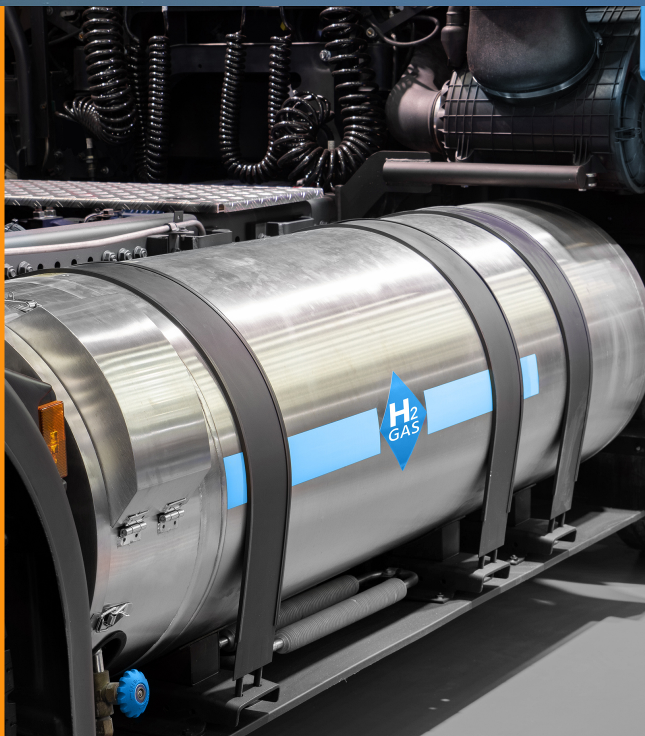
WATER SERVICES
ASSOCIATION OF AUSTRALIA

Urban water industry input to the review of the National Hydrogen Strategy

August 2023



18 August 2023

Review of the National Hydrogen Strategy
DCCEEW Consultation Hub: Make your submission

Urban water industry input to the review of the National Hydrogen Strategy

"Without a national water strategy, there is no national hydrogen strategy"[1]

The Water Services Association of Australia is the peak industry body representing the urban water industry in Australia. Our members are the water utilities, councils and associates who provide water and sewerage services to over 25 million customers in Australia and New Zealand. WSAA facilitates collaboration, knowledge sharing and cooperation within the urban water industry and stakeholders.

Water will be a critical ingredient for the future hydrogen industry – yet it is often taken for granted. Water is referenced in the 2019 National Hydrogen Strategy, along with the need to balance water availability and resources and community concerns raised about water security in focus groups.

In reality, however, there has been limited engagement with water providers, and this varies around the country. This needs to change if Australia's hydrogen ambitions are to be met, as water availability and the timelines for water planning can present real risks.

The National Hydrogen Strategy should be a robust, informative reference on all aspects of hydrogen, with clear guidance for proponents on how governments and communities expect hydrogen to evolve. We make 16 recommendations to address the needs for better, proactive collaboration with water providers and governments.

[1] WSAA report 'Renewing the National Water Initiative – Securing the future of water for people and communities', May 2023

Executive Summary

The emerging hydrogen industry presents an exciting opportunity for Australia. Harnessing it will require well-coordinated collaboration with many sectors, including water. The National Hydrogen Strategy needs to raise awareness of the scale of water demands, and give much more detail on how much water is likely to be needed where, when, of what source and quality, and for different production methods. It needs to emphasise that water scarcity is a constant challenge in Australia, and water needs special attention. Most important of all, more collaborative planning with the governments and water providers that will be asked to make water available for hydrogen in future.

Our 16 recommendations set out a constructive pathway to investigate these questions proactively. The urban water industry and governments have the expertise and skills to work with the hydrogen sector to deliver water to meet the emerging needs in a way that balances sustainability, cost and the expectations of the community.

Underpinning all of this is the need for clear and equitable policy settings on water for hydrogen. As hydrogen proponents may consider schemes in more than one state or territory, consistent settings are important to reduce complexity for operators, and ensure consistency in operating environments and market conditions. This benefits customers and communities too.

The Commonwealth Government is committed to developing a new National Water Initiative. This can help meet the challenges of the future. As WSAA says in its paper Renewing the National Water Initiative: Securing the future of water for people and communities, "without a national water strategy, there is no national hydrogen strategy". The National Hydrogen Strategy and the renewed National Water Initiative should have common water policy settings including:

- **Water sources -** All options on the table for water for hydrogen production, including recycled water, desalination, surface water (rivers and dams), groundwater. The water industry has the expertise and skills to identify the most sustainable mix of water source/s for each location and end use. Simplistic 'one size fits all' assumptions, for example that hydrogen should 'just use desalination', undermine the holistic, place-based approach the water industry takes to sustainably managing our water supplies.

  It is not as simple as identifying which water source/s require the least water. Hydrogen production may require lower volumes of surface water than other water sources, for example – but this may be a less sustainable option in other ways, as it is rainfall-dependent and could impact community water security. Some schemes will need seawater, and we are seeing some proponents want recycled water, in view of its social licence benefits. In some instances a mix of sources may be best.
- **Drought –** will water supplies be guaranteed to hydrogen producers in drought or subject to restrictions? Communities will expect that new industries do not reduce their protection against inevitable drought periods.
- **Who pays** for, and owns, water industry infrastructure for hydrogen – if water assets are to be created for a single large water use customer (eg hydrogen proponent), they should cover the costs, as for other stand-alone customers. The assets should not be paid for by water consumers through water bills, and communities should not bear the risk of hydrogen schemes failing and/or assets becoming unviable. If however a scheme offers shared benefits, a partnership approach that fairly apportions risks and benefits can be developed.
- **Skills and training –** national measures to boost skills and training in hydrogen should include adjacent industries like water, as these industries will require close cooperation and may be competing for the same staff.
- **First Nations –** the National Hydrogen Strategy should enable First Nations communities to enjoy full economic participation in the growing hydrogen industry. It should also require proponents to research and address water supply and water quality gaps in communities within a reasonable vicinity of

hydrogen water supplies. For example if desalinated seawater is to be piped to an inland renewable energy zone, offtakes should be planned for remote communities near its path.

- **Regulatory measures –** water utilities may need amendment to their regulatory settings if governments want them to undertake activities in support of hydrogen, that are not their core business nor cost-effective in their own right.

We also have some key concerns about the current policy environment for hydrogen:

- **Water volumes for hydrogen are often seriously under-estimated –** hydrogen literature often references the stoichiometric need for 9-11 litres of water to make 1 kilogram of hydrogen. As shown by various recent studies (ARUP, GHD) the realistic demand for water is more likely from 20 – 95L/kg, for the full supply chain which includes water treatment losses, cooling water requirements and water used for downstream derivatives such as ammonia. The National Hydrogen Strategy needs to give realistic information. It should provide much more robust and detailed information about water needs from different water sources, developed with water industry input, noting that water needs might change with technical innovations, and committing to regular updates.
- **Costs of water for hydrogen are also under-estimated –** references to water being 1-5% of the cost of hydrogen production appear frequently. We do not know how this was calculated and are unaware of any water industry input. If it is based on current water costs, and does not factor in realistic costs for new large scale water infrastructure, these estimates may be more optimistic than realistic. It is also overly simplistic and may not factor in the many site specific aspects, such as brine management, and rising interest rates which will impact all water costs.
- **Life cycle costs should be considered -** There also needs to be more consideration of the life cycle cost of equipment for different water sources – for example if seawater requires double-pass reverse osmosis, and recycled water requires single pass, producers could be looking at double the cost for membrane replacement using desalination. The water industry has expertise to help hydrogen proponents assess this.
- **More collaborative water planning is needed for hydrogen** – hydrogen proponents and industry representatives need to proactively engage with water utilities, and governments that manage special licences, from now. There is insufficient understanding of the lead times involved in water planning and asset creation. The water industry has the expertise and skill to identify the best source/s of water, and fit-for-purpose treatment, for each specific location. This partnership approach could potentially result in lower project costs and a more engaged community, as water utilities are often long-standing, trusted entities in their regions.
- **Communities care deeply about their water resources** – the need for social licence could have specific dimensions for water. We need to understand community preferences on different water sources for hydrogen, and whether these views change when considering hydrogen for export. Concerns can range from sustainability, to cost, to jobs, to irrigation rights, to safety. Well-planned research designed with water industry expertise, will help identify areas of concern and low understanding, that could shape ongoing plans and community engagement.
- **Guarantee of Origin schemes need to reflect overall sustainability of water** – if Guarantee of Origin schemes are intended to indicate the green credentials of a hydrogen product or source, they need to reflect overall water sustainability – not just how much emissions goes into preparing the water. It should include a water stewardship index including the rainfall independence of the water supply, the extent to which it is reused, whether it offers co-benefits to communities. For emissions, the scheme should only count emissions that are not already incurred through the existing water treatment processes.

