16 September 2021

Submission: Integrating Energy Storage Systems into the National Energy Market

The Australian Pipelines and Gas Association (APGA) represents the owners, operators, designers, constructors and service providers of Australia's pipeline infrastructure, with a focus on high-pressure gas transmission. APGA's members build, own and operate the gas transmission infrastructure connecting the disparate gas supply basins and demand centres of Australia, offering a wide range of services to gas producers, retailers and users.

APGA welcomes the opportunity to contribute to the National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021 Draft Rule Determination (the **DRD**).

As set out in Gas Vision 2050, renewable gases such as hydrogen and biomethane should play a critical role in decarbonising domestic gas use[1]. APGA is the largest industry contributor to the Future Fuels CRC, which has almost 80 research projects dedicated to leveraging the value of Australia's gas infrastructure to deliver decarbonised energy[2]. Hydrogen energy storage and transport by pipeline is a significant piece of this puzzle.

APGA wishes to highlight the potential for financially inefficient energy transport outcomes. due to grouping hydrogen energy storage with the other forms of energy storage identified within the DRD. APGA has not investigated this issue in detail, but it is apparent the differences between the economic and market regulations governing the electricity and gas industries, both of which hydrogen energy storage interact with, need to be examined. Care needs to be taken to ensure that the differing regulatory frameworks do not lead to inefficient outcomes for consumers where there are decisions to be made between transporting and storing electrons and transporting and storing molecules.

Hydrogen produced through electrolysis is predicted to overtake gas power generation (GPG) as the primary sector coupling location between gas and electricity. In doing so, the electrolyser will become a complex interface between the economic regulatory frameworks governing both gas and electricity. Electricity economic regulation will govern the provision and transport of electricity for electrolysis via the NEM, while gas economic regulation will govern the storage and transport of hydrogen to customers, including electricity generation

[1] Gas Vision 2050
https://www.apga.org.au/sites/default/files/uploaded-content/website-content/gasinnovation_04.pdf
[2] Future Fuels CRC
https://www.futurefuelscrc.com/

customers. Between these two frameworks, there is the potential for location decisions of electrolysers to be distorted in favour of one type of transport and storage over another.

This is important as it is usually lower cost to transport energy through gas pipelines than through electricity powerlines. This is demonstrably true for existing energy infrastructure, and it is expected to be the case for hydrogen energy transport as well.

The low cost of energy transport by pipeline today is demonstrated in the Victorian case study as seen in Table 1. Victorian gas infrastructure delivers 156% of the total energy delivered by Victorian electricity infrastructure at 268% the maximum capacity, having cost 1/3 that of electricity infrastructure and while earning 1/4 of the revenue.

Table 1: Costs and deliveries of Victoria's energy infrastructure (2019) [3,4,5,6,7,8,9]

Transmission and Distribution Infrastructure	Regulated Asset Base ($m)	Actual Annual Revenues ($m)	Actual Energy Delivered (GWh)	Max Demand Capacity (MW)
Electricity	17,329	2,825	41,480	8,684
Gas	5,631	774	64,722	23,250
Gas as Percent of Electricity	32%	27%	156%	268%

This relative low cost of gas infrastructure is expected to continue even with 100% hydrogen infrastructure as identified in analysis by the European Hydrogen Backbone (Figure 1). The resultant cost to customer is noted in a report by Advisian for the CEFC (Figure 2).

[3] Electricity DNSP - Operational performance data - 2006-2019, The Australian Energy Regulator 2020
https://www.aer.gov.au/system/files/Electricity%20DNSP%20-%20Operational%20performance%20data%20-%202006-2019.xlsm
[4] Victorian Gas Planning Report Update, AEMO 2020
https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/vgpr/2020/2020-vgpr-update.pdf?la=en
[5] AER Annual Reporting – APA GasNet Australia (Operations) Pty Ltd, Australian Energy Regulator 2021
https://www.aer.gov.au/system/files/VTS%20%28APA%20GasNet%29%202020%20-%20Annual%20-%20RIN%20Response%20-%20Consolidated%20-%2030%20April%202021%20-%20PUBLIC%20%2312%2C211%2C975.xlsx
[6] APA Victorian Transmission System pipeline information - RIN responses, Australian Energy Regulator 2021
https://www.aer.gov.au/networks-pipelines/performance-reporting/apa-victorian-transmission-system-pipeline-information-rin-responses
[7] Multinet Gas pipeline information - RIN responses, Australian Energy Regulator 2021
https://www.aer.gov.au/networks-pipelines/performance-reporting/multinet-gas-pipeline-information-rin-responses
[8] AusNet Services Gas pipeline information - RIN responses, Australian Energy Regulator 2021
https://www.aer.gov.au/networks-pipelines/performance-reporting/ausnet-services-gas-pipeline-information-rin-responses
[9] Australian Gas Networks (Victoria/Albury) Gas pipeline information - RIN responses, Australian Energy Regulator 2021
https://www.aer.gov.au/networks-pipelines/performance-reporting/australian-gas-networks-victoria-albury-gas-pipeline-information-rin-responses

