13 August 2020

Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce

RE: AEMC CONSULTATION PAPER 'SYSTEM SERVICES RULE CHANGES' Ref ERC0290

Delta is pleased to provide for consideration the attached submission on this Consultation Paper.

As you are aware, Delta proposed two of the Rule Change requests included in this Consultation Paper:

- the development of a new day ahead ex-ante market for capacity commitment to address operational reserve and system security concerns not currently addressed in any other market mechanism; and
- an extension to the current suite of FCAS Raise and Lower services to include sustained ramping.

There would appear to be broad agreement on the view expressed by the Energy Security Board in its April 2020 consultation paper 'System Services and Ahead Markets' that "there is a need for new market arrangements for the procurement of system services crucial to the secure and reliable operation of the system." The AEMC has, with the proposed rule changes, a range of options to consider.

Delta agrees with the priorities expressed by the AEMC: "In determining a solution, the Commission will seek to address system security first and foremost. While the Commission acknowledges the need to optimise economic efficiency of service delivery, this needs to be balanced against the implications of an insecure power system. When the fundamental system security needs are met, the Commission will seek to investigate further improvements to the frequency control arrangements to increase the overall economic efficiency of frequency control in the NEM." [1]. These priorities would suggest that solutions that can be more quickly implemented to address a range of system services, such as Delta's proposed 'Capacity Commitment Mechanism' can deliver benefits to customers while more other more enduring solutions continue to be developed.

Yours sincerely

Anthony Callan
Executive Manager Marketing

[1] AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019 Page ii

DELTA ELECTRICITY SUBMISSION TO AEMC CONSULTATION PAPER

13 AUGUST 2020

SYSTEM SERVICES RULE CHANGES

Reference: ERC0290

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1. EXECUTIVE SUMMARY

With the NEM in transition to a high-renewable energy system, coal-fired slow-start generation will be displaced and potentially driven to early retirement even if their system services are needed to maintain a secure and reliable power supply. Looking forward, the System Operator's need to access a range of system services to manage system security and reliability will be just as essential as it is now.

In the immediate future, Delta considers it likely that inverter-based renewable generators will be able to provide only a limited amount of system services (e.g. synthetic inertia, FFR). Synchronous generation will remain the primary source of system services until technologies arise that can replace these services at scale and at an affordable price.

Delta supports a layered market design approach that:

A. supports investment by providing long term regulatory stability by being designed with this high-VRE future in mind; and
B. in the shorter term ensures system security by recognising and valuing system services via mechanisms designed to maximise AEMO's access to system service resources, in particular by facilitating market access to all participants, including the existing fleet of slow-start generators, demand management (DM) and distributed energy resources (DER).

The Capacity Commitment Mechanism proposed by Delta is consistent with a layered design approach and can implemented easily as a transitional solution to potential scarcity in system reliability and security services. The technology neutrality aspect of the Capacity Commitment Mechanism allows participation by the same fast-start plant that can also participate in any Real-Time market, promoting a long-term convergence of prices in these markets.

2. BACKGROUND

The provision of some system services (e.g. Inertia, Primary Frequency Response, voltage control) has been conventionally considered as a by-product of the NEM system's synchronous generators, has not been priced, and has been considered to have the properties of a public good.

This approach applies well in the instantaneous and short-term time frames when synchronous capacity is plentiful but breaks down in the longer term as the NEM transitions to greater reliance on renewable energy sources. Indeed, some system services are already at a point where there is concern: "AEMO considers that the decline in frequency performance has reached a point where there is now an immediate need for additional frequency response to restore effective frequency control in the NEM to maintain the safety, security and reliability of the power system."[1]

Current Inverter-based asynchronous renewable generators have effectively de-coupled the provision of system services from the supply of energy. It is this de-coupling that makes it necessary to provide separate market signals for system services rather than maintain the status quo where

[1] AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019 Pages i-ii

system service prices remain embedded in energy market price signals provided by a diminishing pool of suppliers (the ageing fleet of synchronous generators).

This is the long-term backdrop to the present task of providing a market design solution to the System Operator's problem of ensuring adequacy of system services at all times.

3. SYSTEM SERVICES: PUBLIC GOOD V COMMON-POOL RESOURCES

The Oxford Institute for Energy Studies June 2020 paper 'Market Design for system security in low-carbon electricity grids: from the physics to the economics" (OIES Paper EL 41) outlines the modern classification of goods in economic theory and proposes the classification of a number of electricity system services as follows:

Figure 1: Economic Good Classification of System Services (per OIES Paper EL 41)

	Non-Rival	**Rival**
Excludable	Club Goods Operating Reserve	Private Goods
Non-Excludable	Public Goods PFR, DFR Inertial Response	Common-Pool Resources Fault Levels Dynamic Voltage Static Voltage Rival with increasing Congestion

This paper's discussion of appropriate market design and procurement models for these system services is based in part on the classification of those services. in Figure 1 above.

Delta is of the view that the classification of some key System Services (e.g. Inertia, Frequency Response and Region-wide Voltage Control services) as 'Public Goods' could be reasonable when those resources are abundant. In the Australian NEM this resource availability differs by region with some regions presently having, to different extents, an abundance of those resources and others, e.g. SA, do not. Over time, with the anticipated retirement of the coal-fired fleet (especially when 'two-shifting' slow-start thermal plant becomes common) the balance between the supply of these system services and their demand may make them look more like a Common Pool Resource than a Public Good.

Delta makes this observation in order to argue that this expands the potential range of market design approaches available to policy makers to manage procurement of these services over the longer term and that a blend of standard-based (e.g. mandatory generator performance standards)

and market-based measures may be most appropriate for System Services such as PFR, DFR, Inertia and (Region-wide) Voltage Control.

4. REGULATORY PRIORITIES

Delta agrees with the priorities expressed by the AEMC: "In determining a solution, the Commission will seek to address system security first and foremost. While the Commission acknowledges the need to optimise economic efficiency of service delivery, this needs to be balanced against the implications of an insecure power system. When the fundamental system security needs are met, the Commission will seek to investigate further improvements to the frequency control arrangements to increase the overall economic efficiency of frequency control in the NEM."[2]

Delta endorses this approach and suggests that the same approach is applicable to other system services and is consistent with Delta's recommendation in Section 5 below that a simple-to-implement transitional solution can provide a tool for the Market Operator to achieve system security while more economically efficient solutions are designed and implemented and become capable of providing equivalent efficacy.

5. EYES ON THE PRIZE: REGULATORY GLIDE PATH TO THE FORECAST HIGH VRE FUTURE

A stable policy environment helps to de-risk investment, therefore it would be ideal to 'future-proof' the policy environment by preferring policy solutions that remain appropriate in the forecast high-VRE system. With that said and recognising the realities of the present-day plant mix, the Market Operator must be given the tools to ensure system security during the NEM's years of transition to that future.

Delta does not view transitional measures as necessarily mutually exclusive with 'purer' economically efficient real time dispatch solutions - an overlay of measures may be best during the years of transition. For example Delta views its ERC0307 "Capacity Commitment Mechanism" as an appropriate measure that could relatively quickly give AEMO a useful, market-based tool to secure access to system security services from any provider, including those that need a significant lead-time to deliver capability, like slow-start plant and some DM and DER providers.

On the other hand, Infigen's ERC 0295 "Operating Reserve" proposal would appear to be a candidate for a potential solution in a future where the plant mix was exclusively VRE and fast start generation. In the longer term, the transitional measure may become less relevant and could itself be retired unless some DM and DER participants continue to need the 'aheadness' of Delta's proposed 'Capacity Commitment Mechanism'.

[2] AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019 Page ii

6. DIRECTION V MANDATES V MARKETS V MONOPOLIES

If synchronous capacity is required to provide some services for system security then there are several policy options:

A. AEMO direction of out-of-merit order generation by gas-fired plant (as seen in the SA system);
B. direction to the NSP's to build equivalent synchronous capacity;
C. mandating levels of service provision to all new generators, including renewables, similar to the current generator performance standards expected of synchronous generators;
D. by creating market solutions for the provision of these services; or
E. a combination of both C and D.

Option A

is generally seen as a tool that should stay in AEMO's toolkit for emergency use but is inherently inefficient.

Option B

NSPs certainly have the capability to build synchronous condenser capacity (syncons) to deliver some of these system services however their 'return-on-asset' regulatory incentives will not necessarily provide the most efficient outcome in the long term, particularly in the provision of a service that, unlike transmission lines, is already being provided by competitive market participants and is not a natural monopoly.

