25 July 2022

Submission: Response to Capacity Mechanism Project High-level Design Paper

The Australian Pipelines and Gas Association (APGA) represents the owners, operators, designers, constructors and service providers of Australia's pipeline infrastructure, connecting natural and renewable gas production to demand centres in cities and other locations across Australia. Offering a wide range of services to gas users, retailers and producers, APGA members ensure the safe and reliable delivery of 28 per cent of the end-use energy consumed in Australia and are at the forefront of Australia's renewable gas industry, helping achieve net-zero as quickly and affordably as possible.

APGA welcomes the opportunity to contribute to the Energy Security Board (**ESB**) consultation on the Capacity Mechanism Project High-level Design Paper (the **Consultation**). While APGA is agnostic to the form of mechanism delivered to ensure reliability and security in the NEM, progress towards the development of a Capacity Mechanism by the ESB demonstrates genuine recognition that electricity generated needs to be differentiated by more than cost of generation alone.

APGA supports a net zero emission future for Australia by 2050[1]. Renewable gases represent a real, technically viable approach to lowest-cost energy decarbonisation in Australia. As set out in Gas Vision 2050[2], APGA sees renewable gases such as hydrogen and biomethane playing a critical role in decarbonising gas use for both wholesale and retail customers. APGA is the largest industry contributor to the Future Fuels CRC[3], which has over 80 research projects dedicated to leveraging the value of Australia's gas infrastructure to deliver decarbonised energy to homes, businesses, and industry across the nation.

As representatives of the gas transmission pipeline industry in Australia, it is not APGA's place to provide guidance on the intricacies of electricity market design. Instead, however, as advocates for the least cost pathway to energy decarbonisation in Australia, APGA provides the following recommendations for consideration in capacity market design to avoid unintended consequences which may limit the mechanisms' ability to achieve its desired goal.

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[1] APGA Climate Statement
https://www.apga.org.au/apga-climate-statement
[2] Gas Vision 2050, APGA
https://www.apga.org.au/sites/default/files/uploaded-content/website-content/gasinnovation_04.pdf
[3] Future Fuels CRC Website
https://www.futurefuelscrc.com/

Design for Dunkelflaute

The recent east Australian energy crisis has demonstrated that energy security is put at risk by a short electricity market. Unplanned generator outages combined with short domestic and international coal and gas markets to helped cause the short electricity market this time around. However, the energy crisis in a majority VRE NEM will instead come from dunkelflaute – extended periods of low sunshine and wind.

Dunkelflaute is the VRE equivalent of a short fuel market for thermal generation. While coal boilers and gas power generation cannot generate electricity without coal and gas, wind farms and solar panels cannot generate electricity without wind and sunshine. The solution to short domestic coal and gas markets is to ensure domestic production capacity is greater than domestic and export demand capacity. However, it is economically impractical to ensure a sufficiently long electricity market using VRE technologies alone[4].

The introduction of a capacity mechanism provides an opportunity to support investment in generation capacity which will be reliable and available during the energy systems' times of need – which will be reliable and available during dunkelflaute.

To design a capacity mechanism which effectively combats dunkelflaute, the ESB must prioritise generator characteristics which counter the challenges of dunkelflaute:

- Dunkelflaute is as predictable as the weather – a dunkelflaute event will definitely occur several times per year, but we only gain certainty of an event within a day or two of each event occurring.
- Dunkelflaute occurs on the same timescales as weather systems – sometimes across a day or two, sometimes across a week or three.
- Dunkelflaute is a weather extreme – as global warming has a greater impact on the climate, weather extremes will become more common.

For a capacity mechanism to mitigate against dunkelflaute it will need to incentivise investment in generation capacity which will be reliable and available for days or weeks on end independent of the weather.

Electricity storage technologies such as Battery Energy Storage Systems (BESS) or Pumped Hydro Energy Storage (PHES) supplied by VRE encounter economic or technical constraints in these conditions. BESS and PHES are generally designed to generate at capacity for hours or days in order to cycle stored energy as rapidly as possible. This is because the economics of these technologies become impractical when energy is stored for weeks or months on end. Additionally, they need to recharge from the grid itself in order to provide capacity.