- **Oxygen –** there is also important research to be done to understand the potential value to be gained by constructing oxygen offtakes in hydrogen facilities, for use in wastewater treatment and other industries, whether or not the water utility is providing water.

Recommendations:

Our recommendations are:

1. The National Hydrogen Strategy should include policy settings governing water for hydrogen. It should explicitly reference the National Water Initiative and the two Commonwealth government documents should be consistent.
2. The revised National Hydrogen Strategy should clearly communicate realistic estimates of water for production of different types of hydrogen, and downstream derivatives such as ammonia. This should reflect the ranges in water demand based on source water, cooling method, wet/dry location, the proportion consumed vs re-usable, and other factors. It should explicitly call out the need for hydrogen proponents to work with the water industry and governments to identify the most sustainable water use option/s for each situation, taking into account competing needs and uses.
3. The graphic in the National Hydrogen Infrastructure Assessment (figure 3.7.2) should be revised based on realistic water estimates, expressed in more detail, and the assumptions presented.
4. The revised National Hydrogen Strategy should contain more detailed, refined guidance on likely costs of water infrastructure for hydrogen, including different sources of water, costs for construction of new infrastructure, including transport costs, and assumptions used. This should not be expressed as a percentage of assumed hydrogen costs (which also vary). Options could include levelised cost per kilolitre terms and/or other metrics. This should be developed collaboratively between the hydrogen industry and the water industry for credibility, and clearly flag that assumptions can quickly change with time and need regular revisiting.
5. The National Hydrogen Strategy should require hydrogen proponents to engage with state/territory government water planning departments and water utilities proactively and early, to understand their region's water availability, planning processes, likely processes for engagement with any hydrogen projects, costings, risk allocations and other parameters. Such policy settings need to be clearly set out in state hydrogen strategies.
6. A water for hydrogen working group should be formed including state, territory and federal government representatives, water industry representatives, academics and hydrogen industry representatives.
7. The National Hydrogen Strategy must set some principles around water planning for hydrogen, and these should align with those in the National Water Initiative. These must include the need for proponents to consider all sources of water for hydrogen. The most sustainable water source/s will not necessarily be those that simply use the least water. For example hydrogen production might require less surface water than seawater, but surface water may be a less sustainable option in other ways, as it is rainfall-dependent and could impact community water security.
8. The hydrogen and water working group (Recommendation 6) should develop a piece of work that:
    a. Estimates the current use of water for fossil fuel production purposes now, and its decline, by location, over time;
    b. Estimates the increasing water use for hydrogen, by location, over time; this could consider academic work done so far (eg Net Zero Australia) but critically, needs to

have water industry review and input. It may consider benchmarking existing water use for ammonia and methanol production;

   c. Broadly maps water availability of different sources by location across Australia;

   d. Presents these complementary axes against the estimated zones for hydrogen production (such as outlined in the Net Zero Australia work).

9. Net Zero Australia is encouraged to share the assumptions behind their water estimates with the water industry, to review any findings in terms of total water quantities, and the availability of different sources of water. This could cross-reference the ARUP study commissioned by the Australian Hydrogen Council. Any such work needs to incorporate ongoing review processes to reflect the quickly evolving knowledge base.

10. The National Hydrogen Strategy should set an action for the water and hydrogen industry to conduct research about community views on water use for hydrogen, including views on different sources of water, views on how sustainably the water is produced (see Guarantee of Origin section), and degree of comfort with different sources of water being used for hydrogen products that are exported offshore.

11. Guarantee of Origin schemes need to reflect the overall sustainability of water, not just the amount of emissions produced. The overall sustainability of water could be a 'Water stewardship index' and should include factors such as level of rainfall-independence within local context; degree of benefit provided to neighbouring communities; degree of circularity vs linear/single use; as well as emissions produced in the water treatment for hydrogen production.

12. If the Guarantee of Origin emissions calculations for hydrogen products include water supply emissions they should include only the incremental stages of treatment of the water that are specifically performed for hydrogen production. For example, schemes using recycled water should not count all the emissions produced in recycling the water as some of the stages of recycling treatment are performed already, as a requirement for discharge of the water to the environment. The GoO scheme should only capture *additional* emissions for *additional* stages of treatment that the water undergoes to prepare it for hydrogen use. This is consistent with the regulatory treatment of assets for recycled water schemes.

13. The National Infrastructure Assessment should give particular attention to water, but not in a way that divorces water planning for hydrogen, from the overall planning for water resources for all other needs – to ensure holistic hydrological sustainability.

14. The Strategy should ensure that plans to create a suitable hydrogen workforce, include plans for upskilling the workforces of adjacent industries, to cover the resource needs for areas of intersection in future.

15. The 'common use infrastructure' principle should extend to First Nations communities. The Strategy should require planning for hydrogen infrastructure to co-plan essential services such as energy, water, waste management and telecommunications to remote First Nations communities located near hydrogen infrastructure as well. For example, if a desalination plant is planned to pipe water inland, it should provide high quality water for remote communities within a reasonable vicinity, thus helping to close the gap.

16. The Strategy should provide First Nations and other remote communities with information about the intended water supply plans for projects in their state/territory, plus the plans for creating offtakes to supply communities within a reasonable vicinity.

This submission focuses on water – questions 20, 21, 13, 22, 23, and 27 to 30.

1. WSAA submission on behalf of the urban water industry - Water for hydrogen

The Consultation paper asks:

20. What actions do you view as being critical to build and maintain community support for Australia's developing hydrogen industry?
21. How should the interests of the emerging hydrogen industry with respect to water security be balanced with other users?

This paper sets out our concerns and recommendations about water in response to the above two questions. However, we believe that water planning is important enough to be elevated to the supply chain discussion (Question 10):

10. What are the most significant supply chain barriers being faced by Australia's hydrogen industry? Where should Australian governments focus efforts on securing elements of supply chains needed to enable the accelerated growth of the hydrogen sector?

1.1 The renewed National Water Initiative should set out policy settings on water and hydrogen

In our recent paper 'Renewing the National Water Initiative – Securing the future of water for people and communities", WSAA stated that **"Without a national water strategy, there is no national hydrogen strategy"[2].** Hydrogen production of all colours, particularly green, is inextricably linked to the availability and sustainable use of water.

The Commonwealth Government has committed to renew the National Water Initiative which was first signed as an intergovernmental agreement in 2004. This is a good initiative as the 2004 agreement does not reflect the emerging challenges and opportunities of the current age, such as hydrogen. If hydrogen could use more than the entire community water use of Australia, or more water than the entire mining sector does today, then hydrogen should be covered in detail in this foundation platform for good water governance in Australia.

It should include policy settings on:

- **Water sources -** All options on the table for water for hydrogen, including combinations of sources
- **Drought -** are water supplies guaranteed to hydrogen producers in drought? Or, will they be subject to restrictions like other water users? Any differences in approach will drive proponents to shop around within the market. At the same time, communities will want to ensure that in inevitable drought periods, their water supplies are not compromised.
- **Who pays** for, and owns, water industry infrastructure for hydrogen? This could include desalination or recycling treatment plants, electrolysers, transfer pipelines and more. It is generally considered that new water capacity for hydrogen should be paid for by hydrogen producers, not subsidised by water bills. That will also ensure that communities do not take on the risk of creating assets that may not be used if hydrogen hubs fail or hydrogen does not end up occupying as much of the energy market as envisaged. Providing water for hydrogen may be considered an unregulated product in some jurisdictions. Partnership funding approaches may be developed where co-benefits exist.

[2] WSAA report 'Renewing the National Water Initiative – Securing the future of water for people and communities', May 2023

- **Skills and training –** the water industry is already seeking to have national measures to boost skills and training be incorporated in the National Water Initiative. If hydrogen is likely to add a whole new dimension to this challenge, then consistent support from all levels of government should be built in.
- **First Nations –** as outlined in Section 4, there are already huge challenges in this area as all too many remote First Nations communities do not have reliable, clean, safe drinking water supplies. We are seeking the inclusion of measures to address this in the National Water Initiative. The Initiative and the Strategy should commit governments to ensure that when making water plans for hydrogen, they maximise the ability to solve other local water problems for remote First Nations communities within a reasonable vicinity, thus supporting national Closing the Gap priorities and Sustainable Development Goals. This should also include co-design by the communities themselves, and a broader focus on ensuring Aboriginal and Torres Strait Islander peoples are equipped to participate, benefit and be empowered by the emerging hydrogen industry.
- **Regulatory measures –** water utilities may be simple water providers, or regional coordinators for hydrogen production, or customers for oxygen and other chemicals. If governments wish water utilities to do something that is outside their core business or not cost-effective in its own right, they may need to create an enabling environment through regulatory settings to provide water utilities with the mandate to undertake specific activities. As an example, the Statement of Obligations in Victoria provides a clear mandate to Victorian utilities to reach net zero in defined timeframes.

