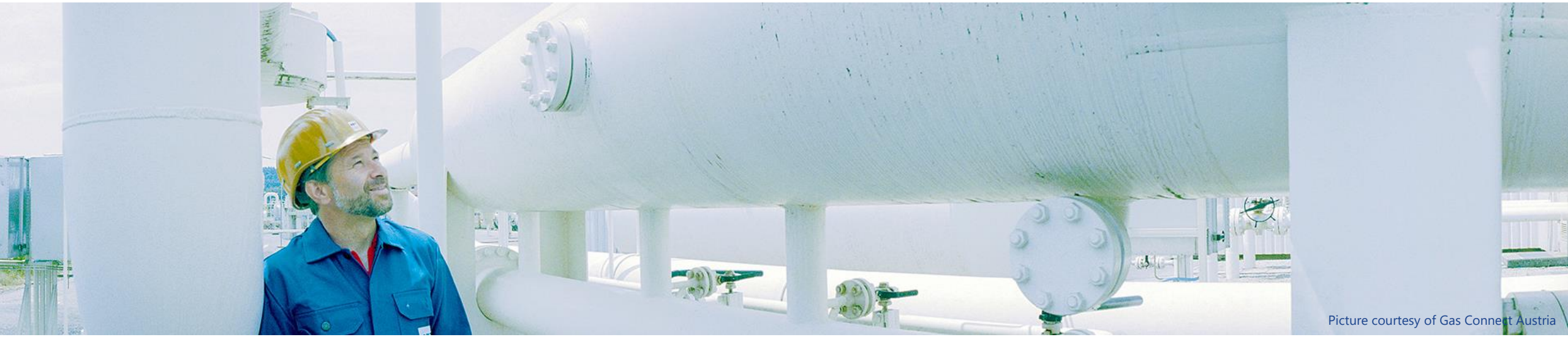


Prime movers' group on Gas Quality and H_2 handling

#8 meeting, 20th April 2021 (13:00 – 16:00 CET)

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.

Agenda

Agenda

Topic	Time
1. Welcome and agreement on agenda	13:00 – 13:05
2. H2vorOrt project presentation	13:05 – 13:40
3. Debrief on SG2 progress & PMG feedback	13:40 – 14:10
Break	14:10 – 14:20
4. Open discussion among stakeholders: Hydrogen and Gas Market Decarbonisation Package Public Consultation – Which impact does it have in PMG work?	14:20 - 15:00
5. Open discussion among stakeholders: 35th Madrid Forum – Gas quality in the in the existing gas network	15:00 – 15:25
6. A.O.B. & next steps	15:25 – 15:30

