

21 October 2021

Ms Anna Collyer  
Chair  
Australian Energy Market Commission  
Sydney

Dear Ms Collyer

**DIRECTIONS PAPER - CAPACITY COMMITMENT MECHANISM AND SYNCHRONOUS SERVICES MARKETS - AEMC 9 SEPTEMBER 2021**

Delta Electricity (Delta) welcomes the opportunity to provide detailed comment on the Commission's Directions Paper on Capacity Commitment Mechanism and Synchronous Services Markets (the Directions Paper) to:

- reinforce the need to change the current market design in order to explicitly value all essential system services as the rapidly changing generation mix in the NEM is providing fewer of these essential services – thus pressing the limits of current system security and operational experience;
- endorse the Non-Market Ancillary Services (NMAS) approach presented in the Commission's paper as being superior to the Market Ancillary Services (MAS) approach and, thus, support the Commission's preliminary conclusion that it "regards the NMAS approach as its preferred approach to confidently support efficient scheduling and dispatch by AEMO." <sup>1</sup>; and
- propose the key features of an NMAS approach that would ensure slow start plant is incentivised by market price signals to provide operating reserve, ramping capability and essential system services to minimise AEMO directions.

Adoption of the NMAS approach would result in more efficient scheduling and dispatch of generators and, thus, provide AEMO with greater confidence that the system will be secure. This should ultimately lead to lower costs for consumers as it would minimise the prospect of inefficient market interventions by AEMO. Adoption of this approach would therefore reinforce the principles embodied in the National Electricity Objective.

Delta wishes to emphasise the need to take steps well ahead of 2025 to address these issues to ensure Australian households and businesses continue to enjoy a reliable, sustainable and affordable supply of electricity. There is ample evidence that the NEM is no longer functioning efficiently – AEMO directions, increasing LOR notices and the use of the RERT are some examples. This need for urgency is acknowledged in the Directions Paper, with the paper noting:

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<sup>1</sup> AEMC, *Directions Paper 9 Sept 2021, Section 2.1, Page 11*

*“Security is critical, and stakeholder feedback through both the AEMC and the ESB processes suggests that addressing missing system services cannot wait until 2025.”<sup>2</sup>*

This submission is in two parts: an explanation of Delta’s position below and an appendix with Delta’s detailed response to questions in the Directions Paper.

## **Background**

The Directions Paper highlights important points and principles that are in alignment with many of Delta’s positions put forward in its rule change request and subsequent submissions. In particular:

- a non-real time market proposal that responds to the prevailing inadequacy of energy price signals to incentivise investment for system reliability and the need for an optimisation of services from slow start plant that need commitment certainty at least a day ahead;
- Essential System Services (ESS) will be required from the fleet of thermal slow-start synchronous generators for stable system operation for some time as the NEM transitions to a high IBR future (IBR -Inverter Based Resources such as Battery, Wind and Solar PV);
- real-time co-optimised spot markets in ESS (or their successor services) is an appropriate long-term goal but, in the short term, would fail to allow for the re-commitment timeframes of slow-start thermal units and therefore likely to fail to deliver adequate ESS at times, necessitating more frequent market operator intervention; and
- a transitional arrangement is needed to ensure stable system operation, that provides AEMO with access to ESS from all sources, including slow-start thermal units, via a competitive, technology-neutral mechanism, and is:
  - relatively simple to implement (by not requiring a wholesale redesign of NEMDE);
  - provides pricing/value signals for the ESS, and
  - can accommodate a smooth transition to real-time co-optimised spot markets in services required for system stability and security.

## **NMAS is the Preferred Option**

Delta, in its Rule Change Request (ref ERC0306), proposed a Capacity Commitment Mechanism intended as a readily implementable solution. The NMAS approach can deliver the same benefits if AEMO establishes a market-based system for resource providers to offer capability on an appropriate ahead basis to take account of supply lead times. Delta therefore supports the preference expressed in the Directions Paper for NMAS (over the alternative MAS) as the best mechanism to ensure AEMO can achieve a reliable power system over the NEM transition period.

