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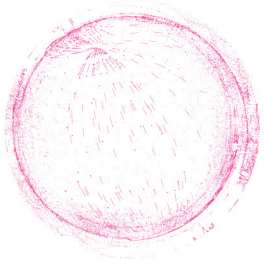

30-10-23

Re: WA Government Renewable Hydrogen Target Consultation

Thank you for the opportunity to submit feedback on a potential Renewable Hydrogen Target for the South West Interconnected System (SWIS).

I don't support the proposed scheme as described in the consultation paper. It is likely that the scheme will increase the cost and slow the decarbonisation of the SWIS, while incentivising projects that target inappropriate uses of hydrogen and so ultimately the scheme may be detrimental to local industry development.

I have provided further comments below in relation to some of the questions posed in the consultation paper.

Question 1. What are some examples of an objective or objectives that could be used to assess the benefits, costs and impacts of a Renewable Hydrogen Target for electricity generation?

Generating electricity from hydrogen as an intermediate energy carrier is significantly less efficient and more costly than generating electricity directly from gas or renewable energy resources.

Generating electricity from hydrogen introduces additional processing, transportation, and storage steps, with additional associated capital and operating costs and significant energy conversion losses. These additional costs and losses are brute facts and not just a product of the immaturity of the hydrogen industry.

We need to quickly transition the world's energy system and incentivising inefficiency will make the transition slower and more expensive.

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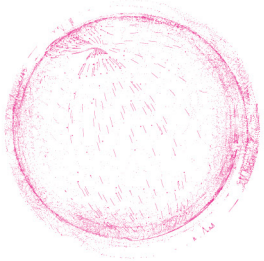

If we focus on electricity generated from hydrogen produced through electrolysis then there will only be net additional decarbonisation of the SWIS if that electricity was produced from new renewable power systems in the SWIS, and/or if it reduces curtailment of existing renewable power systems in the SWIS.

This will not occur if electricity generated from renewable hydrogen causes more electricity generation from fossil fuel sources in the SWIS or if it cannibalises electricity directly generated from renewable power systems.

It appears likely that under a 'Guarantee of Origin' scheme hydrogen accredited as being renewable can and will be produced from electricity generated from gas and coal (increasing fossil-fuel use in the SWIS). It is likely to allow the use of Renewable Energy Certificates generated by renewable systems in other states, not connected to the SWIS, and from systems that are not operating at the same time as some hydrogen production systems (e.g., certificates from day-time solar in NSW being surrendered against WA consumption at night to produce hydrogen).

It is also likely because the owners/operators of hydrogen production systems will be economically incentivised to maintain a high utilisation factor for their plant, which will require producing hydrogen at times when the energy mix in the SWIS includes a high-proportion of electricity generated from fossil fuels, and the scheme provides no incentive for project developers to include hydrogen storage (i.e. it appears to incentivise 'baseload' generation not 'peaking' generation).

While the consultation paper states that the design of a 'Guarantee of Origin' is not within the scope of the consultation, the design of the scheme must consider the potential unintended consequences that arise from allowing hydrogen to be deemed as renewable when it is physically produced from fossil fuels and the associated impact on market dynamics and grid emissions intensities.

There is a very real risk that electricity generated from 'renewable' hydrogen will cannibalize actual physical renewable electricity generation from actual renewable energy resources (wind and solar). This potential should be modelled and quantified by EPWA before the scheme design is finalised.

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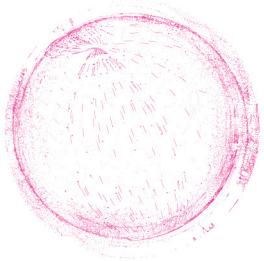

Even in circumstances where renewable hydrogen is produced from location and time-matched renewable electricity the system will need significantly more renewable power systems to offset the large losses associated with electricity generation from renewable hydrogen (indicatively up to 70%) to achieve the same level of electricity output and decarbonisation that would be achieved otherwise.

While this will have a big impact on SWIS system costs and emissions abatement, the level of additional hydrogen demand that is created is likely to be insignificant in the context of global demand for hydrogen, given the other more appropriate hydrogen use-cases and the greater need for hydrogen in other larger economies.

Lastly, I note that electricity from renewable hydrogen has the potential to increase global warming (unless it is produced through low-temperature fuel cells). Combustion of hydrogen produces NOx which has a global warming effect.

While this effect is smaller than the warming produced by the emissions from combustion of fossil fuels, the emissions from the combustion of hydrogen will increase the global warming associated with the operation of the SWIS, and this factor should be considered in relation to the scheme objectives.

Based on these observations, I recommend setting an objective and a requirement that the scheme reduces actual physical energy emissions in the SWIS, irrespective of the ultimate design of the 'guarantee of origin' scheme.

This should be assured through detailed modelling that considers the likely actual physical source of electricity (and associated direct physical emissions) used to produce renewable hydrogen in the SWIS, any displacement/cannibalisation of other forms of renewable energy generation in the SWIS, and the additional global warming associated with the combustion of hydrogen to produce electricity.

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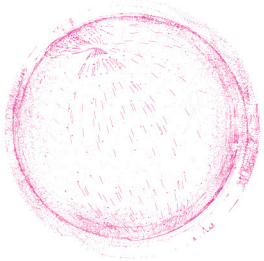


Question 2. How might other uses of renewable hydrogen be accommodated under a Renewable Hydrogen Target certificate scheme? How might Government otherwise support and/or encourage other use cases for hydrogen?

