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National Hydrogen Strategy Working Group
Department of Industry, Innovation and Science
GPO 2013
Canberra ACT 2601

9 April 2019

RE: National Hydrogen Strategy – Request for information

To Whom it May Concern,

Engineers Australia welcomes the opportunity to respond to the COAG Energy Council Hydrogen Working Group's discussion paper, to help inform Australia's National Hydrogen Strategy. The National Strategy developed by the Working Group build on from the briefing paper released by the Office of the Chief Scientist, and the hydrogen roadmap released by the CSIRO.

Engineers Australia is the peak body of the engineering profession. We are a member-based professional association with about 100,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering. Our members are governed by our code of ethics, using our knowledge and skills for the benefit of the community, ahead of personal or sectional interests.

Engineers Australia is a strong supporter of developing new industries in Australia that can grow Australia's workforce, increase trade opportunities, strengthen domestic fuel security, and can assist in reducing emissions. Engineering expertise is critical to the success of a variety of emerging technologies, and that includes the use of hydrogen for energy. Workforce planning is always required to maintain a healthy and stable economy, and workplace planning in a new hydrogen industry is essential, and this includes maintaining a sufficient level of engineering expertise.

This Engineers Australia submission addresses several questions posed by the Working Group.

What do you think are the two or three most significant recent developments in hydrogen?

Although hydrogen fuel technologies have existed for a significant amount of time, there are a few new developments which should be examined by the Working Group. These developments include, but are not limited to:

1. Recent research which indicates that there is the potential for mass generation of hydrogen with near-zero greenhouse gas production. The most promising work has come from the Hazer Group, which is currently commercialising technology developed at the University of Western Australia. There are additional benefits to this research as it is possible for this process to be tied into concentrated solar thermal energy to support the cracking process.

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2. The improvements in the performance of vehicle fuel cells. This includes cells that are complimented with batteries and supercapacitors which are used in buses, heavy trucks and trains as the improved vehicular performance is coupled with baseload. There is also improved range in new light-vehicles, with estimates of around 800 kilometres, which is a substantial range without the need to refuel frequently.

3. Photocatalytic and photo-electrochemical water splitting space should be examined and new developments should be followed by policy makers. This area still needs further development but there have been promising signs in the initial stages.

What are the most important safety issues to consider in producing, handling and using hydrogen in Australia?

The chemical industry has been producing hydrogen for more than a century, and there are many proven production techniques and technologies that are suitable for various scales. Most hydrogen produced is consumed on-site and little is usually stored and storing in small and large quantities remains challenging. To this end there are several safety issues that the working group should consider, including:

1. The risks associated with explosion, ventilation, hydrogen embrittlement, and ammonia toxicity. If industry is to expand rapidly this must be managed through a regulatory framework with industry guidelines and the training of a skilled workforce.

2. The current challenges with storage, most notably the associated safety risks when used with vehicles.

What environmental and community impacts should we examine?

As with the development of any new industry which could expand rapidly, the environmental and community influences need to be fully examined and assessed. A large-scale hydrogen industry will affect the environment and the community, and this should be explored by the working group. Engineers Australia believes there are two key areas that the Working Group should examine:

1. The production of a large-scale fuel source without increasing greenhouse gas emissions. The development of a large-scale, low-emission fuel industry has wide-ranging community and environmental benefits and can assist in meeting Australia's national emission reduction targets. The overall carbon dioxide footprint from source to point must be examined so that the full benefit of this fuel source can be determined. Conventional steam methane reformation increases greenhouse gases as it generates carbon monoxide and carbon dioxide from a fossil fuel that has carbon dioxide sequestration from the atmosphere. Any thermochemical production of hydrogen from methane or coal must include carbon capture and storage if this new industry is going to provide significant environmental benefits.

2. The long-term option for hydrogen fuel technology to assist in Australia's domestic production of fuel. This has important community benefits as Australia is currently heavily reliant on imported liquid fuels for commercial and domestic use. Not only will an additional industry boost jobs and increase trade, it will provide added national energy security at a time when Australia has become increasingly vulnerable to global forces and international supply chains.

