

Hydrogen opportunities for water utilities

Globally, hydrogen is undergoing a renaissance as the world seeks to decarbonise. Water utilities can play a potentially large role in decarbonising the economy through both biogas, which is produced in wastewater treatment, and hydrogen, which can be both an energy source and a fuel. Water utilities are in a unique position of competitive advantage with regard to the requirements of production, including having access to water, land away from population centres but close to markets, and renewable energy. Two Australian examples of water utility hydrogen projects are Yarra Valley Water in Melbourne, and Water Corporation in Western Australia, which have used their particular circumstances to participate in the hydrogen value chain in different ways.

CLIMATE THEMES ADDRESSED



NET ZERO EMISSIONS



ENERGY MANAGEMENT



FUGITIVE EMISSIONS



ENERGY EFFICIENCY



EMERGING TECHNOLOGY



RENEWABLE ENERGY



RESOURCE RECOVERY/ REUSE

Background

The urban water industry is actively exploring the opportunities, challenges and benefits that could arise from participating in the hydrogen economy. Key drivers for this include:

- Water is a key input for all forms of hydrogen production
- Water utilities often have land available with appropriate attributes to support safe and cost-effective hydrogen production
- Water utilities are large energy users, and many have made Net Zero-carbon emissions commitments
- Increasing commitment by the urban water industry to transition to and actively participate in the circular economy.

There are two main ways that water utilities can participate in the hydrogen economy:

- 1 Supplying water to hydrogen production facilities
- 2 Participating in the hydrogen value chain in various ways (ie. producing hydrogen)

The availability of water and land are the two key attributes that give water utilities a competitive advantage in the production of hydrogen at cost-effective scales. This gives rise to several considerations for water utilities in participating in the hydrogen economy:

- 1 Managing the competing demands for water and deciding which water resource is the most cost-effective and yet also meets other business and customer considerations
- 2 Wastewater treatment assets are often strategically located in outer-suburban fringes with good connectivity to transportation, gas, industrial and manufacturing infrastructure.

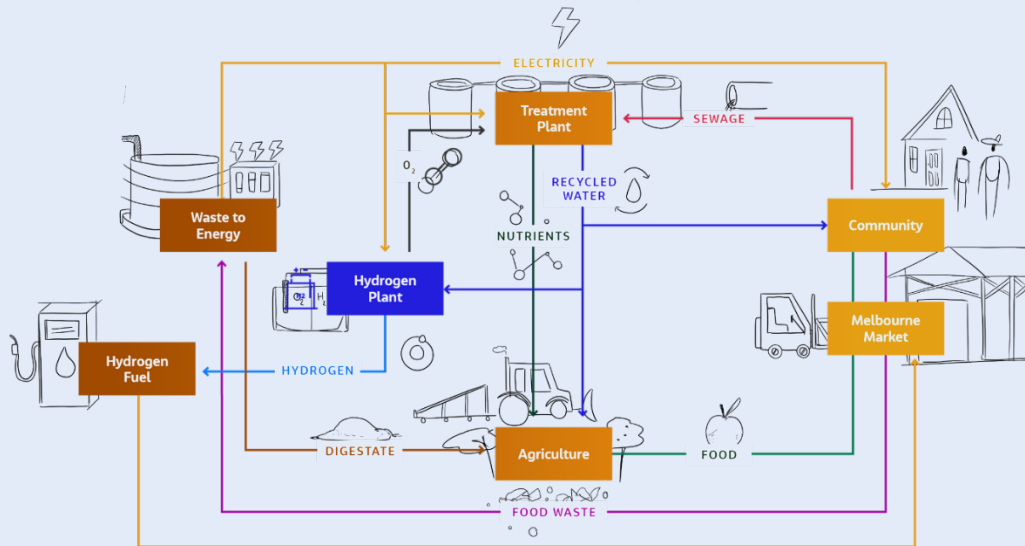
Supplying raw water to hydrogen production facilities is a legitimate business pathway for water utilities. However, the attributes described above can support a significant value add, and source of unregulated revenue, if utilities produce hydrogen themselves and make use of the by-products within their own operations, or on-sell them to the market.

‘Green Hydrogen’ – referring to hydrogen produced with renewable energy – will have the most marketability and consumer preference of all types of hydrogen production.

Yarra Valley Water and Water Corporation have approached the hydrogen economy in different ways.

Water Corporation has partnered with the Hazer Corporation, at their Woodman Point Wastewater Treatment Plant, which is the location of Hazer’s Commercial Demonstration Plant (CDP) that is currently being built. The CDP aims to demonstrate a proprietary technology that utilises the methane component of the biogas (ie. CH₄) generated from sewage treatment to produce hydrogen and captures the carbon as graphite, which has commercial and industrial value.

FIGURE 41 Conceptual circular economy diagram for hydrogen production



SOURCE Yarra Valley Water

FIGURE 42 Hazer demonstration plant site at Water Corporation’s Woodman Point Treatment Plant



Yarra Valley Water is working towards an electrolysis hydrogen production facility co-located at their Aurora Wastewater Treatment Plant in Melbourne’s northern suburbs, which also already houses a Waste to Energy plant. This will use renewable energy generated from the waste to energy plant, to split recycled water into hydrogen and oxygen, with the oxygen forming a critical part of the business case, as it is able to be reused in the wastewater treatment plant process, or on-sold to commercial and industrial users.

The green hydrogen will supply local demands for renewable fuel to be used in stationary power and heat generation; industrial applications; blending into the natural gas distribution network; and fuel for supporting mobility applications such as forklifts, buses and back-to-base trucks.

Benefits to the utility, and to climate-related outcomes

Both these projects provide multiple benefits:

- Reducing/offsetting carbon emissions
- Support a circular economy approach by reusing what are typically termed 'waste' products – treated recycled water and biogas from wastewater treatment
- Providing new revenue sources to the utility.

For Water Corporation, the initial target of the commercial demonstration plant will have a hydrogen production capacity of 100 tonnes and 38 tonnes of graphite per year. Although modest in scale at present, this project has commercial potential with the hydrogen as low emission fuel and the graphite for sale into the advanced materials market for carbon fibre and related products.

The major benefits to Water Corporation include an offtake agreement for its biogas, productive use of excess biogas that may have otherwise been flared, collaboration with industry to assist development of new technologies and demonstration of the potential of a circular economy approach. A full-scale plant following the commercial demonstration plant would significantly increase these benefits.

For Yarra Valley Water, the major benefit is to demonstrate how a water corporation can leverage the following positive attributes:

- 1 Owned and available special purpose land
- 2 Surplus recycled water
- 3 Direct access to renewable energy
- 4 Local demand for hydrogen
- 5 Partial subsidy from internal demand for oxygen
- 6 Access to new technologies, to produce a renewable fuel that can decarbonise hard to reach areas of the economy, at prices that compete with the displaced fossil fuels.

Yarra Valley Water has applied for grant funding to deliver a pilot plant, and then subsequently for a larger permanent facility that will produce and distribute 700 tonnes of green hydrogen per annum to local demands, leaving the oxygen to be consumed onsite by a new recycled water treatment facility.