An NMAS approach is preferred for the following reasons:

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<sup>2</sup> AEMC, *Directions Paper 9 Sept 2021, Page IV*

- NMAS will provide AEMO with the greatest level of certainty of resource adequacy to ensure a stable system;
- NMAS has the potential to provide a more competitive and useful price/value signal by being able to access all NEM ESS capability, not just a portion;
- NMAS should be able to run in parallel with the future successor (unbundle services to the ESS in the transition period), allowing efficient price discovery by enabling providers to arbitrage between the markets;
- NMAS does not require wholesale redesign of NEMDE, lowering overall implementation costs and facilitating a more rapid deployment to address looming issues;
- compared with the NMAS approach, which by design ensures ESS resource adequacy, a MAS mechanism exposes the system to potential shortfalls in ESS – refer to the subsection “Spot Prices Outcomes may impact ESS supply” below;
- the MAS approach involves a real-time dispatch of ESS, which will fail to recruit all potential sources of ESS, to ensure stable system operation. This is because it fails to recognise the start-up times of slow-start thermal generators, specifically, those that may be de-committed periodically to accommodate the daily Solar PV profile;
- if, under a MAS approach, the AEMO needs to intervene by directing units to re-commit in order to address an ESS shortfall, the resulting MAS price for that ESS will have been capped by the intervention, masking the ‘true’ value of the ESS and compromising the transparency of the approach;
- Delta notes the significant drawbacks identified by AEMO associated with binary constraints that may be associated with dispatching under a MAS approach:
  - the inability of binary constraints to be co-optimised with Energy and FCAS markets;
  - the potential for computational complexity to prevent convergence on an optimal solution within the 5-minute market computational timeframe; and
  - the inability to produce marginal price signals; and
  - In this context, Delta notes that transmission element status and the commitment status of generators may all be binary constraints with the Transitional Period introducing greater uncertainty around slow-start thermal generator commitment status.

Delta notes the following comment by the Commission on page 47 of its paper:

*“Further work is needed to consider any specific design details of any detailed mechanism under these two overarching approaches.....”*

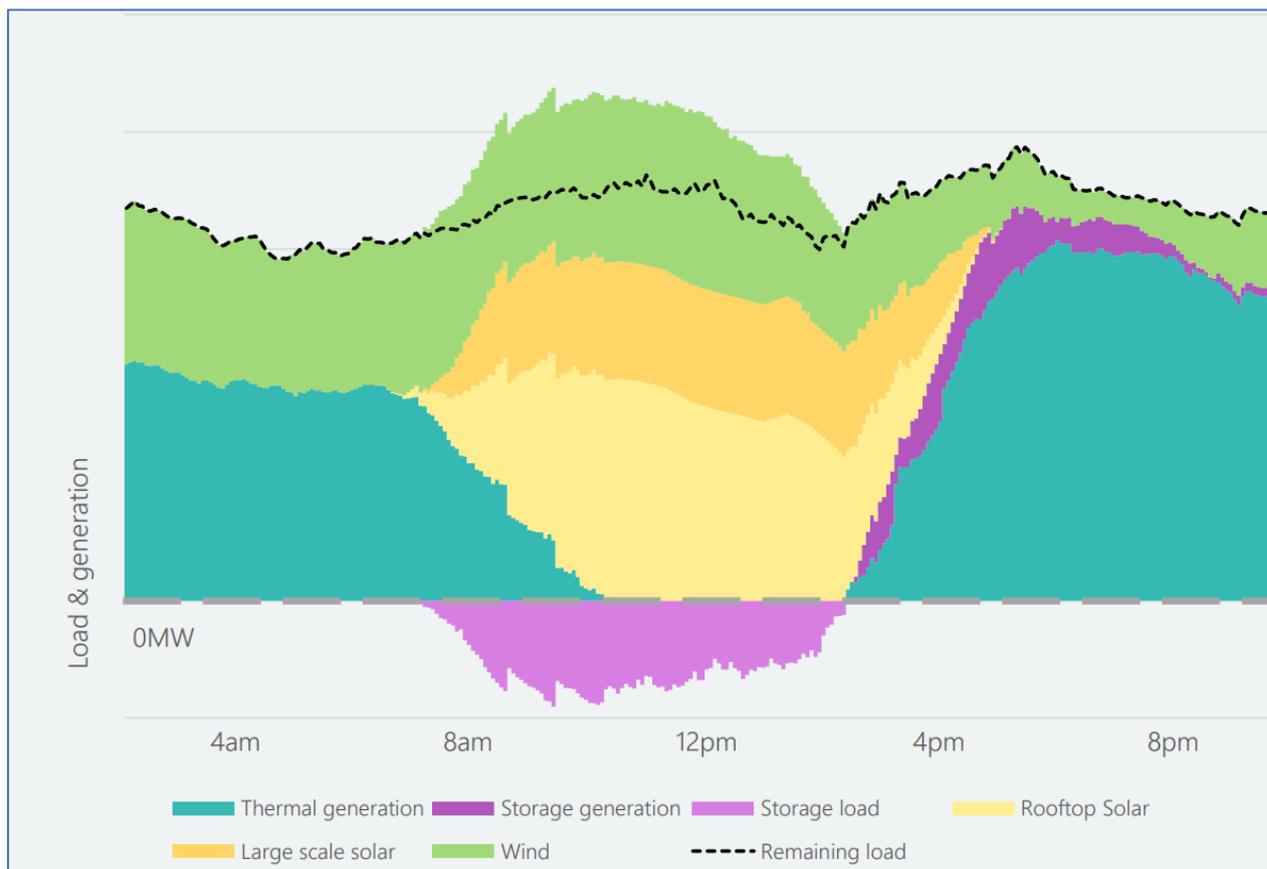
Delta considers the following should be the key elements of the detailed mechanism to be developed by the Commission:

