Gas for Climate

Facilitating Hydrogen imports from non-EU countries

10 October 2022



Moderator Martijn Overgaag

Director at Guidehouse



Agenda

- **10.00 10.10** Welcome and introduction from Gas for Climate representative
- 10.10 10.15 A new landscape of the EU energy system
- **10.15 10.35** Facilitating hydrogen imports from non-EU countries
- **10.35 11.00** Q&A



Welcome from the Consortium

Gas for Climate was initiated in 2017 to analyse and create awareness about the role of renewable and low carbon gas in the future energy system. Gas for Climate is committed to achieve net zero greenhouse gas emissions in the EU by 2050.







Head of Policy & Communications

OGE



Gas for Climate over the years



REPowerEU aims to make Europe independent from Russian gas well before 2030



Gas savings additional to Fit for 55 as stated in REPowerEU for 2030 (in bcm)*

- → Renewable gases play a key role in meeting the REPowerEU ambition:
 - Increase energy security and reduce dependency on Russian gas
 - Contribute to achieve energy transition objectives and speed up the implementation of climate goals
 - Alleviate part of the energy cost pressure on households and companies
- → The EC's Hydrogen Accelerator now also introduced a hydrogen import target of 10 Mt by 2030

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* Gas for Climate (2022). Action Plan for Implementing REPowerEU. (<u>Link</u>)





Speaker **Tareq Zahw**

Managing Consultant at Guidehouse



Facilitating H2 Imports from non-EU Countries

Infrastructure requirements, regulations, and policy instruments to facilitate hydrogen imports from non-EU countries.

GAS FOR CLIMATE A path to 2050

Paper structure

Import options and Infrastructure

Pipelines - Shipping - Storage



Certification, permitting and standardisation

Certification - Permitting - Standards



Supporting international hydrogen projects

EU funding schemes - H2Global as best practice - International Cooperation



Action to facilitate hydrogen imports



Paper structure

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Action to facilitate hydrogen imports



Import corridors

- → Three hydrogen imports corridors prioritised by the REPowerEU plan
- → Hydrogen can be imported via
 pipelines, as well via ship to planned,
 new, or repurposed import terminals.
- → The corridors will initially connect local supply and demand in different parts of Europe, in parallel to expanding and connecting Europe with neighbouring regions with export potential.



Transport options for hydrogen

- → New, dedicated hydrogen pipelines or repurposed existing natural gas pipelines
- Shipping of carriers:
 - → Ammonia
 - → Liquid Organic Hydrogen Carriers (LOHC)
 - → Liquid Hydrogen
 - → Methanol
 - → Synthetic methane
- → Hydrogen can be extracted from its carriers or directly utilised near the terminal (e.g., ammonia for fertiliser)



Pipelines

- → North Sea Corridor: competitive renewable and low-carbon hydrogen, given its near distance and being potentially produced from wind resources
- → Mediterranean Corridor: large renewable hydrogen potential from renewable energy sources in North Africa (wind and solar)
- → Ukraine Corridor: access to low-cost, hydrogen supply from Eastern and South-Eastern Europe

EHB initiative: 60% of the pipelines in the Mediterranean corridor (2.4 Mt) and 70% of the pipelines in the North Sea corridor (7 Mt) could be repurposed by 2030



Shipping

→ Potential carriers

Liquid H2, LOHC, **ammonia**,

methanol and synthetic methane

Hydrogen / Hydrogen Carrier Imports	Import Quantities (Mt)	Hydrogen mass (Mt)
Synthetic Methane	Planned 13.6 Mt	2.6 Mt
Ammonia	Current* 4.0 Mt	0.5 Mt
	Planned 8.4 Mt	1.14 Mt
Methanol	Planned 1.0 Mt	0.14 Mt
Total hydro	4.4 Mt	

* Current ammonia imports are assumed to be potentially from renewable or low-carbon hydrogen by 2030

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Brunsbüttel 2. Dow, Stade 3. Uniper WilhemIshaven