While there may be location-specific niche exceptions the assignment to NSPs of the responsibility for provision of system services currently provided predominately by market-facing participants, who appropriately bear the risk of over-investment or stranding of capacity, would appear to be a retrograde step away from competitive markets.

NSPs should not be excluded from the provision of these services but, to avoid any incentive for gold-plating, that component of their business should reside in the non-regulated portion of their business and not be subsidised by network customers.

Option C

Delta considers it likely that, at a cost and at a distant future time, inverter-based renewable generators may be able to provide a range of system services, however for this to occur there will need to be sufficient incentive for them to do so. Delta's view is that in the forecast high-VRE future, where at times of the day VRE provides substantial generation, there is no alternative to exacting similar mandatory generator technical standards on VRE generators as presently apply to synchronous generators to ensure that at all times an adequate volume of system services is available for AEMO to dispatch. Delta notes that a report commissioned by AEMO in support of its Working Paper: 'Fast Frequency Response In the NEM' advised that *"An emulated/synthetic inertial response from wind turbines (a type of FFR) could prove to be an important and cost-effective component for managing high RoCoF in the future. Wind turbines installed today are expected to remain in operation for 10-30 years, and retrofitting, calibrating and verifying this capability later could be considerably more expensive than including it during the initial design and commissioning (when the OEM is already engaged in the testing and verification process). This suggests that it could be prudent to encourage the inclusion of an emulated/synthetic inertial response capability in new*

entrant wind farms, particularly in South Australia. Wind farms could include the capability, but not necessarily deliver the response, at this stage. This would ensure they are available to deliver this service when it is required in future" and that a *"mandatory requirement for emulated/simulated inertial capabilities has been introduced in Hydro-Quebec and Ontario, and has not halted investment in new wind generation .."*[3]. (emphasis is Delta's).

Delta considers that standards applying to new inverter-based systems should evolve with the objective being to match performance standards to advances in technology capability, with the desired end-point being universal generator performance standards and in the meantime such new generators should be permitted to contract for the mandatory capability to be provided by others

Option D

Delta considers that market-based solutions would seem preferable to encourage long term allocative efficiency of capital as well as short term dispatch efficiency.

On the question of 'which market?', the fastest-growing generation type, inverter-based renewable technologies, have already decoupled energy supply and system services supply so it doesn't make sense to rely on tweaking energy market prices to provide a signal for system services. System services need a visible market price to inform investment decisions.

Option E

Aside from the retention of Option A for emergency use Delta suggests that Option E is the preferred alternative:

- mandatory universal generator standards (including for inverter-based generators) ensure there is resource adequacy of system services available to dispatch; and
- dispatch of system services is market-based.

The market-based dispatch of system services should achieve operational efficiency and, with the option to contract out mandatory generator performance standards, long-run allocative efficiency should be achieved with a positive driver in place to promote innovation in new inverter control systems.

7. VISIBILE MARKET PRICES: THE EARLIER THE BETTER

If market-based solutions are to be used for system service dispatch then the price of provision of the services needs to be visible and it is Delta's view that earlier price-finding is better to help de-risk potential investments.

The NEM is highly regionalised and has already had one region (SA) pass into the forecast high-VRE future that the balance of the NEM is heading towards. The NEM region approaching the same point

[3] AEMO, Future Power System Security Program: International Review Of Frequency Control Adaptation, DGA Consulting Report 14/10/2016, Page 109 https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Reports/FPSS---International-Review-of-Frequency- Control.pdf

will likely be within the timeframe of new plant build decision-making. Accordingly, Delta suggests it is never too early to make system service prices visible.

8. SPECIFIC RESPONSES TO AEMC QUESTIONS IN THE CONSULTATION PAPER

Delta's comments to the AEMC's Questions are tabulated below.

QUESTION	RESPONSE
QUESTION 1: CURRENT ESB & AEMO WORK RELATING TO THE RULE CHANGE REQUESTS 1. What are stakeholders' views on how the rule change processes should be integrated with ESB and AEMO work programs? 2. Are there any additional processes that should be closely considered by the Commission when progressing these rule change requests?	Delta considers the integration of these processes as illustrated in Figure 1.2 'AEMC consultation timeline including relevant ESB post-2025 milestones' to be appropriate. Delta's additional comment is on the issue of immediacy in relation to some specific issues. Where AEMO has signalled that it already has a pressing concern with an issue then consideration should be given to fast-tracking solutions that are 'good enough' and in the right regulatory direction while solutions that are more perfect continue to be developed. Delta believes this comment is supported by the AEMC's statement: "*In determining a solution, the Commission will seek to address system security first and foremost. While the Commission acknowledges the need to optimise economic efficiency of service delivery, this needs to be balanced against the implications of an insecure power system. When the fundamental system security needs are met, the Commission will seek to investigate further improvements to the frequency control arrangements to increase the overall economic efficiency of frequency control in the NEM.*"[4] This urgency is not hypothetical; concern with some system operating parameters has already been expressed by AEMO: *"AEMO considers that the decline in frequency performance has reached a point where there is now an immediate need for additional frequency response to restore effective frequency control in the NEM to maintain the safety, security and reliability of the power system."*[5] *"NEM inertia levels could drop by 35%. Historically, NEM mainland inertia has never been below 68,000 megawatt seconds (MWs). By 2025, inertia could drop to as low as 45,000 MWs. This will increase the required volume and/or speed of frequency sensitive reserve following a contingency event, and the power system will operate in configurations where the system dynamics are different to those experienced today."*[6]

[4] AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019 Page ii
[5] AEMC, Primary frequency response rule changes, Consultation paper, 19 September 2019 Pages i-ii
[6] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Page 10

QUESTION	RESPONSE
QUESTION 2: TIMETABLE FOR THE CONSULTATION PROCESS 1. Do stakeholders have any comments on the proposed timetable for the system services rule changes?	Delta is happy with the proposed timetable. In keeping with the sense of urgency in dealing with some system services (refer Delta's response to Question 1 above), Delta recommends looking for any 'low hanging fruit' regulatory measures that lend themselves to rapid implementation.
QUESTION 3: THREE WORK STREAMS: DISPATCH, COMMITMENT AND INVESTMENT 1. Do stakeholders agree with the AEMC's approach to grouping the rule changes, at least for initial consideration? 2. Do stakeholders believe that Figure 3.1 captures the key issues to be considered for each rule change in each time frame? 3. Do stakeholders have views on whether/which services should be procured in certain time frames and not others?	Delta would have anticipated its 'Introduction of Ramping Services (ERC0397)' proposal to have been a dispatch timeframe proposal, being proposed as an extension to FCAS services. There is a linkage to Commitment decisions but only to the extent that the pool of ramping service providers would be those generators who are already committed. Similarly, Delta's understanding of the Hydro Tasmania 'Synchronous Services Markets (ERC0290)' proposal is that NEMDE optimisation would take into account new and amended constraint equations to commit system services resources for the next trading interval and therefore might have been more readily characterised as either a dispatch or a (fast-start) commitment timeframe proposal. Notwithstanding these comments, Delta understands from Figure 3.1 that for all proposals all workstreams will consider issues under all timeframes (investment, commitment and dispatch) and therefore assumes it should make no practical difference which workstream a proposal is allocated to.

QUESTION	RESPONSE
QUESTION 4: THE SYSTEM SERVICES OBJECTIVE 1. Do stakeholders agree with the AEMC's proposed system services objective being used to assess these rule changes? If not, how should it be amended or revised?	Agreed, subject to the note below. Delta notes the use of the term 'value' in the context of efficient operation at "least cost i.e. for a given level of output, the value of those resources (inputs) for this output are minimised." In using the term 'Value' Delta assumes it is used in an economic sense as a measure of the benefit provided by a good or service to an economic agent, which is not the same thing as a market price. Electricity demand and electricity supply are aggregate measures in which each producer and each consumer may have a different view on value of a service, accordingly Delta would welcome clarification on whether this usage is intended to signal any particular preference in approach.
QUESTION 5: THE PLANNING, PROCURING, PRICING AND PAYMENT SERVICE DESIGN FRAMEWORK 1. Do stakeholders agree with the '4Ps' service design framework being used to design these rule changes?	Agreed, subject to the note below. Delta notes that the Short narrative below the "4 Pay" item includes "This includes the consideration of the efficient allocation of costs and risks with the parties best placed to manage them." Delta trusts that this formulation includes the commonly applied principle of 'Causer pays'.
QUESTION 6: PRINCIPLES FOR ASSESSMENT 1. Do stakeholders agree the principles proposed for assessing the rule change requests are appropriate? If not, which should be amended, excluded or added?	Agreed, subject to the note in response to Question 5 above.
QUESTION 7: INFIGEN'S RULE CHANGE REQUEST, FAST FREQUENCY RESPONSE MARKET ANCILLARY SERVICE — ISSUES AND PROPOSED SOLUTION. 1. What are stakeholders' views on the issues raised by the Infigen in its rule change request, *Fast frequency response market ancillary service*?	Without augmentation or amendment, Delta believes this proposal has two significant weaknesses that may cause the proposal to fail to achieve its objective in today's NEM and in the years of transition to the forecast high-VRE NEM: 1. <u>Not technology-neutral</u> In keeping with its position in relation to other proposals, Delta believes that a Real-Time co-optimised solution excludes the participation of de-committed slow-start synchronous generators which:

QUESTION	RESPONSE
2. Do stakeholders agree with Infigen's view that a change to the NER is required to encourage efficient provision of FFR services in the NEM following contingency events? 3. What are stakeholders' views on if there are any other issues or concerns that stakeholders have in relation to frequency control in the NEM as levels of synchronous inertia decline? 4. Do stakeholders consider there are alternative solutions that could be considered to improve the frequency control arrangements in the NEM for managing the risk of contingency events as the power system transforms? 5. Do stakeholders consider that 5-minute markets for FFR ancillary services likely to be effective and efficient in the global interconnected NEM and on a regional basis? 6. Do stakeholders consider Infigen's proposal would provide adequate pricing signals to drive efficient investment in FFR capability in the NEM? 7. What are stakeholders' views on, if introduced, how the costs associated with any new FFR market ancillary services should be allocated? 8. What do stakeholders consider to be the likely costs associated with establishing two new ancillary service markets for FFR in the NEM? 9. Would are stakeholders' views on how the proposed solution may result in any substantial adverse or unintended consequences in the NEM? 10. Are there specific issues with FFR that stakeholders think should be addressed in the NER as part of the establishment of markets for FFR services?	○ is on its face discriminatory, failing the technology-neutrality test; and ○ fails to access all of the resources available to the System Operator, potentially leading to unnecessary actual FFR shortfalls. 2. <u>Resource Adequacy</u> Delta is not convinced that the mere creation of a spot market for FFR will, in itself, be sufficient to bring additional capacity to the market in a timely manner and that therefore this rule change request does not address the longer-term issue of resource adequacy for FFR. FFR will not be required is there is adequate inertia in the system. If large synchronous generators are needed in the system for voltage control and reliability, inertia can be provided at a very competitive price. Delta can agree with some of this proposal as it applies to dispatch of FFR in a the forecast high-VRE NEM where FFR resource adequacy has been secured and the generation sector is comprised of inverter-based VRE and fast-start gas and hydro generators - the problem is that is that the proposal does not fully address the NEM of today or the transition years.

QUESTION 8: INFIGEN'S RULE CHANGE REQUEST, *OPERATING RESERVE MARKET*, ISSUES AND PROPOSED SOLUTION.	
1. Do stakeholders agree with Infigen that tight capacity conditions and increasing uncertainty in market outcomes are problems that an operating reserve would address? 2. Are there alternative solutions that could be considered to address tight capacity conditions and increasing uncertainty in market outcomes? 3. Do stakeholders consider Infigen's proposal would provide adequate pricing signals to drive efficient use of and investment in operating reserve services now and in the future? 4. How do stakeholders think separate operating reserves arrangements would affect available capacity in the spot, contracts and FCAS markets now and in the future? 5. How do stakeholders think separate operating reserves arrangements would affect prices in the spot, contracts and FCAS markets now and in the future? 6. How could the design of an operating reserve market (e.g. criteria for eligible capacity) best support competitive outcomes both in the operating reserves market but also energy and FCAS markets? 7. What are the factors that should be considered when seeking to set and procure efficient levels of operating reserve?	Delta believes this proposal has significant weaknesses that may cause the proposal to fail to achieve its objective in the NEM of today and the transition years: 1. <u>Not technology-neutral</u> In keeping with its position in relation to other proposals, Delta believes that a Real-Time co-optimised solution excludes the participation of de-committed slow-start synchronous generators as well as most Demand Management (**DM**) and Distributed Energy Resources (**DER**) which, on face value, is discriminatory failing the technology-neutrality test; 2. <u>May lead to actual shortfalls in reserve</u> By virtue of excluding several classes of participants (see 'Not Technology-neutral' section above) this proposal will fail to access all of the resources available to the System Operator, leading to unnecessary actual shortfalls in reserve; 3. <u>Resource Adequacy</u> The 30-minute timeframe for reserve procurement suggests it is unlikely that any additional capacity would be available above that which can already respond to an energy market signal in Predispatch. Accordingly, participating capacity in this proposed market appears to simply be trading an uncertain energy market price and dispatch for a certain reserve market price and dispatch without necessarily increasing the quantum of Reserve Capacity available to the Market Operator; 4. <u>Implementation Complexity</u> Implementation requires integration into NEMDE of a new Real-Time market to be co-optimised with the existing Energy and FCAS markets. <u>Strengths</u> If implemented in combination with an ahead-market for unit commitment such as Delta's "Capacity Commitment Mechanism" (ERC0307), the weaknesses in sections 1, 2 and 3 above would be addressed and

QUESTION	RESPONSE
8. Would Infigen's proposed operating reserve market result in any substantial adverse or unintended consequences in the NEM? 9. What are the costs associated with establishing an operating reserve market in the NEM? If introduced, how should these costs be allocated? 10. What kind of incentive/penalty arrangements would be necessary to be confident the operating reserves procured are available when needed?	this proposal may find more optimal solutions than would be available with the “Capacity Commitment Mechanism” and the existing energy and FCAS markets alone.

QUESTION 9: DELTA'S RULE CHANGE REQUEST, *INTRODUCTION OF RAMPING SERVICES,* ISSUES AND PROPOSED SOLUTION. 1. Do stakeholders agree with Delta that price volatility that occurs when dispatchable generators ramp through their energy bid stacks in response to predictable, daily, high rates of change from solar ramping up and down is a problem that needs addressing? 2. Do stakeholders think that a new raise and lower 30-minute FCAS would address the price volatility at these times? Are there alternatives that could be considered to address this problem? 3. Do stakeholders consider Delta's proposal would provide adequate pricing signals to drive more efficient use of and investment in ramping services than existing price signals and information provided through the PASA and pre-dispatch processes? 4. How do stakeholders think a separate 30-minute ramping product would affect available capacity in the spot, contracts and FCAS markets now and in the future? 5. How do stakeholders think a separate 30-minute ramping product would affect prices in the spot, contracts and FCAS markets, now and in the future? 6. How could the design of a ramping FCAS product (e.g. criteria for eligible capacity) support competitive outcomes both energy and FCAS markets?	Delta wishes to clarify that it was not asserting that ramping to accommodate the solar profile is currently causing unacceptable energy market price volatility, merely observing that the phenomenon sets the stage for price volatility to occur as the ramping requirement/ramping capability balance tightens. Delta considers this is a case of identifying an issue before it actually becomes a pressing problem. Consistent with Delta's approach outlined in Section 5 above, Delta believes that to provide regulatory stability which will foster investment the appropriate design philosophy is to establish rules that will be appropriate to the forecast high-VRE NEM, with such transitional arrangements that are necessary to secure the system. Accommodating the Solar profile requires sustained ramping from the balance-of-generation-fleet over up to 2 hours down in the morning and up in the afternoon (Sustained ramping is also needed to deal with contingency events like weather events and solar eclipse). The requirement for better management of higher ramping is recognised in AEMO's 2020 ISP [7] : *"**Key messages*** *• Efficient integration of renewable generation requires both flexibility from thermal generators and interconnection to accommodate large variations in renewable generation, especially the daily cycling of solar. …"* A view supported by specific issues AEMO has raised on managing increasing ramping requirements: *"As the NEM transitions to a grid increasingly dominated by IBR, AEMO is also placing an increasing focus on management of active power control and management of ramping events due to wind and solar (including DER) variability."* [8] *"There is a limit to the accuracy of deterministic forecasts of expected ramps, even using current best practice approaches. Forecasting limitations increase uncertainty and the need for greater ramping reserves."* [9], an issue elaborated on in the same paper: *"The magnitude and frequency of large ramps*