- an ‘ahead’ decision aspect of the mechanism to ensure all available technologies and demand side responses can participate, in order to avoid inefficient real time market directions;

- timely implementation based on AEMO’s forward assessment of need;
- use existing AEMO IT platforms to minimise cost to participants;
- technology neutral, incorporating both supply and demand side resources; and
- is consistent with the ESB Post 2025 market reform recommendations.

## Market in Transition

The following chart from AEMO’s NEM Engineering Framework July 2021 Report illustrates the transitional challenge for a possible day in the next five to 10 years.



As AEMO notes in relation to the chart:

- daytime period – high variable renewable energy (VRE) generation, with storage utilising excess generation. Thermal generation is displaced by VRE, and all thermal generators shut down over the daytime. Over this period, operators must manage minimum demands, headroom for frequency control, inertia, and system strength; and
- evening and night-time period – VRE generation is much lower, with storage and thermal plants turning on to cover the change. Over this period, operators must manage fleet ramping capability and energy storage levels.

Delta notes that gas-fired thermal plant can start and stop reliably as shown in the AEMO chart. Coal plant may be able ‘two-shift’ at a considerable cost of additional maintenance

and reduced technical life, but start-up reliability is not at the same level as gas plant. Further, it is doubtful sufficient gas would be available to meet the thermal generation indicated in the diagram and, even if it was, the economic cost of electricity supply would increase materially. Until replacement technology is available, coal fired will be required to operate through periods of very low prices to provide system services and be available post solar operation to maintain system reliability.

Battery and other storage systems will be contributing to meeting the evening and night-time supply, as well as the ramping capability to meet demand as solar generation ramps down at the end of each solar day. However, storage systems are already included in the chart by AEMO and it is clear that thermal generation remains the dominant source of ramping capability. Whilst it might be argued that the 5 minute spot price should be an adequate signal of ramping scarcity, the day ahead pre-dispatch prices will not provide the level of revenue certainty required for slow start plant to commitment unless the average spot price over a longer timeframe is sufficient.

The AEMO chart is a good example of why the operational characteristics of flexible plant must be considered in the reform process. The modelling behind the chart would suggest the market is signalling thermal shutdowns but system operation imperatives will drive a very different outcome. An NMAS approached based on Delta's rule change request would more than adequately deal with this dilemma.

#### *Spot Prices Outcomes May Impact ESS Supply*

While AEMO did not comment on spot prices in this context, Delta would suggest daytime energy pricing should reflect SRMC (say, wind/solar \$0/MWh less LGC = -\$40.00/MWh). Delta considers the NEM storage capacity will likely not be large enough to influence price setting during middle of day. Large thermal units with typical minimum loads of 200-300MW are faced with choosing between either the severe financial burden of generating minimum load at these negative prices if the unit is kept in service, or de-committing the unit and incurring the financial (burning bulk fuel oil) and engineering (expended thermal creep life) costs to re-start the unit. Independent decisions will be made as to whether it is worthwhile to re-commit units, creating a source of uncertainty for the Market Operator of the adequacy of supply of Essential System Services (ESS).