Recommendation 1: The National Hydrogen Strategy should include policy settings governing water for hydrogen. It should explicitly reference the National Water Initiative and the two Commonwealth government documents should be consistent.

1.2 **Water volumes for hydrogen are often seriously under-estimated**

The National Hydrogen Strategy (2019[3]) indicates 9 litres of water are needed to make 1kg of hydrogen, with a note that this may vary based on the condition of the raw water, ie how much treatment it needs to be suitable for hydrogen production, and other factors:

Water inputs

Producing 1 kg of hydrogen requires at least:[v]	
Electrolysis	9 L
Coal gasification	9 L
Steam Methane Reforming (SMR)	4.5 L

These are theoretical amounts of water based on the chemical pathway for each process. In practice water requirements for hydrogen production will vary depending on production method and technology, water content of inputs, and additional water needs for processes like cooling and input water purification.

This statement vastly underestimates the actual water needs for hydrogen production, and may be leading to complacency in the hydrogen industry about water needs.

[3] https://www.dcceew.gov.au/sites/default/files/documents/australias-national-hydrogen-strategy.pdf

The National Hydrogen Infrastructure Assessment (see figure 3.7.2[4]) estimates some national total water demands, with no separation by location.

There is also no guide as to what rate of water demand is assumed in this graphic, ie whether it is the 9l/KG listed in the National Hydrogen Strategy, or a figure from within a realistic range:

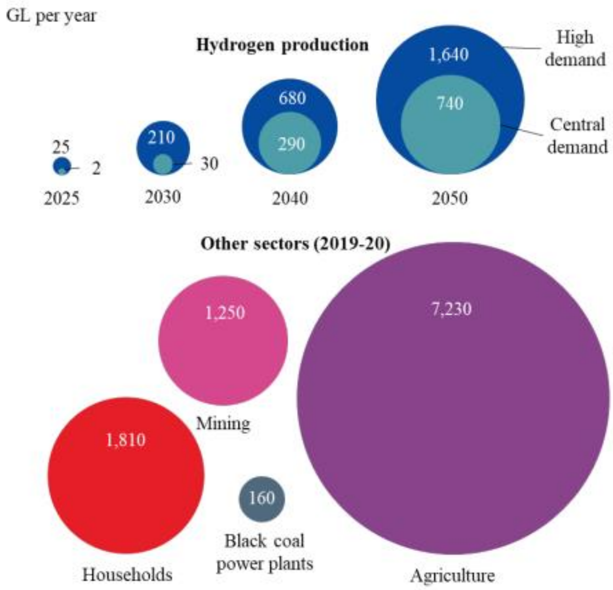


Figure 3.7.2 Modelled water consumption for hydrogen production, compared to current consumption in other Australian sectors. [64]

Recent papers have provided in-depth calculations of the realistic quantities of water needed for hydrogen production:

1. GHD's 'Water for hydrogen' paper – which forecasts up to 95 litres per kilogram of hydrogen:

Table 2: Hydrogen Production – Water Demand

H2 production pathway	Stoichiometric demand (L/kg H_2)	Total demand (L/kg H_2), assuming good quality raw water import
Natural Gas reforming (grey H_2)	4.5	15-40
Natural Gas reforming with carbon capture (blue H_2)	4.5	18-44
Biogas reforming (can be classified as green H_2)	4.5	20-45
Coal gasification (black H_2)	Dependent on C:H ratio in coal and coal moisture content	70
Biomass gasification (can be classified as green H_2)	Dependent on C:H ratio in biomass and biomass moisture content	60
Water electrolysis (green H_2)	9	60-95

2. The Australian Hydrogen Council commissioned ARUP's Technical Paper 'Water for Hydrogen' which presented a range of volumes needed based on water source, cooling method (evaporative or dry air cooling), how much of the water is consumed (vs re-usable) and location. This is referenced in an Australian Hydrogen Council water presentation[5]:

[4] https://www.dcceew.gov.au/energy/publications/national-hydrogen-infrastructure-assessment
[5] https://h2council.com.au/wp-content/uploads/2022/10/221020-AHC-Arup-presentation.pdf

Total volume comparisons

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- When multiplied out to National Hydrogen Strategy scenario hydrogen volumes, consumed water in 2030 is not high compared with other industries
- By 2050 the figures could equal or exceed the water used by the mining industry as a whole

Dry zone, evap cooling	Surface	Recycled	Seawater
Water volume, litres per kg	28	28	76
Deloitte 2030, GL for 1.8Mt H2	50.4	50.4	136.8
Deloitte 2050, GL for 34.1Mt H2	954.8	954.8	2591.6

Dry zone, air cooling	Surface	Recycled	Seawater
Water volume, litres per kg	14	24	24
Deloitte 2030, GL for 1.8Mt H2	25.2	43.2	43.2
Deloitte 2050, GL for 34.1Mt H2	477.4	818.4	818.4

Sector/scenario	Water (GL)
Total agriculture, forestry and fishing	7,319*
Total mining	842*
Coal mining and coal fired power stations in NSW and QLD 2020	383**
Total manufacturing	550*
Australian households 2016-17+	1,900***

* *ABS - 4610.0 Water Account, Australia, 2019-20*, released October 2021. Totals are use that's self-extracted or distributed, minus flows returned to the environment, and have taken out energy and water because too large (hydropower).
** Overton, I. (2020) 'Aren't we in a drought?', *The Conversation*, 5 May.
** * Australian Infrastructure Audit 2019, Chapter 9, p. 604.

The ARUP study is a valuable piece of work, which was designed to show the relative water use of different options around hydrogen. However in so doing it may lead hydrogen proponents to look for surface water schemes – which are often less sustainable and reduce water security for local communities, and less reliable during drought. The National Hydrogen needs to emphasise the critical strategic point that the most sustainable choice for water option/s is not just about 'least water use'.

3. There is a planned Scaling Green Hydrogen CRC which also intends to develop more detailed estimates (still at bid stage).

Many other examples can be found in hydrogen literature citing the 9-11/kg stoichiometric figures, which substantially under-estimate water demand. This is likely one of the contributing factors to the emerging hydrogen industry under-estimating the need to take water needs seriously. It is crucial that the revised National Hydrogen Strategy provide more detailed and realistic estimates of water needs.

It also needs to flag the continually evolving technology that may change the water outlook – for example, the innovation by University of Adelaide (see article, right) may be a game-changer that could dispense with the need for separate desalination plants. The Strategy needs to commit to a process of regular review of water assumptions with a working group including expert water planners.

Green hydrogen straight from the ocean: Adelaide researchers crack new method

Researchers from the University of Adelaide, along with international partners, have successfully used seawater with no pre-treatment to produce green hydrogen. The team did this by introducing an acid layer over the catalysts in situ. "We have split natural seawater into oxygen and hydrogen with nearly 100% efficiency... using a non-precious and cheap catalyst in a commercial electrolyser," University of Adelaide's Professor Shizhang Qiao said.

Recommendation 2: The revised National Hydrogen Strategy should clearly communicate realistic estimates of water for production of different types of hydrogen. This should reflect the ranges in water demand based on source water, cooling method, wet/dry location, the proportion consumed vs re-usable, and other factors. It should explicitly call out the need for hydrogen proponents to work with the water industry and governments to identify the most sustainable water use option/s for each situation, taking into account competing needs and uses.

Recommendation 3: The graphic in the National Hydrogen Infrastructure Assessment (figure 3.7.2) should be revised based on realistic water estimates, expressed in more detail, and the assumptions presented.

