

11 February 2021

Ms Merryn York  
Acting Chair  
AEMC

Attn: Ms Kate Wild  
Mr Joel Aulbury

Dear Ms York,

**Integrating Energy Storage into the NEM – Ref: ERC0280**

Please see our submission to the AEMC's Option Paper titled National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021, proponent AEMO.

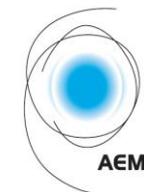
Should there be any queries on this submission please call +61 417 285 194 or e-mail [d.dawson@carisbrookeconsulting.com.au](mailto:d.dawson@carisbrookeconsulting.com.au) .

Yours sincerely



David Dawson  
Managing Director

Attachment A – Response template



## Integrating storage – options paper: stakeholder feedback template

The template below has been developed to assist stakeholders in providing their feedback on the questions posed in this paper and any other issues that they would like to provide feedback on. The AEMC encourages stakeholders to use this template to assist it to consider the views expressed by stakeholders on each issue. Stakeholders should not feel obliged to answer each question, but rather address those issues of particular interest or concern. Further context for the questions can be found in the consultation paper.

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| Questions  |   | Feedback   |
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| Chapter 1 – Registration and participation framework |   |  |
| Question 1: Registration and classification (p. 17)  |   |  |
| 1  | Is introducing a new participant category, an Integrated Resource Provider (option 4), to better facilitate entry and participation of storage and hybrid facility, more preferable than modifying existing participant categories (option 3)? Are either option 3 or 4 more preferable to options 1 and 2? | <p><b>Option 1: Current arrangements</b> – <u>Not supported</u> for storage and/or hybrid facilities. This is predominantly for reasons of a doubling or more of administrative overhead, bidding clash issues between load and generation each 5 minute market interval &amp; resulting potential market penalties, having to meet 2 GPS models one for generation &amp; one for load so connection costs are higher, and therefore not advancing competition and therefore not advancing the NEO.</p> <p><b>Option 2: AEMO’s BDRP proposal</b> – <u>Second Preference</u> for storage and/or hybrid facilities. Main disadvantage is it does not assist the development of service provision at a connection point, which is how AEMO defines the GPS and controls the dispatch of services into the network. It does not advance the regulatory framework far enough, when fast advances are desperately needed to support renewable integration.</p> <p><b>Option 3: Simplify Existing Registration proposal</b> – <u>Not supported</u> for storage and/or hybrid facilities. This does not go far enough to remove barriers to entry for <u>new service provision</u> by storage and/or hybrid facilities, and does not assist business model development and new investment. The NEM needs new services to maintain stability, strength, inertia, reliability and other emerging services. Obligations set at connection point does not assist uniformity or standardisation of service definitions across the NEM and hence not assist the emergence of</p> |

| Questions                                    |   | Feedback   |
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|  |   | <p>new AEMO supervised service markets for the new &amp; expanded services it will need in the future. It's a step too short!</p> <p><b>Option 4: IRP proposal – First Preference</b> for storage and/or hybrid facilities. Here it is technology neutral, allows a range of services to be provided dependent on technology chosen and business model being pursued by the new entrant (or existing SP). Most importantly it attaches obligations to the services provided at connection points by the registrant, which can be directly tied to the GPS modelling and commissioning tests at that connection. This directly supports a range of new services to be defined and provided, allowing new AEMO supervised service markets to develop over time. It also better supports definitions of risk sharing under PPA arrangements, as new markets develop. This is an optimal step forward, and better supports the ESB's two-sided market reforms.</p>   |
| <b>Question 2: Classifying MSGAs (p. 18)</b> |   |  |
| 1  | <p>Do you agree that, if an Integrated Resource Provider category (option 4) is established, battery aggregators should use that category and MSGAs should not be allowed to classify storage units exempt from the requirements to register as a Generator? And in that case, should the current arrangements regarding the provision of market ancillary services by MSGAs be maintained?</p> | <p>If it is assumed the NEO will be advanced if there is competitive neutrality between different storage and/or hybrid technologies, and existing and new generators &amp; loads, connected to the network <u>then a difference in treatment</u> for like-for-like units under a regulatory framework is not justified economically. For example units connected at different voltage levels will be able to provide different energy and/or FCAS or emerging services, so if aggregated smaller units can provide the same services, they should be treated by the market and regulatory framework in a similar manner to individual larger units.</p> <p>Therefore the NEO is advanced where different aggregated unit portfolios which can provide the same services as say large storage (eg: PHES, 100's MW), medium storage (distribution level, ~0.25MW to 30MW), or small scale storage (residential / SME, &lt;20kW per connection) are treated the same for dispatch, risk sharing &amp; settlement purposes. Differences in treatment <u>should be avoided if technically possible</u>. This would ensure similar treatment for like-to-like service provision, primarily to avoid anti-competitive price discrimination within and driven by the market framework. Market participants will then take on the risk profile they are comfortable with, and this includes aggregators (and their small storage clients).</p> <p>So the question that arises is whether or not aggregated smaller storage and/or hybrid connections which may be dispersed throughout a region or over a number of regions, but which can be collectively controlled by the MSGA, really provide the similar market ancillary services that large transmission or medium distribution-connected storage and/or hybrid</p> |