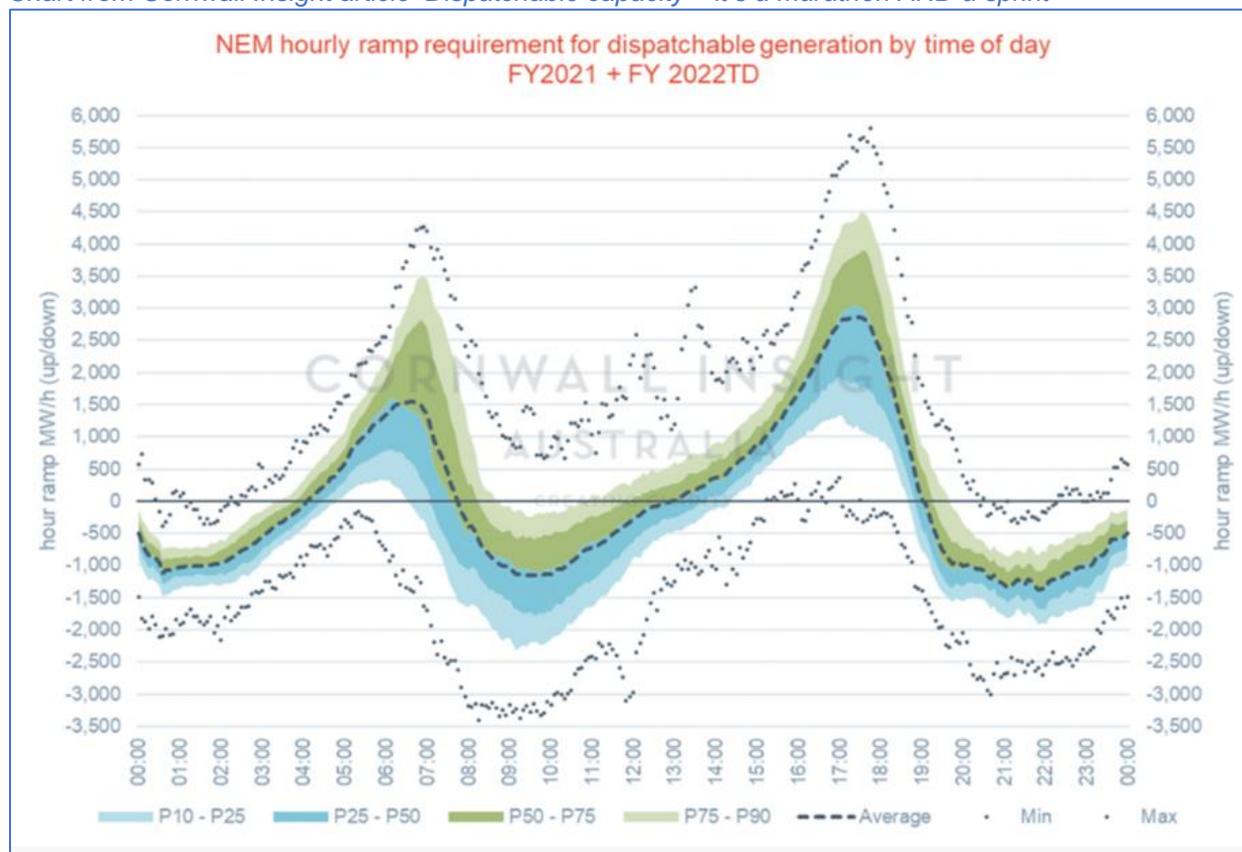
It is precisely this source of uncertainty that can be addressed by allowing for unit re-start times in the design of the transitional mechanism. Delta's proposed Capacity Mechanism, and the Directions Paper's description of NMAS, can also allow for thermal unit re-start times in dispatching ESS through the transitional period. The Market Ancillary Services (MAS) alternative transitional mechanism for dispatching ESS does **not** allow for thermal unit re-start times.

#### *Spot Prices Outcomes May Impact Ramping Capability*

ESS, critical as it is, is not the only services in which AEMO may face shortfalls as a result of the NEM transition. Delta first raised the issue of the growing sustained ramping requirements imposed on the balance-of-NEM by the growing penetration of Solar PV in its Rule Change Request Delta Electricity ERC0307 - "Introduction of Ramping

Services”. Cornwall Insight article ‘Dispatchable capacity – it’s a marathon AND a sprint’<sup>3</sup> dated 6 October 2021 highlights the same issue. Refer the Chart below from the same article.

Chart from Cornwall Insight article ‘Dispatchable capacity – it’s a marathon AND a sprint’



Cornwall notes in the article that:

- “As the sun begins to set, the ramp requirement to the evening peak is on average just over 2.5 GW. However, 40% of the time, the requirement can be even higher between 2.5-4.5 GW in an hour.”; and
- “For now, incumbent generators (like coal) will need to meet these requirements. Provided that coal remains online with the current dispatchable capacity, there is likely to be sufficient capacity in reserve to meet the ramping requirements of the system, albeit in an incremental way (every five minutes). However, as these units retire, something else will need to rise to meet these needs.”

Delta notes that:

1. while Cornwall refers to “as these units retire, something else will need to rise to meet these needs”, in the period preceding full retirement, day-to-day de-commitment and re-commitment decisions of thermal units will have the exact same effect;

<sup>3</sup> Cornwall Insight <https://portal.cornwall-insight.com/s/blog-article/aCa8d0000000anCAA/dispatchable-capacity-its-a-marathon-and-a-sprint>

2. Cornwall's reference to "2.5-4.5 GW in an hour" corresponds to the P50 to P90 levels in their Chart above and the Maximum is 5.5 GW in an Hour and that this ramping capability needs to come from dispatchable synchronous generators; and
3. In Delta's proposed rule change on this issue, Delta calculated actual and estimated future Solar Ramping (expressed as MW per half-hour) as:

