AUSTRALIAN ENERGY COUNCIL

National Hydrogen Strategy Taskforce
Department of Industry, Innovation & Science
Industry House
10 Binara St
CANBERRA ACT 2600

28th March 2019

Submitted via e-mail to: hydrogen@industry.gov.au

Dear Sir/Madam,

National Hydrogen Strategy

The Australian Energy Council (the "**Energy Council**") welcomes the opportunity to make a submission in response to the COAG Energy Council's *National Hydrogen Strategy Request for Information – Discussion Paper*.

The Energy Council is the industry body representing 23 electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. These businesses collectively generate the overwhelming majority of electricity in Australia, sell gas and electricity to over ten million homes and businesses, and are major investors in renewable energy generation.

Introduction

The Energy Council supports the development of a National Hydrogen Strategy. Clearly the targeted objectives for hydrogen, with the exception of hydrogen for industry, are yet to emerge in Australia. To that extent, government support for the overall strategy, initial research & development, and removal of regulatory barriers is supported. This has parallels to similar activities undertaken by the Australian Renewable Energy Authority ("**ARENA**") which may be a good body to oversee government involvement.

The Energy Council sees value in hydrogen potentially being used to support electricity systems, for example as a form of storage. While initial research & development funding and removing barriers to entry is an appropriate role for government, the Energy Council also notes the risk of extended support being interpreted as energy market intervention, which would be counterproductive. Ideally the electricity market's existing signals, such as low prices at times of surplus generation, should alone encourage technology-neutral private investment in hydrogen systems, as well as other forms of storage.

Discussion

The power system is undergoing a significant transition as variable renewable energy, both small-scale and large-scale, displaces conventional generation. In the most recent Quarterly Energy Dynamics Report,[1] the following figure was shown, which demonstrated the magnitude of the transition in operational demand quantities, to the extent that SA had its lowest operational demand ever recorded.

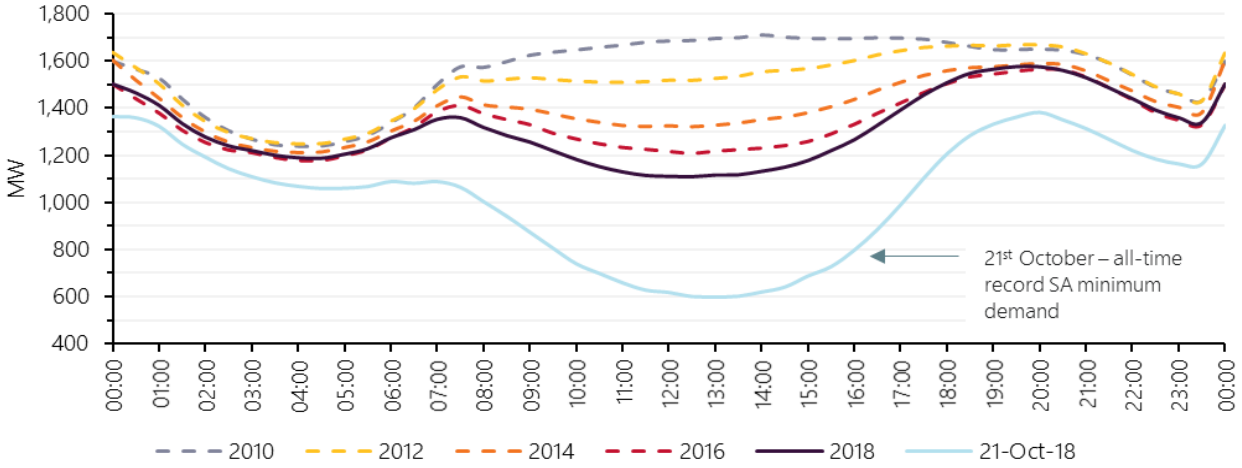
[1] Australian Energy Market Operator, *Quarterly Energy Dynamics Q4 2018*, 13th February 2019

