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To: Department of Climate Change, Energy, the Environment and Water
Re: National Electricity Market review

Thank you for the opportunity for the Institute for Energy Economics and Financial Analysis (IEEFA) to provide input to the Department of Climate Change, Energy, the Environment and Water (DCCEEW)'s review of the National Electricity Market.

IEEFA is an independent energy finance think tank that examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy.

Kind regards,

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Key challenges in the current NEM

The National Electricity Market (NEM's) current settings have supported a remarkable transition towards a share of nearly 40% renewables in a short period of time. There is strong momentum towards a continued increase in renewable energy, but reforms are needed to facilitate this transition in a way that delivers the best benefits to energy consumers.

In IEEFA's view, some of the key challenges facing the future of the NEM include:

- We are not currently making the best use of abundant low-cost solar energy.
- A supply-side bias is blocking the development of valuable demand-side measures, which would enable the transition to a lower-cost energy system.
- Wholesale spot prices are increasingly zero or negative in the middle of the day, which is changing the business case for renewable generators, storage and other technologies.
- There is uncertainty around the frequency and severity of potential future 'low VRE [variable renewable energy]' periods under a high-renewables system, and what is required to maintain reliability in these periods.
- The retirement of coal power is being poorly managed, which is leading to uncertainty for investors in new capacity.
- The National Electricity Objective (NEO)'s new emissions objective is not well integrated into the market's design, leading to challenges in meeting that objective.

Key principles for the NEM review

IEEFA believes the NEM review should follow the principles below. We have recommended a number of ideas be considered to help achieve those principles, which are further detailed over the following pages in our response to the consultation questions.

- Align the entry and exit signals for generation and storage capacity with Australia's long-term emission reduction goals, including the 2030 82% renewables target, and the 2050 net zero emissions target.
- Avoid delaying the exit of emissions-intensive generators beyond what is necessary to maintain reliability.
- Align the NEO's emissions objectives with the design and function of the electricity system, which could incorporate emissions pricing.
- Provide sufficient certainty to investors, to support the timely investment in new capacity.

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- Align market settings to support very high penetration of the lowest-cost form of new build generation: renewables coupled with storage.
- Provide the appropriate signals to support cost-effective demand-side actions, which value the multiple services provided by consumer energy resources (CER), and make better use of our abundant low-cost solar energy.
- Ensure the market is supported by appropriate technical standards and regulations, particularly regarding demand response measures.
- Facilitate appropriate public engagement with, and participation in, the electricity market to ensure the transition delivers an efficient, least-cost electricity system for consumers.

Response to consultation questions

Investment incentives

How might the NEM wholesale market and derivate markets most efficiently evolve to provide signals for investment in firmed, renewable generation and storage capacity?

There is a need to provide signals for investment in demand-side measures, as well as supply-side measures, to ensure Australia meets the 82%-by 2030-renewable energy target and aligns with the Paris Agreement. To meet these targets, it will also be necessary to ensure there are signals to exit for emissions-intensive generators.

IEEFA believes that emissions pricing should be within the scope of solutions considered by this review. The core challenge in aligning energy market outcomes with an emissions objective is that emissions are an unpriced externality. Placing a direct price on emissions is one of the most efficient ways this challenge can be overcome in an existing market.

Is there a role for certified schemes to promote investment in firmed, renewable generation and storage and what might these look like?

There may be a role for certificate schemes i.e. expanding the Renewable Energy Target (RET). Depending on what the market design looks like, these may or may not continue to be required to reach the 82% renewables target. Alternatively, a more direct emissions pricing scheme in the NEM may be a more efficient mechanism.

Could the Retailer Reliability Obligation (RRO) play a role to incentivise new investment if it was expanded in the future?

The role of the RRO was explored in detail in the Energy Security Board Post 2025 Market Design. IEEFA recommends the review panel start with those responses, and also gather up-to-date information on how the RRO is currently performing and if there have been challenges.

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Could other capacity mechanisms efficiently attract investment in firmed, renewable generation and storage capacity?

Capacity Investment Scheme

The Capacity Investment Scheme (CIS) will support Australia in reaching the 82% renewables goal. However, as we outlined in our submission to the Capacity Investment Scheme Expansion Consultation[1], "The CIS will underwrite 23GW of renewables. However more than 23GW of renewables are required to reach 82% renewables by 2030. IEEFA and ITP Renewables modelling showed about 36GW of large-scale wind and solar would be needed to achieve that target.[2] Therefore there is a gap of about 13GW."