H2vorOrt project presentation

Debrief on SG2 progress & PMG feedback

Initiatives & projects template

- 9 answers received

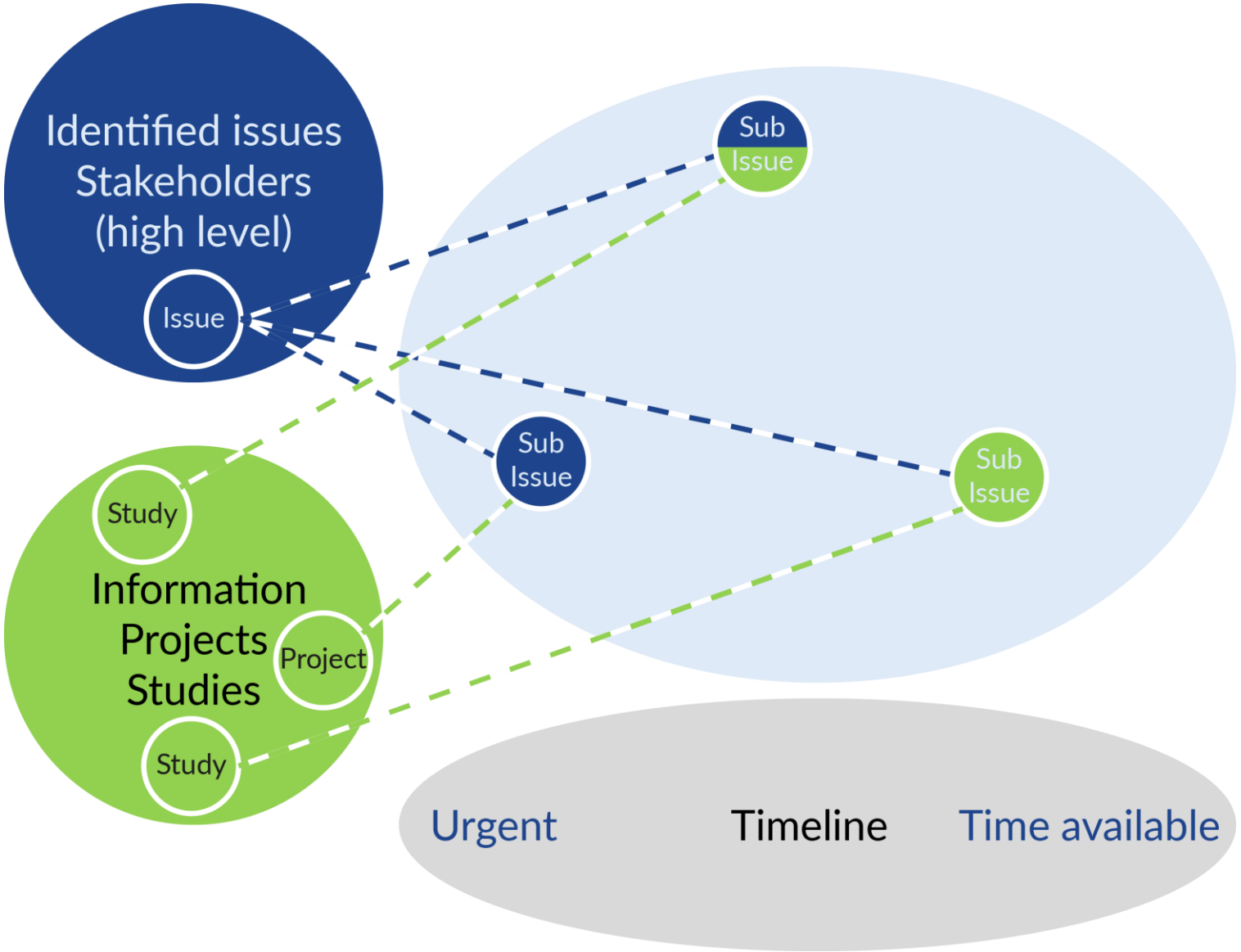
Might not enough for the purpose of the exercise…

Initiatives & projects template

- **Why mapping out current initiatives & projects is key**
  - Showcasing what is/has already been done
  - Seeing how different solutions have worked/not worked out
  - Sharing lessons learnt and best practices
  - Finding out ‘blueprints’ that could be repeated in different cases
  - And most important… it will ensure that work done is not repeated!

Extended deadline to 29th April

How does PMG work fit into SG2 deliverable?



Discussion on roadmap concept

Scenarios proposal & assumptions

Today

- Natural gas systems
- Point-to-point H2 connections
- Increasing biomethane injection
- H2 injection into the grid in pilot projects
- H2 mainly produced for dedicated onsite consumption
- Information on current limiting values is collected by Marcogaz, GERG, other associations work

Some gas quality fluctuations

1 scenario

Short-term/Mid-term (2025-2040)

- Developments of EU H2 backbone
- H2NG produced decentralized and injected to the grid
- Current installed base of applications limits the use of H2NG

Some end-use consuming H2NG

4 scenarios

Long term (2040-2050)

- Full deployment of H2 backbone at TSO and DSO level
- H2NG in some regions and/or as 'buffer' for H2 surplus
- Increased demand of H2 at all levels

Full sector coupling

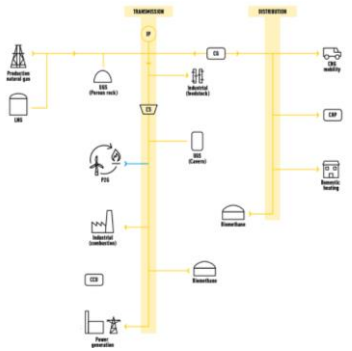
1 scenario

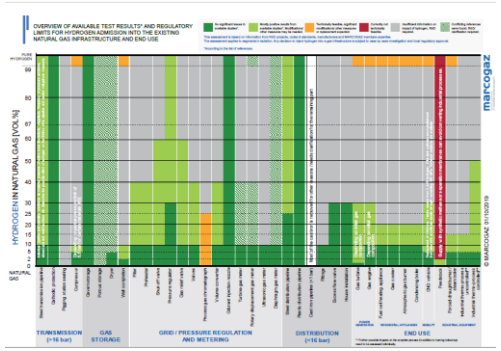
How to transition?

