Purcell in Global Hydrogen Review: Adapting in a New Era

March 28, 2024 Conrad Purcell

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Haynes Boone Partner Conrad Purcell authored an article for the Spring Edition of *Global Hydrogen Review* on the existing hydrocarbon infrastructure needing to be adapted to work with alternative fuels.

Read an excerpt below:

The electrification of transport, heating and industry, using power generated from renewables, is the basis on which many governments hope to reduce greenhouse gas (GHG) emissions and thereby arrest climate change. Inevitably there will be certain sectors in which GHG emissions are hard to abate, such as shipping, aviation, steel and cement production and petrochemicals. In order to reduce GHG emissions from these sectors, governments are supporting industry to find solutions based on the use of hydrogen and its derivatives. If a substantial part of the economy is to be powered by hydrogen, then the existing hydrocarbon infrastructure will need to be adapted to work with alternative fuels.

Pipelines
Whether hydrogen production takes place at large scale centralised production facilities or at a more local decentralised scale, it is likely that end users will in future be reliant upon at least some transportation infrastructure if hydrogen is to be used as a feedstock for industry, as well as potentially as a fuel for power generation. The allocation of risk between hydrogen producers, pipeline owners and buyers of hydrogen will need to be carefully managed to ensure that a commercially robust contractual and regulatory framework is in place. In the UK, the Energy Act 2023 has extended the provisions contained in the Gas Act 1986 to cover the licensing of pipelines for the transport of hydrogen. Many of the risks associated with hydrogen gas are similar to the risks associated with natural gas (which is mostly made up of methane), but there are some differences. Some of the key issues that will need to be addressed include the corrosive effect of hydrogen on steel – which is used in the construction of many pipelines – and the risk of hydrogen gas escaping through gaps in the pipeline due to the very small size of hydrogen molecules. This may be addressed either by modifying pipelines or by using a blend of hydrogen and natural gas that is sufficiently chemically similar to the original design parameters of the pipeline to avoid any negative impact. Blending a small quantity of hydrogen into the natural gas system (between 5% - 15%) is currently considered to be safe in Europe and may help to facilitate the energy transition. However, this is not a complete solution where the ambition is to move away from fossil fuels altogether.

Shipping
If hydrogen production takes place at an industrial scale using renewable energy to make 'green hydrogen' in parts of the world where the conditions are best suited to its production, such as parts of South America or Australia, then it will need to be transported to the places where it will be used. Historically, natural gas has been transported over long distances as LNG and it is possible for hydrogen to be liquified and transported as LH2, although the costs of doing so are high. This is

partly because of the very low temperature required for LH2 and partly because of the volumetric energy density of LH2. Although long distance pipelines may be a solution to the problems associated with shipping hydrogen, another alternative is to convert hydrogen to ammonia, which is cheaper and easier to transport by ship than hydrogen. Ammonia can be used as a replacement for hydrocarbons in a number of currently high GHG emission areas, such as the manufacture of fertilizers for food production and as fuel. However, there are some drawbacks to the use of ammonia as it is a toxic chemical and the risks associated with handling it and the possibility of environmental damage resulting from spillages reduce its attractiveness as an energy carrier. There are some industrial processes where pure hydrogen will be required and it does not make sense to convert hydrogen to ammonia, transport it to another location, and then crack it to get back to hydrogen. In such cases, it may be that the most economically viable solution is to move the industrial activity for which pure hydrogen is required to a part of the world where hydrogen is available locally.

To read the full article in *Global Hydrogen Review*, click here.