

Navigating Water's Role in the Australian Green Hydrogen Economy: An Industry Led Approach to Finding the Way

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SUMMARY

The expansion of the Australian hydrogen industry has been gaining momentum for several years. To date, exploratory efforts to realise a green hydrogen economy has focused on renewable power, price, production, transport, end users and government funding. Australian water utilities have been asking how they should engage with this emerging industry, and how the water industry plays its part given the importance of water availability to making hydrogen production viable. To explore this, we sought to generate stronger industry focus and understanding through a series of webinars creating a platform for an industry-wide conversation and the opportunity to collect data on perceived risks and opportunities directly from participants and expert guests. The findings from this investigation were the basis for a series of steps for water utilities to navigate their role in this new green hydrogen economy and determine how they can engage and benefit the communities that surround them.

KEYWORDS

Energy Transition, Green Hydrogen, Renewable Energy, Water Requirements, Water Utilities

INTRODUCTION

The Australian Government has publicly endorsed the ambition to decarbonise our economy by turning our nation into a renewable energy superpower. Australian-made green hydrogen will be essential to make this a reality. Australia already has hydrogen export agreements with Japan, South Korea, Germany, and Singapore to assist them with their energy transition and decrease reliance on gas supply. To facilitate this export, eight hydrogen hubs have been established with the Federal Government across the country.

Given the increasing role green hydrogen is expected to play in decarbonisation, the Australian water sector has been called on to play its part in the global energy transition, especially to enable domestic hydrogen production. While political and industry support is growing, many key questions remain about how Australian water utilities can – or should – deliver on these expectations within their scope, mandate, and budget. As Australia's green hydrogen ambitions develop, proponents need to appropriately consider the water supply challenge as a critical and complex aspect of project development. With estimates that green hydrogen production will reach one million tonnes per annum by 2030 and 45 million by 2050, there will be significant implications for water¹. Australia is a dry context climate which has fought hard against drought in the past, with water already seen as a scarce resource, there will be less water available for new and large industrial uses like hydrogen production.

Therefore, we decided to conduct a webinar series to bring water utilities along the journey, sharing what we have learnt from the past few years from various projects as well as learning from our various guests. Our intention with the webinar series was to respond to the industry need from water utilities across Australia, with the intention to increase awareness to water related issues for hydrogen projects. The objectives of the sessions were to create a feeling that utilities are not alone in the issues they are facing in bringing to life the vision of a hydrogen economy and that through practical advice they could develop a better understanding of the role they can play in this emerging green hydrogen economy within Australia.

METHODS

The method for bringing the webinar series to life and development of the key findings included:

- Development of key themes for the webinar series and identified thought leaders and experts appropriate to lead this discussion. It was determined marketing of events would occur organically through LinkedIn and direct emailing through established client relationships.
- Intention of the webinars was to have industry-based discussion with the opportunity to poll community and determine patterns across the market.
- Attendance results were more than expected (over 950 total registrations across water, government, and energy industries) – this illustrated our belief that there is a strong interest in the topic for water utilities and allowed us to get valid data on their thoughts.
 - On whether water utilities can play in green hydrogen production: yes, as a water provider (54%), yes, as a hydrogen producer (24%), potentially but there are other priorities (22%), & that they have no role to play (0%).
 - The biggest challenges related to water supply for green hydrogen were cost of treatment of available sources (38%) & Competing end users (23%).
 - The water sources seen as the most likely to be used for hydrogen production were seawater (51%), wastewater (22%), surface water (21%) & groundwater (6%)
- During the webinars, Q & A from audience was used to guide the conversation and drive engagement as well as sharing of various documentation. Feedback and commentary on other information needed was collected and analysed to help inform future webinars.
- Following each event, summary articles were produced and distributed capturing key themes.
- The outcome was a coherent understanding of the current state of thinking for the industry, which held useful insights.
- Further analysis following the completion of the series allowed a pathway to emerge, which seemed to respond to the greatest need expressed by the water industry on how to move forward.

RESULTS AND DISCUSSION

Initially our thoughts were around how do we tie such a complex issue together, with the model for hydrogen production and available infrastructure playing a key role, as well as the amount of actual source water required and where we can source the water from another key variable to consider. Where is the best place to locate this infrastructure and how does it compete with other priorities for water utilities. These technical problems are combined with several non-technical problems including social license to operate and in Australia, what happens when water scarcity increased in the next drought. All these key topics and learnings from the webinar series were placed onto a whiteboard, where linkages were then drawn on key themes. This then led to logical steps and pairings coming together, which turned into a pathway model which forms the main thesis of this guide, distilling the information into three actionable steps for water utilities to follow.