How to transition?

Scenarios proposal

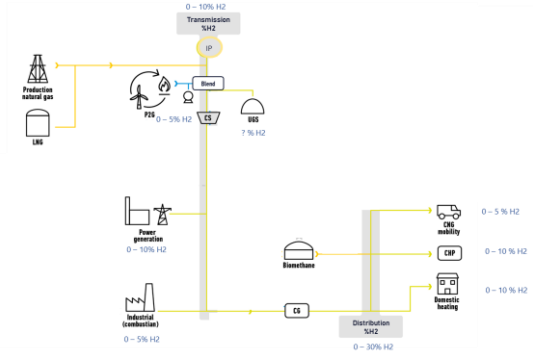
Today



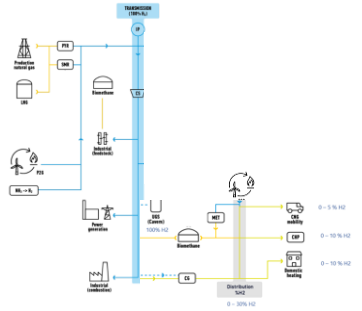


Short-term/Mid-term*

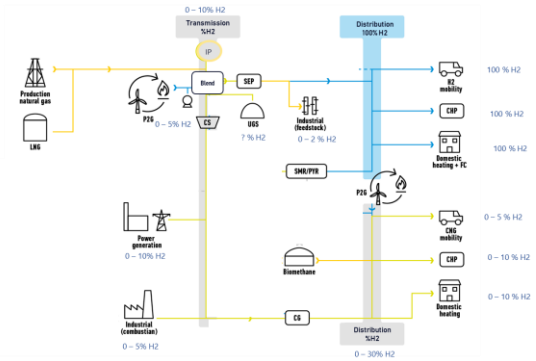
H2NG at TSO and DSO level



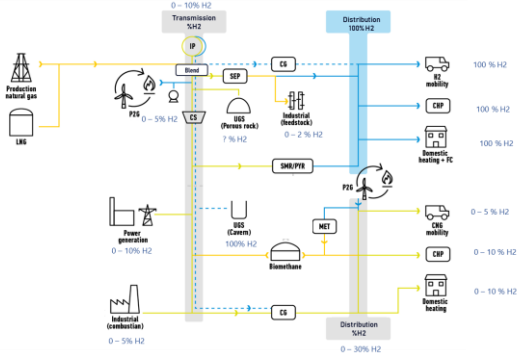
Pure NG and H2 backbone at TSO level, H2NG at DSO level



H2NG at TSO and DSO level, plus H2 grids at DSO level

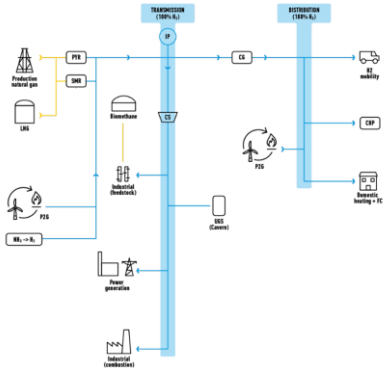


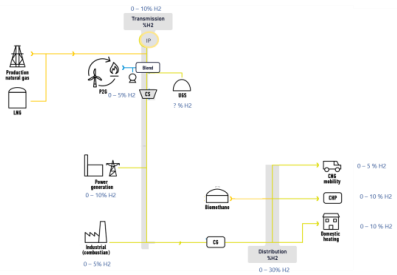
H2NG at TSO and DSO level, plus H2 grids at DSO and TSO level