QUESTION	RESPONSE
7. What are the factors that should be considered when seeking to set and procure efficient levels of ramping services? 8. Would Delta's proposed new 30-minute raise and lower FCAS products result in any substantial adverse or unintended consequences in the NEM? 9. What are the costs associated with establishing new 30-minute raise and lower FCAS products in the NEM? If introduced, how should these costs be allocated? 10. What kind of incentive/penalty arrangements would be necessary to be confident the new 30-minute raise and lower FCAS products procured are available when needed?	*in VRE across the NEM is increasing. This means there will be larger and more frequent fluctuations in generation that will need to be managed to maintain the supply-demand balance."* [10] *"Ensuring sufficient flexible system resources are available to enable increased variability at times of high wind and solar penetration will become increasingly challenging. Times characterised by low interconnector headroom (spare capacity) or 'cold' offline plant will be particularly difficult to manage."* [11] Delta is not alone in its concern that the increasing need for ramping services be addressed: *"The magnitude of peak ramps (upward/downward fluctuations in supply/demand) is forecast to increase by 50% over the next five years as a result of increasing wind and solar penetration. Operators need to ensure there is adequate system flexibility to cover increased variability across all times."*[12] And in relation to the change in Demand Profile due to DRE: *"These changes in the load profile result in an economic and operating challenge for continuous baseload. This creates an increasing need for resources (generators or price responsive demand) to ramp up and down quickly. Mechanisms need to be put in place to ensure that efficiency across the supply mix is incentivised and able to meet demand across all timeframes."*[13] And AEMO assessed the ramping requirements and capability of the system to respond across different timeframes:

[7] AEMO 2020 ISP Appendix 6. Future power system operability July 2020, Section A6.3.3 Coal ramping and flexibility
[8] AEMO 2020 ISP Appendix 6. Future power system operability July 2020, Section A7.1. Introduction
[9] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Pages 11, 61
[10] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Page 57
[11] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Page 11
[12] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Pages 11, 61
[13] AEMO observations: Operational and market challenges to reliability and security in the NEM, 30 March 2018 Page 21

QUESTION	RESPONSE
	"the key findings from AEMO's analysis of system flexibility across 30-minute, 1-hour, and 4-hour timeframes in the NEM …… shows that by 2025, in the absence of enhanced operational tools and regulatory frameworks, a degree of VRE curtailment or market intervention may be required to maintain adequate system flexibility across all timeframes." [14] In the forecast high-VRE NEM of the future the question is where will this sustained Ramping capability come from? In quantity, it will need to provide the entire NEM Demand less that amount of diversified wind that is expected to be available at a high confidence level (e.g. 95% POE). Delta estimated the NEM aggregate Solar ramp at 12,000MW in 2024 (Central scenario) and that is growing fast: AEMO identified that for 2034-35, in South Australia alone *"Ramping between midday …. and evening is typically 2.4 GW but can be up to 4 GW"* [15] i.e. ramping requirements in SA, representing 7% of NEM energy consumption, is equivalent to between one to two times the capacity of Snowy 2.0. It should also be noted that peak gas plant is generally not running and has around a 15minute delay to synchronise, load up and provide ramping services. As identified by AEMO in its 2020 ISP, the likely candidates are synchronous generators such as hydro, gas-fired plant and the various energy storage technologies being proposed and deployed. While a Ramping Raise service is easy to visualise as the start-up and loading of a hydro or gas plant, the Ramping Lower Service can only be delivered if the generator is already in service and loaded to a high level and ready to reduce load in a sustained fashion. It is the coordinated daily operating pattern of many generators to deliver this outcome that makes it ill-suited for delivery by an energy market alone and better suited for delivery by a specific service as proposed. This is consistent with AEMO's view: *"AEMO is concerned that the current market design is not sufficiently valuing resource characteristics of flexibility and dispatchability, and that, in the absence of a market design change, sufficient investments in new resources or existing resources that provide dispatchable capability are unlikely to occur. We note our observations are consistent with similar findings in the Finkel Review."* [16]

[14] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Page 60
[15] AEMO 2020 ISP Appendix 6. Future power system operability July 2020, Section A6.4.4 South Australia
[16] AEMO observations: Operational and market challenges to reliability and security in the NEM, 30 March 2018 Page 11

QUESTION	RESPONSE
	Ramping is presently embedded in the existing Spot energy and FCAS markets, accordingly Delta anticipates that disaggregating the service will reduce the existing Spot market prices. NEMDE is already dealing with the forecast uncertainty of the large solar and net Demand profiles due to weather and insolation variation. Enablement of Ramping would be co-optimised within NEMDE in a manner similar to other FCAS services. <u>Implementation</u> Cost of establishment of the proposed new Ramping services should be modest as it is proposed as an extension to the suite of existing FCAS services. As indicated in its proposal, Delta believes the principle of 'Causer pays' should apply and the costs allocated to solar generators, providing them with mitigation incentives such as co-location with energy storage facilities. In terms of incentive/penalty arrangements, any hydro, gas-fired and most storage technologies should be capable of delivering the ramping service. In the same way as other FCAS markets are optional, Delta had assumed the ramping service would also be optional and generators would choose whether to participate or to bid capacity only in the energy market. This choice should drive a price equilibrium between the two markets, trending to risk-adjusted equivalent returns on asset in both.

QUESTION 10: DELTA'S RULE CHANGE REQUEST, CAPACITY COMMITMENT MECHANISM FOR SYSTEM SECURITY AND RELIABILITY SERVICE, ISSUES AND PROPOSED SOLUTION.	
1. Do stakeholders agree with Delta that there is an increasing risk that capacity capable of providing reserves or services may not be available at times when the power system may need them to respond to unexpected events because of increasing incentives to de-commit? 2. Do stakeholders think that a mechanism to commit capacity one day ahead of time would deliver the reserves or services needed? Are there alternatives that could be considered to address this problem? 3. Do stakeholders consider Delta's proposal would provide adequate pricing signals to drive more efficient use of and investment in reserves and system services? 4. How do stakeholders think Delta's capacity commitment payment would affect available capacity in the spot, contracts and FCAS markets now and in the future? 5. How do stakeholders think Delta's capacity commitment mechanism would affect prices in the spot, contracts and FCAS markets now and in the future? 6. How would a capacity commitment mechanism and payment affect entry, exit and competition in the NEM over the short and long term?	Concern with the potential of shortfalls in capacity and/or system services in the evolving NEM is a recurring theme in recent technical reports including AEMO's "Renewable Integration Study, Stage 1 Report" April 2020 and AEMO's "AEMO observations: Operational and market challenges to reliability and security in the NEM", March 2018.cf Delta considers its proposed Commitment Mechanism as a relatively easy-to-implement way to provide the System Operator with a tool to acquire the full range of system services from generators within a simple market framework. Delta is of the view that a day-ahead commitment timeframe is essential to ensure technology-neutrality. Shorter commitment timeframes have the effect of limiting participation to certain classes of participant. A day-ahead timeframe also likely to suit some Demand Management and Distributed Energy Resources (DER) and therefore also enable their participation in this market. Along with generator technologies, this breadth of potential voluntary participation in this market should promote efficient competitive outcomes. This view is supported by AEMO: *"The current arrangements expect the coordination of resource commitment to happen by each participant managing the commitment of their resources to manage their individual trading risks and opportunities. This does not, however, equate to system-wide optimal resource commitment. Even with more information concerning the requirement needs of the system, generators and retailers will not take action if they perceive it is contrary to their economic interests. System requirements then go unmet, compelling AEMO to intervene (consistent with our experience, discussed in Chapter 2).* Delta's view is that a Real-Time energy signal is inappropriate for accessing the resources of slow-start plant. Similar views are expressed by AEMO: *In effect, the single price for energy no longer accurately prices the value of these essential capabilities, thereby necessitating some level of unbundling and payment for performance to avoid spot price distortion.*

