Risks facing the new hydrogen economy

A view from LRQA

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As the world intensifies its search for new ways to reduce greenhouse gas emissions, Leanne Halliday from LRQA outlines the advantages offered by hydrogen as a replacement for fossil fuels. Leanne also describes the rapid evolution of the hydrogen economy and some of the risks it faces and explains why assurance services from a reputable third party will perform a vital role in securing hydrogen as a major source of clean energy. ***Know more. Risk less***.

Background

With further technology advancements and investment hydrogen can substitute natural gas for heating and electricity generation because it has a high calorific value and its combustion products (mainly water) are carbon free. In November 2021 the European Commission published a report entitled: 'Hydrogen: Europe's Industry rolling out hydrogen projects on massive scale' [(1)]. Featuring over 750 projects, the report said that the project pipeline is testimony to the size and dynamism of the European hydrogen industry.

One of the ways in which President Biden is seeking to deliver on his promise to build a modern, sustainable infrastructure and an equitable clean energy future, is by "using renewables to produce carbon-free hydrogen at a lower cost than hydrogen from shale gas through innovation in technologies like next generation electrolysers" [(2)]. At the COP26 climate conference, 33 of the world's major economies pledged to ensure the availability of affordable renewable and low-carbon hydrogen by 2030 [(3)].

Carbon-free 'green hydrogen' is made from the electrolysis of water powered by renewable energy, such as wind or solar. Hydrogen can be produced by a number of methods – methane steam reforming is currently the most common, but this is powered by fossil fuels and therefore generates carbon dioxide emissions and is known as 'grey hydrogen'. However, if carbon capture can be applied to the CO_2 emissions, the end-product is known as 'blue hydrogen'.

Hydrogen offers the potential to: store surplus renewable power; help decarbonise sectors that are difficult to electrify, such as long-distance transport and heavy industry; and replace fossil fuels as a zero-carbon feedstock in chemicals and fuel production.

Exploiting opportunities through risk management

The global scramble to develop a hydrogen economy is generating an enormous requirement for new products and technologies, so we are seeing a boom in the manufacturers of new equipment. This includes electrolysers, fuel cells, inverters, etc. as well as new equipment for the distribution and combustion of hydrogen. So, this situation presents a great opportunity for the energy sector and its suppliers, but of course that opportunity comes with risk.

Clearly, the volume of equipment required to exploit the hydrogen opportunity is going to be immense, and LRQA is already hearing from customers that they are starting to place purchase orders for equipment that they won't need for two to three years, just because of the risk in the supply chain.

New manufacturing entrants to this market will need to be able to build trust and confidence as quickly as possible, and this is where LRQA's experience and expertise can help.

What are the risks?

Standards and regulations

Globally, there are currently no common regulatory or standards regimes covering the generation, distribution and industrial use of green hydrogen. Hydrogen and the new equipment in the supply chain, will need to be traded globally, so standards and regulations will be necessary to ensure quality, reliability and safety.

Unknown supply chain

At the moment, we are not just looking at a shortage in the supply chain; we are looking at a completely new market. Products such as the latest electrolysers and fuel cell technologies are relatively new and unproven, and the volumes required are unprecedented, so there are major risks in the supply chain, because the demand for quick supply at high volumes may supersede the requirement for quality and safety.

Social licence

Lessons learned from other sectors such as coal seam gas, have shown us that industries which inspire public attention can experience major problems and delays in projects. One of the challenges for the hydrogen sector, particularly with the older demographic, is its historical association with the hydrogen bomb and the Hindenburg airship disaster. Consequently, there will be an important role for education and reassurance, particularly given the prospects of hydrogen boilers in domestic houses, and hydrogen powered vehicles. This also reinforces the requirement for new standards and regulations that build trust and confidence.

Lack of experience

Most of the people and organisations that are moving into the hydrogen space come from the oil and gas or traditional power sectors, but as the lightest element hydrogen behaves in very different ways to other fuels, so there will be a strong demand for knowledge and expertise on how to manage hydrogen safely. For example, consideration needs to be given to the type of pipes, valves, pressure vessels, compressors, welding etc. that liquid or gaseous hydrogen contacts. For example, hydrogen has a faster flame speed than fossil fuels, and hydrogen embrittlement can weaken metal or polyethylene pipes and increase leakage risks, particularly in high-pressure pipes[4].

Why LRQA?

Experience and expertise – with experts on international committees around the world, LRQA is highly experienced in the development of standards and regulations that protect safety and quality, build confidence in the market and inspire investment. Since 2003 LRQA has been active in a number of international hydrogen initiatives including the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) Regulations, Codes, Standards & Safety (RCSS), the Mission Innovation Challenge on Clean Hydrogen, and the International Energy Agency Safety Task.

1. **Expediting locally** – working with local regulators and vendors, and with an understanding of the supply/demand risks, LRQA staff help to ensure delivery of the right products at the right time.
2. **Expertise** – LRQA subject matter experts understand hydrogen, and the unique requirements of hydrogen infrastructure, so they are able to help with design reviews and specifications to ensure the procurement of fit-for-purpose products.
3. **Global vendor assurance** – building trust and confidence in the supply chain
4. **Complete range of assurance services** – with no pre-existing global or regional standards for measuring the carbon credentials of hydrogen, LRQA can validate and verify everything from product design through to emissions. Typical services include due diligence, onsite inspection, vendor assessment, design verification, product certification, carbon footprint and GHG emissions verification.

Summary

The hydrogen economy is evolving rapidly with an enormous number of new projects being created globally. Many pilot plants are now in operation and with global energy prices increasing, the prospects for reducing the difference between natural gas and green hydrogen are promising. However, it will take a few years for the market to develop so we have time to establish standards and best practices that are fit for purpose.

As the market develops, LRQA's customers are telling us that they need a reputable third-party with the experience and expertise to point the way forward; helping regulators to establish practical, workable rules and procedures that protect safety, lower risks and ensure that the vitally important potential of green hydrogen is exploited for everyone's benefit.

For more information on our range of assurance and inspection services, visit lrqa.com/uk

References:

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3 COP26 World Leaders Summit –Breakthrough: Affordable renewable and low carbon hydrogen is globally available by 2030. www.gov.uk/government/publications/cop26-world-leaders-summit-statement-on-the-breakthrough-agenda-2-november-2021/cop26-world-leaders-summit-statement-on-the-breakthrough-agenda#hydrogen

4 Blending Hydrogen into Natural Gas Pipeline Networks (2013). U.S. Energy Department's National Renewable Energy Laboratory https://www.nrel.gov/docs/fy13osti/51995.pdf

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