The NEM review should consider whether the CIS should be expanded or another scheme put in place to ensure the expansion of low-cost renewable energy continues in support of Australia's emissions objectives. IEEFA believes the CIS is at risk of creating "zombie" projects that never get built, as contracts could be awarded to projects that are not viable or feasible, and never end up getting built. Key changes that ensure the CIS's success were outlined in a prior piece, *Five ways to save the Capacity Investment Scheme from attack by zombies*.[3] The changes include:

1. Create a race through oversubscribing tender rounds and making contracts contingent on those that get in first to achieve a capacity target.

2. Provide an exceptional value standing offer underwriting contract that projects could access outside of the tender process.

3. Make it a condition of tender eligibility that projects must already have necessary government planning and environmental approvals.

4. Keep tenders to a national basis, don't pre-allocate capacity to individual states.

5. Drop criteria relating to community engagement and social licence and leave these issues to be dealt with through planning approval policies.

Capacity mechanisms

Capacity markets and mechanisms carry a number of risks, most notably including over-procurement of capacity, leading to higher-than-efficient system costs, while shifting that cost onto consumers. This has been observed in a number of markets in the US, as we outlined in a submission to the Energy Security Board (ESB).[4] Further, the capacity mechanism recommended by the ESB included payments to existing coal generators, which risked delaying the exit of high-emissions coal-fired power plants. This would prevent Australia from reaching its emissions reduction goals.[5] Based on IEEFA's high-level calculations, it also appeared to be a costly

[1] IEEFA. Submission to Expanded Capacity Investment Scheme (CIS) – Design Paper. 25 March 2024.
[2] IEEFA. The approaching surge of renewables and storage leaves no space for Eraring. 14 December 2023.
[3] Green Energy Markets. Five ways to save the Capacity Investment Scheme from attack by zombies. April 2024.
[4] IEEFA. IEEFA Response to Capacity Mechanism Project Initiation Paper. February 2022.
[5] IEEFA. Planning for the exit of coal rather than delaying the inevitable through a capacity market. June 24 2022.

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mechanism as it proposed to provide payments for a large amount of capacity, rather than a targeted amount of capacity for a specific purpose.[6]

Some capacity markets in Europe have been criticised as not sufficient in incentivising low-emissions capacity, and supporting existing capacity or capacity that did not require the capacity payment to ensure bankability. Some case studies are presented below, and further can be found in our submission to the ESB.[7]

Poland

- A 2021 modelling of Poland's energy system found "the introduction of a capacity market delays the decarbonisation of the power system and has a negative impact on carbon neutrality. Even though coal-fired units are phased out, they are mainly replaced by natural gas."[8]

- A 2021 study of the outcomes of Poland's capacity market found "The results prove that the primary beneficiaries of the capacity market in Poland have been the existing units (including the refurbishing ones) responsible for more than 80% of capacity obligation volumes contracted for 2021–2025. Moreover, during the implementation of the capacity market in Poland, the planned units that signed long-term capacity contracts with a total share of 12% of the whole market were already at the advanced phases of construction, and the investment decisions were made long before the implementation of the capacity market mechanism."[9]

The UK

- "The UK capacity market had a cumulative cost from 2014-2018 of £3.8 billion – 75% of payments went to existing coal, gas and nuclear plants, and only 10% to modern assets. It was found that most existing power plants remunerated under the scheme would have remained available regardless of the scheme."[10]

- A UK Government run review found "Whilst the Capacity Market has seen growing participation in recent years from low carbon forms of generation such as wind and solar renewables, electricity storage, and some types of Demand Side Response (DSR), it has historically secured predominantly carbon intensive forms of generation, particularly unabated gas-fired generation. For example, about two thirds of capacity with agreements for Delivery Year 2024/25 is gas fuelled."[11]

[6] IEEFA. Energy Security Board's Capacity Payment: Burden on Households. August 2021.
[7] IEEFA. IEEFA Response to Capacity Mechanism Project Initiation Paper. February 2022.
[8] Energies. Can Decarbonisation and Capacity Market Go Together? The Case Study of Poland. 20 August 2021. Page 1. *Aleksandra Komorowska*.
[9] Energies. Capacity Market and (the Lack of) New Investments: Evidence from Poland. 23 November 2021. Page 1. *Przemysław Kaszynski, Aleksandra Komorowska, Krzysztof Zamasz , Grzegorz Kinelski and Jacek Kaminski.*
[10] IEEFA. IEEFA Response to Capacity Mechanism Project Initiation Paper. February 2022.
[11] The UK Department for Business, Energy and Industrial Strategy. Capacity Market: Improving delivery assurance and early action to align with net zero. July 2021. Page 11.