**NEM Total Solar Profile Ramping Summary**

Scenario	Maximum ROC MW/half-hour	Total Ramping, MW
2019/20 Actual	1328	8425
2024/25 - Central	2090	12212
2024/25 - Fast Change	2370	14908

The historical actual maximum rate of change observed by Cornwall was 5.5 GW per hour (2,750 MW per half-hour) which already exceeds Delta's estimated 2024/25 'Fast Change' 2,370 MW per half-hour estimate of approximately one year ago. This suggests that the operational challenge of meeting these very high ramping requirements is arriving even faster than Delta had estimated and should place a level of urgency in developing a mechanism (if necessary, a transitional arrangement) to deal with it. It should be noted that that conventional thermal plant needs to be committed to provide ramping capability and high ramp rates cannot be sustained without incurring material increases in maintenance costs.

Delta would be pleased to discuss this submission with the Commission's officers if there are any queries or clarification required.

Yours sincerely,



Anthony Callan  
Executive Manager Marketing

## 1.1. APPENDIX – DELTA RESPONSE TO AEMC DIRECTIONS PAPER QUESTIONS

No.	STAKEHOLDER QUESTIONS	DELTA RESPONSE
1	<p>STAKEHOLDER QUESTIONS</p> <ul style="list-style-type: none"> <li>• What do stakeholders think of the characterisation of power system requirements as described above?</li> </ul>	<p>Delta notes AEMO’s ongoing work on ‘NEM power system design and engineering framework’ (<b>Engineering Framework</b>) and considers the AEMC’s characterisation of power system requirements a consistent and reasonable expression of that work, i.e. that as an engineering task it should be possible to specify parameterised grid-forming services (including any inter-relationships between them) that are currently being provided under stable system configurations (of the NEM’s fleet of synchronous generators, network elements and load) but are also technically capable of being delivered by appropriately designed Inverter Based Resources (<b>IBR</b>).</p> <p>Delta understands these grid-forming services to collectively be equivalent to the Essential System Services (<b>ESS</b>) frequently referred to in recent papers.</p> <p>Once those new service specifications have been developed, then they may be used as the basis of technical standards for new IBR installations, for any mandatory generator performance standards and for the specification of new Ancillary Services to be dispatched in Real Time by an expanded NEMDE. The additional complexity to NEMDE is a concern in terms of the possibility of NEMDE not converging to an optimal result within the time available in a 5 minute settlements environment (as mentioned at the AEMC’s Stakeholder presentation).</p>

No.	STAKEHOLDER QUESTIONS	DELTA RESPONSE
	<ul style="list-style-type: none"> <li>• What do stakeholders think of about the need to transition from system configurations to service-based procurement over time?</li> </ul>	<p>Delta considers the management of the NEM’s transition period to be critical and has emphasised this point in multiple submissions.</p> <p>In previous submissions Delta has expressed concern at the potential inability of the Market Operator to access sufficient ESS, in particular during the transition period when high Solar PV generation can create circumstances that encourage slow-start thermal units to decommit.</p> <p>Any mechanism which does not consider re-start times for slow-start units introduces risks of reliability shortfalls or non-market solutions like Market Operator intervention during the transition period. It is for this reason that Delta was not in favour of the proposals contained in ERC0290 as, in Delta’s view, by potentially excluding slow-start sources of ESS this proposal was neither technology-neutral nor likely to minimise the risk of shortfalls of ESS.</p> <p>For this reason, Delta is strongly in favour of the NEM alternative as it can provide a backstop to ensuring stable system operation through AEMO’s application of system configurations in the transition period.</p> <p>Delta considers the service-based procurement of unbundled services to be a promising market development pathway and in this Submission, Delta will refer to these new unbundled services as <b>New Market Ancillary Services</b> or ‘<b>NewMAS</b>’. Delta anticipates that these NewMAS may be specified, rolled out as technical standards, defined as new ancillary services and incorporated into NEMDE over time, potentially with different services on different timeframes.</p>