QUESTION	RESPONSE
7. What are the factors that should be considered when deciding how much capacity to commit ahead of time? 8. Would Delta's proposed capacity commitment mechanism result in any substantial adverse or unintended consequences in the NEM? 9. What are the costs associated with establishing a capacity commitment mechanism in the NEM? If introduced, how should these costs be allocated? 10. What kind of incentive/penalty arrangements would be necessary to be confident that the committed capacity would be available throughout the commitment period and/or when called upon?	*AEMO's only available tool for this now is market intervention, which we are increasingly required to use to manage reliability and security risk. AEMO considers this a sub-optimal result. We believe that once the market is aware of and can be paid for these availability and reliability services, the market will offer in resources that are more diverse and provide to customers the benefits of competition and innovation."* [17] (Emphasis is Delta's). *"the real-time spot market does not provide a clear, explicit value for the flexibility that is required in the system to keep operating reserves available to meet unpredictable changes in the demand and supply equation and address ramping requirements.* *Further, when the spot price is forecast to be low due to high levels of VRE availability, it implicitly suggests that dispatchable flexibility is of little or no value to the system, which, of course, is not the case."* [18] **Delta considers the 'Capacity Commitment Mechanism' is not necessarily a competitor to potential Real-Time solutions but can be a complementary mechanism to support a transition to the forecast high-VRE future NEM. There are benefits from day-ahead and Real-Time mechanisms operating in parallel to address both forecastable shortfalls as well as emergent shortfalls in system services.** If, in the forecast high-VRE future NEM, there is an enduring need for the level of "aheadness" for participants like DM and DER then this Commitment Mechanism may continue to serve a useful role after the retirement of legacy slow-start plant. Delta anticipates that the slightly higher utilisation of legacy generators will likely marginally increase the propensity of these generators to hedge a larger proportion of their marginal unit. Delta anticipates that the slightly higher utilisation of legacy generators will serve to slightly reduce Spot market outcomes, both in terms of absolute level and volatility. This effect naturally tapers off over time as legacy generators retire. A significant motivating factor behind Delta's proposal of this Commitment Mechanism is to help two-shifting thermal units make their capacity available to avoid System Service shortfalls. The likelihood of slow-start

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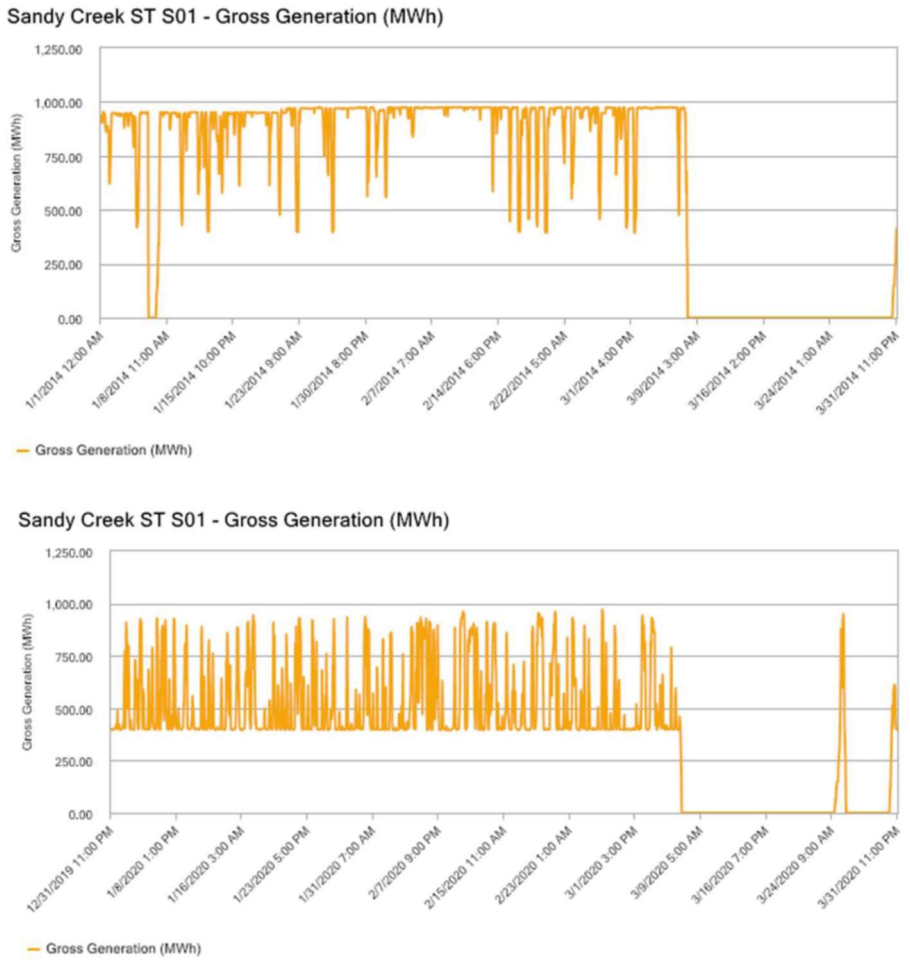
QUESTION	RESPONSE
	thermal units facing pressure to de-commit in the middle of the day is recognised by AEMO in its 2020 ISP as a rational response to spot price signals: ""Alternative regimes that operators of coal generation might consider pursuing include partial decommitment of units during the shoulder seasons, to reduce wear and tear from cycling and exposure to low wholesale prices." [19] And, in relation to NSW: "The coal generation fleet responding to the low prices by shutting down in the middle of the day, seasonably mothballing or retiring early." [20] This impetus towards two-shifting will follow previous experience in the UK following the 'dash to gas'. AEMO has identified some of the operational challenges of two shifting plant as follows: *" The ongoing reduction in daytime operational demand as DPV growth continues will impact bulk system operation in several ways, including:* • *Reducing load available to keep synchronous generating units operating at their minimum stable outputs in order to provide essential system services such as system strength, inertia and voltage control,* • *Reducing the effectiveness of critical back-stop mechanisms necessary for system recovery or restoration during major power system events, due to the reduced availability of stable load blocks,* • *Voltage control challenges in parts of the transmission network experiencing reducing load in the daytime due to the aggregated impact of significant clusters of DPV generation."* [21] A transition to two shifting of coal-fired plant is currently being observed in the ERCOT Market in the US due to solar PV penetration, refer charts below[22]:

[19] AEMO 2020 ISP Appendix 6. Future power system operability July 2020, A6.3.3 Coal ramping and flexibility
[20] AEMO 2020 ISP Appendix 6. Future power system operability July 2020, A6.4.2 New South Wales
[21] AEMO, Renewable Integration Study: Stage 1 report, 30 April 2020 Appendix A Page 34
[22] Institute for Energy Economics and Financial Analysis "Solar Surge Set to Drive Much of Remaining Texas Coal-Fired Fleet Offline" July 2020. https://ieefa.org/wp-content/uploads/2020/07/Solar-Set-to-Drive-Much-Remaining-TX-Coal-Fired-Fleet-Offline_July-2020.pdf

QUESTION	RESPONSE
	Figure 4: Cycling Activity at Sandy Creek Unit 1  *Source: S&P Global Market Intelligence database.*

QUESTION	RESPONSE
	Delta believes the Commitment Mechanism will have a positive impact on both entry and exit of system services resources. By providing a market mechanism for legacy generators to provide system services that have until now not been valued but treated as a free by-product, the visible ahead market price will benefit slow-start generators by creating some additional certainty to their market revenues which will aid orderly withdrawal. Secondly, that same visible market signal will help de-risk new service providers, including DM and DER entering the market. AEMO has expressed similar views: *"We believe that once the market is aware of and can be paid for these availability and reliability services, the market will offer in resources that are more diverse and provide to customers the benefits of competition and innovation."* [23] This Commitment Mechanism is intended to deliver any single or any combination of the system services that participants can provide, accordingly Delta would suggest AEMO is best placed to determine the levels of the various services that should be available on any particular day to deal with system normal and credible contingency events. The proposed day-ahead mechanism should be one of the simpler solutions to implement. Once implemented, daily costs will frequently be zero, rising as synchronous generator capacity in the NEM reduces due to retirements. These costs will be market-based and should find efficient solutions. Costs will be offset by savings from reductions in AEMO's need to intervene in the market. The existence of a Commitment Mechanism such as is proposed may help to avoid a repeat of the premature withdrawal of synchronous plant in South Australia occurring in other jurisdictions, in which case the benefit in terms of avoided loss of Customer Load dwarfs any attributable costs.