These features are incompatible with providing capacity during dunkelflaute.

Amongst the nuance of any capacity mechanism design, the ESB will need to ensure that it prioritises the investment beyond technologies which can only provide capacity for limited

[4] This has been demonstrated in part in the South Australian NEM region. Dunkelflaute events across the past three months have reduced VRE generation to around 10% of total demand. This would require 10 times the current VRE deployment to provide energy security with VRE generation technologies alone.

periods of hours or days. Dunkelflaute requires an economically viable generation capacity solutions for days and weeks. Australian electricity customers face genuine risk of forced load shedding in a net zero electricity future without a genuine solution to dunkelflaute.

Related Responses to Questions for Stakeholders

- **Question 3:** No, there is not sufficient evidence to say that the at-risk periods can be defined on a time-based definition. Simply setting time periods in which compliance is required opens to clear and easy gaming of the mechanism.
- **Question 4:** There is a risk of the emergence of more than one at-risk period in the NEM. This should be addressed by designing a mechanism that considers performance relative to capacity events which the mechanism actively addresses.
- **Question 6:** De-rating factors should relate to performance during dunkelflaute events.
- **Question 18:** the scheme should require a guarantee of quantity relative to dunkelflaute events.
- **Question 21:** The ESB should consider periods of dunkelflaute and duration of continuous dispatch by generation capacity technologies when determining demand curves.
- **Question 35:** De-rating should take dunkelflaute events into account.
- **Question 41:** Which of the options better protects the NEM during a dunkelflaute event.

Electricity does not have to go it alone

There is a solution to the long duration, weather coupled challenge of dunkelflaute; a solution which borrows from the experience of the NEM of today – the decarbonisation of the Australia gas grid.

Today, Australia's domestic gas supply chain operates parallel to the NEM and deliver more end use energy to domestic energy customers than the entire national electricity system combined[5]. Customers choose to use gas instead of electricity because it is cheaper to do so than electricity on both a wholesale and retail basis[6,7]. Additionally, todays gas supply chain provides the scale and depth of energy supply which enables traditional dispatchable GPG technologies to provide generation capacity when the NEM needs it most.

Transitioning Australia's gas grid into a second renewable energy supply chain could provide a net zero NEM with the same level of technically and economically viable generation capacity resilience as the gas grid provides the NEM today. The opportunity a net zero gas

[5] Australian Energy Update 2021, Australian Federal Government Department of Climate Change, Energy, the Environment and Water 2022
https://www.energy.gov.au/publications/australian-energy-update-2021
[6] State of the Energy Market Report Chapter 6: Retail Energy Markets, Australian Energy Regulator 2021
https://www.energy.gov.au/publications/australian-energy-update-2021
[7] National Energy Market Data Dashboard, Australian Energy Market Operator 2022
https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/data-dashboard-nem

supply chain is greater than allowing mature GPG technologies to provide net zero grid firming services in a majority VRE NEM, however.

By providing a pathway for the direct use of renewable gases via the gas grid, the scale of the problem needing to be solved by a capacity mechanism can be minimised. This can allow for a capacity mechanism design to ensure security and reliability for a smaller, more optimised NEM. Avoiding unnecessary electrification will help to avoid overinvestment in generation capacity, in particular where the direct use of renewable gases is more cost effective for energy customers.

Why is GPG such a valuable source of grid firming capacity today?