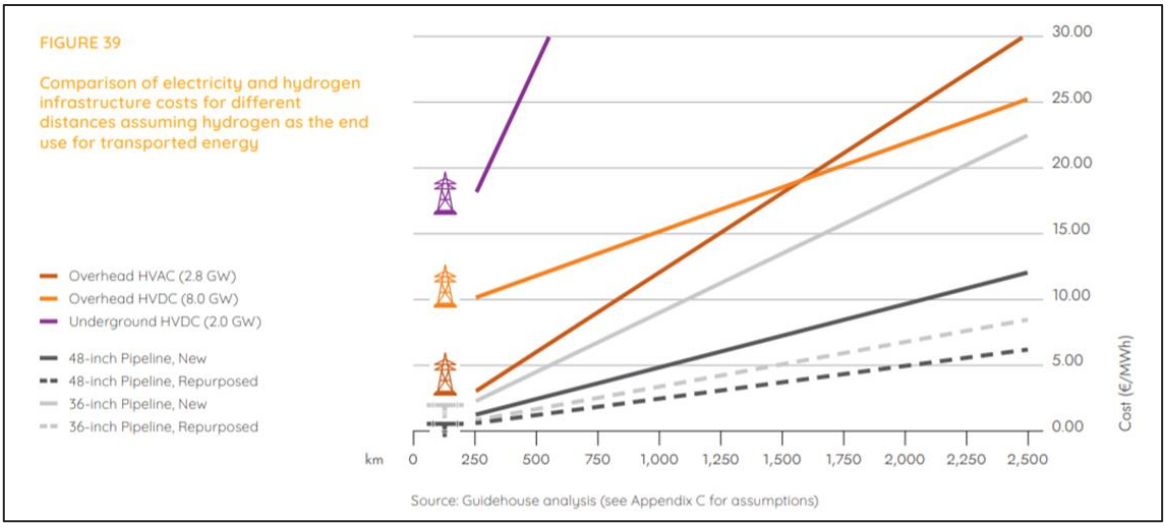

Figure 1: Comparison between energy transport by H2 Pipeline and Powerline[10]