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QUESTION 11: HYDRO TASMANIA'S RULE CHANGE REQUEST, *SYNCHRONOUS SERVICES MARKETS,* ISSUES AND PROPOSED SOLUTION. 1. Do stakeholders consider this rule change proposal presents a viable model for the provision synchronous services? a. Could this proposed model be used to provide the essential levels of system strength (and / or inertia and voltage control) needed to maintain security and the stable operation of non-synchronous generation? b. Could this proposed model be used to provide levels of system strength (and / or inertia and voltage control) above the essential level required for security? 2.Do stakeholders consider that the creation of a synchronous services market could have any adverse impacts on other markets in the NEM? If so, what would these impacts be? 3.Would the proposed model set out in the rule change request efficiently price and allocate costs for synchronous services in the NEM ? 4.Do stakeholders consider the model set out in the rule change request would be capable of sending price signals sufficient to encourage new investment in synchronous capacity? 5.Do stakeholders consider the rule change provides an appropriate incentive mechanism for existing synchronous generators to make operational decisions to provide synchronous services ?	This proposal operates in Real-Time driven by new Constraint Equations, automatically co-optimised by NEMDE. Constraint equations are to be re-written to make commitment of resources (the System Service Generators or SSGs) a constraint equation output. AEMO would be required to publish two Energy Market Spot prices, the Spot clearing price paid to non-SSG generators and a Spot price inclusive of an uplift to compensate the SSGs which is paid by the loads. Same principle extends to the FCAS markets. In some respects, this proposal appears to act like a Real-Time commitment mechanism rather than a market for Synchronous Services. Being defined in terms of constraint equations differentiates this proposal from others under consideration by the AEMC at this time. While utilising the existing constraint equation processes should be easier to implement, the requirement to publish two Spot Prices for the Energy Market and the FCAS markets in which the SSGs participate appears to introduce significant additional market complexity. New constraint equations are to be developed under this proposal to address inertia and other requirements. The constraint equation basis in the design allows these requirements to be localised down to the level of specific transmission nodes which appears to would be an advantage in addressing local issues on the network. There may be a niche application of this mechanism to address localised system strength issues. Depending on the constraint equations prices may be nodal prices and nodal pricing in the NEM is a completely separate debate.

QUESTION	RESPONSE
6.Do stakeholders consider the rule change provides the appropriate locational signals for the provision of synchronous generators to provide synchronous services ? 7.What do stakeholders see as the primary opportunities / limitations of the mechanism as proposed by Hydro Tasmania? 8.Would the model proposed in the rule change request enable effective competition in the market for the provision of synchronous services? 9.What suggestions do stakeholders have in relation to the first order changes that would be required in NEMDE to facilitate this proposal and any second order changes that may be required as a result of this rule change proposals' implementation?	It is not clear whether this proposal will produce a regional demand curve: the "Demand" curve for Synchronous Services is embedded in the constraint equation parameters which reduces market visibility on the depth of the various service markets. It is difficult to see how Demand Management or some DER could participate (other than by automatic systems such as under frequency load shedding), therefore this proposal does not appear to be a step towards a 2-Sided Markets future. The dispatch timeframe appears to be one to which only fast-start generators can respond which limits the pool of providers and prevents participation by de-committed slow-start generators and some DM and DRE participants which suggests that this solution would apply best in the forecast high-VRE NEM however in the current-to-short term timeframe this proposal would not, on its own, access all of the system service capability available to AEMO.

QUESTION	RESPONSE
QUESTION 12: TRANSGRID'S RULE CHANGE REQUEST, EFFICIENT MANAGEMENT OF SYSTEM STRENGTH ON THE POWER SYSTEM, ISSUES AND PROPOSED SOLUTION. 1. Do stakeholders consider that TransGrid's approach address all issues related to system strength currently experienced in the NEM? 2. Do stakeholders consider that a system strength planning standard met by TNSPs would effectively and pro-actively deliver adequate system strength? 3. Do stakeholders consider TransGrid's proposal will provide useful and timely locational and financial signals to new entrants? 4. Do stakeholders agree that the 'do no harm' obligations should be removed? a. If so, do stakeholders consider an alternative mechanism is required to regulate or incentivise the minimisation of a new connecting generator's impact on the local network and proximate plant? 5. What are stakeholder's views regarding generators' being required to make a financial contribution for provision of system strength services? 6. Would stakeholders be supportive of the ownership of existing private system strength assets being transferred to TNSPs, as suggested in TransGrid's rule change request? 7. Would the proposed, TNSP-led solution to system strength result in any adverse or unintended consequences for market participants in the NEM?	Delta's preference is to limit the scope of regulated service provision in the NEM. The services described in the TransGrid rule change are clearly contestable given the current requirements and outcomes from generators which in certain locations install synchronous condensers to facilitate connection to the grid. In fact, these services go to the heart of generator location signalling in the NEM. Delta agrees with the TransGrid proposal insofar as AEMO should set service requirements in consultation with the network owner. However, the provision of those services should be contestable and competitive. Network owners should not be enabled to derive regulated income from the provision of these services. Provision of system strength services should be a separate, contestable, business outside of the current TNSP regulatory regime. To use TransGrid's example in section 5.1, TransGrid should be entitled to offer to those two generators the alternative of access to a system service that TransGrid can provide by building a network-optimised syncon but if the generators can provide that service more cheaply, the generators can build their own. No regulated TNSP revenues should subsidise this service as it would result in consumers subsidising potentially inefficient generator location choices.

QUESTION	RESPONSE
QUESTION 13: EVOLVING THE REGULATORY DEFINITION OF SYSTEM STRENGTH Do stakeholders consider that the AEMC's working description of the effects of system strength, and related problem description of system strength and its components accurately represents all elements of system strength, as experienced in the NEM? If not, are there other components of system strength that the AEMC should include? What measures might be used to define system strength? Is fault level the only measure that can be used practically, or are other measures available?	Delta believes that AEMO's working description is a good summary of the issues. An additional dimension that could be considered is that of electrical distance from the network's Regional 'centre'. Solutions located in the more heavily meshed centre of a Region's network may have limited effect on system strength at a remote part of the network. Presently, most proposals that rely on price signals are relying on Region-wide price signals. Exceptions, in Delta's view are the HydroTasmania proposal in which the constraint equations may be defined to the level of specificity of a transmission node and TransGrid's proposal which can also address local issues. Delta is opposed to nodal pricing per se (due to philosophical objections to Balkanising the existing Regions which reduces liquidity and gives market power to participants islanded at those nodes) however Delta does see merit in recognising that it may be appropriate to have different regulatory solutions for an isolated part of the network compared to those that apply to the Region more widely. i.e. a one-size-fits-all approach may be suboptimal. Delta sees scope for more than one of the proposed rule changes to be implemented in parallel.

QUESTION	RESPONSE
QUESTION 14: MECHANISMS FOR SYSTEM STRENGTH ABOVE MINIMUM LEVELS NECESSARY FOR SYSTEM SECURITY In relation to the provision of system strength above minimum levels necessary for system security and the relevant rule change requests: 1. Do stakeholders consider the centrally coordinated model, as proposed by TransGrid, is the preferable option for providing system strength above the essential levels required for secure operation? 2. Do stakeholders consider the decentralised, market-based model proposed by HydroTasmania is the preferable option for providing system strength above the essential levels required for secure operation? 3. Could a hybrid of these models be used to deliver system strength above the minimum? 4. What do stakeholders perceive to be the strengths and weaknesses of each model? 5. Do stakeholders consider there are other, alternative models for delivering system strength above the minimum levels required for secure operation? 6. What do stakeholders perceive to be the biggest benefits and risks to introducing a mechanism to deliver system strength above the minimum levels required for secure operation?	1. Delta is not in favour of TNSPs having a broad mandate to build, as regulated assets, system services presently largely provided by market-facing participants. As outlined in Delta's response to Question 13 Delta does recognise local or remote situations where this may be appropriate but, if left to run unbounded across the NEM, it exposes the market to a higher baseline of costs from potential over-build ('gold-plating') as TNSPs seek to maximise their regulated asset base; Where system strength reinforcement is necessary because of new generation investment, Delta is strongly of the view that, as expressed elsewhere in this Submission, system strength resource adequacy should be ensured through universal mandatory generator standards, together with an option for participants to either provide the mandatory capability from their own assets or alternatively to contract for service provision by others (e.g. contracting for the NSP to build a syncon as a contestable part of the NSP's business); 2. It is not clear that the HydroTasmania proposal, based on constraint equations, would deliver system strength resources in excess of the essential levels. The high prices generated for a scarce essential system service at a transmission node may appear to attract investment but without any 'demand curve' for the service the investor may be concerned that any new system service capacity may collapse the price and render the investment uneconomic. 3. Delta does believe that there is a case for more than one model to be implemented: one that can address Region-wide issues and one that can address local/niche system strength issues. 4. Delta has included a one-page summary of its understanding of the strengths and weaknesses of the alternative models. Refer Section 9. 5. In relation to delivering system strength above the minimum levels, Delta would make the following observations: • The system normally runs in exactly that configuration: most times there is an excess of all resources and shortfalls in resources are typically weather or contingency driven. • While a temporary lack of resources due to contingencies is self-healing, a systemic lack of resources will represent market failure. Resource adequacy should be the regulatory priority. • As suggested above, universal mandatory generator standards, together with an option for participants to either provide the mandatory capability from their own assets or alternatively to contract for service provision by others should ensure system strength resource adequacy, providing the performance standards (service volume) are set at the right level;