Step 1: Define the role the utility will play.

The first step for a water utility is determining if they can and if they should be involved in the green hydrogen economy. The question is what role that should be. Based on attendees surveyed at our webinar series more than half of water and energy industry professionals believe water utilities will play a key role in green hydrogen as a water provider. Do they want to provide water to a third-party producing hydrogen, do they want to partner with these organisations to develop hydrogen together or do they want to produce the hydrogen themselves? Do we have enough water and what quality of water can we make available for green hydrogen? Finally, utilities need to consider how we balance the cost of the investigation of green hydrogen production to our customers. Following our analysis, water utilities should investigate what their appetite is for entering the green hydrogen economy and how they think they can best be involved as a water provider, partner, or hydrogen producer.

Step 2: Understand the variables.

Understanding the many variables to produce green hydrogen can help water utilities decide how best to use their existing assets or where to make investments. From a water perspective, there are four critical areas that can impact a project's overall costs: water source, quality, and availability; cooling options; waste management; and technology and process design. Depending on the technology selected, water requirements for green hydrogen can be significant with the currently most viable sources for water utilities being seawater, surface water and wastewater treatment effluent. When we asked water and energy industry professionals who attended our webinar which source, they believed

would be used for hydrogen production, 52% said seawater, with another 20% saying surface water, 19% saying wastewater effluent and the other 9% based on various other sources. Depending on the source water the number of stages of treatment required vary. Availability of surface water on the other hand is dependent upon rainfall. It can also be riskier from an environmental and social perspective including the social licensing around water and operation. However, the benefit of using surface water over seawater is the lower levels of treatment required. Generally, the water treatment process for hydrogen involves advanced treatment using reverse osmosis (RO) and continuous electrodeionisation (CEDI). The amount of pretreatment however is dependent upon the source water contaminants as well as the configuration of the RO system (e.g. number of stages and passes required). Water utilities should develop a full understanding of what water sources they can make available, in what locations and what quantities to them conduct studies to determine their technology and water requirements to better define key variables and the method to progress.

Step 3: Realise the full potential.

The last step in the process is to consider how water utilities can maximise the opportunities of this new infrastructure and green technology. When we asked our webinar attendees what part of the water industry's circular economy goals hydrogen will be most important for the results were split, with the three most popular answers each getting around 30% of the votes being in order, part of an integrated water – energy type plant which uses byproducts, providing a high value use for recycled water and capturing renewable energy from waste. Waste streams from other processes, which may contain valuable materials, could be removed from the water for hydrogen and become more concentrated through membrane treatment. The material can then be sold or used within other aspects of the water or hydrogen production process or even combined with hydrogen for end use.

Opportunities to pair hydrogen with existing assets or into future planning already in place. For example, existing desalination plants could have additional side treatment added to produce water for hydrogen. Alternatively, drought resilience planning involving desalination could install side stream hydrogen and recycled water as a byproduct to mitigate against that capital investment risk. Harnessing wastewater treatment plants and potentially large volumes of wastewater effluent or biogas from digesters could also be investigated. Utilities already face issues around managing water and wastewater assets and balancing funding, so it is essential to make sure these aspects are under control before adding hydrogen as a separate item to already high workloads and asset loads. Therefore, the last step for utilities is to review the process they have develop and look for synergies and benefits to realise the full potential of their contribution to this emerging circular and renewable future energy process.

CONCLUSIONS

Following the webinar series and the navigating of water and utility's role in the green hydrogen economy, the following key takeaways were observed:

- Curiosity and interest in the Australian water sector around green hydrogen is high.
- Water utilities and their partners are still working through the best role to play in engaging with this aspect of the energy transition, particularly as government endorsement and support continues to grow.
- This series of steps provides utilities and their partners a useful guide for navigating the role utilities can play, especially in a water-scarce context like Australia.
- Additionally, exploratory conversations around key issues that generate industry engagement can yield surprising results.

Progress towards a green energy future will require further industry collaboration, engagement, and cooperation as we collectively navigate complexity and shared challenges like those presented here both technically, socially, and regulatory in nature. Other countries looking to Australia as an example could benefit from both the findings of this work and the collaborative approach to its development, drawing together industry perspectives and sharing a reflection of that position.

REFERENCES

1. ACIL Consulting for ARENA (2018) Opportunities for Australia from Hydrogen Exports