1.3 **Costs of water for hydrogen are also under-estimated**

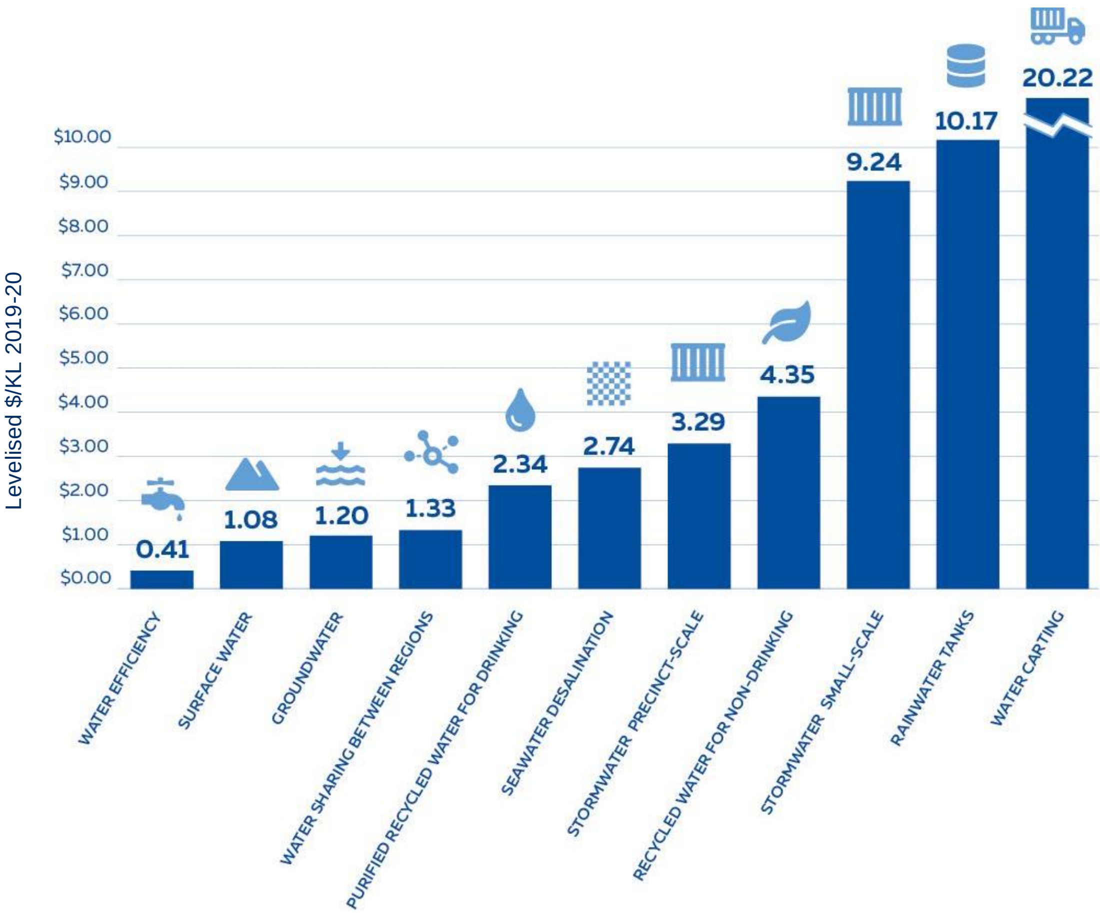
Hydrogen literature often includes estimates that water will represent a small fraction of the price of hydrogen production – eg 2%, 5%. As an example, the National Hydrogen Infrastructure Assessment states that "The cost component of water in hydrogen production, approximately 2%, is not a significant barrier to growth from this perspective." Similarly the 2019 National Hydrogen Strategy states "The cost of the electricity to desalinate seawater to produce hydrogen is minor – likely less than five cents per kilogram of hydrogen."

There is no reference to how these cost assumptions are derived, and we are not aware of any opportunity for the water industry to review them and give input. We believe these estimates may be too low – they may be based on the current prices of water, which is likely to go up reflecting current market conditions and substantial asset investments needed across the country as long-lived water assets reach their capacity and the end of their life. It is also overly simplistic to express them as a percentage of hydrogen project costs – given that these costs themselves can vary.

The estimates may also not be factoring in the need to create new infrastructure, such as new desalination plants. There is a misconception in the energy community that the existing desalination plants have spare capacity that could be available for hydrogen – this is largely incorrect. Most large cities already account for the full capacity of their existing desalination plants for resilience to drought and climate extremes, and are already contemplating more desalination plants for community supply alone.

Desalination plants are high cost infrastructure (Sydney Desalination Plant was refinanced for over $2 billion around 12 years ago, Wonthaggi Desalination Plant estimated at over $5 billion several years ago). They also typically take 4-10 years to build including all required environmental approvals, land acquisition and other processes. It would be valuable to engage with the urban water industry about realistic costs of water in the future hydrogen economy and include more robust figures in the new National Hydrogen Strategy, clearly explaining some of the assumptions used, and building in regular updates.

WSAA completed a study of over 330 Australian water supply projects which provided an indicative guide of levelised cost in $2019-20. This could be further developed to provide clear guidance to the hydrogen industry. These costings covered the full cost of the water being produced and delivered to the customers, which in some cases was able to use existing transport infrastructure, required building new distribution infrastructure. It must be emphasised that this graphic and these water projects were planned for urban use, not hydrogen, and do not include further pre-treatment that may be needed for water that is a hydrogen feedstock (which is often demineralised). Nonetheless they provide some insight:



Transporting water is one of the most expensive parts of the water business – as water is heavy and often requires pumping. If hydrogen proponents are considering projects involving long transport distances, for example coastal desalination plants to produce water that is piped inland, this is likely to be high cost. Estimates of 2-5% may be more optimistic than realistic.

As well as the cost estimates potentially being unreliable, we need to emphasise that a cost lens is too limited a way to look at water. Communities care deeply about their water resources and in particular whether they are used sustainably and locally. This is outlined below in Section 1.11.

Recommendation 4: The revised National Hydrogen Strategy should contain more detailed, refined guidance on likely costs of water infrastructure for hydrogen, including different sources of water, costs for construction of new infrastructure, including transport costs, and assumptions used. This should not be expressed as a percentage of assumed hydrogen costs (which also vary). Options could include levelised cost per kilolitre terms and/or other metrics. This should be developed collaboratively between the hydrogen industry and the water industry for credibility, and clearly flag that assumptions can quickly change with time and need regular revisiting.

1.4 More consideration of life cycle costs

There also needs to be more consideration of the life cycle cost of equipment for different water sources. For example, if seawater requires double-pass reverse osmosis and recycled water requires single pass, producers could be facing double the cost when membrane replacement for desalination is required during the life of the equipment.

1.5 **More collaborative water planning needed for hydrogen**

To date, water appears to be taken for granted by many parts of the hydrogen industry, although this is changing to some degree, and the picture varies across Australia. The Australian Hydrogen Council has done commendable early work to raise awareness of realities around hydrogen water needs.

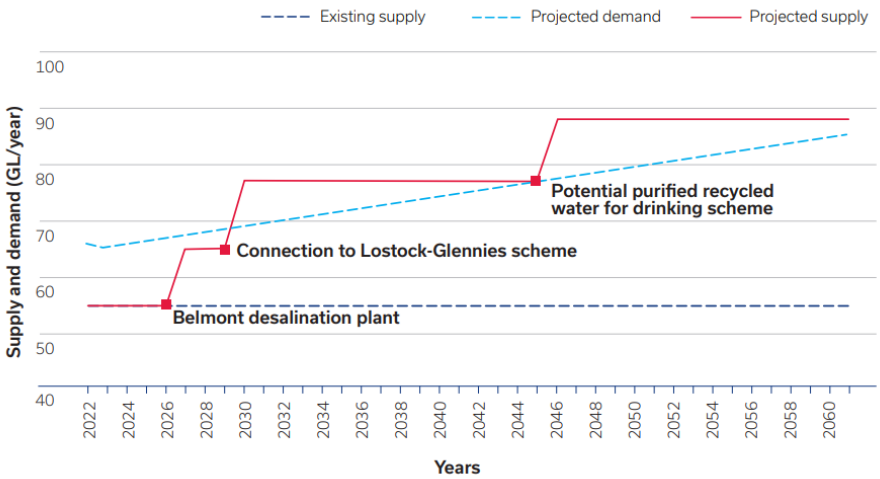
If hydrogen ambitions reach their intended scale, the total water demand for hydrogen could be substantial – the Australian Hydrogen Council estimates more than the entire water usage of the mining sector in Australia. This cannot be done without effective planning. So far the level of engagement has varied between states/territories and regions.

There is also limited understanding of the complexity and scale of water planning. Water utilities and governments typically plan for a 20-50 year horizon for water needs for regions, and the planning process itself takes 2-4 years. Construction of water supply infrastructure can often take 4 – 10 years, including all required approvals and land acquisition. Many hydrogen projects are assumed to be feasible in fairly tight timeframes – the water industry is concerned that these plans are not factoring in realistic estimates of the time it takes to plan, build and commission water industry infrastructure. This may require initial investment decisions to be made prior to water supply agreements with hydrogen industry customers being reached. Consideration of funding options is required to ensure regulated customers are protected from investment risks if industry projections do not eventuate.

Case study – Lower Hunter Water Security Plan

Released in 2022, the Lower Hunter Water Security Plan is a whole-of-government approach to ensuring the region has a resilient and sustainable water future that contributes to regional health and prosperity, and is supported by the community. The plan outlines an adaptive approach that utilises a range of measures including improved water efficiency, reduced water leakage, increased recycling and new water sources to meet community water needs out to 2060 (see graphic below).