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

P +61 3 9205 3100
E info@energycouncil.com.au
W energycouncil.com.au

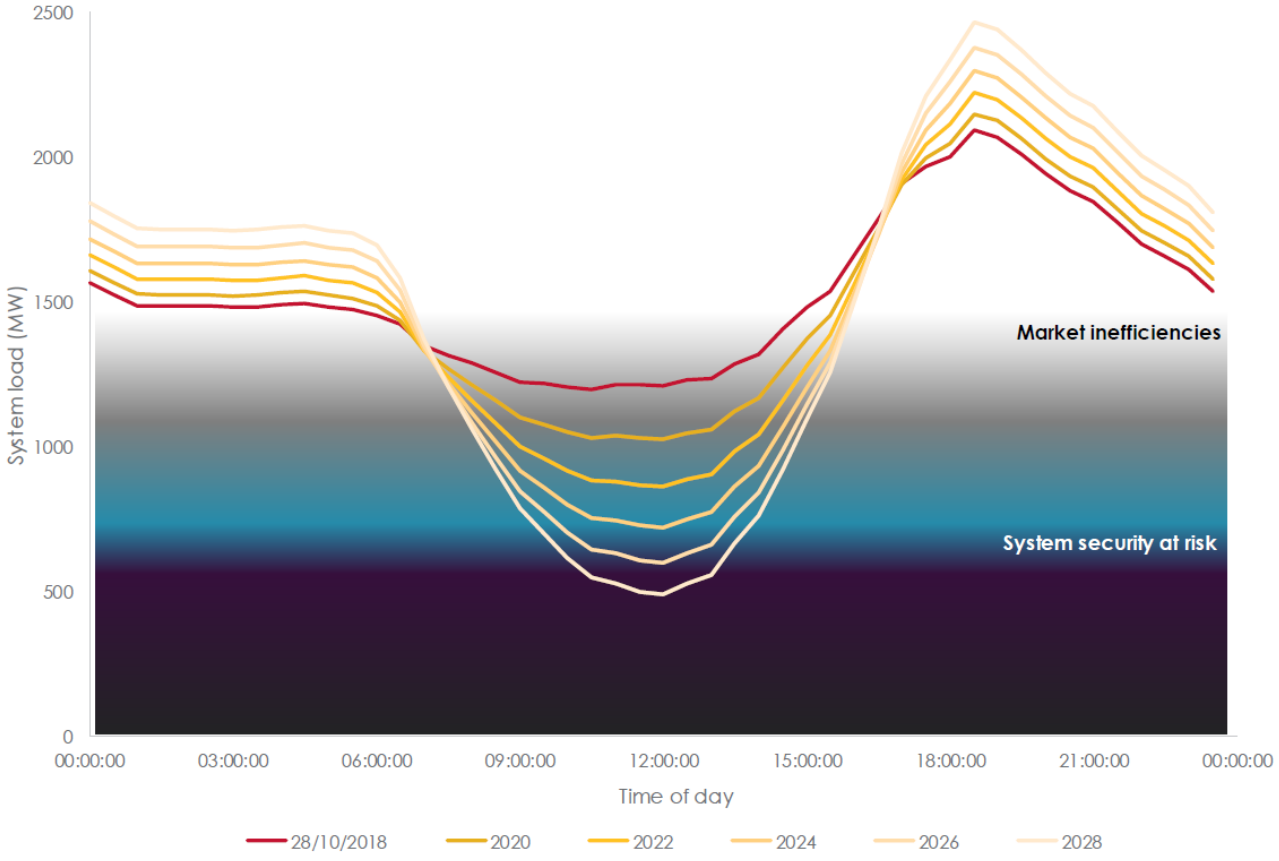
ABN 92 608 495 307

Average Q4 Daily Operational Demand in South Australia[2]



The situation for the Wholesale Electricity Market of Western Australia is arguably more severe, as being an isolated system it has no interstate options to export this surplus. This is demonstrated in the following graph.