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|  |  | <p>facilities do. Here a working group of independent power engineers needs to provide advice on the physics of the network, and if needed, the characteristics &amp; breakdown of aggregation categories.</p> <p>Unfortunately in a physical sense the individual MW size of a unit and their disbursement within an aggregated portfolio, their aggregated power flow characteristic within a sub-region and/or on a feeder, and the individual connection voltage &amp; LV phase connection do matter. So while aggregators should be allowed to provide ancillary services as proposed in Option 3, and be reflected in Option 4, some level of differential treatment between large units and smaller aggregated units will likely need to occur.</p> <p>As a suggestion the units above (say) 20kW, or aggregating to above this within a sub-region and/or on a feeder which is uniform in a power sense, should be treated the same as larger units in the existing generation &amp; load categories, and the new IRP. At the moment units below 5MW are unscheduled, &gt; 5MW and &lt;= to 30MW semi-scheduled and &gt;30MW scheduled. All storage units should be registered into similar categories, with the aggregator being responsible for maintaining the register of the smaller units under its control and/or contract for market purposes. The aggregator should be bidding its portfolio into the AEMO markets and be held responsible for its portfolio performance. The data on individual units &amp; connection within the portfolio should be maintained by the aggregator, and be available to AEMO, as it is seeking to achieve for small solar PV connections. It seems the current MSGA arrangements which do not allow MSGA participants to provide market ancillary services may be contrary to a goal of competitive neutrality if such aggregated units could provide these services to the network in a power engineering sense.</p> <p>To summarise. If MSGA aggregation is at a voltage level which cannot provide FCAS to AEMO's definition of aggregated GPS and/or standards requirements, then it should not be accommodated as such, nor should any loopholes allow obligations to be avoided. If they can provide these services in an aggregated sense, and AEMO can dispatch these collectively against the proved GPS requirements, they should be allowed under the new Option 4 IRP arrangements. For those aggregated portfolios which cannot meet these requirements they should still be able to provide DSM services such as load on (charge), load/supply off (neutral) and supply on (generate) in a coordinated or semi-coordinated way to shift energy from excess supply to peak load periods. Such load shifting should be able to be bid into AEMO's existing energy market structure.</p> |
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|  |   | <p>To assist market and service development and as currently exists, MSGA's should be excluded from provision of FCAS services, but be allowed to migrate to IRP registration and be allowed to provide FCAS once the required GPS &amp; connection requirements are met.</p> <p>Should the limit points 30MW, 5 MW and lowest (say) 20kW change over time, they should change for all registrants. These should conform to the Generator Registration Thresholds rule change once finalised.</p>   |
| <b>Question 3: Existing storage participants (p. 19)</b>   |   |   |
| 1  | Should existing storage participants be transitioned to a single participant category (as they are currently registered as both a Market Generator and Market Customer)?  | Existing storage registrants should be able to transfer from their existing registrations to the new IRP registration at their own discretion without having to redo their GPS connection studies, at any time within a transition period of (say) 3 years from the final rule change determination enshrining the IRP participant category. But after that date need to redo their GPS studies in accordance with the NER at that time, and the obligations imposed on the IRP registration.   |
| <b>Question 4: Scheduling of hybrid facilities (p. 20)</b> |   |   |
| 1  | What proportion of a hybrid facility's sent-out generation capacity would need to be dispatchable for the whole of the hybrid facility's sent-out generation to be able to follow dispatch instructions, under a single DUID? | <p>This should be determined by the IRP's commitment in the GPS study and commissioning process for a particular hybrid connection behind a single DUID. An IRP's ability to deliver scheduled services will differ between load, generation &amp; storage technology mixes behind a single DUID and their ability to:</p> <ul style="list-style-type: none"> <li>• Partially or fully discharge stored energy;</li> <li>• Comply with particular charge &amp; discharge ramp rates given their storage state of charge and generation / load technology type;</li> <li>• Dependant on the load shifting, FCAS and other services the storage owner/operator has committed to under its PPA and/or firming contracts; and</li> <li>• Hybrid load requirements which limit dispatchable network service availability.</li> </ul> <p>These characteristics are implicitly embedded in the business case for each hybrid and/or storage investment and must be at the discretion of the IRP as it bids into the existing and new service markets which will develop over the renewable transition period.</p> <p>AEMC's suggestion for a 'dynamic scheduling obligation' has merit where the characteristics of this arrangement are embedded in the GPS modelling accepted by AEMO in the connection registration for a single DUID. Alternatively, if the IRP prefers separate connection points for</p> |