*They could be combined depending on region's requirements

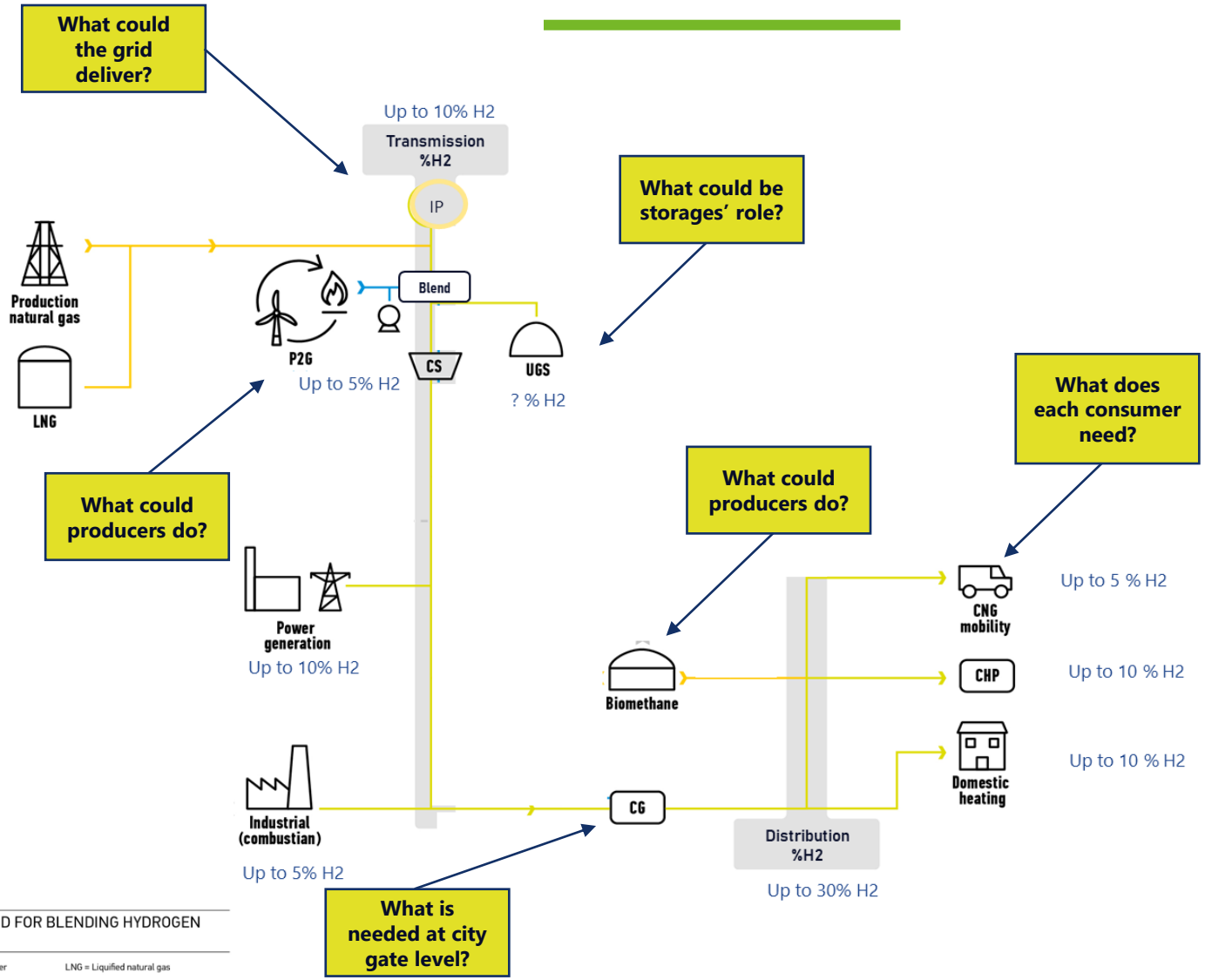
Long-term*





Note: In some regions, the injection on H2 could be switched to H2 backbones. The NG demand is expected to decrease

How to ensure a smooth connection of interfaces?