Load curve on the minimum demand day, 2018 actuals forecast to 2028, based on ESOO PV forecasts[3]



The Energy Council supports electrolytic hydrogen production plants being used to absorb excess generation but notes that the periods of surplus as described in the graphs above may only occur under certain conditions, such as sunny periods near midday. Any production facility will need to anticipate days of higher prices, coinciding with lower supply availability (such as cloudy, windless days), or higher demand (such as mid-winter

[2] Ibid., Figure 3, p.7
[3] Australian Energy Market Operator, *Integrating Utility-scale Renewables and Distributed Energy Resources in the SWIS*, March 2019, p.27, Figure 9

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

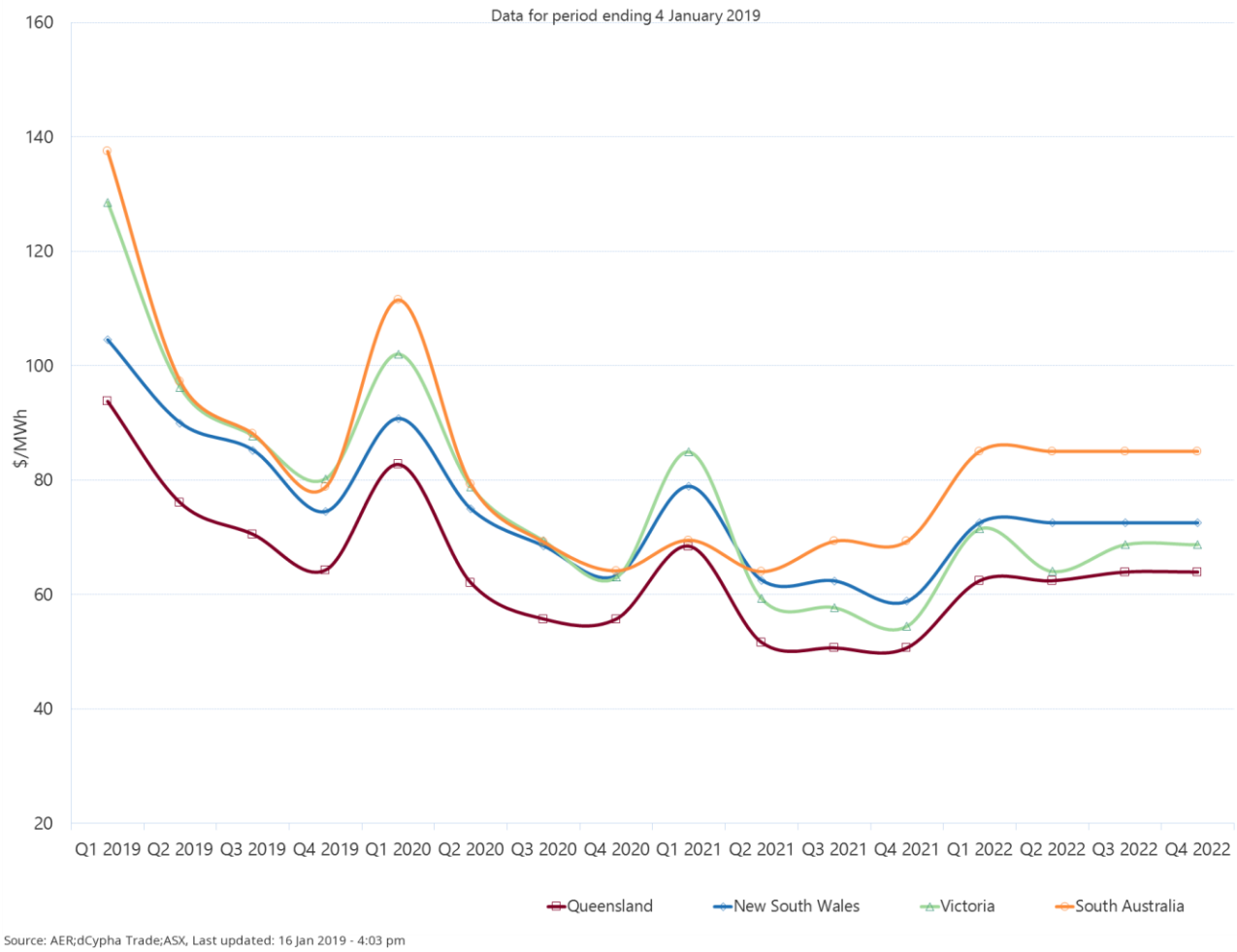
Phone +61 3 9205 3100
Email info@energycouncil.com.au
Website www.energycouncil.com.au

