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Working for an Australia free of poverty

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Submission to AEMO 2022 Forecasting Assumptions Update

We thank Australian Energy Market Operator (AEMO) for a chance to make a submission to the 2022 Forecasting Assumptions Update.

The Brotherhood of St Laurence (BSL) Climate Change and Energy team advocate for an equitable transition to a decarbonised society in line with limiting global temperature rise to no more than 1.5°C, in a way that leaves no one behind.

This brief submission is focussed largely on the Forecasting update's proposal to add a second hydrogen scenario. We are involved it the Victorian gas access arrangements and have been considering the issues related to residential gas.

We recognise the importance of other components of the ISP forecasting assumptions, however, have not commented on them here given we don't have the capacity to consider them in detail.

Contents

1 The process to determine scenarios should include broad engagement to identify optimal scenarios

AEMO has stated that they have considered an alternative scenario to replace the 'steady progress' scenario based on a request from gas industry stakeholders. Submissions on this proposal were invited through late December 2021, and January 2022.

Victorian gas networks have flagged stranding risks associated with transmission and distribution businesses. The interest of gas networks to pursue an opportunity to repurpose their existing pipelines to transport hydrogen, may not necessarily align with all or any consumers.

The process of selecting scenarios select a set of scenarios with the greatest potential to deliver efficient decarbonisation and affordable energy to consumers. All stakeholders, including consumer organisations, should be involved in proposing, shortlisting and selecting scenarios – with the optimal scenarios (those with most potential for delivering an efficient transition and affordable energy costs) being adopted for the ISP.

Future scenarios should be evaluated from a consumer perspective, not industry stakeholders.

We recommend that any change in scenarios be subject to broader consultation, including with consumer stakeholders.

2 The uncertainty of hydrogen forecasts may lead to inefficient investment

2.1 Current green hydrogen costs are high

The cost for producing green hydrogen is highly uncertain, given the industry's infancy in Australia, but some analysts have suggested $5-6 per kg[1] [2] [3], $42 - $50/GJ (at 120MJ per kg).[4]

2.2 Future green hydrogen costs are highly uncertain

The 2022 ISP's Hydrogen Superpower draws on CSIRO's GenCost 2020-21 Report.

CSIRO's methodology for calculating future hydrogen costs for various scenarios – including PEM electrolyser costs – is necessarily hypothetical, given the lack of global experience in developing or deploying this technology at scale. The methodology described in CSIRO's narrative description explains that hydrogen costs have been assumed to fall in accordance with a 'learning rate' developed with respect to the volume of load they have been deployed to serve globally in any hypothetical scenario.

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[1] Feryhough. 2021 *Australia has 38GW of green hydrogen in pipeline, but major cost falls needed* https://reneweconomy.com.au/australia-has-38gw-of-green-hydrogen-in-pipeline-but-major-cost-falls-needed/?fbclid=IwAR1z8jpDvaqwl2zoC5jCToRq7sJTr8a_8oEbb8ztq-173l1oSo9PmiugRAg

[2] Lewis, Josh, 2021 *Australia Leads Green Hydrogen Pack with 69GW Project Pipeline* Upstream Energy Explained https://www.upstreamonline.com/hydrogen/australia-leads-green-hydrogen-pack-with-69gw-project-pipeline/2-1-1072243

[3] Eduardes-Evans, Henry 2021 *Japan's Suiso Frontier sets sail for Kobe with liquid hydrogen cargo* https://www.spglobal.com/platts/en/market-insights/latest-news/energy-transition/012822-japans-suiso-frontier-sets-sail-for-kobe-with-liquid-hydrogen-cargo

[4] Office of Energy Efficiency and Renewable Energy *Hydrogen Storage* https://www.energy.gov/eere/fuelcells/hydrogen-storage

This type of high-level approach is necessary for green hydrogen, given its early stage of development. However, it is important that the hypothetical and theoretical nature of the cost forecast is recognised in interpreting the results.

Firstly, the single-factor 'learning rate' approach does not take into account the many real world factors that will actually determine technology price. Multiple reviews of the single-factor approach have found significant discrepancy (in orders of magnitude) even between different learning rate models, let alone between real world technology cost trajectories and the forecasts developed through these means.[5] It has been recommended that this uncertainty is managed with critical interpretation of the use of this model, and careful sensitivity analysis to accommodate its uncertainties. [6]

Secondly, while CSIRO's learning rate model includes a local and a global factor – it is important to recognise that local influence is secondary to the global. The Australian market is small. Local uptake rates may have an influence on future prices, but only where global adoption rates have first been established – a factor that is out of our control.