SCHEMATIC CONFIGURATION OF THE GAS GRID FOR BLENDING HYDROGEN AND METHANE (ENTSOG, 2019)

CH_4 H_2 CH_4H_2 CO_2

CC = Carbon Capture
CCU = Carbon Capture Utilisation
CG = City Gate
CHP = Combined Heat and Power
CNG = Compressed Natural Gas
CS = Compressor station
DAC = Direct Air Capture
FC: Fuel Cell
IP = Interconnection Point
LNG = Liquified natural gas
MET = Methanation
P2G = Power to Gas
PYR = Pyrolysis
SMR = Steam Methane Reforming
UGS = Underground Gas Storage

*Readiness based on Marcogaz infographic (2019)

Most voted topics to work on

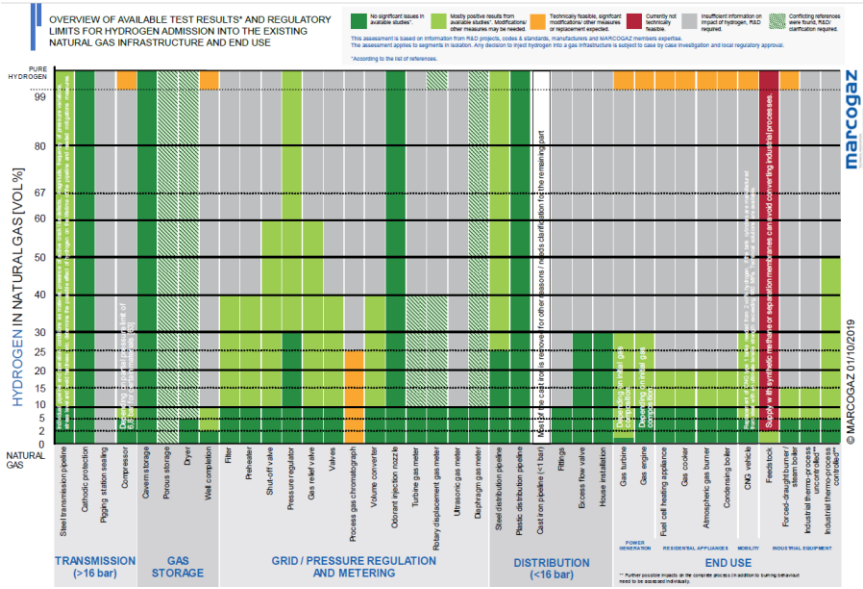
1. Blend stability & injection control mechanisms
2. Blending/de-blending & other conversion services
3. Feasibility of injection points
4. Digitalisation & smart services
5. Specifics for reverse flows
6. Others:
   - Downstream use of H2 (impact on appliances)
   - Plug flow issues
   - Odorisation

What is needed from each topic?

H2NG possibilities of the gas value chain

1. Not only maximum level is important but also the achievable bandwidth:

- There is information that for certain applications higher levels of hydrogen are allowed but that the application is limited in the H2NG range, i.e., it is not able to accommodate H2NG mixtures from pure NG to the maximum hydrogen level in NG
- **Which categories are involved and what are the limiting values for both: the H2NG upper and lower limits (i.e., how much could H2 fluctuate) depending on the base gas?**
- **Can the network be operated in such a way to accommodate this? What would be needed?**
  - A surplus of hydrogen needs to be available at all time to facilitate periods of low hydrogen supply. How can this minimum “base load” of H2 be provided?
  - The injection station needs to have a high availability. Is that economically possible?



Marcogaz infographic (2019)

H2NG possibilities of the gas value chain

2. Blending & injection facilities

- Is standardization work underway?
- Is all necessary equipment (i.e., sensors, instrumentation) available? (Who is performing research on these topics)
- What about the costs? Will it be possible to have dedicated injection facilities per end user? Or is it only possible to install centralised injection facilities (for example at the TSO – DSO interface)

3. Blending capacity

- The available blending capacity is depending on the available natural gas (quality, amount) passing along. If available blending capacity is too low to accommodate the hydrogen, curtailment of the hydrogen will take place. How to deal with this?
  - Flexibility of the hydrogen production (information exchange of available blending capacity)
  - How to inform shipper that its energy entry is curtailed and that he needs to balance the network by another source

4. Deblending

- At which moment will this technique be suitable for large scale usage?
- Magnitude/effect of pressure drop through membranes?
- Practical applications?