By drawing its fuel supply from a domestic gas market an much larger than total potential GPG fuel demand, GPG is able to deliver the affordable, reliable capacity required to secure the NEM for days, weeks, and even months on end. GPG, supported by the gas supply chain, can provide this generation capacity without the technical and economic challenges of BESS and PHES due to two primary technoeconomic factors:

- The impacts of GPG CAPEX to GPG fuel costs on GPG Levelised Cost of Energy means GPG can afford to operate only when needed, rather than needing to operate constantly to keep levelized costs low.
    - This means that GPG is able to sit in reserve until its generation capacity is needed in the NEM.
    - As such, GPG has the economic ability to be available to respond to NEM capacity shortfalls which may only occur a few times per year.
      and
- GPG draws fuel from a live, liquid and flexible gas market which is an much larger than the entire GPG sector demand combined.
    - This means that GPG fuel supply is not dependant on GPG demand alone. As such, GPG can draw upon much more energy than can be economically supplied by size limited storage technologies alone.
    - As such, GPG has the technical ability to respond to NEM capacity shortfalls for weeks and months on end.

These features are perfect for both addressing the generation capacity challenges of today and the dunkelflaute generation capacity challenges of tomorrow.

Related Responses to Questions for Stakeholders

- **Question 1:** Evolve beyond modelling of full electrification of gas demand, instead considering gas use decarbonisation via renewable gas uptake.
- **Question 33:** The ESB should consider the need to identify and optimised scale of a majority VRE NEM when determining forward capacity requirements. This should not assume the need to electrify all Australian energy demand as this is not likely to produce a cost optimised energy system for Australian energy customers.

Need for technology neutrality

Within the Consultation paper, the ESB considers capacity mechanism design features which would determine whether the capacity mechanism is or is not technology neutral. APGA strongly advises that any capacity mechanism must be technology neutral as to avoid creating markets that put other priorities ahead of NEM security and reliability.

The transition to a net zero NEM is absolutely critical across the coming decades. However, this should be achieved through targeted mechanisms specifically focused upon NEM emissions reduction, rather than shoehorned into NEM mechanisms designed for other purposes such as capacity assurance.

This advice parallels advice provided by Professor Graeme Samuel AC within the Final Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)[8]. Calls were made within submissions to this review that the EPBC Act should introduce a "climate trigger" based on full emissions from a development. This Final Report notes the following in response to these proposals:

> *"Successive Australian Governments have elected to adopt specific policy mechanisms to implement their commitments to reduce emissions. The Review agrees that these specific mechanisms, not the EPBC Act, are the appropriate way to place limits on greenhouse gas emissions."*[9]

APGA recommends that the same conclusion reached within the Samuel Review should apply to the development of the capacity mechanism by the ESB. By not applying the same conclusion, the ESB risks baking emissions policy into non-emissions related legislation which is likely to become inconsistent with federal emissions reduction policy as this policy evolves. Worse, however, is the risk that in designing a non-technology neutral capacity mechanism, the purpose of the mechanism itself may be undermined, in particular if robust technologies such as GPG are excluded from the mechanism on the basis of the current carbon intensity of their fuel supply.

Related Responses to Questions for Stakeholders

- **Question 1:** Evolve beyond modelling of full electrification of gas demand, instead considering gas use decarbonisation via renewable gas uptake.
- **Question 15:** Existing and new capacity should be treated equally in order to avoid market distortion that could lead to unnecessary deployment of new capacity.
- **Question 16:** For the avoidance of doubt, APGA recommends that the ESB should not take into account consideration of emissions intensity of generation on the basis

[8] Final Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), Australian Federal Government Department of Agriculture, Fisheries and Forestry, 2020
https://epbcactreview.environment.gov.au/resources/final-report

[9] Section 1.4.1 of the Final Report of the Independent Review of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), Australian Federal Government Department of Agriculture, Fisheries and Forestry, 2020
https://epbcactreview.environment.gov.au/resources/final-report/chapter-1-national-level-protection-and-conservation-environment-and-iconic-places/14-recommended-reforms

that emissions reduction is best considered in emissions reduction specific legislation.

- **Question 36:** All technologies should have their performance considered equally and relative to the actual delivery of capacity when required by the NEM.
- **Question 41:** Which of the options best delivers a technology neutral mechanism.

To discuss any of the above feedback further, please contact me on +61 422 057 856 or jmccollum@apga.org.au.

Yours Sincerely,

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