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		<p>When NewMAS is launched, Delta does not consider it to be a choice of either NMAS OR NewMAS but rather starting with NMAS and phasing in NewMAS. Grid-forming IBR resources may initially be limited to the first few installations that incorporate that capability but can be expected to grow rapidly as new IBR systems are installed and potentially, existing Inverter systems are upgraded.</p> <p>NMAS will be important for providing initial price signals for developers to decide on the level of capability of new IBR build. IBR capable of providing Grid-forming services will not need to wait until NEMDE can dispatch the new services. IBR should be able to participate in either the NMAS or NewMAS markets which should aid price discovery as IBR would arbitrage between the two.</p> <p>As grid-forming IBR capability grows, AEMO’s system configurations should reflect that with new system configurations requiring fewer synchronous units to ensure system stability.</p> <p>If NMAS price signals for services do not yield the required level of IBR investment in grid-forming services, then regulatory action may need to be taken towards mandatory generator performance levels for IBR installations.</p> <p>In short, Delta sees the two endpoints clearly as:</p> <ol style="list-style-type: none"> <li>1. initially based on system configurations; and</li> <li>2. ultimately a service-based procurement mechanism.</li> </ol> <p>Delta also sees that the best way to manage the transition from the starting point to the end point is by letting the two mechanisms run in parallel for as long as each mechanism serves a useful purpose. Price signals from the two mechanisms should converge (likely with some basis difference in prices due to differences in specific</p>

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		<p>service definitions) due to the potential for arbitrage between the two markets.</p>
2	<p><b>QUESTIONS ON THE CURRENT ARRANGEMENTS</b></p> <ul style="list-style-type: none"> <li>• What are stakeholders views on the AEMC’s characterisation of the current arrangements to produce dispatch schedules and ensure the power system remains secure?</li> </ul>	<p>Delta considers the AEMC’s characterisation of the current arrangements to be concise and balanced.</p>
	<ul style="list-style-type: none"> <li>• What are stakeholder perspectives on the AEMC’s view that the implementation of either the MAS or NMAS approaches should ultimately transition to procuring unbundled system services as operational and technological knowledge improves?</li> </ul>	<p>Delta had already suggested in its 13 August 2020 Submission (System Services Rule Changes Reference: ERC0290) that a future high-VRE NEM will, following the retirement of ageing slow-start thermal generation, need to obtain ESS from IBR systems as well as the fleet of Hydro and Pumped-storage synchronous generators. At that time Delta considered it likely that inverter technology could, at a cost, be developed to provide ESS and that the most effective way of ensuring ESS resource adequacy would be to impose mandatory generator performance standards on IBR systems.</p> <p>Delta anticipates that the transition to NewMAS will take a number of years: to initially specify the new services, determine standards to apply to new installations, build the additional services into NEMDE and for installed NewMAS capability to grow.</p> <p>Once there is sufficient dispatchable NewMAS capability to satisfy the market operator that secure system operating states can be assured then the MAS or NMAS systems could be deemed to have served their purpose and be retired.</p> <p>Key for a smooth transition is the ability of NewMAS to operate alongside the transitional approach for a period that may extend to a number of years. Delta considers that this is relatively easy to achieve under the <b>NMAS</b> approach as, over time, AEMO can</p>

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		<p>update its set of stable system configurations to allow for the then-extant quantum of dispatchable NewMAS.</p>
3	<p><b>QUESTIONS ON THE MAS APPROACH</b></p> <ul style="list-style-type: none"> <li>• What are your views on the trade-offs identified between the linear and binary formulation of constraints?</li> </ul>	<p>Delta considers the fundamental problem with the MAS approach is obtaining an adequacy of ESS resources to ensure a stable system when a large proportion of ESS is still provided by slow-start thermal generators which may have been forced to decommit due to low spot energy prices in the middle of the solar day. These generators take hours to re-commit and when decommitted cannot respond to 5-minute market signals.</p> <p>With the above paragraph in mind, binary control variables with a large impact may include whether a large synchronous generator is in or out of service. The impact of such commitment decisions when there is ample supply of ESS may be muted. However, in the transition period there may be times of high solar PV output when multiple thermal units consider de-committing, leading to high volatility in ESS price outcomes.</p> <p>Delta defers to the AEMC’s analysis regarding binary constraint variables:</p> <ol style="list-style-type: none"> <li>1. the inability of binary constraints to be co-optimised with Energy and FCAS markets;</li> <li>2. the potential for computational complexity to prevent convergence on an optimal solution within the 5-minute market computational timeframe; and</li> <li>3. the inability to produce marginal price signals all appear to be significant drawbacks.</li> </ol>
	<ul style="list-style-type: none"> <li>• Would the transparency of the market improve under this MAS approach, and how important of a consideration is this?</li> </ul>	<p>Under the MAS approach, if there is a shortfall of ESS the pre-dispatch ESS price could be very high. However, this is likely to be</p>