Projections of water demands to support hydrogen in the region have emerged since completion of the plan and could see an increase in water demands of 15-20% for the region, bringing forward future water supply scheme investments by up to 20 years if drinking water sources were used. There is support from the community for recycled water which makes the most of our existing water resources, particularly before investing in new sources. New rainfall independent supplies such as desalination and recycled water will help improve system resilience for future uncertainty including a changing climate. Due to lead times for new large water supply infrastructure it will be important to develop a timely, coordinated approach to water supply planning to service mid and upper range industry projections.



In hydrogen hub locations, the planning challenge is exacerbated by the sheer number of potential proponents looking at an area. Working with multiple proponents, who are working to different investment decision dates (including waiting for outcomes of Hydrogen Headstart applications), is highly complex as it could require potential aggregation of water volume, with uncertainty about which schemes will proceed and which won't. Because the investment decision dates are separated, decisions about sizing of infrastructure are difficult; especially in a regulated environment, which was not designed for the scale of asset growth earmarked for hydrogen. If governments want to achieve an export scale hydrogen industry, they need to support water utilities from a funding, regulatory and risk perspective, to ensure that appropriate common user infrastructure is able to be developed in line with the hydrogen industry's plans, without allocating the burden of risk and uncertainty to communities.

Australia is a vast continent with extreme variability in climate and water availability, by location and season. Current scale water production and naturally occurring water is matched to current usage requirements. It is the role of water utilities and governments to balance the water needs of competing uses plus environmental and cultural allocations. They also are intimately conscious of environmentally sensitive sites such as the Great Barrier Reef. They are experienced at this and well versed in the challenges of competing uses. Only with deep collaboration can both industries seek to manage their respective roles and deliver on their core commitments.

Hydrogen proponents need to engage thoroughly, and soon, with water utilities and governments – if they want water needs for hydrogen to be considered as part of the long-term holistic planning processes undertaken. Considering the speed at which hydrogen plans expect production to be underway, the National Hydrogen Strategy needs to urgently drive this engagement and collaborative planning.

Planning for water needs has to date seen the water industry in the simple role of provider of water (from a range of potential sources). However, the water industry has scope to be more, including:

- **Regional coordinator** – there are regions, such as in Victoria, where water could be collected and made available in a regional grid. It could incorporate different sources such as desalination and recycled water, taking pressure off scarce fresh water resources. But the water industry could go beyond simply providing water – water utilities are generally well established, well connected long term regional players, that can coordinate the opportunities for hydrogen production, transport, distribution and export. There are good opportunities for effective collaboration between water and hydrogen industries.

- **Customers for oxygen** – the bi-production of oxygen is an area of untapped potential value in the hydrogen field. Oxygen produced by electrolysis is generally wasted to atmosphere, and presumed to have little value. However this oxygen could be used in wastewater processes to improve efficiency and defer the need for capital investment. The water industry also has other needs for oxygen (eg. odour control, production of disinfection chemicals). Equally, many other industries rely on a reliable supply of oxygen for their production needs (eg. metals production, healthcare, glass, chemicals).

  Early pilot work is being done to understand the potential value of investing in constructing an oxygen offtake from a hydrogen facility, to beneficially reuse the oxygen in wastewater treatment.

  The economic development opportunity lies in understanding that hydrogen production could drive an additional market, in which water utilities, and other businesses could be oxygen customers. This is not linked to whether the water utility supplies the water for the hydrogen facility, or what source/s of water. It does not mean the water utilities would necessarily look to produce hydrogen themselves. However, it is another factor that may make partnerships between water utilities and hydrogen proponents valuable, as utilities could have multiple beneficial co-benefits to offer – available water, such as recycled water; treatment plant sites which may have sufficient space nearby for electrolyser placement; treatment processes that could use enriched oxygen; and location close to transport and distribution hubs.

The potential of this second market needs to be understood as it could influence where hydrogen hubs are located, as hydrogen proponents may choose to locate where there are potential oxygen customers that can provide an additional revenue stream. It could also influence the electrolyser market, as electrolysers could be customised for better oxygen production during the hydrogen production process.

The valorisation of oxygen is being explored in connection with the Scaling Green Hydrogen CRC, and some water utilities are advancing demonstration trials to help. For the water industry, issues to explore include the cost-effectiveness using oxygen in wastewater treatment processes, and the cost to build oxygen offtakes and retrofit them to existing plants. This will be site-specific.

- **Water utilities can also produce green hydrogen themselves** – for example from recycled water at water resource recovery plants. Some pilot trials are underway around the country. The scale of this can vary from a small production capacity that could be used internally for hydrogen vehicles (and demand management opportunities to support grid stabilisation), to a potentially larger production that could be sold to energy providers for distribution. If these schemes can contribute to national targets, they are worth pursuing. However, hydrogen production at wastewater facilities may only be niche in scale. If governments want us to pursue this, in some cases the water utilities may need support or the provision of a 'regulatory mandate' through government mechanisms such as formal directions, to justify the investment needed – as producing hydrogen is not a core water utility business.
- These roles are explored in WSAA's report Water Fuelling the Path to a Hydrogen Economy.

Recommendation 5: The National Hydrogen Strategy should require hydrogen proponents to engage with state/territory government water planning departments and water utilities proactively and early, to understand their region's water availability, planning processes, likely processes for engagement with any hydrogen projects, costings, risk allocations and other parameters. Such policy settings need to be clearly set out in state hydrogen strategies.

Recommendation 6: A water for hydrogen working group should be formed including state, territory and federal government representatives, water industry representatives, academics and hydrogen industry representatives.

1.6 **Water is scarce in Australia: All options on the table for hydrogen**

Water is a scarce resource in Australia. Many places are already seeing sustained reductions in inflows to rivers and dams. Climate change will exacerbate these reductions in many instances. Many cities and towns are already on a journey to complement their traditional water sources, such as rivers and dams, with more rainfall-independent sources of supply such as desalination and recycled water (for non-drinking purposes) or purified recycled water which can be used to supplement drinking water supplies. There is a misconception in some sectors that the existing desalination plants have spare capacity already – this is not the case. The capacity of large desalination plants in most regions is already spoken for, to provide resilience to existing water supplies, and more desalination plants are being considered.

All sources of water are likely to play a crucial role in future in Australia – including surface water, groundwater, desalination, recycled water and stormwater; even mine discharge water. There will be increasing competition for water resources. Recycled water from wastewater, is a valuable commodity which is also now recognised as a resource that can be used for a wide range of purposes from irrigation and industrial applications, through to supplementing drinking water supplies once purified suitably.

Some of the large scale hydrogen schemes are likely to need more water than is available from recycled water. However this will not always be the case, and communities may prefer to see available recycled water used beneficially before new infrastructure is created. Holistic planning is needed to consider these options and their relative costs and benefits.

Water is also highly localised – the nature of water risks, stakeholders and community views varies. There is a core need to not apply blanket assumptions for water issues.

1.7 Some hydrogen schemes may access water separately from the urban community supply

Not all water for industry in Australia is currently provided by urban water utilities. For example, some of the water that goes to large users like mines, power plants and agriculture, is provided via direct special water access licences granted to private entities by state and territory governments. Because hydrogen involves sourcing water from options including recycling and desalination there is a tendency to include it in consideration of urban water supplies which currently use these technologies. However, there are choices to be made by governments and policy makers about the treatment of water for hydrogen. Should it be included in urban water planning like industrial and commercial customers, or should it be treated more like water for mines, power supplies and agriculture and seen as separate to urban water planning? Will it be hybrid, and vary by location?

There needs to be consideration between water utilities and governments as to which approach, or a mix of the two, is most suitable for hydrogen, in each location. The answer will not be one size fits all – in some states and regions governments could decide to treat water supply for hydrogen as separate from community water supply, in other places, governments will look to the water utility to provide water for hydrogen alongside other community uses, and balance the competing needs.

Whichever way is adopted in different places, the water supply still needs to be balanced holistically and cautiously, noting the range of uses plus environmental and cultural allocations need to be provided. At a hydrological level, wherever you take the water from, it can still detract from the water supply that is available to others for other purposes. Even where water is provided via special access licenses, there are still customers who could be impacted such as farmers and irrigators. As climate change continues, there is likely to be more pressure on water for all purposes. All governments will need to undertake careful planning to ensure that the water balance is protected.

The 2019 National Hydrogen Strategy itself details community concerns raised about water security in focus groups. This is why farmers and irrigators noted concerns about hydrogen in the focus groups for the 2019 National Hydrogen Strategy. In a context of changing weather patterns this concern is only likely to increase.