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How can markets ensure we have sufficient capacity in place when and where we need it before existing resources retire? How do the market settings preferred by stakeholders provide sufficient confidence to consumers and governments that capacity will be delivered?

Reliability settings

The Interim Reliability Measure (IRM) of 0.0006% unserved energy appears to be an overly stringent standard. It translates to roughly seven minutes of outage across the NEM. The Reliability Panel found this standard correlates to a significantly higher level of reliability than what consumers are willing to pay for. Furthermore, the extension of the IRM to 2028 lacked broad stakeholder support, with no supportive submissions from energy producers or consumers, and just one stakeholder – the Australian Energy Market Operator (AEMO) – supporting its extension in the second round of submissions. IEEFA is concerned that the inclusion of the IRM in the Electricity Statement of Opportunities (ESOO) reporting could skew media coverage towards alarmist headlines, and potentially could skew government decisions to pay for additional levels of supply in the system beyond efficient levels, or beyond levels ideal for consumers.[12]

Furthermore, CER can provide resilience services that aren't factored into this standard. For example, household batteries or electric vehicles (EVs) with bidirectional charging can provide households with a secure supply of power during a grid outage. Future reliability planning will need to consider the role that CER can play alongside supply-side investments.

Supply entry and exit

IEEFA believes that electricity markets need adequate signals to invest in new supply and adequate signals to incentivise the exit of existing high-emissions supply.

Supply entry could be ensured through appropriate market design and settings, plus the use of government certificate and underwriting schemes like the RET and the CIS, or through market design only. The NEM review panel will need to consider how to ensure that any new supply incentivised to enter has zero emissions. Appropriate exit signals for existing generators will also support the entry of new supply.

The exit of high-emissions supply needs to be incentivised, and ideally this would occur in an orderly manner with a clear timeframe. IEEFA has previously outlined a number of options to manage coal exits to provide more certainty around exit dates, and therefore certainty for investors in new replacement capacity in our report.[13] These could be considered by the NEM review panel. A number of these options are outlined below (please note that IEEFA put these ideas forward in 2021 and has yet to consider their relevance in the 2025 context):

[12] IEEFA. Australia's Interim Reliability Measure and the ESOO. 30 August 2023.
[13] IEEFA. There's A Better Way To Manage Coal Closures Than Paying To Delay Them. September 2021.

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- Align coal exit dates between state government plans, federal government plans and announcements to AEMO, and set them with more certainty. Then, incoming generation schedules (including CIS auctions, for example) can be aligned to coal exit schedules.

- Implement financial bonds from owners of coal-fired power plants, which are forfeited if they close with insufficient notice, to provide more certainty around exit dates.

- Introduce regular monitoring on progress in the ability to close the next coal generator in a given state by bringing on new supply (and taking demand-side measures), and introduce a requirement that once the next exiting coal-fired power plant is replaced, it is required to close.

- Undertake financial and engineering audits of coal power plants to provide information on how much longer they could reasonably run for, and the costs associated.

Moreover, IEEFA considers that the Orderly Exit Management Framework (OEMF) carries a number of risks and pitfalls, particularly regarding cost and emissions, which mean it is best avoided. The OEMF also does not appear to provide the required clear coal exit schedule certainty to the market – much of the steps within the OEMF process appear to be subject to the discretion of the state energy minister and not entirely transparent and predictable.[14]

If there is concern that new supply will not be in place in time for generators to exit, additional reserves could be built into the system, though IEEFA has not explored this idea in detail.

How can the NEM wholesale market and any other markets work in tandem to ensure we have appropriate signals for the right type of resources in place when and where we need it?

There has been discussion among the energy industry about what low wind and solar periods ('low VRE' periods) will look like in the future, and what kind of resources the NEM would require to maintain reliability through longer-than-typical periods of low wind and solar.There is currently a very limited understanding regarding the future likelihood and nature of low-VRE events. AEMO notes in its 2024 Integrated System Plan that "extended VRE 'droughts' are rare and, over the long term, difficult to predict in duration and intensity".[15]

IEEFA believes further analysis is needed on this topic to understand if and at what penetration of renewables the low-VRE periods would be a challenge, and what these periods would look like in terms of duration and intensity. So far, the available research shows that they may not be as extensive as previously expected.[16]

After studying these periods, the market should be designed to incentivise demand-side measures and/or supply-side resources to provide an adequate response during these periods.