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		<p>the very time when the Market Operator may need to ensure a stable system configuration by directing a generator to run, thus ‘crushing’ the ESS market price in MAS. Delta is not convinced that the objective of transparency is achieved if the MAS yields prices are effectively capped.</p> <p>In terms of the market power issue identified by the Commission in 5.4.3, Delta notes that the aggregate generation capability not affected by re-commitment times is smaller than the aggregate fast-start capability and therefore the MAS approach, which favours fast-start capability has a shallower pool of providers and may be more susceptible to market power issues than the NMAS approach where the pool of providers = all installed capacity.</p>
4	<p><b>ON THE NMAS APPROACH</b>  Would the transparency of the market improve under this approach, and how important of a consideration is this?</p>	<p>The NMAS approach is predicated on achieving stable operating configurations taking into account commitment timeframes. This feature alone gives confidence that price outcomes will avoid the extreme scarcity outcomes that could emerge from the MAS approach described above and is more likely to transition smoothly to NewMAS market pricing as generators with NewMAS capability become predominant.</p> <p>As the NMAS should provide a more stable price signal, investment should be more confident, i.e. NMAS is potentially a better price signal for allocative efficiency.</p> <p>The potential for NewMAS providers to bid into either NMAS or NewMAS should lead the two market prices to converge (albeit with some basis difference for the difference in service specification), again strengthening the credibility of the price signal.</p>

No.	STAKEHOLDER QUESTIONS	DELTA RESPONSE
		<p>If the purpose of the ESS and NewMAS prices are to deal with the issue of resource adequacy by encouraging an efficient (and timely) investment in capability, then the credibility of these price setting mechanisms is very important.</p>
5	<p><b>QUESTIONS ON THE COMMISSION'S RECOMMENDATIONS</b></p> <ul style="list-style-type: none"> <li>• Do you think that either option would result in a more efficient, secure dispatch? Weighing up the inherent limitations of both approaches, which is likely to be more efficient, and why?</li> </ul>	<p>Delta's view is that, by design, the NMAS proposal will deliver a stable system configuration and therefore should represent the most secure approach. While NMAS may not yield marginal or spot price, it certainly does yield an average price (and the price of the next increment of capability). Average price information is still useful information for investors who typically invest to achieve an annual rate of return, not 5 minutes of economic sunshine. Further, NMAS implemented through contracts is still a competitive process, with participation possible from all capacity so it cannot be characterised as not efficient.</p> <p>A MAS approach, dispatching bundled ESS in the transition period, while appearing to be piecewise efficient, fails to gain participation from all possible sources of ESS supply and therefore is not likely to lead to the lowest price. It also carries a risk of failure to schedule adequate ESS (refer comments in Answer to Question 3 above), requiring Market Operator intervention – an inefficiency not faced by the NMAS approach.</p> <p>Delta concedes that the NewMAS markets, when fully deployed with adequate capability able to participate in those markets, should represent the most efficient outcome and is a worthy target to aim for.</p>
	<ul style="list-style-type: none"> <li>• Which option might better address concerns relating to the exercise of market power by service providers?</li> </ul>	<p>Refer answer to Question 3, second dot Point. NMAS enables the largest pool of potential providers and so best addresses Market Power concerns.</p>

No.	STAKEHOLDER QUESTIONS	DELTA RESPONSE
	<ul style="list-style-type: none"> <li>• Do you think that either option would be result in greater market transparency? Which option would be more transparent?</li> </ul>	<p>On balance Delta considers the NMAS market to provide overall greater transparency as, by virtue of achieving stable system configurations, the need for Market Operator intervention is minimised to only deal with emergencies.</p> <p>While the MAS approach provides transparency on bids and prices, it does not place a value on the ESS capability unable to participate in that market nor does it capture the inefficiency of the Market Operator interventions to address failure of MAS to schedule adequate ESS capability.</p>
	<ul style="list-style-type: none"> <li>• Which option might provide more efficient long-term signals to market participants, better influencing their investment and disinvestment decisions?</li> </ul>	<p>Refer answer to Question 4. Delta believes NMAS has the potential to provide more credible price signals for allocative efficiency.</p>
	<ul style="list-style-type: none"> <li>• Which option might better promote the evolution of our knowledge of the power system?</li> </ul>	<p>Both the NMAS and MAS approach are temporary, transition-period only schemes. There will be ongoing work to unbundle the ESS and specify the NewMAS. Delta does not see either approach adding to fundamental power system understandings.</p>
	<ul style="list-style-type: none"> <li>• Which option might more easily transition away from bundled system services as represented by constraints relating to specific system configuration to one based on unbundled services?</li> </ul>	<p>Both MAS and NMAS should be able to operate in parallel with the NewMAS rollout – NewMAS picking up capability scheduling to its ability with the balance provided by the transitional system. The difference is the Market Operators confidence in achieving a stable system configuration is higher with NMAS as that approach has that property by design.</p> <p>Refer answer to Question1, second bullet point. As more capability becomes available for the NewMAS system to schedule, AEMO should be able to determine stable system configurations relying on reducing numbers of synchronous generators. It is a separate</p>