Good water planning involves looking at the best portfolio of solutions for locations – not putting ‘all your eggs in one basket’ but rather having a diversified mix of water sources. The results vary considerably based on geography and other factors. Water is heavy and any source of water that requires long transport distances are likely to be very high cost. For example: some parts of Australia have groundwater available. For coastal locations, the ocean presents a plentiful water source that is non rainfall dependent, though the water requires very high treatment. Desalination may be feasible for brackish water, including at inland locations; it is likely extremely high cost to desalinate and transport sea water to inland locations. Recycled water is available in virtually all urban locations as it reuses water that we already have. To achieve a secure water supply, most places will typically develop a mix of sources.

The National Hydrogen Strategy needs to avoid simplistic assumptions and shortcuts, and drive the energy industry to engage with the water industry in doing the work to identify the best sources or portfolios of water sources for each scheme. The Strategy should explicitly require water planning for hydrogen to consider all sources of water, and the most sustainable and cost-effective mix for their location; the same goes for other water intensive industries. This applies whether or not the water for hydrogen is to come out of the urban community's water supply. The principles should align with principles in the renewed National Water Initiative.

For the hydrogen opportunity to drive robust economic development that benefits Australian communities, it needs to complement, not cannibalise existing sources and end uses of water. There are already hydrogen pilots occurring using river water, recycled water, and desalination is targeted for others. A significant danger is that the hydrogen industry looks for simple 'one size fits all' water approaches, which will undermine the holistic approach the water industry takes to sustainably managing our water supplies.

Recommendation 7: The National Hydrogen Strategy must set some principles around water planning for hydrogen, and these should align with those in the National Water Initiative. These must include the need for proponents to consider all sources of water for hydrogen. The most sustainable water source/s will not necessarily be those that simply use the least water. For example hydrogen production might require less surface water than seawater, but surface water may be a less sustainable option in other ways, as it is rainfall-dependent and could impact community water security.

1.8 Timing of water needs is as important as quantity

For effective water planning, there needs to be a detailed assessment of the timing needs for water for hydrogen. Against the backdrop of rising hydrogen demands, water demands for fossil fuel production should be winding down. The energy and water industries would value understanding how the rising water use for various colours of hydrogen, compares in timing and quantity against declining water use for fossil fuel production such as coal-fired power. Given the cost of water infrastructure, it is undesirable to build expensive new plants such as desalination, if it is only to cover a short-term hump in usage. The water industry practises adaptive planning approaches that identify staged investment approaches to reduce the risk of wasted investment.

This also needs to consider what happens in each jurisdiction when special access licences for fossil fuels expire – if they are renewed at all and/or made available to new users such as renewable energy.

1.9 Common user infrastructure

There is also the notion of common user infrastructure. The 2019 National Infrastructure Assessment states "On the other hand, hydrogen production locations along the coastline could have access to water from purpose-built desalination plants, with this potential water source excluded from the WRI model. The development of such facilities, while it could slightly increase the cost of hydrogen, could represent an opportunity for shared infrastructure with the local communities and provide an additional source of potable water to supplement local supply. However, the environmental impact of such plants should also be carefully evaluated, as the high salinity brine released in the water purification process can impact delicate ecosystems such as the Great Barrier Reef in Queensland."

The Consultation Paper talks about maximising common uses of water infrastructure, and ensuring that water assets can supply water to whoever is in need. This makes perfect sense conceptually, and may present some sensible opportunities for meeting multiple needs via hydrogen water infrastructure projects.

However, it suggests that all water sources are equal. In fact, water industry planning is a complex process which incorporates the relative cost and sustainability of the range of water sources available in a location, in a holistic way. It may make little sense, for example, to build a high cost coastal desalination plant with the assumption that the spare water can be used for public space irrigation. Desalination is very high cost water and it may make far more sense to plan water resources holistically and create a local water source to meet the needs for public space irrigation.

We support exploration of the opportunities for common use infrastructure so long as it is done in a holistic way as part of broader strategic water planning. It should explore a wide range of shared potential benefits such as co-developed recycled water infrastructure, inland or coastal, to support agriculture and other industry needs.

Recommendation 8: The hydrogen and water working group (Recommendation 6) should develop a piece of work that:

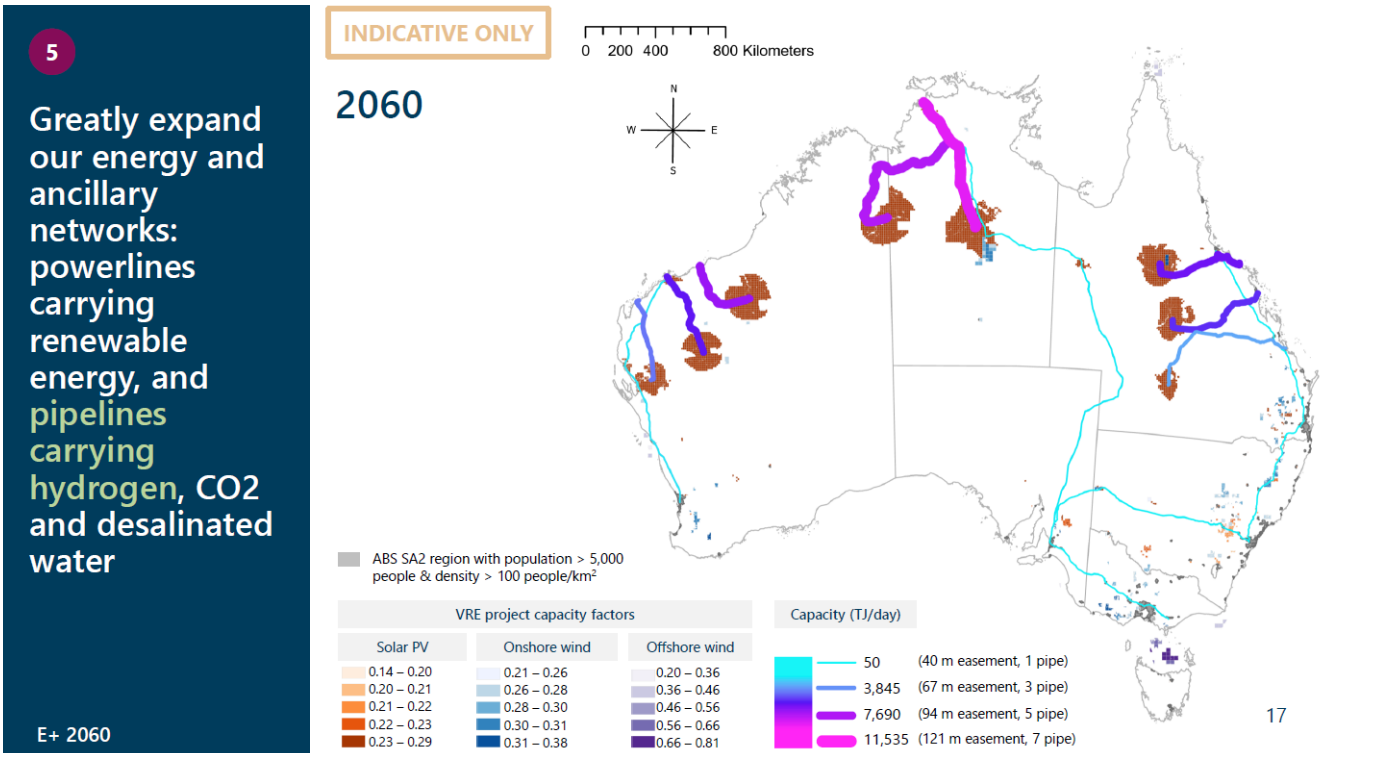
- **Estimates the current use of water for fossil fuel production purposes now, and its decline, by location, over time;**
- **Estimates the increasing water use for hydrogen, by location, over time; this could consider academic work done so far (eg Net Zero Australia) but critically, needs to have water industry review and input.**
- **Maps water availability of different sources by location across Australia;**
- **Presents these complementary axes against the estimated zones for hydrogen production (such as outlined in the Net Zero Australia work).**

1.10 Net Zero Australia work

The Net Zero Australia study about pathways to Australia's renewable energy future, estimates that Australia's total water consumption increases by 2 – 3.5 times its current, with net fresh water demand falling as major coastal desalination plants are built in most states. This work is founded on a simple assumption of 100% desalinated water. The work has not involved any consultation with the urban water industry who conduct the water planning.

While it is valuable to do this work, the picture it presents for water is challenging. Most of the identified renewable energy zones in northern Australia are not close to water supply, and transporting desalinated water inland via pipelines is high cost. It would be valuable to cross-check these plans against water availability matrixes (see Recommendation 8). A significant danger is that the hydrogen industry looks for simple 'one size fits all' water approaches, which will undermine the holistic approach the water industry takes to sustainably managing our water supplies.

WSAA recommends that this work be circulated for water industry input, and have commenced this process with Net Zero Australia.