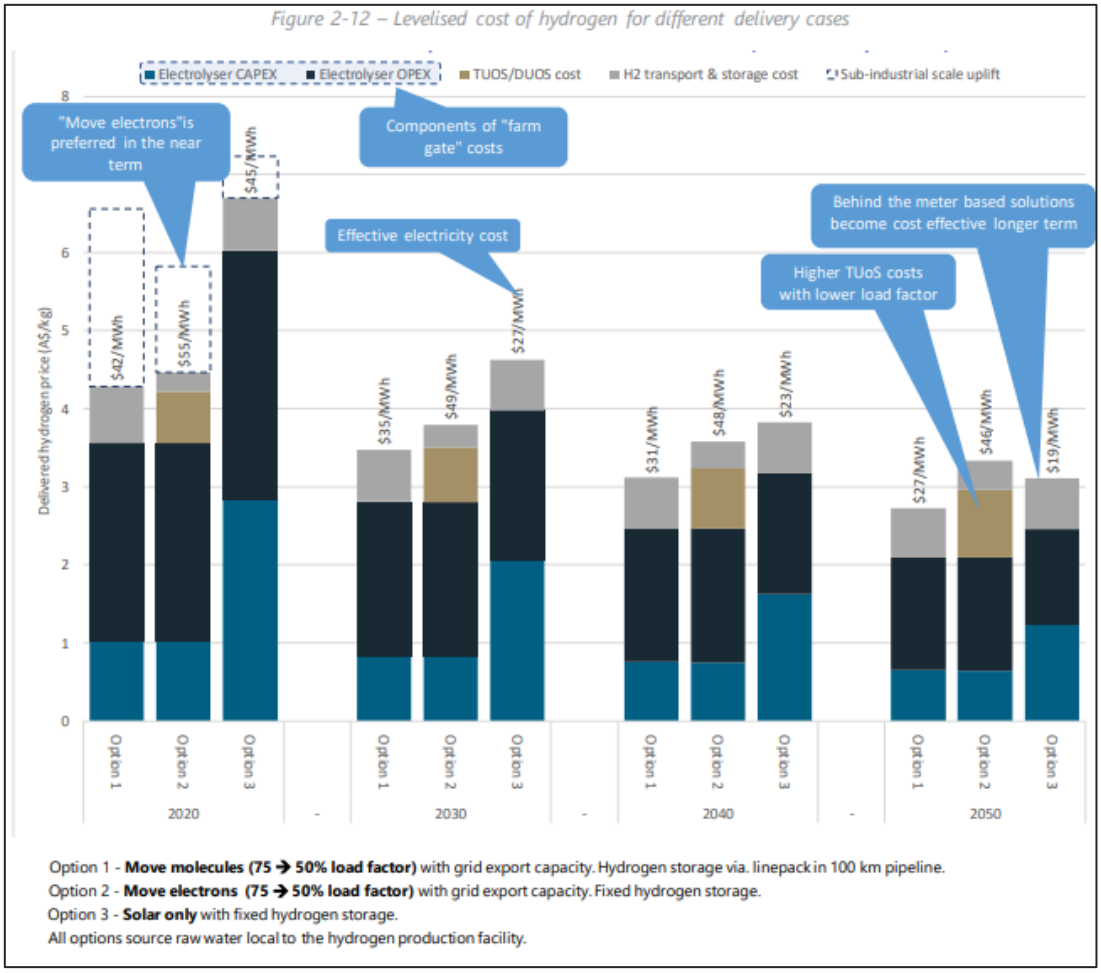

Figure 2: Levelised cost of hydrogen for different delivery cases[11]

Note that *Option 1: Move molecules* represents the lowest cost in all but one case.

[10] Analysing future demand, supply, and transport of hydrogen https://www.grtgaz.com/sites/default/files/2021-06/European-Hydrogen-Backbone-report-June2021.pdf

[11] Australian Hydrogen Market Study https://www.cefc.com.au/media/nhnhwlxu/australian-hydrogen-market-study.pdf

While the data in Figure 1 is in a European context, APGA has commissioned industry research into whether this relationship is expected to hold in the Australian energy market. This research will also seek to confirm that energy storage in gas pipelines remains significantly cheaper than forms of electricity storage when considering hydrogen. This is the case today with cost of gas storage in pipelines sitting well below the $10/MWh per day mark[12].

When developing a hydrogen project where there is any real distance between the primary energy source and the final consumer, a choice will need to be made around where to locate the electrolyser – at the source, at the sink, or somewhere in between. The developer will choose the option which enables them to deliver the lowest cost hydrogen product to its customer. In the absence of differing regulatory frameworks or network efficiencies, this choice would equate to choosing the lowest cost energy transport combination.

Differences in gas and electricity economic regulation could lead to locational decisions that have higher total transport costs that, through the market carriage model of the electricity regulatory framework, are effectively passed on to all energy customers within the NEM region.

This is not the first time the NEM has dealt with this scenario. The late 2000's saw analysis into whether GPG should be located at the gas source or key electricity demand nodes. The outcome here was to locate GPG at key electricity demand nodes, maximising the use of lower cost gas transport. This outcome supported the adoption of lowest cost energy transport, valuing this over the division of higher energy transport costs among all electricity users.

APGA welcomes further discussion to explore any issues arising from the differences in the electricity and gas regulatory frameworks for this new, potentially major, interface between them.

To discuss any of the above feedback further, please contact APGA's National Policy Manager, Jordan McCollum, on +61 422 057 856 or jmccollum@apga.org.au.

Yours Sincerely,

JORDAN MCCOLLUM
National Policy Manager

[12] ACCC Gas Enquiry 2017 – 2025 Interim Report January 2021
https://www.accc.gov.au/system/files/Gas%20Inquiry%20-%20January%202021%20interim%20report_3.pdf