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		question whether at the margin a unit of NewMAS should be scheduled if the cheaper alternative is available from NMAS. Given the lumpy character of synchronous generators there is probably scope for expensive marginal NewMAS to be dispatched to avoid dispatching a large lump of ESS capability via NMAS.
	<ul style="list-style-type: none"> <li>• What are the likely implementation costs and timeframes, for AEMO and market participants, for each approach? Are there additional implementation considerations that we should take into account?</li> </ul>	NMAS avoids AEMO and all participants having to incur expense in amending their (5-minute) market systems and as both MAS and NMAS are both transitional systems, the lower cost of implementation of NMAS should be an important consideration.
	<ul style="list-style-type: none"> <li>• Do stakeholders consider there are additional merits or drawbacks to either approach that are not explored in this paper?</li> </ul>	Yes. Delta has outlined in its other answers to the Commission's questions in this table several reasons why the NMAS approach should be preferred (which includes some issues already identified by the Directions Paper), including: <ol style="list-style-type: none"> <li>1. NMAS will provide the Market Operator the greatest level of certainty of resource adequacy to ensure a stable system.</li> <li>2. NMAS has the potential to provide a more competitive and useful price/value signal by being able to access all NEM ESS capability, not just a portion of it.</li> <li>3. NMAS should be able to run in parallel with the future successor, unbundled services to the ESS in the transition period, allowing efficient price discovery by enabling providers to arbitrage between the markets.</li> <li>4. NMAS does not require wholesale redesign of NEMDE, lowering overall implementation costs and facilitating a more rapid deployment to address looming issues.</li> <li>5. Compared with the NMAS approach, which by design ensures ESS resource adequacy, a MAS mechanism exposes the system to potential shortfalls in ESS – refer to</li> </ol>

No.	STAKEHOLDER QUESTIONS	DELTA RESPONSE
		<p>the subsection “Spot Prices Outcomes may impact ESS supply” on Page 4.</p> <ol style="list-style-type: none"> <li>6. The MAS approach involves a real-time dispatch of ESS which will fail to recruit all potential sources of ESS for the Market Operator to access to ensure stable system operation. This is because it fails to recognise the start-up times of slow-start thermal generators, in particular, those that may be de-committed periodically to accommodate the daily Solar PV profile; this means that</li> <li>7. If, under a MAS approach, the Market Operator needs to intervene by directing units to re-commit in order to address an ESS shortfall, the resulting MAS price for that ESS will have been capped by the intervention, masking the ‘true’ value of the ESS and compromising the transparency of the approach.</li> <li>8. Delta notes the significant drawbacks identified by AEMO associated with binary constraints that may be associated with dispatching under a MAS approach:                         <ol style="list-style-type: none"> <li>a. the inability of binary constraints to be co-optimised with Energy and FCAS markets;</li> <li>b. the potential for computational complexity to prevent convergence on an optimal solution within the 5-minute market computational timeframe; and</li> <li>c. the inability to produce marginal price signals.</li> </ol> </li> </ol> <p>In this context, Delta notes that transmission element status and the commitment status of generators may all be binary constraints with the Transitional Period introducing greater uncertainty around slow-start thermal generator commitment status.</p>

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6	<p><b>QUESTIONS ON THE COMMISSION'S RECOMMENDATIONS</b>  What are stakeholder's views on the Commission's recommendation of the NMAS approach?</p>	<p>Delta supports the AEMC's recommendation of the NMAS for much the same reasons given by the AEMC.</p> <p>Delta is strongly of the view that an NMAS can provide the Market Operator with the greatest assurance of meeting stable system operating conditions during the transition period, so long as the mechanism has the design features articulated in this submission.</p>
7	<p><b>QUESTIONS ON THE COMMISSION'S FUTURE WORK</b>  • What are stakeholders views on the issues that need to be examined further to inform this analysis?</p>	<p>Delta's proposed solution lends itself to a relatively quick interim implementation. The earlier that price signals for ESS are provided, the earlier that inverter capabilities will be expanded. Delta still considers there is merit in an interim implementation to provide some breathing space (as well as practical experience) while further development work towards a more comprehensive implementation occurs.</p>
	<p>• Do stakeholders consider that there are additional issues that need to be examined in future analysis?</p>	<p>Delta considers the issues addressed in the Directions Paper, as well as the additional issues identified in Section 5.4.3, to be a very substantial body of work. Undoubtedly additional issues will be identified as more progress is made towards specific implementation.</p> <p>Whatever the specific design for implementation of an NMAS scheme is, its purpose should be in furtherance of the NEO, providing capability or ESS that is not available from other sources in the transition period and that without such an arrangement, the system will be less secure, and less reliable until such time that sufficient ESS is available from those other sources.</p>