[14] IEEFA. Submission to Orderly Exit Management Framework Consultation. 2 February 2024.
[15] AEMO. Appendix 4 to the 2024 Integrated System Plan for the National Electricity Market. June 2024. Page 8.
[16] Centre for Applied Energy Economics & Policy Research, Griffith University. Quantifying the risk of renewable energy droughts in Australia's National Electricity Market (NEM) using MERRA-2 weather data. July 2022. Page 24. *Gilmore J, Nelson T and Nolan T*.

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Resources that could assist in these periods include demand-side measures (e.g. energy efficiency schemes, demand flexibility, orchestrated vehicle-to-grid) and supply-side measures (e.g. new supply, reserves).

While gas peaking power plants are one supply-side solution that could play a role in low-VRE periods, gas is one of the most expensive forms of generation in the NEM, and there are significant infrastructure challenges in maintaining a fleet of gas peakers that are to be used intensively, but very infrequently.[17] A rushed approach to incentivising the buildout of gas capacity without a clear understanding of how much is needed (and efficient) could lead to overinvestment, and higher overall costs for consumers.

How can these market settings facilitate emissions reduction in line with the National Electricity Objective and Australia's international commitments?

The market settings must align to the NEO, including its emissions sub-objectives. An emissions price should be considered by the NEM review as it is likely to be the most efficient and effective option to achieve this. Otherwise, consideration should be given to the shadow emissions price and how this could influence investment decisions in the NEM. Consideration could also be given to adjusting the Safeguard Mechanism to improve how it applies to the electricity sector.

Consumer interaction with the wholesale market

What can be done to facilitate better interaction between the demand-side, the spot market and any existing or future financial markets?

For the most part, the demand side of the electricity system has been treated as a non-controllable factor that must be solved for by using supply technologies. However, there is now an increased awareness that better integration of demand- and supply-side factors could help lower the cost of the energy transition, while carrying significant benefits for consumers.

Equally, the consumer experience must be given important consideration. It is not realistic to expect that most consumers will have the capacity and willingness to actively engage in wholesale electricity markets as traders.

Pricing is likely to play a role in driving more consumer interaction with the wholesale market.[18] However, there have been recent criticisms of the roll-out of time-of-use pricing, particularly:

- Consumers being switched to time-of-use tariffs against their knowledge or consent.
- Consumers with limited ability to flex their demand being switched to time-of-use tariffs.
- Time-of-use tariffs being designed by retailers, which may not work in the best interest of consumers.

[17] IEEFA. How much gas does the future grid need? September 2024. Page 6.
[18] Energeia. Distributed Energy Resources Enablement Project - Discussions and Options Paper. 22 May 2020. Page 48.

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Better regulations are needed to ensure that customers can access time-of-use tariffs that offer genuine cost savings, and that they have the choice to opt in or out of time-of-use tariffs and demand response expectations.

Further, consideration could be given as to how to ensure time-of-use messaging is clearly communicated to customers. For example, time-of-use schedules could be set at the same time across the whole state (rather than varying by network area), and governments or energy industry stakeholders could clearly communicate this to customers through public messaging.

There is already a significant amount of demand response and storage managed through Virtual Power Plants (VPPs), as IEEFA has outlined in a prior report. The total demand response and storage in VPPs has been estimated by IEEFA to be 2,339MW. Further information on VPPs can be found in the Appendix of this submission.

