AUSTRALIAN HYDROGEN COUNCIL

Accelerate market growth through repurposing natural gas assets where economic

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Natural gas emits less carbon than coal when combusted, and it is used in significant quantities across the country for a range of applications.

However, political decisions are starting to be made on the future of natural gas in a decarbonised world. These decisions may unintentionally stifle or delay the benefits from both the hydrogen industry and from more coordinated planning across gas and electricity.

Hydrogen (and biogas) can be used in gas transmission and distribution pipelines, initially to decarbonise natural gas use, and in the longer term to replace natural gas entirely. The future for hydrogen (as another gas) may also be reliant on hydrogen pipelines for transportation. Hydrogen allows ‘sector coupling’, which allows planners to choose between electricity and gas infrastructure for different needs, across greenfield and existing assets. The economic efficiency that this brings will improve cost (and consumer price) outcomes. It will also reduce the risk of stranded assets in the gas infrastructure and promote energy resilience through diversity.

Figure 3 from the previous chapter showed lowest cost transportation options from a recent Energy Transitions Commission report. We have repeated the figure below to reiterate how important gas distribution and transmission pipelines will be for moving hydrogen in larger volumes (shown here as more than 10 tonnes a day). This provides a clear illustration of how different transport options suit different needs.

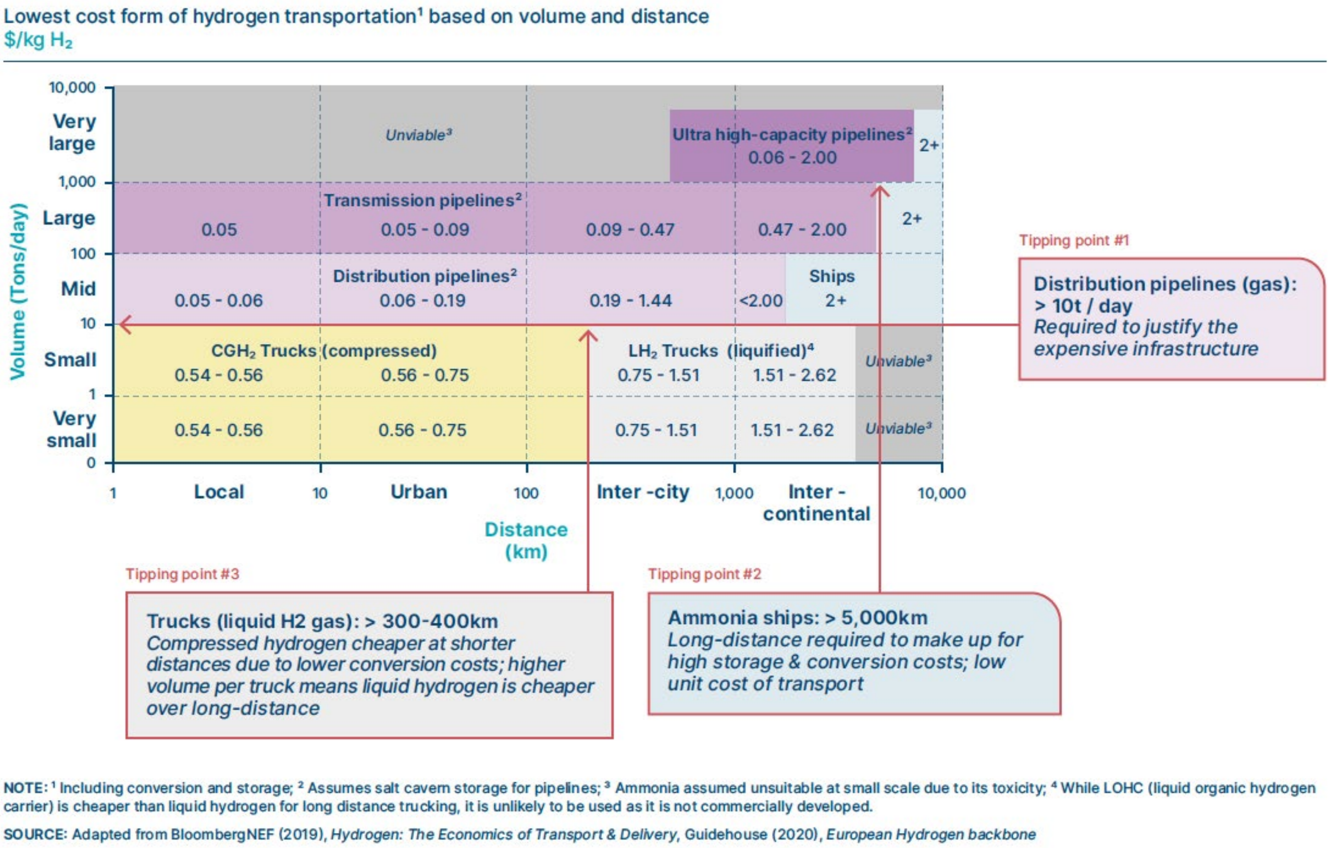

Figure 3: Analysis of lowest costs for hydrogen transport. SOURCE: Energy Transitions Commission (2021), page 38.

The tipping points noted here may not always be a precise reflection of Australia's circumstances, but we note there is some consistency in the pipeline transportation tipping point. In its work for the Clean Energy Finance Corporation, Advisian[69] found that transporting hydrogen via pipelines would result in a lower final cost for delivered hydrogen where a hydrogen electrolyser project is around 20MW capacity. Using our internal calculations, this is roughly equivalent to the 10 tonne/day tipping point in Figure 3.[70]

Advisian also notes that other factors should be considered when comparing the 'moving the electrons' and 'moving the molecules' options[71] in producing and delivering hydrogen, such as interfaces with the National Electricity Market and uncertainties regarding transmission use-of-system (TUoS) fees. Further, while the move molecules approach "generally incurs higher initial capital costs, the resulting pipeline infrastructure can provide storage functions through linepack and it may be possible to realise additional revenue from third party agreements to move hydrogen".[72]