Recommendation 9: Net Zero Australia is encouraged to share the assumptions behind their water estimates with the water industry, to review any findings in terms of total water quantities, and the availability of different sources of water. This could cross-reference the ARUP study commissioned by the Australian Hydrogen Council. Any such work needs to incorporate ongoing review processes to reflect the quickly evolving knowledge base.

1.11 Communities care deeply about their water resources

Communities care deeply about their water resources and in particular whether they are used sustainably and locally. They will not be receptive to water being expressed as a fraction on a cost ledger. Communities are acutely aware that water is scarce and there are competing demands on it. The 2019 National Hydrogen Strategy itself details community concerns raised about water security in focus groups. In a context of changing weather patterns this concern is only likely to increase.

Surface water resources can deplete very quickly, as was shown in the NSW drought in 2019, when 50 towns were counting towards Day Zero. Water is a fundamental essential service for all aspects of life and communities will not want to see its availability traded for another service, even if energy is also an essential service. They will expect that renewable energy schemes are developed in a way that do not threaten other essential services.

In addition the issue of domestic versus export use needs to be considered. The national hydrogen plans identify substantial export opportunities for different colours of hydrogen. Care should be taken here as communities may not support their water resources being used for export products. Professor Alan Finkel referred to renewable energy exports as 'shipping sunshine[6]', but sunshine is something Australia has in abundance. We do not have abundant water, and in many parts of Australia we have very fragile water balances. Exporting green hydrogen could be perceived as 'shipping our water'.

[6] https://reneweconomy.com.au/shipping-sunshine-finkel-launches-race-for-clean-hydrogen-in-an-electric-planet-63464/

Community acceptance is relevant for any use of water, but given the expectations for hydrogen's scale and speed, that makes the need for understanding community views on hydrogen more urgent. If the hydrogen industry is seeking to obtain and maintain social licence, they should work with the water industry to canvass community views on which sources of water they see as acceptable for use in domestic hydrogen production and export. Communities may be less supportive of schemes that use scarce water resources for export commodities. Some water sources such as desalination or recycling may be seen differently to fresh surface water sources. Research to understand these nuances will be a valuable ingredient in scheme planning. The Scaling Green Hydrogen CRC could be a good vehicle for this work.

Recommendation 10: The National Hydrogen Strategy should set an action for the water and hydrogen industry to conduct research about community views on water use for hydrogen, including views on different sources of water, views on how sustainably the water is produced (see Guarantee of Origin section), and degree of comfort with different sources of water being used for hydrogen products that are exported offshore.

1.12 Guarantee of Origin schemes need to reflect overall sustainability of water

Guarantee of Origin schemes are a key indicator to purchasers and consumers, of the credibility of a hydrogen source or project. In the Clean Energy Regulator's development to date of a scheme so far, the focus has been almost exclusively on using the GoO scheme to reflect the 'green' credentials of a scheme, based on emissions reduction. The scheme emulates the IPHE[7] global method – but that method may need adaptation for the Australian context, where water scarcity is a uniquely critical issue.

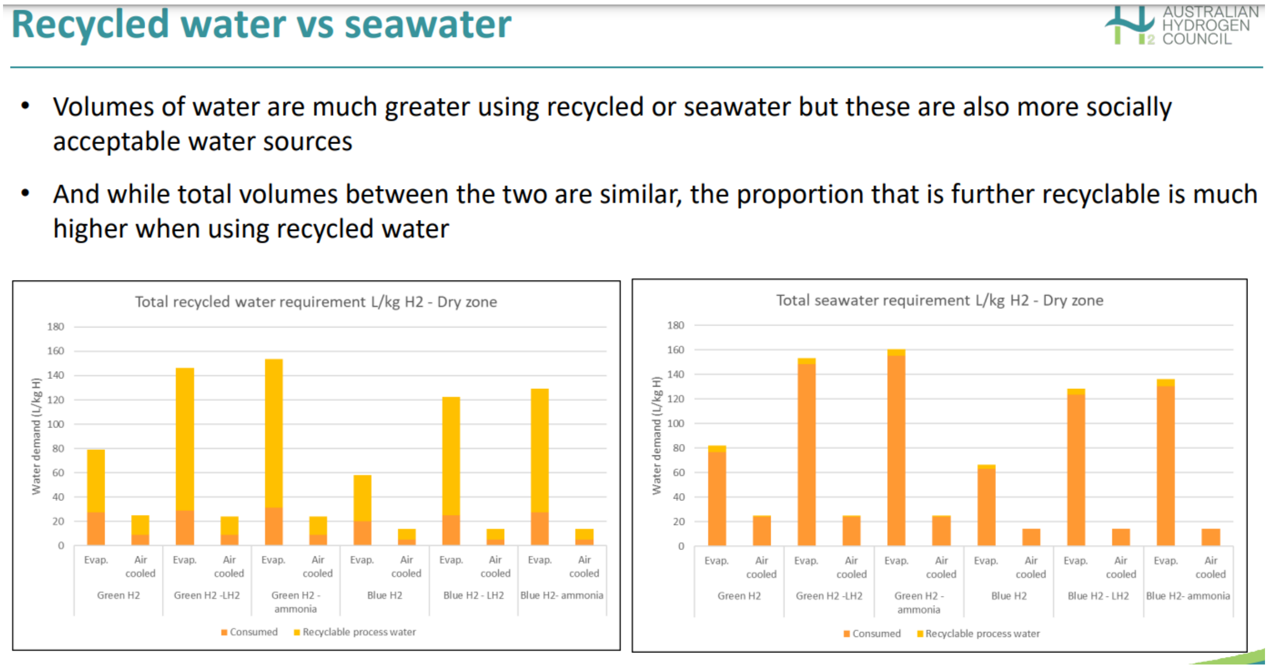
While we understand the desire for simple, tangible metrics, scoring hydrogen project water credentials on emissions alone would skew the results in favour of schemes using surface water, which produce less emissions in treatment – but perversely, could impact water security for local communities more than other water sources. The GoO scheme needs to do better than this. When it comes to water, sustainability is far broader and encompasses various aspects, including:

- Level of rainfall/climate independence – a water source that relies on rainfall, such as surface water (rivers or dams), is usually less sustainable – it is both less reliable for the users (eg during drought), and could require taking scarce water from the environment, which impacts river health and overall ecological sustainability. Other sources such as recycled water and desalination are more rainfall/climate independent as they can produce water even in times of drought or flood/cyclone/bushfire, their water production extracts less water from waterways meaning river health is better preserved. However, this is location-specific, and the GoO needs to find a way to capture this sustainability or it could lead to perverse outcomes.

- Degree of benefit to neighbouring communities – as outlined below in Section 4, many of the hydrogen schemes are likely to be sited in regional or remote locations. Some of these locations eg in Northern Australia are in the vicinity of small First Nations communities with known problems with water scarcity and lack of a reliable, clean safe drinking water supply. Research has shown that customers tend to support essential service schemes that offer co-benefits such as support to First Nations communities (see WSAA Willingness to Pay for carbon abatement study[8]). If a water source is to be created to transport inland, for example a coastal desalination scheme, the GoO scheme should measure the extent to which that hydrogen project can benefit neighbouring communities, and the extent to which it implements that assistance.

[7] International Partnership for Hydrogen and Fuel Cells in the Economy – link
[8] https://www.wsaa.asn.au/publication/willingness-pay-carbon-abatement-and-co-benefits-australian-urban-water-sector

- Degree of circularity – the principles of circular economy seek to keep products in use for as long as possible, at their highest value. Water is a prime candidate for reuse at several stages – the source water can itself be recycled, for example wastewater effluent is already treated before its release to the environment, and can be refined through further treatment processes such as reverse osmosis to create water of a quality suitable for hydrogen. In addition, some of the water used in hydrogen is consumed, whereas some of the water can be re-used such as in cooling processes (see Australian Hydrogen Council study by ARUP, below). Scheme proponents make a series of water stewardship choices in their scheme design, including cooling tower selection, brine management; with different levels of benefit that should be reflected in GoO. Communities often like to see that we are using the water we have efficiently[9] and will likely be supportive of schemes that maximise the reuse of water – the GoO scheme should reflect this.



- Emissions production: GoO schemes have the potential to unfairly represent certain water sources if they do not accurately pinpoint the *incremental* emissions involved in treating water to certain sources. An example WSAA has presented to the Clean Energy Fund to date is recycled water. Water utilities already have requirements in their licences to treat water to a certain standard before it can be discharged to the environment – ie they already have to recycle the water to a certain degree as part of standard wastewater treatment. It is important that the GoO scheme does not include those emissions, which are already incurred for the purposes of the water utility delivering its core business purposes.