Table 1: Scale of distributed energy resources (DER) in the NEM

Type of DER capacity	MW capacity	MWh
Energy Queensland flexible demand	850MW	not available
Enel X VPP (largely demand response, but some storage, includes 66MW enrolled in the WDR mechanism)	350MW	not available
Origin Loop VPP (includes 200MW business demand response) Spike household demand response program has 133,000 customers and a 66% response rate but it is unclear from Origin's reports if this is included in this figure or not)	815MW	not available
AGL VPP	210MW	not available
Reposit VPP (storage, *estimated*)	41MW	81MWh
Tesla South Australian VPP (storage, *estimated*)	28MW	54MWh
ShineHub – 2,311 homes (2022)	9.4MW	23.7MWh
Simply Energy - 1,361 energy storage systems (as of 2021)	6MW	not available
Other assorted VPPs (*estimated*, based on the fact there are another 15 household VPP offerings established with say 2MW on average each – EnergyAustralia, Sonnen, Energy Locals, Mondo, Discover Energy, amber, netc, Powershop, SolarHub, arcstream/qcells, Tesla (outside SA), Project Edge, Project Symphony, Rheem-CET, Ausgrid) Figures from Sunwiz: Ausgrid has 750 customers with 3.4MW/7.3MWh as at December 2021(but this is likely to have some overlap with Reposit's VPP numbers)	30MW	not available
VPPs (flexible demand and storage)	**2,339MW**	
Household rooftop solar	14,300MW	n.a.
C&I rooftop solar	7,690MW	n.a.
Total rooftop solar capacity	**21,500MW**	
Household battery storage capacity – 180,000 systems noting that some of these will be included in VPP capacity above (Sunwiz 2022 numbers) estimating 6kW average size	not available	2,093MWh
C&I battery storage capacity (Sunwiz 2022 numbers)	not available	191MWh
Total distributed battery storage capacity	not available	**2,284MWh**

Source: IEEFA.19

[19] IEEFA. Growing the Sharing Energy Economy. October 2023.

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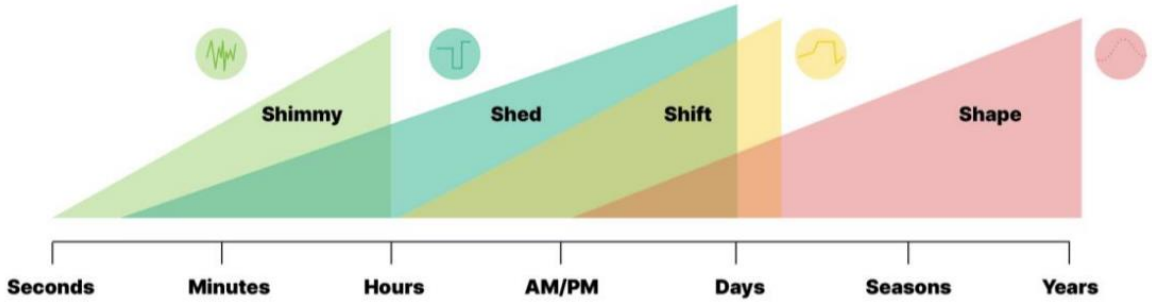
Demand response is typically thought about in a number of timescales: “shimmy, shed, shift and shape”, as outlined by the Lawrence Berkley National Laboratory (LNBL) and Race for 2030 CRC, and adapted by IEEFA in the figure below.

Figure 1: The types of flexible demand by timescale



		Wholesale Market & Grid Scale Renewable Support	Network Investment Savings	Contingency & Emergency Reserve	Distribution Network Support	Frequency Control Ancilary Services
Shift	Moving demand sporadically in response to an external signal	High	Medium High	Low	Medium Low	N/A
Shape	Moving demand routinely according to a standard long-term pattern	Medium High	Medium High	Low	Medium Low	N/A
Shed	Switching off equipment	Medium Low	High	High	Low	Medium Low (Lower only)
Shimmy	Moving demand over very short timescales in response to an external signal	N/A	N/A	N/A	High	High

Source: IEEFA.[20]

Moving demand sporadically in response to an external signal, for example load “shifting”, may be most appropriately facilitated through consumer interaction with the wholesale market or another such dynamic market.

Load shaping might potentially be best encouraged through a mechanism that is more passive and regular, encouraging regular consumption of power in the middle of the day to improve the utilisation of abundant solar energy (for example through time-of-use pricing or encouraging hot water systems to always heat up in the middle of the day).

IEEFA recommends the following measures should be considered by the panel to improve the uptake of demand response:

1. The wholesale demand response mechanism should be revised to include aggregated CER in the mechanism, and improve the baselining methods as IEEFA recommended in a prior report.[21]

[20] IEEFA. Growing the Sharing Energy Economy. October 2023.
[21] IEEFA. Growing the Sharing Energy Economy. October 2023.

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2. A scheme similar to the NSW Peak Demand Reduction Scheme (PDRS)[22] should be designed that is national in scope, addressing relevant load shifting, shaping and shedding options. This scheme would provide an upfront incentive to install the DER technology along with a requirement to be enrolled in a demand response program. The scheme should be rolled out by installers, and the installers should be given an incentive to enrol customers in the scheme, in order to improve uptake.

