

Hydrogen Forum

An IHS Markit initiative considering the potential role of hydrogen in a net-zero carbon world

2019

Introduction

In 2018, the European Commission announced the objective of reaching a "net zerocarbon world" for its revised 2050 energy roadmap. If the European Union agrees to adopt this target, there will be no role by midcentury for the combustion of unabated natural gas in EU countries.

Hydrogen is one option that is receiving increased attention. Hydrogen and other green gases can address the short-term need for rapid greenhouse gas abatement while providing a long-term storage solution. It can be used for power generation, heat, industrial uses and transport – while using Europe's gas infrastructure already in place.

However, before hydrogen can be considered as a significant contributor to the future fuel mix a series of practical issues need to be addressed, and businesses and investors will need to develop business models that offer the prospect of acceptable returns.

IHS Markit has built structured, sectoral insight and a unique cross-industry space with a community of 150+ representatives from 40+ organizations to monitor those change in Europe's markets.



Hydrogen Forum structure

Increasing renewable penetration will lead to a rise in curtailment. Power-to-X can capture this unused energy



Power-to-X can capture this unused energy



In 2050, the share of zero-price hours will range from 1 percent to 37 percent across Europe, reflecting different power generation mixes, but also varying levels of interconnection

Zero-price hours' as potential power supply for P2H2: modelled here for 2030 and 2050

Structure of the Hydrogen Forum

Deliverables and scope of work can evolve based on participants feedback

Meetings during the year

June and end October/November 2019

Location

a 'hydrogen-interesting' location. **Suggested first meeting:** 12-13 June 2019 Marseille, France, 12 June visit of Jupiter 1000

A two-day session for each meeting

The first day will include a tour of a hydrogen facility followed by dinner, the second day is a workshop day with a presentation and discussion of analysis on specific topics.

For the first session

Suggested topics for analysis:

- Supply:
 - Comparison of a broader set of hydrogen production options from biomass/waste; a further review of costs
 - Compare costs of hydrogen production with biomethane and synthetic gas
- Infrastructure:
 - Comparison of the costs of transporting hydrogen compared with electricity and natural gas
 - What is the tradeoff for infrastructure between synthetic methane and hydrogen?
- Expanded tipping points:
 - Compare the costs of biomethane and synthetic gas with hydrogen in transport and space heating

Deliverables already available for members based on the pilot study delivered in 2018



1. Technology status

This section describes the various technologies for the manufacture of hydrogen, comparing the capital expenditure requirements, operating and maintenance costs, and efficiency.

The focus is on comparison of manufacture by electrolysis using zero-carbon renewable electricity ('green hydrogen') and by steam-reforming of methane ('blue hydrogen') with carbon capture and storage. Other technologies will be reviewed in less detail.



2. Practicality

Practical issues surround the rollout of any new technology or fuel into the energy mix. For hydrogen these issues include questions of the suitability of existing gas distribution for injection of hydrogen or conversion to pure hydrogen; the need for hydrogen storage and suitability of various solutions; safety aspects of hydrogen use in different circumstances; the conversion of equipment and consumer appliances to use hydrogen; and, for transport uses, the requirements of the refuelling network.

Appropriate regulatory frameworks will be needed to encourage development of hydrogen. There will be strong competition for hydrogen in some sectors from other ways of reaching low-carbon outcomes – notably from battery electric vehicles in the mobility sector, and heat pumps for space heating. These issues – regulation and market competition in the innovation space – will also form part of the practical constraints around developing future use.



3. Tipping points

The report identifies what IHS Markit sees as 'tipping points' that can trigger a take-off of hydrogen from niche fuel into a more significant part of a zero- or ultra-low carbon future, as costs fall with increasing volume. These will differ sector by sector. The report will propose tipping points for potential significant applications:

- HGV transport for fleet vehicles (buses, versus diesel use, for example)
- Blending of hydrogen into existing gas infrastructure
- Conversion of methane grids to pure hydrogen
- Industrial use in refineries and ammonia production
- Management of curtailment
- Provision of long term or high volumes storage.

Other key 'tipping points' may emerge as the study proceeds.

The analysis for the tipping points includes costs of the relevant hydrogen-use technologies and their ancillary equipment, compared with the costs of a credible alternative solution to hydrogen. The cost of carbon avoided is also calculated.



4. Business models for integrating hydrogen

The potential diversity of the future use of hydrogen implies that companies in many different sectors will take an interest in its commercial possibilities. Choice of an appropriate business model will depend both on the anticipated uses, and on the existing business model of the company concerned.

This section reviews existing structures by which companies are integrating hydrogen into their businesses. It will also suggest models that may be adapted by utilities, gas supply and infrastructure companies, integrated energy companies, and new entrants to the fuel supply business. Key questions will include:

- For 'green hydrogen', in the electricity sector, whether to accept curtailment, or pursue a curtailment-based strategy or a dedicated facility approach for hydrogen
- For infrastructure owner-operators, whether to pursue a geographic pure hydrogen strategy or a strategy of carbon-reduction by blending – or to combine both
- What scale of production to aim for, over what time frame the answers are likely to be different for 'blue hydrogen' and 'green hydrogen'
- Some companies may have an interest in development of very large-scale operations – this could this have a significant effect on the competitive environment
- Some companies may be constrained, for commercial or regulatory reasons, to a specific sector focus; others may prefer a broader approach, incorporating for example mobility, industrial uses, and supply/distribution to heating markets



5. Quantitative analysis

The quantitative analysis assesses potential scale and volume of hydrogen for 2030, 2040 and 2050. The hydrogen outlook will be consistent with IHS Markit energy scenarios.

- For the power sector we ensure consistency with existing outlooks for renewable deployment, interconnection and alternative forms of storage. Sensitivity cases based on approach to net-zero carbon emissions will be developed.
- For the residential/commercial, industrial and transport sectors, an assessment of the scope of hydrogen is presented along with a discussion of infrastructure needs.



Study team



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