Building on the concept of pipelines providing value through linepack storage, the Energy Transitions Commission analysis shows that moving molecules is preferred to moving electrons where there is no storage close to the end use location. If there is low-cost hydrogen storage close to the end use location the choice between moving electrons and moving molecules is less definitive for greenfield transmission pipelines (depending on the cost of the electricity transmission lines), but overall "retrofitted natural gas transmission pipelines will offer the lowest transportation costs".[73]

53 Advisian (2021), page 16.
54 Hydrogen production is around 3,369 tonnes a year, which, if we assume a theoretical 100 per cent capacity for a 20MW electrolyser, is close to the 3650 tonnes a year from the Energy Transitions Commission.
55 See page 22 for our discussion of this.
56 Advisian (2021), page 10.
57 Energy Transitions Commission (2021), page 40.

3.1 Recommendations

Decisions on future hydrogen infrastructure and project locations should consider the existing natural gas infrastructure and the degree to which it might be repurposed for hydrogen.

It is vital to avoid make decisions that unnecessarily lock out hydrogen applications or have the effect of unnecessarily delaying the scale required for Australia to compete for hydrogen exports (or reach net zero). However, this should not be at any cost: the effects on customer prices must also be understood and built into planning.

3.1.1 Co-optimise assets with end user prices in mind

Gas pipelines are long-lived (can be 80 years old), are already in the ground, and their costs are shared between current and future gas users. Assets are depreciated over their useful (that is, economic) lives, with the depreciation cost apportioned over time.

As pointed out by the Australian Energy Regulator (AER):

> *The longer an asset stays in use, the lower the depreciation cost born by customers each year. Uncertain future utilisation of the pipelines may put pressure on prices by shortening the economic lives of network investments.*[74]

The AER discusses a case study that it is worth reproducing here in full, as follows.

Case study: Evoenergy

In response to the ACT Government's policy decision to phase out gas connections in the ACT and promote electric alternatives to gas, we accepted Evoenergy's proposal to shorten the asset lives for its new pipeline assets in its 2021-26 access arrangement. As noted earlier, shortening asset lives has the effect of increasing the depreciation cost in any given year, which, other things being equal, will increase the pipeline's efficient cost and access prices. This decision was taken to reduce the risk that that these new assets may become stranded (that is, they are no longer capable of making an economic return, despite not being fully depreciated) and to protect customers from significant price increases resulting from a declining customer base in the future. In particular, we were concerned about intergenerational equity for gas consumers, as well as the lesser ability of vulnerable consumers to switch away from gas.