What are the top two or three factors required for a successful hydrogen export industry?

There are a number of factors which should be examined if Australia is to have a successful hydrogen export industry. These include, but are not limited to:

1. The development of strong long-term agreements and regional partnerships. This includes policies which encourage long-term investments from major countries which will have a demand for Australia's hydrogen and have established hydrogen markets, most notably Japan and Korea. It is also important that there is a framework established for Australian companies to have strong intellectual property claims in these markets. Regional partnerships also need to be established with Australia's neighbours including New Zealand, Fiji, Papua New Guinea and other pacific island countries where diesel is insecure and expensive and hydrogen fuels could be an alternative fuel source.

2. In the absence of dedicated infrastructure for conveying hydrogen, other options will need to be explored to assist with an export industry. One option includes utilising Australia's existing network of gas pipelines. Hydrogen can be converted into synthetic natural gas, which can diversify the use of hydrogen and it also reduces the hazards associated with handling and transporting. The Working Group should examine the potential for utilising Australia's existing pipeline network for this fuel source.

What are Australia's key technology, regulatory and business strengths and weaknesses in the development of a clean hydrogen industry?

Australia has several strengths which will help in the development of a clean hydrogen industry, but at the same time there are a number of weaknesses which need to be addressed.

Current benefits include:

1. World leading research organisations that have already identified hydrogen as an important part of Australia's energy mix and provided roadmaps to the successful development of this industry. This includes initial research reports from the CSIRO and the Office of the Chief Scientist. These organisations would have already laid the groundwork for a National Strategy and would have experts who have been assessing Australia's hydrogen industry.

2. Australia has a highly skilled technical workforce with a proven capability in large nation-building infrastructure and energy projects. This will be no different with a hydrogen industry, as Australia will lean heavily on the technical experts to get the industry up and running successfully.

Current weaknesses include:

1. A regulatory environment that does not include a set national energy and emissions plan in the transport sector. A regulatory environment in the light-vehicle market for emissions would assist in the rapid uptake of alternative-fuelled vehicles, including hydrogen-fuelled vehicles.

2. The current cost and availability of hydrogen powered vehicles. Costs will fall with economies of scale, but for an initial uptake of vehicles government incentives and investment options may be required to kick-start the industry. This also ties-in with the current limited availability in hydrogen-fuelled vehicle options for those looking to purchase a vehicle, as well as limited refuelling options for those who purchase a vehicle.

What workforce skills will need to be developed to support a growing clean hydrogen industry?

A highly skilled workforce will be instrumental to support a clean hydrogen industry, ensuring its successful operation in Australia. This includes:

1. Skilled workers proficient in the manufacture, installation and operation of electrolysers, fuel cells and membranes at economies of scale.

2. A skilled workforce which can plan for the hydrogen energy process. This includes the whole of plant modelling and design from grid wind and solar to electrolysers, hydrogen storage and transport, ammonia production and membrane technology for conversion back to hydrogen.

3. Development of skilled workers proficient in technology for transport of ammonia and fuel cell conversion to hydrogen for all forms of heavy transport and for power generation.

What areas in hydrogen research, development and deployment need attention in Australia? Where are the gaps in our knowledge?

There are a few areas where the National Strategy Working Group should look to identify gaps in our knowledge. This includes:

1. How to move the focus to generating hydrogen as a net supplier, rather than just using hydrogen as a proxy for storing energy.

2. How to develop efficient and cost-effective electrolysers, fuel cells and membrane technology, as well as the compression and transportation of hydrogen.

3. Modelling and costing for plants of efficient sizes and locations where renewable electricity, water, technical capability, regional markets and transports are all available. This would be to determine investment risk and the potential for incentives or subsidies to move first-adopter plants to the operational stage.

Engineers Australia thanks the Working Group for the opportunity to comment on the National Hydrogen Strategy. To discuss any of the points raised above in more detail, please contact Jonathan Russell, National Manager for Public Affairs, on 02 6270 6565 or at JRussell@engineersaustralia.org.au.

Yours sincerely,

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