  If a hydrogen scheme uses recycled water, it will likely require further treatment of that recycled water – such as through reverse osmosis. The GoO scheme should only capture those incremental emissions created by the application of supplementary treatment processes for hydrogen production. This is consistent with the regulatory treatment of recycling assets – the assets used to treat the water to the minimum standard for environmental release are classified as wastewater treatment assets. Any additional assets that then create recycled water as a saleable product are classified as recycled water assets and their costs form part of the recycled water cost recovery framework.

Recommendation 11: Guarantee of Origin schemes need to reflect the overall sustainability of water, not just the amount of emissions produced. The overall sustainability of water could be a

[9] See Priority 2 – Making the Most of What We've got (Lower Hunter Water Security Plan Community Consultation report)

'Water stewardship index' and should include factors such as level of rainfall-independence within local context; degree of benefit provided to neighbouring communities; degree of circularity vs linear/single use; as well as emissions produced in the water treatment for hydrogen production.

Recommendation 12: If the Guarantee of Origin emissions calculations for hydrogen products include water supply emissions, they should include only the incremental stages of treatment of the water that are specifically performed for hydrogen production. For example, schemes using recycled water should not count all the emissions produced in recycling the water as some of the stages of recycling treatment are performed already, as a requirement for discharge of the water to the environment. The GoO scheme should only measure and capture *additional* emissions for *additional* stages of treatment that the water undergoes to prepare it for hydrogen use. This is consistent with the regulatory treatment of assets for recycled water schemes.

2. Water requires special attention, but the water context must still be managed holistically

27. How can the National Hydrogen Infrastructure Assessment be delivered to maximise the value to governments and industry?

For example, the existing approach could be repeated or alternatively specific infrastructure issues such as water supply and treatment, storage, hydrogen pipelines could be given particular attention.

28. How can Australian governments ensure the efficient use of existing infrastructure, and delivery of new infrastructure, including common user infrastructure?
29. How should the infrastructure needs of the hydrogen industry be balanced with other infrastructure users e.g electricity generation?
30. What are the trade-offs (or synergies) of developing a hydrogen industry with other government goals?

For example, the growth of the hydrogen sector may present trade-offs regarding the prioritisation of the 82% national renewable electricity target, or competition for existing water infrastructure. However, hydrogen also presents an opportunity to enhance grid stability and could contribute positively to regional water security issues through the development of shared infrastructure.

WSAA believes that water infrastructure should be given particular attention as it is an ingredient which could disrupt the entire hydrogen enterprise if not managed well.

However, this should not be carved out from overall water planning processes – whether for urban supplies or for special access licences - as this goes against all principles of holistic planning which are key to the ongoing sustainable management of water.

As per our recommendations in earlier sections, water planning should receive special attention; should be done collaboratively with the water industry and governments; should develop detailed studies about the timing and location of water use, and availability across Australia; and should consider a mix of sources. Opportunities for common use infrastructure should be examined carefully for the overall cost-effectiveness versus other approaches.

Recommendation 13: The National Infrastructure Assessment should give particular attention to water, but not in a way that divorces water planning for hydrogen, from the overall planning for water resources for all other needs – to ensure holistic hydrological sustainability.

3. Workforce planning for hydrogen needs to encompass adjacent industries like water

13. What is the role of industry and governments to ensure the hydrogen industry has access to an appropriately sized and skilled workforce?

This is indeed a substantial challenge because large scale hydrogen will require new scientific, construction, operation, validation, transportation and logistics skills sets. The challenge is compounded because many industries will be on similar paths, and likely competing for the same people to make up their workforce.

Authorities will develop plans to address this which include training, attracting and retaining existing staff; pipelines of new staff from domestic and overseas labour markets; and supporting measures around establishing competencies, training resources and vocational pathways. Governments and industries will all have a role to play in meeting this challenge – and need to work collaboratively to reduce duplication and minimise cannibalisation.

One of the areas of need will be for people who can interface between adjacent industries involved in planning for hydrogen. Water is one of these. An effective hydrogen economy will require people in the energy industry to be conversant with water planning methods and water operations. Similarly, people in the water industry will be increasingly required to understand hydrogen operations and the opportunities for beneficial cooperation.

There are already substantial, well documented, urgent challenges within the water industry, in attracting and retaining qualified staff, and in providing well resourced, robust training programs. A bleed of water staff to renewable energy projects could exacerbate this. This needs to be managed carefully, as without well-run water treatment facilities, there will not be reliable supplies of water for hydrogen.

In this context we recommend:

Recommendation 14: Ensure that plans to create a suitable hydrogen workforce, include plans for upskilling the workforces of adjacent industries, to cover the resource needs for areas of intersection in future.

4. Water sources for hydrogen should seek to address First Nations water shortages as well

22. How else can Australian governments ensure that First Nations communities are resourced to effectively participate, benefit and be empowered by the development of the hydrogen industry?
23. Is there more information that the communities including First Nations communities would like to receive about the renewable energy and hydrogen sector? What information should be provided?

It is critical that Australian governments enable First Nations communities to benefit from the development of the hydrogen industry, given that it will likely impact their lands, their resources and their people. We support the measures touched on in the Consultation Paper such as capacity building to build community understanding and better engagement. We would add to this: ensuring there is clear and consistent regulatory support for First Nations empowerment across the country, including minimum standards for sharing of economic benefits, that go beyond historic norms.

The recent announcement of a project in East Kimberley, Western Australia, provides an inspiring example. See article "Aboriginal owners and energy investors team up in plan for $3bn green hydrogen plant in WA" in the Guardian[10].

Consideration of First Nations outcomes has deep connections to a large body of work WSAA conducted which has identified that there are hundreds of remote First Nations communities, particularly in WA, SA, NT and QLD, that do not enjoy a reliable supply of clean, safe drinking water. This relates to both:

- a reliable quantity of water in their locations, whether it comes from rivers, bores or other sources; and

- the quality of that water – there are many documented cases of water quality that does not comply with Australian Drinking Water Guidelines, and many more cases where there is no compliance regime to find out about non-compliances. The lack of reliable water aligns broadly with higher rates of illness and other poor outcomes which Closing the Gap work tries to address.

This is a complex situation that has arisen over many years and with many changes in governance and other arrangements in different jurisdictions. For more detail, see our report Closing the Water Gap for People and Communities.

Climate change will exacerbate these problems and make for even less reliable water for many remote First Nations communities.

Federal and state/territory governments are undertaking substantial work to try and improve the water services to remote First Nations communities. Better water services is not only a human right, it also helps to address other fundamental closing the gap issues, because water supports the infrastructure in First Nations communities. For example poor water quality drives people to drink bottled water or soft drink, which exacerbates affordability and health issues. Poor water quality causes non-functioning of plumbing and other hardware, which can lead occupants to move in with others, adding to over-crowding and mental health issues.

One of the recommended approaches to address this is **place based planning**, so that the communities themselves can co-develop arrangements for their community, and they can coordinate all the different services centrally (power, water, sanitation, telecommunications, waste management) rather than each utility managing its own services remotely and in isolation, which can lead to a road being opened one week by the power company, and again a short time later by the telecommunications company.

Large scale hydrogen projects provide an opportunity not just for economic gain to First Nations communities, but to build other forms of essential infrastructure at the same time as hydrogen infrastructure is built. For example, if a hydrogen hub is planned for remote areas in the northern part of Australia, place-based planning could identify the water, telecommunications and waste management needs for remote communities within a reasonable vicinity. If delivered concurrently, the incremental cost would be minor, but the contribution to better living outcomes could be substantial.

Unlike many areas of water provision which are paid for by the users, this is unfeasible for water for remote First Nations communities. Clean, safe drinking water must be viewed as a basic human right which all Australians are entitled to – and too many First Nations remote communities have been missing out on this for far too long. Therefore governments, the hydrogen and water industries need to provide information on the funding arrangements for extending water infrastructure for hydrogen to help close the

[10] https://www.theguardian.com/australia-news/2023/jul/18/aboriginal-owners-and-energy-investors-team-up-in-plan-for-3bn-green-hydrogen-plant-in-wa

gap.

Recommendation 15: The ‘common use infrastructure’ principle should extend to First Nations communities. All planning for hydrogen infrastructure should seek to provide essential services such as energy, water, waste management and telecommunications to remote First Nations communities located near hydrogen infrastructure as well. For example, the planning for water provision to a renewable energy scheme for hydrogen should ensure that it incorporates high quality water for remote communities within a reasonable vicinity.

Recommendation 16: Provide First Nations and other remote communities with information about the intended water supply plans for projects in their state/territory, plus the plans for creating offtakes to supply communities within a reasonable vicinity.

We thank you for the opportunity to contribute to this worthwhile review. Please contact me if you would like any further information, on adam.lovell@wsaa.asn.au or 0417211319.

Kind regards

Adam Lovell
Executive Director
Water Services Association of Australia