How might the NEM wholesale market best allow for customers to engage in the market to benefit from their investment in CER, while allowing for different consumers to choose how they engage and continuing to recognise electricity is an essential service with associated accessibility issues for many consumers?

Electricity is an essential service, and the NEM settings will need to be optimised to ensure that appropriate signals are in place to deliver low-cost energy, while also incorporating safeguards to ensure all consumers can access electricity, maintaining the social licence of the transition. As discussed above, not all consumers will be able or willing to increase their engagement with the wholesale electricity market.

Many consumers have, and will likely continue to, invest in CER such as rooftop solar. In future this is likely to expand to include residential batteries and vehicle-to-grid capabilities.

CER offers many benefits to consumers and the grid as a whole, and is likely to play a significant role in the future NEM. The NEM review should carefully consider the balance of who receives the benefits of CER, such that:

- Individual consumers are incentivised to install CER.
- The broader consumer base sees the benefits of CER.
- Networks are appropriately incentivised to support uptake of CER.

Improved technical standards and regulations would help to maximise the benefits of CER, including:

- Widespread adoption of dynamic operating envelopes (DOEs).
- Ensuring customers have access to fair dynamic export tariffs.
- Valuing the resilience services that CER can provide, for example as backup power during a grid outage.

The system-wide benefits of CER have been discussed in an IEEFA report, *DER could provide $19 billion economic boost by 2040*.[23]

[22] NSW Climate and Energy Action. Peak Demand Reduction Scheme. December 2024.
[23] IEEFA. DER could provide $19 billion economic boost by 2040. 15 February 2024.

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Changing nature of spot electricity prices

How will prices at different times of the day and year change and evolve with the move towards firmed, renewable energy generation and storage?

In the future, wholesale prices will increasingly be driven by time-of-day and weather in response to wind and solar output. This is already occurring, and while it results in higher variability in prices – it is a highly predictable form of variability.

The trend towards very low mid-day wholesale prices signals a significant change for the market, but also presents a significant opportunity to reduce system costs, if demand and supply can be coordinated, to tap into this low-cost energy.

One approach to take advantage of this would be to increase the level of intra-day storage in the NEM – for instance using large-scale or small-scale batteries. However, there are also a number of lower-cost ways that demand could be shifted to take better advantage of this low-cost energy. For example, by shifting hot water energy consumption to the middle of the day[24], or by pre-heating and pre-cooling homes[25]. The NEM review panel should consider how these measures should be encouraged.

How might the NEM wholesale market and derivative markets allow market participants to most effectively respond to fluctuating prices and manage price risk?

Dynamic and transparent markets that are effectively digitally integrated will be key in a future with high renewables penetration and high levels of DER.

Consideration will need to be given to who bears risk in this market. If electricity is considered an essential service, it is likely appropriate to shield small consumers from those risks. Small consumers may not have the means or will to fully engage with wholesale markets as traders. By comparison, large energy generators and retailers are much more active participants and may have more capacity to take on, and benefit from, price risk.

However, ensuring a high-renewables electricity system works in the long-term interests of consumers will require setting up the appropriate signals and mechanisms that allow the cost savings of renewables to flow through to consumers. This should include pricing options that minimise exposure to volatile wholesale prices, while still rewarding consumers who are able to flex their demand or contribute additional generation to the grid when it is needed.

[24] IEEFA. Australia needs more efficient, smarter home hot water systems. 21 August 2024.
[25] RACE for 2030. H1 Opportunity Assessment: Residential solar pre-cooling and pre-heating. November 2021.

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Essential system services

What new markets and other measures might ensure they are provided?

Alternative technologies that can provide essential systems services – such as batteries – will need to be adequately compensated. Any new markets developed will need to be careful to avoid providing price signals that act to delay the exit of emissions-intensive generation that also provide these services.

Which entities are best placed to determine what is needed, where and when?

Knowledge asymmetries exist in the current NEM. For example, distribution businesses may have more oversight than others of where certain system services may be needed on their networks.