Government should prioritise the use of renewable hydrogen in industrial and chemical processes, as an alternative to diesel and gas in situations where direct electrification is not possible, and as an export fuel to economies that do not have the same quantity and quality of renewable energy resources as Western Australia.

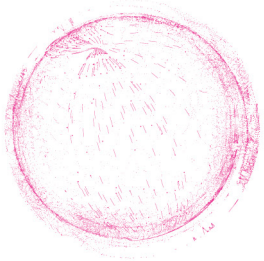
Producing electricity in the SWIS from renewable hydrogen has less merit than these uses and risks misallocating resources to the wrong use-case for hydrogen, which may ultimately be detrimental to the development of the hydrogen industry.

Please see comments on Question 7 for suggestions on how Government might otherwise support and encourage other use cases for renewable hydrogen.

Question 3. What role do you believe renewable hydrogen can play in the decarbonisation of electricity generation? To what extent will a Renewable Hydrogen Target for electricity generation in the SWIS assist in achieving the decarbonisation objectives of the State Government?

Where renewable hydrogen has a role in the SWIS it is as a source of clean firm dispatchable capacity (backup for times of lower direct and more efficient renewable generation from solar and wind), not as a source of 'bulk' or 'baseload' energy, which the current proposed scheme appears to incentivise.

To motivate this use of renewable hydrogen as a source of capacity rather than energy, the obligation on electricity retailers and large electricity consumers should be in relation to reserve capacity requirements (Megawatts), rather than relation to the total volume of electricity generated/consumed over a year (Megawatt-hours).



The Western Australian Wholesale Energy Market (WEM) has a mechanism requiring retailers and large electricity consumers to pay for system capacity requirements. This mechanism could be leveraged to require a portion of the system capacity requirements to be met by power systems fuelled with hydrogen.

Alternatively, the obligation could be in relation to '24x7 Carbon Free Energy'[1].

That is, electricity retailers and large electricity consumers could be obliged to acquire and surrender time-stamped Renewable Hydrogen Certificates (or more ideally a technology-agnostic alternative) for some portion of electricity use in every time interval in the year, ensuring that the SWIS has sources of renewable energy at all times, even at times when there is no solar and wind resources (e.g. at night when the wind isn't blowing).

These two approaches would also have the benefits of mitigating the risk of cannibalisation of more efficient direct generation of electricity from renewable power systems, incentivising more appropriate hydrogen technology development (e.g., including hydrogen storage), and, driving timelier and more cost-efficient decarbonisation of the SWIS (although no intervention in relation to the use hydrogen in the SWIS may be better still).

Question 7. What are some other approaches which could be considered alongside a renewable hydrogen electricity generation certificate scheme that would provide a framework to deliver on the objectives or outcomes sought?

Consideration should be given to introducing an obligation on major industrial users of grey hydrogen to source a portion of their hydrogen from renewable sources.

The production of grey hydrogen from fossil fuels for use in chemical and industrial processes is one of the largest sources of global carbon emissions (on a par with global emissions from aviation), and so this would be a more beneficial way to use policy to drive demand for renewable hydrogen.

[1] http://un.org/en/energy-compacts/page/compact-247-carbon-free-energy

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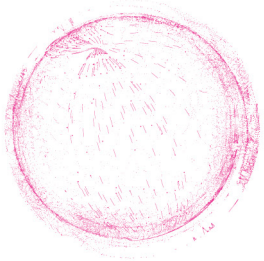

Consideration should also be given to introducing an obligation on importers, retailers, and/or large consumers of diesel fuel.

Western Australia imports almost seven billion litres of diesel each year, a large portion of which is used in rural and remote locations for transport, industrial plant, and power generation.

These rural and remote locations are outside of the SWIS and so don't have access to an inter-connected power grid and the associated diversity and reliability of direct renewable energy sources. Renewable hydrogen could be an ideal substitute for diesel and gas in these locations.

Policy that increases demand for hydrogen for these uses will incentivise more appropriate hydrogen projects and will ultimately be more beneficial to local hydrogen industry development.

Concluding comments

The proposed approach risks creating perverse incentives to generate hydrogen from fossil fuel energy sources, increasing the carbon intensity of the SWIS (subject to the ultimate 'guarantee of origin' scheme that is employed), and will require significantly more renewable power systems to be built at a high cost to energy consumers to compensate for the very significant losses associated with electricity generation from renewable hydrogen.

In relation to the power system, alternative approaches based on system capacity requirements or '24x7 carbon free energy' could be more efficient and effective, as discussed in the response to Question 3.

In relation to the broader Western Australian economy, alternative approaches based on placing an obligation on large users of grey hydrogen, or large sellers/importers/users of diesel fuel could be more efficient and effective, as discussed in the response to Question 7.

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Thank you again for the opportunity to provide feedback on this policy and I will follow the further development of the policy with keen interest.

Your energy nerd,

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About Gridcog

Gridcog (formally Gridcognition) is an energy software startup headquartered in Western Australia and backed by the Clean Energy Finance Corporation. Gridcog is a signatory to the United Nations 24/7 Carbon-Free Energy Compact.

Gridcog software is used to plan, track, and optimise complex energy projects integrating renewable generation, energy storage, electric vehicle and fleet charging, and hydrogen production and demand flexibility.

Gridcog is used by energy suppliers, energy services businesses, consultants, distribution businesses, project developers and large energy users across Australia, New Zealand, and the United Kingdom.