

Summary Minutes Meeting 2

Working Group 2 'Supply Chain Development and Risk Management'

26.04.2022, 10 a.m. – 5 p.m.

I. Background and Goal

- The in-person workshop at the H2Global premises in Hamburg envisaged to develop a first draft of the value chain of green hydrogen and ammonia and to outline associated risks.
- For compliance reasons, the following statement was logged in at the beginning of the workshop:

'The working groups' primary goal is to provide knowledge and recommendations to the general public and the public sector within the framework of the H2Global Foundation's statutory purposes in order to support a rapid market ramp-up of green hydrogen and its derivatives.

For compliance reasons the accumulated knowledge will be published on our website and papers will be prepared in order to place the results in a broader context. The results will also be taken into discussions with potential providers of funds regarding the future development of funding instruments like H2Global. Looking at the tender procedure concerning the first 900 Mio. Euros it cannot be excluded that the knowledge gathered in this way and made available to the public will also flow into the design of the tenders. However, this is not the primary goal of the working groups' activities. The workshop's results will thus not influence bidding procedures. Only retroactively the results can be used to benefit future windows developed as part of the bidding procedure.'

- Moreover, it has been explained that the HINT.CO attends the workshop, but will not participate in discussions.

II. Results

Part 1: Identification and location of strategically important hubs in order to develop a comprehensive representation of the value chain for H2 and ammonia

The following hubs have been identified as essential:

1) End-Use: Consumers of hydrogen and its derivatives

- Participants identified and located end users from the following sectors: steel & fertilizer production, chemistry & refinery cluster, shipping, heavy goods transport / mobility (at ports and other loading facilities), aviation (for short-haul flights) as well as aluminum and copper finishing (and other finishing processes), cement, glass, and H2-ready gas power plants considered less significant.
- The following clusters have been identified:
 - Main clusters: Hamburg, *Ruhrgebiet*, Rotterdam / Antwerpen
 - Consumer clusters: *Rhein-Main* area, Völklingen / Dillingen, Leipzig / Halle; *Oder / Berlin* area, Rostock.
- Participants concluded that the demand potential is to be rated 'very high'.
- Moreover, identified clusters largely coincide with Germany's industrial geography, leading participants to conclude that 'infrastructure factors' do not pose an obstacle to satisfying demand.

2) Production (H2 and derivatives)

- While the location of H2 production sites and projects in development phase did not represent a major challenge for participants, uncertainties emerged with regard to mapping (identifying and locating) relevant actors in the field of conversion.

3) Transmission & Storage System Operators

- Apart from some storage sites for ammonia, there were few easily identifiable transport routes and storage sites due to the uncertain market launch of H2 and other derivatives.
- The plan for an H2 distribution network in the port of Hamburg was mentioned
- Among other things, the set-up of the backbone infrastructure (such as North-South and West-East axis for pipelines) is not clear yet.
- With regard to a mapping, there are relatively more starting points for ammonia. H2 and other derivatives are subject to other temporalities; there is less existing infrastructure and both potential assessment and planning are characterised by relatively more uncertainties.

Generally, the discussion revealed that the selected spatial reference – Northern Germany – is not sufficient in order to create a comprehensive map of the value chain, as it excludes the consideration of necessary actors and facilities located in different geographical areas. In addition, many production sites are located outside Europe; the distances to be bridged are huge, raising many difficulties that cannot be taken into account when looking at Northern Germany only. Also, the development of a consistent mapping did not seem expedient to participants, especially with regard to a consistent time frame / point in time. Depending on the product, different dynamics, time horizons, risks and market scenarios have to be considered.



Before continue working on a comprehensive map of the supply chain network, participants decided to conduct a risk assessment first.

Part 2: Risk Scanning & Assessment – elaboration of risks and hurdles associated with the implementation of the value chain in order to develop clear recommendations for action

The group was divided: One group looked at risks as part of the hydrogen supply chain in 2030, the other group looked at risks as part of the ammonia supply chain in 2030. It is important to note that the risk perception of groups generally, may differ.

1) Hydrogen Supply Chain:

- The following risks were identified as rather critical (risks with a relatively high probability of occurrence and potentially major effects):
 - Regulation sets no / false incentives
 - Lack of Financing
 - Insufficient transport and storage capacities
 - No sufficient long term investment security
 - No financial support for infrastructure transformation
 - Import facilities not developed
 - Lack of public investment in infrastructure
 - Lengthy permitting procedures hinder infrastructure development
 - Ineffective certification
- Many of the risks perceived as critical could be grouped under the heading “investment uncertainty”. Infrastructure financing issues play an important role.

2) Ammonia Supply Chain:

- The following risks were identified as rather critical (risks with a relatively high probability of occurrence and potentially major effects):
 - Regulatory constraints
 - Changing regulation regarding the definition of “green”
 - Lack of international alignment to define the product
 - Country risks (political, technical)
 - Premium to be paid is unclear (depending on regulation/certification)
 - Availability of distribution infrastructure (after harbour)
 - Changing tax or subsidy environment
- Regulatory risks in particular were classified as critical by the group.



The detailed results of the risk analysis are currently scientifically processed and will be published as part of a comprehensive paper on the H2Global working groups' results.

III. Next Steps

- Development of schematic representations of the different value chains (liquid and gaseous hydrogen, LOHC, ammonia, jet fuel, synthetic methane and methanol) together with participants of working group 2 in semi-structured interviews
- Workshop on 'Visioning and Roadmapping Green Gaseous Hydrogen and Ammonia Supply Chains' in early June 2022.