ABN 92 608 495 307

or hot summer conditions). There should be no unrealistic expectation that a hydrogen plant can run continuously, or near-continuously, with low prices.

Although there is an expectation present in the forward contract market that average electricity prices will reduce in the future (as demonstrated in the graph below), the horizon of such forecasts is near, and there can be no certainty that any substantial reduction in average prices is likely to be sustained. Thus, to benefit from very low-priced electricity, the business case of any hydrogen plant would need to assume a flexible and short-running periodic profile. Furthermore, markets are generally cyclic in nature, therefore it is likely that over the lifetime of a hydrogen production plant it will be subject to both falling and rising prices. Its business case will need to accommodate these variations.

Quarterly Base Futures Prices[4]



A key question for the hydrogen strategy will be the likely network costs faced by a hydrogen plant. If the plant's operations allow it to only opportunistically use spare capacity on the network, then it would seem inappropriate for it to pay the same network rates as those customers who require firm supply. The Energy Council recommends the strategy investigating regulatory options in this regard.

Fast controllability of an electrolytic plant may also provide options for selling frequency control ancillary services ("**FCAS**") to the National Electricity Market and the WA Wholesale Electricity Market, and supplying voltage control services to networks.

[4] Australian Energy Regulator, https://www.aer.gov.au/wholesale-markets/wholesale-statistics/quarterly-base-futures-prices, accessed 13th March 2019

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

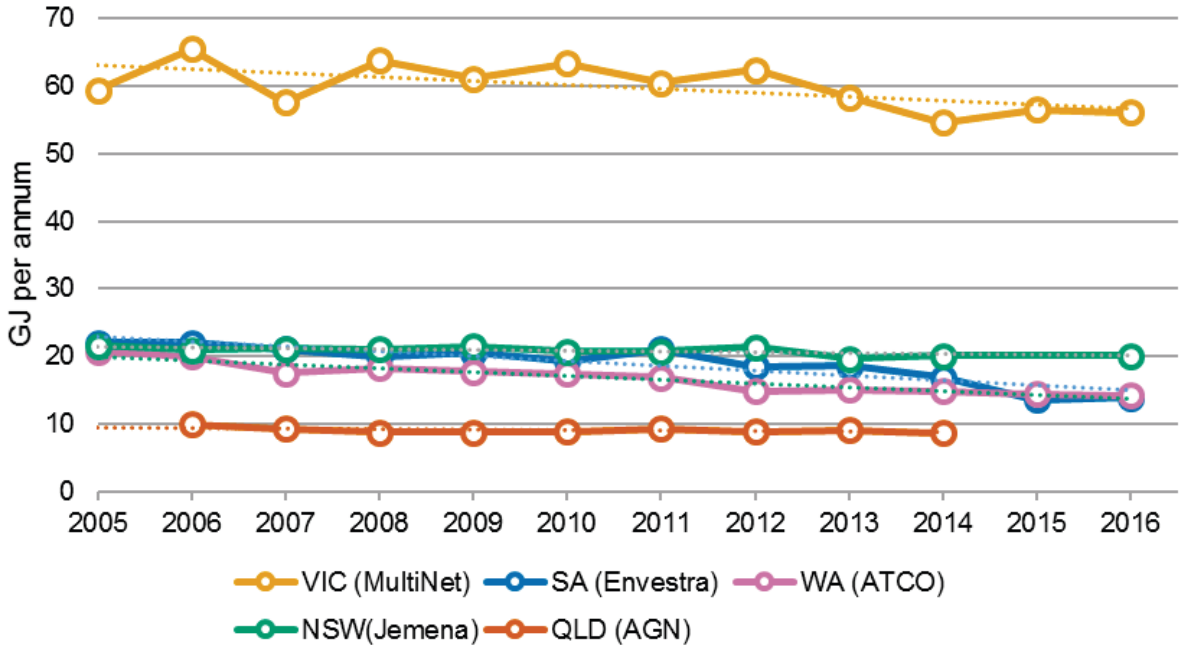
Phone +61 3 9205 3100
Email info@energycouncil.com.au
Website www.energycouncil.com.au

