

ELECTRIFICATION TRACK

ELECTRIFICATION OF FUELS: HYDROGEN

Session overview

Hydrogen has an important role to play in the decarbonisation of the energy sector. Where direct electrification is not practical or economical, renewable fuels will be necessary. Hydrogen and bioenergy are among the few options in this space. In industry, certain processes require hydrogen as a key feedstock: whereas today this process energy is produced mostly from natural gas, there is a clear opportunity to shift to hydrogen production from renewables. At the same time, hydrogen from renewable electricity can represent a source of flexibility for the power system, as well as a means for seasonal storage of electricity from variable renewable energy (VRE) in the gas grid.

This session was moderated by **Tim Karlsson (Executive Director at International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE))** and discussed challenges and opportunities for the power sector linked to the need to produce large amounts of hydrogen from renewable electricity. The session also showcased the viability of key applications for hydrogen in the transformation of the energy system.



Presentation 1: Hydrogen from renewable power

Emanuele Taibi (Power Sector Transformation Strategies, IRENA) presented the key insights for policy makers from the IRENA report [Hydrogen from Renewable Power – Technology Outlook](#) for the Energy Transition. The report states that hydrogen could be the “missing link” in the energy transition. Power-to-gas (P2G) applications can supply large amounts of renewable energy to sectors that are otherwise difficult to decarbonise. These applications are technology-ready and could facilitate the integration of large quantities of VRE in the energy system once they reach market competitiveness. A stable policy framework to encourage the appropriate private investment is critical for that development.

Presentation 2: Projects to realise a hydrogen society in Fukushima

Akiyoshi Hashimoto (Director-General, Commerce Industry & Labour Department, Fukushima Prefectural Government, Japan) underlined the value of hydrogen for a 100% renewable energy supply by 2040 and presented the Fukushima Plan for a New Energy Society, a model construction for a hydrogen-based society that will be applied during the Tokyo Olympic Games in 2020.

Presentation 3: Green hydrogen from Chile

Tomas Baeza Jeria (Innovation and Entrepreneurship Manager, Government of Chile) talked about prospects and challenges for the role of hydrogen in securing Chile’s energy system. In the long term, exporting hydrogen from solar production to supply global demand could be a profitable business case for Chile. By combining proton exchange membrane (PEM) and alkaline electrolyzers with photovoltaic and concentrated solar power, prices of USD 1.3 per kilogram of hydrogen could be realised by 2035.

Presentation 4: Integrated energy system

Geert Tjarks (Programme Manager Power-Based Fuels, NOW GmbH) highlighted the need for an integrated energy system and for collaboration among sectors. Hydrogen will play an important role in combining applications and industries in the future system.

Presentation 5: The role of hydrogen in Europe

Bart Biebuyck (Executive Director, Fuel Cells and Hydrogen Joint Undertaking (FCH JU)) presented the projects established by the European Union to strengthen public-private partnerships, with a focus on fuel cell and green hydrogen projects. The FCH JU currently supports 227 projects around Europe.

Presentation 6:

Toyota's environmental challenge

Ferry Franz (Director, Toyota Motor Europe) presented Toyota's goals for zero carbon dioxide emission vehicles in 2050. The most promising applications for fuel cell technology are trucks, buses and cars travelling long distances.

Presentation 7:

Ancillary services and power system flexibility from the production of renewable hydrogen

Rudolf Zauner (Head of Hydrogen Center, VERBUND Solutions) showed how the utility is working on sectorial integration with green hydrogen and provision of ancillary services to achieve the Austrian target of 100% renewable electricity by 2030. Hydrogen is in direct competition with carbon and natural gas as a reducing agent for the steel industry, and to date the replacement of carbon results in a significant increase in production costs.

Presentation 8:

H21 Leeds City Gate

Dan Sadler (Programme Director, H21 project) presented a study that assesses the technical-economic feasibility of converting the existing natural gas network in the United Kingdom to 100% hydrogen. The study states that the gas grid has the right capacity to supply hydrogen and that hydrogen is a destination fuel rather than a transition fuel.

Highlights from the discussion:

- » **High costs remain a major challenge.** The technologies are ready, but costs have to be reduced rapidly. Significant stable demand is needed to trigger economies of scale and to reduce costs of hydrogen applications for the energy system. In the coming years significant cost reductions for electrolyzers are expected. Low-priced renewable energy from solar and wind will play an important role, because today 70-80% of variable costs are for electricity.
- » **Collaboration and combination of sectors, industries and applications is key.** Synergies with existing business models for the gas grid can be used to further decarbonise the system.
- » **Social acceptance, awareness and education are needed.** Social acceptance and community awareness of the value of hydrogen are crucial for the introduction of hydrogen applications. The technology is evolving rapidly, and society must be well educated about the challenges and benefits of hydrogen. A change in the mindset can create a market pull for green hydrogen. Removing the barriers and having informed conversations about the different options with the gas industry will further push the development of hydrogen technology.
- » **Policy frameworks and markets are needed.** The idea of an integrated energy system with a policy and regulatory framework that encourages private investment in hydrogen technology has to be established. The market is at a very early stage where there are very few competitors. Financial support instruments are necessary to cover the initial cost premium relative to incumbent technologies. The focus has to be on the long-term target instead of on short-term

carbon budgets.



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