Falling gas demand and our decision to allow accelerated depreciation of gas assets has put pressure on gas prices in the ACT. In Evoenergy's case, operational costs and asset maintenance costs will not fall in line with demand, leaving fewer customers to share the costs. While there are some offsets from lower investment requirements, the overall impact of our Evoenergy decision is estimated to increase residential and small business consumer bills by 3.2 per cent and 3.5 per cent respectively over five years.

As customers switch from gas to electricity, significant new investment in Evoenergy's electricity network is required. The extent of these investments, and the extent of offsetting downward pressure on prices from increased electricity demand is not yet clear. Overall though there is a risk that the switch from gas to electricity will put pressure on both gas and electricity prices. Further, the pace of the transfer of gas demand to electricity creates reliability risk for the electricity network if not carefully managed.[75]

This case neatly demonstrates some unintended consequences of the energy transition and the need for careful planning across both the gas and electricity sectors to support energy affordability for consumers.

58 Australian Energy Regulator (2021), page 2.
59 Ibid.

Recommendation 4: Build sector coupling into planning

We recommend the Australian Government explicitly tasks the planning body under Recommendation 1 to address how the gas and electricity infrastructure can be co-optimised for delivering lowest cost hydrogen to end consumers.

3.1.2 Blend hydrogen into the natural gas networks

Regardless of any future ambitions to repurpose the gas distribution and transmission networks to transport and store hydrogen, the gas networks can provide important offtake support to the emerging hydrogen industry. This can also occur without significant additional investment in infrastructure: experts agree[76] that despite the difference between the physical properties of natural gas and hydrogen, hydrogen can be blended into the natural gas system up to a 10 per cent volume without any impact on the pipeline materials, gas safety or end uses.

The hydrogen required for a 10 per cent blend for NSW, Queensland, South Australia and Victoria has been estimated as 71,500 tonnes,[77] which (even with only some jurisdictions included) is already 10 per cent of Deloitte's 2030 'targeted deployment' scenario for the National Hydrogen Strategy.[78]

A project to blend hydrogen into the natural gas distribution networks has already commenced,[79] with 15 further projects in various stages of development.[80] There is also a research and testing programme across the country[81] to establish the science on higher percentages of hydrogen and address potential consumer experiences.

However, explicit government policy support is required, as the gas networks cannot effectively make rate cases to the economic regulator without policy endorsement for expenditure. The most valuable support at this stage is for the Australian Government to address targets for hydrogen blending within a broader planning framework under Recommendation 1.

In addition to the offtake value, we consider that the adoption of an initial 10 per cent target for blending hydrogen into the natural gas networks could also have the benefit of lowering the carbon intensity of homes and business connected to the network while allowing these entities to defer potentially significant investment decisions until connected appliances reach the end of their useful life. Hydrogen blending can also enable additional planning to be undertaken to further determine the economic and social ramifications of electrification or transition to higher concentrations of hydrogen (e.g., the ability of low income households totransition to new energy sources).

Recommendation 5: Blend hydrogen into natural gas to create demand

We recommend the Australian Government sets a target of 10 per cent hydrogen by volume in the natural gas networks, by 2030.

60 For example, GPA Engineering (2019), page 2. See also COAG Energy Council (2019), page 42.
61 Australian Gas Infrastructure Group (AGIG), Jemena Gas Networks (JGN), AusNet Services (AusNet), and EvoEnergy (2020).
62 See Table 2 in chapter 2 of this report.
63 In May 2021, AGIG has started delivering a 5 per cent blend to 700 customers in Mitchell Park, a suburb in South Australia.
64 Number from a search of HyResource (n.d.) for gas network projects.
65 See for example, the work of the Future Fuels Cooperative Research Centre (n.d.), which partners with industry and researchers toundertake research to enable the decarbonisation of Australia's energy networks.

References

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