H2NG possibilities of the gas value chain

5. Mitigation measures for GQ

- PMG SG1 has proposed mitigation measures for Wobbe-index variations
- New focus could be:
  - what new developments are taking place in developing new applications which can cope better with GQ variations?
  - What information from ‘smart’ gas grids could be used?

6. Odorisation

- Topic is already discussed in various fora

7. H2 purity

- Topic is already under discussion in EASEE-gas, a New Work Item Proposal under CEN TC234 and is discussed in various member states. Especially regarding the trace components there seem to be a trend to take over the natural gas specifications (repurposed pipelines)
- Is a harmonized European specification necessary?

Priority list of topics to be tackled to transition towards long term scenario

Urgent topics

1. Acceptable H2 range that can be handled by each appliance/application and how could the network operate this way
2. Blending, de-blending & injection facilities
3. New developments for gas appliance/applications to handle future gas quality (including the understanding of how to make use of 'smart' gas grids)
4. Blending capacity (e.g., how to accommodate H2 injection requests within a limited available blending capacity)

Other topics

1. Reverse flows (TSO/DSO specific topic)
2. H2 odorisation
3. …

What is missing?

What is expected from you?

Acceptable H2 range that can be handled by each appliance/application

New developments for gas appliance/applications to handle future gas quality

How could the network operate this way

Understanding of how to make use of 'smart' gas grids

Based on expressions of interest and feedback submitted in January 2021 and identified topics to be tackled within SG2

What is expected from you?

Blending, de-blending & injection facilities

How to accommodate H2 injection requests within a limited available blending capacity

Transversal

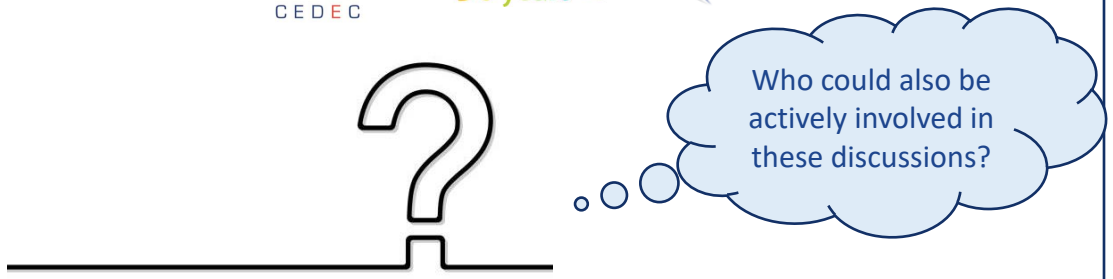
GEODE

GD4S Gas Distributors For Sustainability

CEDEC

eurogas 30 years

entsog



CEER Council of European Energy Regulators

cen CENELEC

EASEE-gas Streamlining the gas business

EFET European Federation of Energy Traders

marcogaz

eurelectric

GERG THE EUROPEAN GAS RESEARCH GROUP

gie

FARECOGAZ

EURAMET

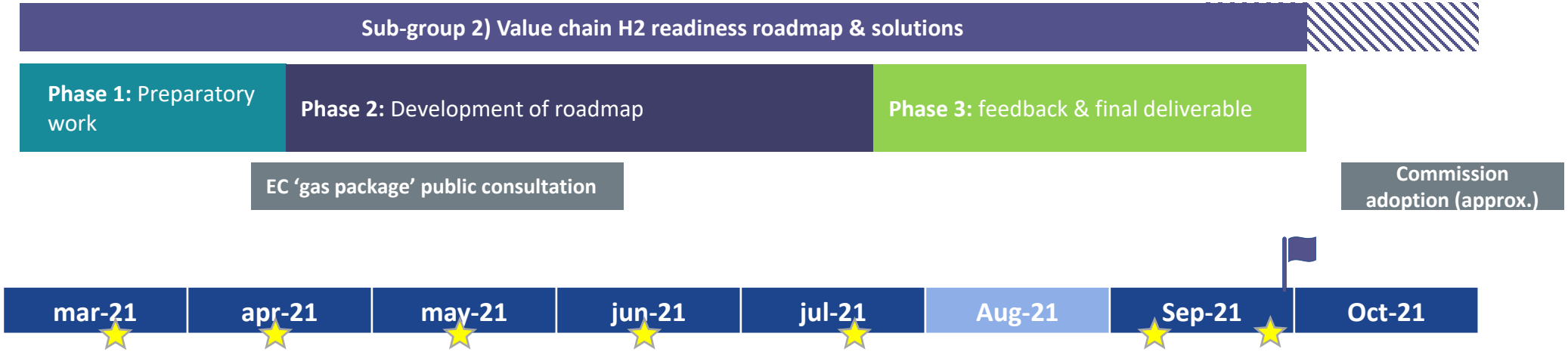
European Commission Joint Research Centre