Thirdly, as a technology in early research deployment phase, the practical limitations on deployment that may impact future costs of green hydrogen are poorly understood. Energy consultant Rystad recently identified two of these: a. the demand for water and the potential requirement to accommodate the additional costs of desalination, and b. the impact that periodic operation (e.g. to take advantage of low electricity prices/renewable excess) will have on the capacity factor of an electrolyser over its lifetime (recognising that electrolyser technology costs are a large factor in the LCOE unit price.) [7] [8]

Given these uncertainties, we stress the importance of ensuring that learning rate estimates are appropriately conservative for the assumed electrolyser costs applied. We also suggest sensitivity analysis with a higher cost scenario.

2.3 Future hydrogen-compatibility costs for networks are poorly understood

The current Victorian access arrangements indicate the poorly understood nature of the costs required to adopt existing pipelines

APA has proposed $37.9m for a study into the potential to introduce a 10% hydrogen blend into their existing high-pressure pipelines. They have informed consumers that without conducting this study, they don't know whether 10% hydrogen can be introduced at any pressure (one approach to mitigating embrittlement and other technical problems posed by hydrogen in steel pipes is to reduce pressure,

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[5] Rubin et al. 2015 *A Review of Learning Rates for Electricity Supply Technologies* Energy Policy 86 198-218 https://www.cmu.edu/epp/iecm/rubin/PDF%20files/2015/A%20review%20of%20learning%20rates%20for%20electricity%20supply%20technologies.pdf

[6] Rubin et al. 2015

[7] Rystad. 2021. *Green Hydrogen Projects will stay dry without a parallel desalination market to provide fresh water* https://www.rystadenergy.com/newsevents/news/press-releases/green-hydrogen-projects-will-stay-dry-without-a-parallel-desalination-market-to-provide-fresh-water/

[8] Rystad Consulting. 2021. *Hydrogen Society* https://sf-asset-manager.s3.amazonaws.com/97637/12/599.pdf

impacting service), and they don't know whether the study will also indicate a potential to use the pipelines for higher blends of hydrogen or 100% hydrogen.

Distributors have proposed a similar amount for the first step in a program to ready their networks for 10% hydrogen – despite the assumption by many high-level reports, and the Energy National Cabinet Reform Committee's announcement to expedite a rule change request to accommodate this – that 10% could be accommodated by existing infrastructure.

There is a lack of knowledge around the materials and technology required for 100% hydrogen.

There is a significant amount of research currently being conducted globally to address this issue, and determine the materials required for safe hydrogen reticulation, the potential to adapt existing pipelines, and additional potential costs, such as explosion-resistant electronics.[9]

We question whether it is appropriate to conduct infrastructure planning on the assumption that hydrogen will be transported in existing pipelines, before the associated conversion costs (and limitations) are well understood.

2.4 Increasing the number of scenarios based on high-level hydrogen price forecasts may skew the outcome

The proposal to include two scenarios based on the development of low-cost hydrogen will double the ISP outcome's exposure to the high amount of uncertainty relating to future hydrogen prices.

This has the potential to skew the recommended infrastructure development pathway, compared to scenarios where the price forecasts are informed by existing technology price trajectory, like solar and batteries.

2.5 Infrastructure planning based on high-level hydrogen cost estimates is already leading to unanticipated and un-evaluated costs for energy consumers

In October 2021, the Energy ministers through the Energy National Cabinet Reform Committee made the decision to expedite rule changes required to introduce 10% hydrogen to the gas distribution network.

The ENCRC's statement also implies that introducing a 10% blend has been assumed to be compatible with existing infrastructure - which suggests that it has been assumed to require negligible investment.[10]

However, this assumption has already proven to be incorrect. Victorian gas distributors have proposed a total of $57M for 'hydrogen readiness' in their current access arrangement, which they have said is largely related to the prospect of accommodating a blend – and APA has proposed $37.9M in research. This

[9] StJohn, Jeff Green *Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?* https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream

[10] ENCRC. 2021 *Extending the national gas regulatory framework to hydrogen blends and renewable gases webpage* https://www.energy.gov.au/government-priorities/energy-ministers/priorities/gas/gas-regulatory-framework-hydrogen-renewable-gases

period's proposed spending has not been presented as the total spending required to accommodate a blend, and no estimate of a total has been provided.

This is an example of the types of additional required expenditure that can be overlooked though a high-level approach to estimating hydrogen deployment costs – and the impacts for consumers.

3 A high future hydrogen price should be applied as a sensitivity to any hydrogen scenario

Given the high level of uncertainty relating to future hydrogen prices, discussed in Section 2.2, it is appropriate that sensitivity analysis includes higher hydrogen prices (for each scenario) – not based on lower uptake, but based on an adjusted learning rate model.

Higher price forecasts should be developed with reference to the current estimated price for green hydrogen.

4 Contact information

To discuss this submission please contact Emma Chessell, 0490 123 642, emma.chessell@bsl.org.au, who prepared the submission or Damian Sullivan, Principal Climate Change and Energy dsullivan@bsl.org.au, 0405 141 735

5 References

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