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|   |   | <p>each asset (or asset group) in the hybrid facility, under different GPS and connection agreement arrangements, this should be allowed under the registration rules. Flexibility in these arrangements, at the discretion of the IRP, will allow the emergence of service innovation unhindered by arbitrary regulatory constraints.</p> <p>However, it is noted that the application of MLFs and TUoS/DUoS charging arrangements will need to be uniformly applied so that existing and new entrant connections are not advantaged or disadvantaged through the approach adopted by the IRP.</p>   |
| 2   | <p>Would a dynamic approach to scheduling obligations, for example shifting between scheduled and semi-scheduled obligations based on the state of charge of the storage unit, be appropriate, and how should this operate?</p> | <p>The NEO is advanced where a) excess renewable energy can be accepted by the network on a semi-scheduled basis once co-located storage is full, or b) renewable energy generated at a connection point can be stored rather than being curtailed because of network constraints, strength and/or energy quality concerns. Therefore 'dynamic scheduling obligations' should be supported at a hybrid connection point within the regulatory frameworks. Such connection being subject to the usual GPS and connection agreement requirements by AEMO/NSPs.</p> <p>The decision to charge (scheduled load), turn-off renewable generation, flow excess renewable generation to the grid (semi-scheduled generation), or discharge (scheduled generation), should be at the discretion of the registered IRP subject to its 5 minute market bidding and dispatch obligations, and our response to Q.10.2 below. AEMO should allow markets to work to the greatest extent possible. If new markets are required to facilitate the transition AEMC needs to rapidly define these and progress these into the NER.</p> |
| 3   | <p>Could the same approach be taken to scheduling load where storage is added to a Market Customer's site, or should different considerations apply?</p>  | <p>Yes. As the connection of storage onto the grid accelerates, the retrofit of storage onto existing renewable energy sites will likely also accelerate, provided barriers to this new investment &amp; connection are not mandated or implied in the NER. The use of one DUID at a connection point, or multiple DUIDs one for each asset behind the connection point, should be at the discretion of the IRP, with the underlying principle of seeking competitive neutrality within the NER with respect to connection (processes &amp; costs) and market operation (bidding &amp; dispatch, penalties &amp; mandates).</p>   |
| <p><b>Question 5: Number of price bands (p. 21)</b></p> |   |   |
| 1   | <p>Do you agree that 20 price bands would be appropriate for grid-scale batteries or would another number of bands be more appropriate?</p>   | <p>10 price bands for scheduled generation and 10 price bands for scheduled load, appears adequate for grid-scale storage facilities, on the basis the IRP is able to define (and alter) the</p>  |

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|  |   | MW load/generation for each bid/dispatch cycle. This power metric will depend on the state of charge & size of the storage facility.   |
| <b>Question 6: Dispatching hybrid facilities (p. 21)</b> |   |  |
| 1  | Are there certain configurations of hybrid facilities that cannot, or should not, be dispatched at a single connection point? | <p>The asset technology mix that exists in a hybrid facility will have some influence over whether a single connection point can deliver to a dispatch instruction, or return information to AEMO, under AGC and ABC signalling arrangements. Synchronous plant (eg: thermal generators, hydro, PHES, condenser, SVAR) tend to have a power control system which can be driven or controlled by AEMO. Likewise renewable generation &amp; storage plant (eg: wind, solar PV &amp; BESS) use inverter technology for connection to the grid, and depending on size &amp; type can also be driven or controlled by AEMO. The technology type will likely determine whether certain assets within a hybrid system can or cannot be dispatched at a single connection point. The requirements for signalling and metering requirements are available under AEMO publications.</p> <p>Economically if an IRP wishes to operate a hybrid system behind a single connection point, it must assume responsibility for delivery against the GPS and access agreement agreed with AEMO/NSP. It must assume all risk for the single connection-point performance. It should be noted that getting a number of asset providers to work together and provide a single PSCAD model for the hybrid system, and other modelling for dispatch constraint certification, will be time consuming and expensive for the IRP, and likely delay GPS modelling and access agreements with AEMO/NSP. Project proponents may find separate asset connections and control an easier path to connection, albeit additional operational obligations and costs may apply as a result.</p> <p>There appears to be no reason to restrict what an IRP does with hybrid facilities investment or deployment behind a single connection point, subject to the IRP being solely responsible for its agreed performance, and compliance with grid connection requirements.</p> |
| 2  | What benefits are achieved by dispatching a hybrid facility at a single connection point, and what issues arise?              | AEMO sees a simplified dispatch arrangement, albeit with multiple dispatch constraints at that connection, and the IRP assumes all dispatch performance risk.  |
| <b>Question 7: Performance standards (p. 22)</b>         |   |  |
| 1  | What issues may arise if performance and access standards are set at the connection point for hybrid facilities? Would these  | No concessions should be made for hybrid systems seeking to connect behind one meter at one connection point. Joint asset PSCAD and other models should be provided by the   |