To support better decision-making, data transparency should be improved across the electricity system. This should include:

- Requiring networks to share any relevant data with AEMO (and preferably the public) that is required to support efficient planning of the electricity system.
- Enabling public access to aggregated smart meter data – which is currently underutilised to the detriment of electricity system planning

A central, independent decision-maker such as AEMO may be best placed to plan for the provision of essential electricity system services. However, it will be important to consider the principles that:

- Planning must be undertaken with maximum transparency to public.
- Planning must be aligned to the NEO (i.e. supporting the long-term interests of consumers, and reduction of emissions).
- Planning must consider a full breadth of options to address the need for these services, both on the demand and supply side.
- Planning must be undertaken independently and free from any particular commercial interests that may oppose the long-term interests of consumers.

To maintain system security and strength, how can we ensure these services are procured before existing plant retires?

Proactive processes and/or markets may need to be put in place before plants retire, to identify the least-cost and lowest-emissions approach to replace them. The procurement of these services should encourage new low-emissions entrants, rather than supporting existing high-emissions assets.

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How can we promote innovation in how these services can be provided at lowest cost?

Competitive tender processes could be put in place, or specific competitive markets could be established. Any process or market will need to include emissions criteria or be designed to encourage zero-emissions technology only, given the NEM's emissions reduction goals.

Enhancing competition

How might we harness the larger number of small resources and growing participation to ensure all markets (i.e. spot, forwards, retail etc) are increasingly competitive?

Market manipulation and market power are driving up wholesale prices according to the Australian Energy Regulator.[26] This issue should be addressed by the review panel.

[26] RenewEconomy. How big utilities manipulate the energy market, even with a high share of wind and solar. 20 December 2024.

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Appendix: VPPs

The following passage is a direct extract from the IEEFA report, *Growing the Sharing Energy Economy*.[27]

> A Virtual Power Plant (VPP) is a network of DER – such as rooftop solar and battery systems, EVs and smart appliances – working together as a single power plant, aggregated via software to participate in the electricity system – via selling power in the electricity market, providing demand response and/or providing grid services.
>
> VPPs are still nascent in the NEM.[28] There are many offerings to customers, but only a few VPPs exceed 100MW. The largest is Origin's, at 815MW (of which 200MW is large business flexible demand). Origin plans to have 2000MW by 2026.[29] It has 400 EVs under management and has an ARENA grant to manage 1,000 EVs.[30] For business customers, Origin offers an "Origin Zero" product, which includes renewable power purchase agreements (PPAs), rooftop solar, batteries, EV fleet management, energy management, data analytics and demand response. For residential customers, Origin has in-sourced OhmConnect's "gamified" demand response capability. Under the voluntary "Spike" program, consumers who reduce their demand during Spike Hours can earn small financial rewards.[31] As Origin's management noted last year, a VPP is a "capital- and cost-efficient tool to create capacity".[32]
>
> AGL states it has 210MW of C&I customer assets under management and monitoring, and a total 316MW under orchestration (excluding smelters)[33] with a "strategic ambition to grow decentralised assets under orchestration". AGL's 2023 annual report states its Peak Energy Rewards program has been expanded to more than 120,000 customers, and in the 2023 financial year it started hot water orchestration trials.[34]
>
> There is no information publicly available on how many DER Energy Australia has under management in its VPPs. The other large announced VPP is the Tesla South Australian VPP on 50,000 Housing SA homes with a planned capacity of 250MW.[35] There is public data on the capacity of this VPP, but more than 4,000 homes are benefiting, which, with a 13.5kWh/7kW peak Powerwall each, is a 54MWh/28MW VPP. Interestingly, Reposit states it has more than 6,000 homes under its No Bill offer, which includes a Reposit Smart Controller, solar, batteries and inverters, which, if the batteries are Powerwall-sized is an 81MWh/41MW VPP.[36]

[27] IEEFA. Growing the Sharing Energy Economy. October 2023.
[28] IEEFA. What Is the State of Virtual Power Plants in Australia? From Thin Margins to a Future of VPP-tailers. March 2022.
[29] Origin. 2023 Annual Report. September 2023. Page 15.
[30] ARENA. Origin Accelerate EV Fleet Program. September 2023.
[31] IEEFA. What Is the State of Virtual Power Plants in Australia? From Thin Margins to a Future of VPP-tailers. March 2022.
[32] Origin. Our strategy presentation. 9 March 2022.
[33] AGL. FY23 Data Centre. September 2023.
[34] AGL. Annual Report 2023. 2023.
[35] Government of South Australia. South Australia's Virtual Power Plant. September 2023.
[36] Reposit. 2023.