QUESTION	RESPONSE
QUESTION 15: REQUIREMENT FOR AN EXPLICIT IN-MARKET RESERVE MECHANISM OR MARKET IN THE NEM 1. What do stakeholders see as the key drivers or changes in the NEM that could be addressed by introducing an explicit in-market reserve arrangement? 2. Do stakeholders' think there is a need for an explicit in-market reserve arrangement in the NEM. If yes, do stakeholders consider the need to be permanent or transitional? 3. How would an explicit in-market reserve mechanism or market impact stakeholders? What would be the key benefits and costs? Would it effect stakeholders' operational or investment decisions? 4. Do stakeholders' think there to be an explicit need for a capacity commitment mechanism as proposed by Delta? Do stakeholders' think this as a separate need to an in-market reserve service?	The answer to this question depends on one's vision for the future NEM. Delta's expectation is that the future NEM will predominately source energy from VRE and be supported by fast-start technologies such as Hydro, gas-fired and storage. In that future, Delta expects that most if not all VRE will have the capability and be mandated to provide most system services, in particular synthetic inertia and FFR. Accordingly, the bulk of installed capacity will be capable of responding to RT dispatch signals and an in-market co-optimised solution is appropriate. For participants such as Demand Management and DRE who may be a source of system services but unable to respond in the timeframe of a RT market, an ahead market will continue to be relevant in finding an optimal solution. Consistent with Delta's views expressed elsewhere, in order to provide a stable investment environment Delta generally favours the 'long view' on establishing a base of regulatory solutions that will remain relevant in the long term, with an overlay of any transitional arrangements needed to deal with current-to-short term market realities. Delta's view is that an ahead market such as its proposed Capacity Commitment Mechanism falls under the category of 'transitional arrangements needed to deal with current-to-short term market realities', one that will provide a market-based arrangement to facilitate AEMO's continued access to the full capabilities of the NEM's legacy fleet of slow-start synchronous generators as well as those developing Demand Management and DRE resources that cannot meet a RT commitment time frame. Delta does not regard the Capacity Commitment Mechanism as incompatible with a RT solution but complementary to it. The voluntary participation feature that Delta proposes will allow providers, who are technically able, to arbitrage between the two markets so that the market prices converge to provide risk-weighted equivalent returns to participants.

QUESTION 16: ACHIEVING SECURITY OR RELIABILITY OUTCOMES USING A NEW IN-MARKET RESERVE MARKET OR MECHANISM? 1. Do stakeholders have views on whether an in-market reserve market or mechanism should solve primarily for reliability outcomes and security outcomes second? Or can this be more effectively co-optimised? 2. How do stakeholders' think an explicit in-market reserve market or mechanism interacting with the existing NEM reliability framework? What are the policy design priorities for a new operating reserves arrangement that would deliver the reliability needs of the power system? 3. How do stakeholders' think an explicit in-market reserve market or mechanism interacting with the existing NEM security framework? What are the policy design priorities for a new in-market reserve market or mechanism that would deliver the security needs of the power system?	Delta believes the answer to this question also depends on one's vision for the future NEM. Delta's view is that system service resource adequacy is most effectively addressed by mandatory standards while dispatch of those resources is best accomplished by a market solution. Given that some regional system security issues, if not promptly addressed, have the potential to extend to adjacent regions, one might view system security issues as a higher priority, however Delta considers that security and reliability are not independent as either could result in loss of load (i.e.. unserved energy) the best measure of which is the Value of Customer Reliability (**VCR**, currently ~$33,000/MWh avg.) not the Market Price Cap (~$14,000/MWh). If the enablement or dispatch of all system services are to be optimised by NEMDE then providing NEMDE's equations (for both 'reliability' and 'security' metrics) use the same value of unserved energy in determining the quantum of system services that are to be enabled (or dispatched), then an appropriate balance between system security and reliability should be achieved. The above comments are on the presumption that separate markets for all services to cover all important system services and dispatch solutions are co-optimised by NEMDE. NEMDE will automatically find optimal solutions for (for example) meeting operating reserve and inertia requirements on a RT basis, alongside whatever ahead market arrangements are in operation. Delta considers the existing NEM security framework as, similar to Delta's proposed Capacity Commitment Mechanism, an arrangement needed to deal with the current-to-short term market realities of the NEM's legacy fleet of generators. Delta supports the retention of AEMO's powers of direction with the suggestion that the compensation mechanism be reviewed so that the class of participants likely to receive direction have an incentive to participate in the new markets for reserve instead. If this question is directed to the issue of whether new reserve markets price signals (in combination with the energy market) will be sufficient to bring new investment in generation, Delta's response is as expressed elsewhere that a regulatory approach that includes the early establishment of market signals for services that are currently not valued, combined with long-term regulatory stability will produce the most favourable investment environment.

QUESTION	RESPONSE
QUESTION 17: REFORMS RELATED TO THE PROVISION OF SYNCHRONOUS INERTIA 1. Do stakeholders consider that the issues relating to declining levels of synchronous inertia have been adequately and accurately described? 2. Are there any other issues related to the provision of synchronous inertia that have not been adequately described? 3. What are stakeholders views on the approach to considering the interaction between FFR and inertia in the NEM?	Delta believes the present arrangements requiring NSP's to provide, on AEMO's declaration of a shortfall, solutions to shortfalls in inertia to be an effective short-term solution that: 1. Should be regarded as a necessary but temporary measure to provide services that are normally provided by market-facing participants; 2. If left to run indefinitely it exposes the market to a higher baseline of costs from potential over-build ('gold-plating') as NSPs seek to maximise their regulated asset base; 3. Reliance on NSP's for this service is a lazy regulatory solution that potentially ignores and disincentivises the ongoing development of capability of inverter-based systems to provide services such as synthetic inertia and FFR. In short, Delta's view is that new Inverter-based generators should have mandatory generator standards that force the uptake of new inverter technology capability to deliver increasing volume and range of system services One approach is to apply the same standards now and it becomes the proponent's choice to address the service obligation by either incentivising inverter suppliers to innovate, building their own syncon capability or by contracting for the provision of synchronous services by others.

QUESTION	RESPONSE
QUESTION 18: REFORMS RELATED FREQUENCY CONTROL DURING NORMAL OPERATION 1. Do stakeholders consider that the issues relating to frequency control during normal operation have been adequately and accurately described? 2. Are there any other issues related to frequency control during normal operation that have not been adequately described? 3. What are stakeholder views on the proposed approach to reforming the process for the allocation of the costs of regulation services (Causer pays)? 4. Is the level of specification of regulations services in the NER fit for purpose as the power system transforms?	Delta agrees with the AEMC's statement that: "In the long term, market participants should be incentivised to provide a sufficient quantity of primary regulating services to support good frequency performance during normal operation." In addition, Delta has the following comments: a) That the AEMC should aim for a frequency control regulatory framework that would remain fit-for-purpose in the forecast High-VRE future when during the middle of the day there may be little or no synchronous generation on-line. Regulatory mechanisms relying on existing slow-start thermal capacity should be considered transitional. b) That, as expressed elsewhere in this Submission, Delta believes PFR resource adequacy should be ensured through universal mandatory generator PFR standards, together with an option for participants to either provide the mandatory capability from their own assets or alternatively to contract for service provision by others; c) that Delta agrees that the potential development of measures to effectively remunerate providers of PFR delivery/enablement has the potential to deliver efficient Real-Time delivery of PFR services; and d) Delta does not consider the 'temporal disconnect' issue to be significant as wholesale participants are generally sophisticated economic entities able to assign ex-post costs appropriately within their businesses and are usually able to react in Real Time to perceived cost exposures. Delta considers the greater issue is to develop an approach to not penalise generators through greater FCAS Regulation 'causer pays' costs when they are providing PFR that is useful to the System.