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|   | standards need to be amended to provide appropriate flexibility for hybrid facilities?  | proponent seeking single-connection hybrid registration, and all of AEMO's/NPS's GPS and connection performance conditions should be met before registration as an IRP. This should be the same for a generator or a load seeking DSM registration, and be uniform across the NEM for like-for-like service provision. The proponent's flexibility behind the single connection (meter) point provides both the benefits it seeks from a hybrid investment and the risks of operation in that manner.  |
| <b>Chapter 3 – Recovery of non-energy costs</b>                         |   |  |
| <b>Question 8: Options for the recovery of non-energy costs (p. 27)</b> |   |  |
| 1   | Which option do you consider to be the most appropriate for the recovery of non- energy costs from market participants? Please provide detail on why it would be the most appropriate option. | Non-Energy Cost Recovery Option 3 best supports the NEO as it provides a much more level playing field within the existing and potential new markets which support the NEM, than currently exist in Option 1 or proposed in Option 2. Option 1 has clear barriers to entry for storage and hybrid facilities, and Option 2 does not remove these. Only Option 3 supports the NEO in all of allocative, dynamic and productive efficiency terms.  |
| 2   | Are there any other factors the Commission should consider when deciding how non-energy costs should be recovered from market participants?   | In the response to Q2.1, we have proposed a lower storage unit MW size related to an MSGA portfolio, and potentially criteria related to network location (their aggregated power influence on feeder, phase, sub-region or region) which might also be used as a boundary criteria against which the separate measurement and analysis of 'sent out energy' and 'consumed energy' for settlement (billing) purposes are no longer practically efficient to measure and aggregate. In this small participant segment, net metering may be a more appropriate allocation tool to support the 'causer pays principle', albeit the AEMC examples show the distortions this introduces. Additional thoughts on an MSGA portfolio which contains client units both above and below this threshold will need to be explored, potentially in the working group sessions contemplated to flesh out the details under the principles informed by this consultation. |
| 3   | Are there any implementation issues the Commission should consider?   | Each DNSP has a different approach to small-scale solar PV and storage connection metering, whether it be 'gross' or 'net' metering. This is also influenced by the approach agreed with / used by Metering Coordinators, Metering Providers, Metering Data Providers and meter data services related to smaller existing and potential new small-scale renewable generation and storage installations. The AEMC should explore in its workshop arrangements to better inform its draft determination, whether these existing arrangements can be made to comply with a uniform application of rules for non-energy cost recovery, and if not identify NER amendments to better integrate small-scale storage & hybrid installations controlled by MSGAs.  |