Energy Community

Based on expressions of interest and feedback submitted in January 2021 and identified topics to be tackled within SG2

Participants feedback

Proposed plan



March-April

- Understanding and agreement on **concept** (development of scenarios, questions to be addressed, timelines to be included)
- **Map out** existing initiatives/projects and links with PMG-SG2 work

May-July

- Development of **roadmap** via bilateral stakeholder engagement
- Ad-hoc meetings to discuss specific topics
- Understanding of agreement & disagreements

September

- Agreement on **final deliverable**
- Dissemination of result

Next steps

- Extended deadline for ‘initiatives & project collection’ template (SG2 first deliverable) until **29th April**

- Today we presented very key concepts for further work in SG2. You are also invited, alog with SG2 participants, to take a look at slides 9 – 19 in more detail and **provide your feedback by email** along this week (**23rd April**)

Thank you for your attention

Co-chairs of SG2

Gas Distributors GD4S For Sustainability

Ruggero Bimbatti

EASEE-gas Streamlining the gas business

Peter van Wesenbeeck

Open discussion among stakeholders: Hydrogen and Gas Market Decarbonisation Package Public Consultation

Which impact does it have on PMG work?

81. In your view, should allowed hydrogen blending levels be introduced, and if yes in what form?

Which impact does it have on PMG work?

83. Do you see changes to the roles, tasks and liabilities of market participants with regard to gas quality monitoring, measurement and management?

Which impact does it have on PMG work?

84. In your view, at what point in the gas value chain should the quality of gases be adapted to the standard specifications, considering also technical feasibility and cost-effectivity?

Open discussion among stakeholders: 35th Madrid Forum – Gas quality in the in the existing gas network

35th Madrid Forum agenda – Gas quality

- Presentations planned:
  1. The Wobbe Index in the H-gas standard and renewable gases in gas quality standardisation – Presentation by CEN
  2. Gas quality management in the European gas networks – Presentation by Frontier Economics
  3. Impact of gas quality changes on gas appliance manufacturers and end-users – EUROMOT presentation (tbc)
  4. EHI presentation (tbc)

35th Madrid Forum agenda – Gas quality

1. Do you support the blending of hydrogen into the existing gas network? If so, to what extent?

35th Madrid Forum agenda – Gas quality

2. Is there a need for binding gas quality standards and/or hydrogen blending levels in EU legislation?

35th Madrid Forum agenda – Gas quality

4. Who should bear the cost of gas quality management within agreed standards?

A.O.B. & next steps

Overview of next steps – Wrap up

Prime movers' group (plenary meeting)

- Next meeting on **31st May**

Sub-group 1) WI framework

- Meeting scheduled on **26th April** to review comments received
- Further steps and work to be discussed with SG1 members and EC

Sub-group 2) Value chain H2 readiness roadmap & solutions

- Next meeting on **20th May**
- Extended deadline for 'initiatives & project collection' template (SG2 first deliverable) until **29th April**
- Need to further engage stakeholders to proceed with the deliverable in time and form!

Thank you for your attention

For further questions, please contact:

Rosa Puentes (rosa.puentes@entsog.eu)
Thilo von der Grün (Thilo.Gruen@entsog.eu)
Nicolas Jensen (njen@eurogas.org)
Leonardo D'Acquisto (leonardo.dacquisto@italgas.it)
Monica Di Pinti (monica.dipinti@cedec.com)
Henning Eklund (heklund@geode-eu.org)