ABN 92 608 495 307

Once produced, the hydrogen will need to find a market. Depending upon quantities produced, the export market may be a suitable outlet. An alternative is to co-mingle the hydrogen with natural gas, although there are limitations in doing so before flame characteristics alter appliance performance, necessitating the conversion of appliances by changing burners.

The literature cited suggests that co-mingling may be a precursor to the complete substitution of natural gas by hydrogen. Although natural gas remains an important residential fuel source, despite an increase in the number of residential connections, average household consumption is declining, as shown in the following graph.

Typical Consumption Trends of Average Household Gas Use[5]



The Australian Energy Market Operator also reports that, despite new connection growth, energy efficiency improvements and appliance fuel switching in response to projected increasing retail gas prices mean that overall residential gas consumption is declining, with expectations of only slight increases in the longer term, as shown in its forecast:

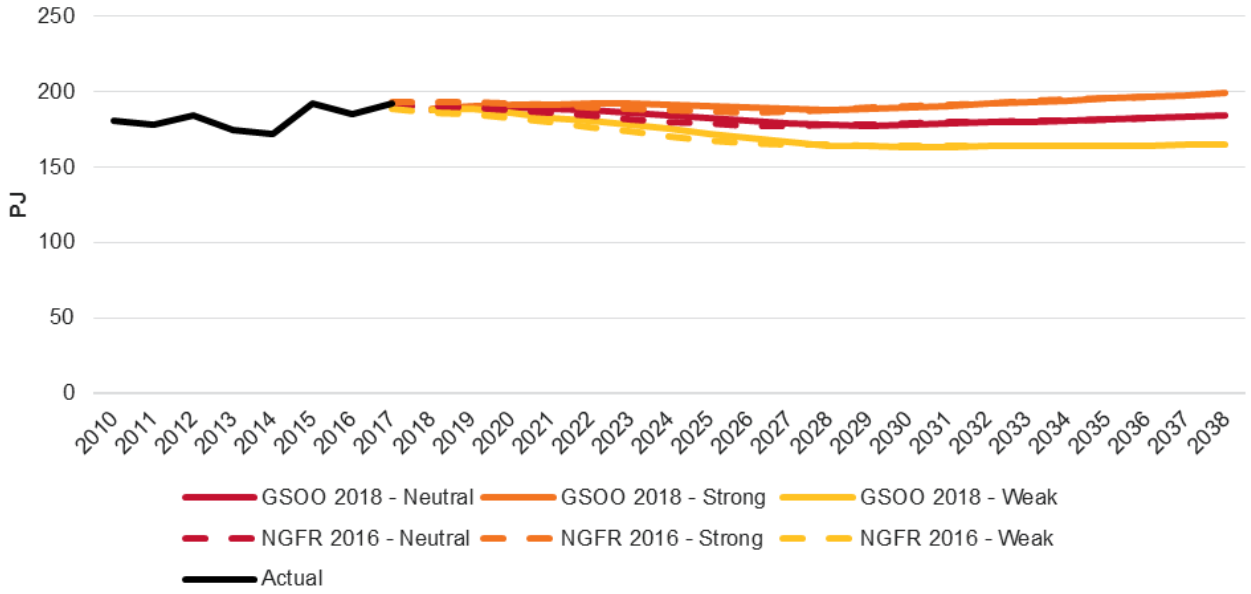
[5] Oakley Greenwood, *Gas Price Trends Review*, Version 2.1 March 2018, p.160, Figure 110