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| Chapter 4 – Additional issues relating to storage              |   |  |
| Question 9: Network service provider connection points (p. 34) |   |  |
| 1  | Do you support the solution outlined in this options paper for resolving the potential issues with establishing standards for NSP owned energy storage? | <p>The approach outlined in the AEMC’s Options Paper is one approach which <u>might work</u>. However, it will have the disadvantage of moving AEMO away from a pure review and advisory role, into having to develop a second functional administrative area for performing the development of and negotiation of connection access agreements with NSPs. As storage &amp; hybrid connections applications are expected to grow significantly in the next decade, this additional and split functionality role is likely best not performed by AEMO. If it undertakes this function is also assumes the risk of accepting access &amp; connection standards and performance levels, which are potentially at lower levels, to assist its’ SO functions which are coming under increasing pressure from the energy transition, thus creating a conflict of interest with its existing independent functions. This will become a distraction from its excellent performance to date, and a point of contention and conflict with other industry participants.</p> <p>This option is <u>not preferred</u>.</p>   |
| 2  | If not, do you consider there to be other potential solutions for resolving this issue?   | <p>The AER has already initiated ring-fencing rules which enforce functional and accounting separation of non-regulated service provision from regulated network service provision. All NSPs have set up these non-regulated businesses to operate in this manner using different business models for contestable electricity services. Owning, operating and maintaining storage &amp; hybrid facilities falls under these ‘Other Electricity Services’ defined by the AER which are also contestable. The AEMC should implement rules which require the affiliated non-regulated business (eg: Mondo) to either a) negotiate access agreements with a third-party operator of such facilities similar to the Ballarat battery project where AusNet Services leases the facility to EnergyAustralia, or b) have the non-regulated business negotiate Standard Access Agreements (SAAs) at arms-length with the NSP which are transparent public documents outlining the minimum Standard Access Obligation (SAO) approach to connection of storage &amp; hybrid which it would accept. In the latter case this would form the basic SAA which a third party could use to negotiate a leasing or operational agreement with the NSP. In both cases, AEMO retains its current review and advisory role in the access agreement processes currently in place. The ultimate goal here is to establish a “triple-win situation” where the benefits and costs of the storage and/or hybrid facility are shared between the NSP, the facility owner and the facility operator.</p> |

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| <b>Question 10: DC coupled systems (p. 38)</b> |   |  |
| 1  | What capital, operational or efficiency benefits do DC-coupled systems provide participants and the NEM as a whole, and how might these benefits help consumers in line with the NEO? | <p>AEMC must remove the barriers AEMO perceives within the NER to the implementation of grid scale DC connected systems behind a single grid-connected inverter. These systems are more efficient than AC coupled systems for hybrid facilities deployment, particularly for many manufacturing facilities, and better support risk reduction for investment business cases. We note such hybrid systems will likely include other power conversion equipment including DC – DC converters, AC – DC rectifiers, embedded AC connected systems, AC and/or DC variable speed drives, controlled thermal loads and others. Allowing these hybrid systems to develop behind a single grid-connect inverter, strongly supports the NEO from a customer / consumer point of view, and reduces the task for dispatch of ‘sent out energy’ or ‘consumed energy’ (or load under DSM) by AEMO, noting comments above in response to Q4.2 above and to Q10.2 below.</p> <p>The owner / operator of the hybrid facilities must become fully responsible for the embedded system performance behind the single grid-connected inverter, including wind and solar PV systems which AEMO would otherwise consider semi-scheduled. It must comply with the connection access agreement it negotiates and perform accordingly, including its active (or automatic) management of hybrid system in the marketplace, so that AEMO receives the market services it dispatches or contracts from that connection.</p> |
| 2  | Do you support amending the NER to permit the registration and operation of DC-coupled systems? If so, how should they register and operate?  | <p>The NER should allow registration and operation of DC coupled systems behind a single grid-connected inverter, where the owner/operator has chosen to operate in either a scheduled or semi-scheduled mode, which is locked in by its connection agreement. Such choice may be constrained by the capacity of the connection inverter and its functionality (smaller capacities being semi-scheduled and larger being scheduled), and/or the network’s ability to absorb or supply energy within network performance standards.</p> <p>It is recognised that a uniform set of dynamic trigger-based dispatch obligations, based on either a) time of day, and/or b) state of charge, at the IRP’s discretion, could allow hybrid facilities to enhance reliable renewable penetration to the benefit of the NEO, and the proponents.</p> <p>A single set of performance obligations at the connection point, while administratively and operationally simpler, is not preferred for DC coupled or indeed mixed or AC coupled systems connected to the grid through a single inverter.</p>   |

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| <b>Question 11: Provision of ancillary services (p. 40)</b> |   |  |
| 1   | Do you support AEMO's proposal to redraft ancillary services provisions in Chapter 2 of the NER to make it more consistent with the services approach to regulation currently being considered by the ESB's two-sided market work? Please explain why or why not. | We support AEMO's proposal to move to a 'services approach' to provision of ancillary services which is consistent with the ESB's proposed two-sided market. Storage and hybrid facilities should be able to change their operational output between provision of energy services, ancillary services and new emerging services throughout the day, and with support of advancements in inverter technology and programming control (eg: provision of effective synthetic inertia which is indistinguishable from synchronous inertia, and others). This flexibility in service provision by the facility through one connection point needs to be supported under the NER so that the benefits to AEMO in its SO function, to the proponents by accessing different markets, and to consumers through better reliability, energy quality and network performance, as renewable integration progresses are achieved. This flexibility in provision of services will enhance the NEO. |