1. RWE Ammonia Terminal

Synthetic methaneAmmoniaMethanol

- 4. TES Wilhelmshaven terminal
- 5. Nouryon/Gasunie, Delfzijl
- 6. OCI/BioMCN, Delfzijl
- 7. Gidara Energy, Amsterdam
- 8. Gasunie ACE Terminal
- 9. Horisont Koole Ammonia
- Terminal

Туре

- 10. Lowlands Methanol, Rotterdam
- 11. Enerkem, Rotterdam
- 12. Fluxys Advario Antwerp Green Ammonia Terminal
- 13. Engie/Fluxys, Antwerp
- 14. Proman, North Sea Port, Ghent
- 15. ENI, Livorno
 - 16. Enerkem, Tarragona

Type LNG terminals 🖬 FSRU Onshore terminal Offshore terminal 12 Mt Status Operational Stade Lubmin Wilhelmshaven, TES Planned Wilhelmshaven, Uniper Construction **Eems Energy Terminal** Swinoujscie **Operational &** Brunsbüttel expansion planned or **Rotterdam Gate terminal** under construction Zeebrugge Built not operational Dunkerque Le Havre → Potential to repurpose LNG terminals for hydrogen carrier Montoir-de-Bretagne Adriatic LNG imports in the short term Panigaglia **Krk Terminal** Gijón (Musel) FSRU1&2-SNAM Host LNG terminals are currently **OLT** Offshore LNG Toscana Fos Cavaou Fos Tonkin Mugardos Bilbao working at full capacity to 15 Mt compensate import shortages Barcelona Alexandroupolis Thr Sagunto Sines Cartagena Porto Empedocle (Sicilia) 15 Huelva

Total import capacities

- → Hydrogen import theoretical capacity across all corridors could reach 105 Mt on the long term
- → Up to 4.4 Mt of hydrogen imports could be realised by 2030 (dedicated hydrogen carrier terminals + repurposed infrastructure)
- → It is uncertain to have gas pipelines and LNG terminals repurposed in the short term. Most gas infrastructure are currently operating at full capacity to compensate gas import shortages

Transport option	Imports capacity potential (Mt of hydrogen)
Dedicated hydrogen carrier terminals	4.4
North Sea pipelines	31
Mediterranean pipelines	15
Ukraine pipelines	28
North Sea and Baltic Sea terminals	12
Mediterranean terminals (including Atlantic terminals)	15
Total	105

Takeaways

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Import terminals for hydrogen carriers: ammonia, methanol and synthetic methane (reconverted to hydrogen) **can be realized by 2030** Beside scaling up dedicated hydrogen imports infrastructure, **repurposing natural gas pipelines and LNG terminals** along all corridors is needed

If renewable and low-carbon hydrogen production projects in exporting countries are realised in time, and only if natural gas infrastructure capacities are made available, **13 Mt of hydrogen imports could be realised by 2030**

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Speaker Jaap Peterse

Consultant at Guidehouse



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2

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Action to facilitate hydrogen imports



Certification of hydrogen (carriers)





Permitting for import projects





Supporting international hydrogen projects

EU funding

No dedicated funding on EU level for imports projects, but existing support mechanisms can help ramp up the hydrogen economy in Europe, thereby also incentivising imports.

Contracts

Long-term offtake contracts might be needed to make investments bankable in potential export regions. H2Global is a positive example on how to de-risk investment on the supply and demand side.

Partnerships

International hydrogen **partnerships** should be **strengthened** and new partnerships with potential **exporters established** between Europe and outside of Europe.



Actions to facilitate hydrogen imports

Infrastructure	Regulatory	Finance & Support
Integrate import considerations in hydrogen infrastructure planning	Rapidly implement the hydrogen sustainability criteria and provide clear guidance for exporting countries	Develop support mechanisms for international hydrogen projects
Develop new hydrogen import infrastructure at scale and assess the possibility of repurposing existing gas import infrastructure	Simplify and streamline permitting procedure to Fast track infrastructure development and pilots	Establish strategic hydrogen partnerships between EU and potential exporting countries



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