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

Phone +61 3 9205 3100
Email info@energycouncil.com.au
Website www.energycouncil.com.au

ABN 92 608 495 307

Residential/Commercial Annual Consumption Actual and Forecast, 2010-38[6]



Therefore any business case for hydrogen use in the domestic market will need to consider long-term future demand. Unless there are compelling product differences or economic benefits, the success of encouraging local hydrogen usage is not assured.

The magnitude of changing the natural gas transmission systems, distribution systems and customer appliances to hydrogen are also not to be underestimated. The Australian Gas Light Company (later AGL Gas Networks) spent 14 years from 1976 to 1990 converting more than 500,000 customers in Sydney from towns gas to natural gas. On this basis the Energy Council questions the unreferenced assertion in the *Hydrogen for Australia's Future Briefing Paper* that, "Preliminary work suggests repurposing natural-gas networks and appliances for hydrogen will be cheaper in some cases than electrification".[7]

In addition, the Energy Council notes that there are technical limitations to direct substitution, including the embrittlement of steel pipelines, meter replacement requirements, and increased unaccounted for gas. There will also be issues due to the different heating values of the fuels, with hydrogen having a higher heating value approximately one-third of natural gas' maximum of 42.3MJ/m^3.[8] While transmission and distribution pipelines are generally built with spare capacity, it is possible that the increased pipeline throughput required to transport hydrogen may lead to delivery constraints without infrastructure upgrades.

These technical issues have been outlined in a Sustainable Gas Institute & Imperial College London White Paper,[9] which recommends further research by the development of practical demonstration projects and whole-system modelling research. The Energy Council concurs that more investigation is needed, and is particularly keen to stress that any technical assessment should be overlaid with rigorous cost-benefit analysis before any public funds are committed.

Conclusion

In conclusion, the Energy Council supports the Federal Government facilitating the entry of hydrogen as a competitive fuel by

- the removal of barriers to entry such as absent regulation; and
- providing hydrogen with a framework to operate safely.

[6] Australian Energy Market Operator, *2018 Gas Statement of Opportunities*, June 2018, p.17, Figure 9
[7] Hydrogen Strategy Group, *Hydrogen for Australia's Future*, August 2018, p.13
[8] Australian Standard AS4564-2011 *Specification for General Purpose Natural Gas*
[9] Sustainable Gas Institute & Imperial College London, *A Greener Gas Grid: What are the options?*, July 2017

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

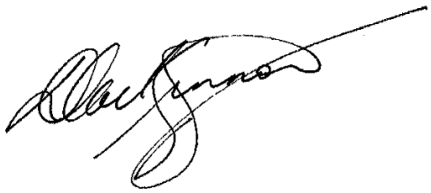
Phone +61 3 9205 3100
Email info@energycouncil.com.au
Website www.energycouncil.com.au

ABN 92 608 495 307

However the Energy Council encourages the Federal Government to maintain a technologically-neutral approach, which will ensure that hydrogen develops as efficiently as possible and competes on a level playing field with other fuels.

Any questions about this submission should be addressed to the writer, by e-mail to Duncan.MacKinnon@energycouncil.com.au or by telephone on (03) 9205 3103.

Yours faithfully,



Duncan MacKinnon
Wholesale Policy Manager
Australian Energy Council

Level 14, 50 Market Street
Melbourne 3000
GPO Box 1823 Melbourne Victoria 3001

Phone +61 3 9205 3100
Email info@energycouncil.com.au
Website www.energycouncil.com.au

ABN 92 608 495 307