QUESTION	RESPONSE
QUESTION 19: REFORMS RELATED FREQUENCY CONTROL FOLLOWING CONTINGENCY EVENTS 1. Do stakeholders consider that the issues relating to frequency control following contingency events have been adequately and accurately described? 2. Are there any other issues related to frequency control following contingency events that have not been adequately described? 3. What are stakeholders views on the best way to address the challenges to managing system frequency following contingency events, including reforms to value and reward FFR? 4. Is the level of specification for contingency services in the NER fit for purpose as the power system transforms?	All of Delta's response to Question 18 also apply to this question, in particular: a) That the AEMC should aim for a frequency control regulatory framework that would remain fit-for-purpose in the forecast High-VRE future when during the middle of the day there may be little or no synchronous generation on-line. Regulatory mechanisms relying on existing slow-start thermal capacity should be considered transitional. b) Delta supports the proposed FFR Rule Change as one mechanism that addresses only point e) of Delta's response to Question 18 – that of efficient Real-Time delivery of FFR services, but not the issue of resource adequacy nor efficient use of capability from slow-start generators. c) Delta considers that the greater concerns are: I. ensuring long-term PFR resource adequacy, per item b) in response to Question 18 above. Without resource adequacy, the efficiency of the commitment and dispatch processes is moot; and II. In the transitional period, efficient use of capability from slow-start generators. d) Delta notes that a more holistic definition of PFR resource adequacy would need to include for Regulation services, FFR, synthetic inertia and synchronous inertia and to potentially place different values on those services based on their interaction, substitutability and efficacy in controlling frequency following contingency events. Accordingly, a more nuanced level of specification of contingency services may well be required to fully recognise the potential services available through technological innovation in the control of Inverter-based generation systems.

QUESTION	RESPONSE
QUESTION 20: TECHNOLOGICAL AND TEMPORAL ISSUES FOR SYSTEM SERVICE PROVISION 1. What are stakeholders' views on how the arrangements for system services can be developed, to best utilise the capability of both established as well as new and emerging technologies? 2. Do stakeholders have any initial thoughts on how the arrangements for system services can be best coordinated over dispatch, commitment and investment time frames?	Delta has strongly held views on these issues that have been expressed at a number of places in this submission: a) That the AEMC should aim for a system service regulatory framework that would remain fit-for-purpose in the forecast High-VRE future when during the middle of the day there may be little or no synchronous generation on-line. Regulatory mechanisms relying on existing slow-start thermal capacity should be considered transitional but necessary. b) That, as expressed elsewhere in this Submission, Delta believes system service resource adequacy should be ensured through universal mandatory generator standards, together with an option for participants to either provide the mandatory capability from their own assets or alternatively to contract for service provision by others; Delta agrees with AEMC's views in the last two paragraphs of section 9.1.1 of the Consultation Paper and Delta is similarly optimistic of the capability of technological innovation to deliver a broader range of services from inverter-based systems given appropriate incentives – such as from item b) above. Delta does not believe the AEMC's statement in 9.1.1 *"Efficient policy frameworks will take a portfolio approach to sourcing system services, making optimal use of the capabilities of all assets in the power system, which, when used in combination, should be capable of providing the same or better system performance than in the past."* is sufficient. The statement as quoted appears focussed on the timeframes of efficient commitment and dispatch, not on investment (resource adequacy). Delta believes the statement does not recognise the impact that universal mandatory generator standards could have on innovation to deliver resource adequacy and consequently it places too much emphasis on using the existing, shrinking resource base of slow-start synchronous generators.

QUESTION	RESPONSE
QUESTION 21: AHEADNESS AND COMMITMENT 1. Do stakeholders agree with the characterisation of arrangements for aheadness and commitment, including the potential benefits? 2. What are stakeholders' views on the potential downsides of introducing arrangements for commitment of capability ahead of dispatch? 3. Are there alternative arrangements that can reduce the increasing uncertainty associated with power system operation in the NEM?	Delta agrees with the AEMC's summary in section 9.2 of the Consultation Paper. It is Delta's belief that the market overall will benefit in terms of reliability and security outcomes as well as costs however it is understood that specific participants may benefit more under an alternative model. This is a distributional issue and Delta would recommend giving greater weight to system security and reliability in its consideration. Delta notes that there is a distinction to be made between efficacy and certainty. Delta supports solutions that are effective in giving AEMO the tools necessary to secure the system and agrees that the richer information provided to participants by ahead markets does promote greater certainty.
QUESTION 22: COST RECOVERY ARRANGEMENTS 1. What are stakeholders' views on the appropriate approach to cost recovery for each of the system services discussed in this paper? 2. In each case, how can the cost recovery arrangements be developed to lower the overall costs of the NEM?	In general, Delta favours a 'causer pays approach' which provides the causer incentives to mitigate their demand for system services from the balance-of-system. This is the philosophical underpinning to Delta's view that ALL new generators in the NEM should comply with universal generator performance standards, whether by incorporating technical capability in their designs or by contracting to a third party to provide the service. With the incentives described above, apart from niche situations (for example in remote parts of the transmission system) the mandatory generator standards should provide sufficient resources to allow the markets for services to clear at efficient levels, refer Delta's response to Question 14, Item 5 (above).

QUESTION	RESPONSE
QUESTION 23: IMPLEMENTATION CONSIDERATIONS 1. What are the challenges or implications associated with implementing proposed arrangements discussed in this paper? 2. What are stakeholders views on the prioritisation or staging of the reforms to address the issues discussed in this paper?	In general, Delta believes that systems re-design to incorporate new services to be co-optimised by NEMDE will take a substantial effort to scope, design implement and test. Delta believes there are low-hanging fruit in the proposals that lend themselves to relatively quick deployment and that Delta's Capacity Commitment Mechanism is one of these, as is relatively incremental changes to the FCAS Markets such as Delta's proposed Ramping services and Infigen's proposed FFR services. In terms of priority, Delta would recommend the Capacity Commitment Mechanism as being good 'bang for your buck' in quickly providing AEMO a tool to address multiple system scenarios involving one or several concurrent system service shortfalls.

9. ANNEXURE 1 – MATRIX OF PROPOSAL PROPERTIES

	Infigen ERC 0295 "Operating Reserve"	Delta Electricity ERC0307 "Capacity Commitment Mechanism"	Infigen ERC 0296 "Fast Frequency Response"	Hydro Tasmania ERC0290 "Synchronous Services Markets (Including Inertia)"	Delta Electricity ERC0307 "Introduction of Ramping Services"	AEMO ERC0263 "Primary frequency response incentive arrangements"	TransGrid ERC0300 "Efficient Management of System Strength"
System Service targeted	Operating Reserve	All (Operating Reserve, Inertia, Freq Response, Voltage Control, synchronising torque)	FFR	'synchronous services' (Inertia, fault level and voltage control)	30-minutes Raise and Lower Ramping	PFR	System Strength (Fault level, Short Circuit Ratio, synchronising torque Voltage Control, inertia mentioned)
Method	A new RT market co-optimised by NEMDE	24hr Ahead Market for commitment with dispatch by NEMDE as usual except for minimum dispatch=MSOL	New RT FCAS service	A Commitment mechanism in RT driven by new Constraint Equations, automatically co-optimised by NEMDE Providers enabled by NEMDE get paid their bid price.	RT market by new Raise and lower FCAS services	Rules Changes 1. changes to mandatory generator PFR standards; 2. changes to Rules to remove disincentives to generators providing PFR	Rules change to allow TG to more proactively invest in 'system strength' assets
Strengths of the Proposal	Good candidate solution for a 'Future NEM' system with exclusively VRE/fast-start plant mix	All participants can participate, incl DM and DRE Simple to implement Good candidate for an interim/transitional period solution Can work alongside RTE solution.	Good candidate solution for a 'Future NEM' system with exclusively VRE/fast-start plant mix	Good for addressing local system strength issues down to specific the Transmission Node	Identifies one of the missing services ahead of the system reaching a critical shortage. Likely to be low-cost while synchronous capacity is plentiful, rising as capacity retires and VRE expands	Easy fix for AEMO, to gain access to technical capability of current fleet.	Better economic allocative efficiency; Likely to result in at least adequate resource delivery but with risk of over-investment (see below)
Weaknesses of the proposal	Exclusive to Fast-start	Commitment outcomes may result in some out-of-merit order energy dispatch.	Exclusive to committed capacity	Does not produce a demand curve, prices may be nodal prices depending on the constraint equations. Exclusive to Fast-start	Lack of market disruption has not yet prioritised the need for this service	Does not produce a market signal. Inequitable burden-sharing. Unfairly compensates for new incremental costs, not the sunk costs in providing the underlying capability (Market free-rides on the past investments of some participants).	Risk of Gold-Plating due to overbuild. Risk of NSP competing with private market-facing participants in provision of same service
Technology Neutrality	RT limits participation by slow-start, DM and DRE participants	Technology neutral, incl. DM and DER	RT limits participation by slow-start, DM and DRE participants	RT limits participation by slow-start, DM and DRE participants	Technology neutral, incl. DM and DER	Targets existing synchronous generators	Biased towards Technologies deployed by TNSPs, excludes all generation sector technologies

GLOSSARY

RT means Real Time
DM means Demand Management
DER means Distributed Energy Resources (eg Solar PV aggregators)
PFR means Primary Frequency Response
FFR means Fast Frequency Response