7 May 2020

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

By online submission: AEMC EPR0076

Dear Mr Pierce

Submission to the AEMC's Discussion Paper – System Strength investigation

The Australian Energy Market Operator (AEMO) welcomes the opportunity to provide comment on the Discussion Paper, Investigation into system strength frameworks in the NEM.

AEMO believes this review is timely given other important work underway in the NEM which include the recent release of AEMO's Renewable Integration Study[1], implementation of the Actionable Integrated System Plan (ISP) rules as well as the Energy Security Board's development of a framework for Renewable Energy Zones (REZs) and the post-2025 design program, which includes market design initiatives on essential system services and scheduling.

It is necessary to consider these when reviewing the system strength frameworks so that a holistic approach is applied that results in the most efficient outcome in the long-term interests of consumers. For this to occur, AEMO is of the view that the four models proposed by the Commission are not as discrete as has been described in the discussion paper and there is not just one solution to the problem.

Consequently, AEMO has considered an alternative hybrid model that encompasses the attributes of a centralised approach for the planning and procurement of system strength services (Model 1) with the attributes of a decentralised market-led arrangement for the optimisation (or scheduling and dispatch) of system strength services (Model 2). AEMO believes this alternative model may:

- Address many of the issues with the current system strength frameworks;
- Deliver the most efficient option to meet the NEM's system strength requirements as well as other power system security requirements; and
- Complement the work being undertaken through the industry-wide processes/investigations outlined above.

Our alternative model is discussed in Attachment 1 and is suited to being developed under the ESB 2025 program due to similarities with that work and the time it may take to implement.

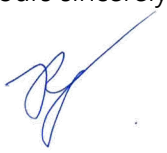
[1] AEMO report: Renewable Integration Study Stage 1, available at: https://aemo.com.au/energy-systems/major-publications/renewable-integration-study-ris

Notwithstanding this, AEMO has discussed some short-term measures that could be implemented prior to this.

AEMO looks forward to working with the AEMC and other stakeholders throughout this process.

Should you wish to discuss any of the matters raised in this submission, please contact Kevin Ly, Group Manager - Regulation on kevin.ly@aemo.com.au

Yours sincerely



Peter Geers
Chief Strategy and Markets Officer

Attachments: AEMO's high level consideration of the Discussion Paper

ATTACHMENT 1:

AEMO'S HIGH LEVEL CONSIDERATION OF THE DISCUSSION PAPER (EPR0076)

AEMO welcomes the opportunity to provide feedback on the AEMC's Discussion Paper.

This submission outlines AEMO's views on the existing frameworks and our thoughts on the AEMC's four models. It also outlines an alternative model, for the AEMC and other stakeholders to consider, which we believe could improve the system strength frameworks.

1. Existing framework

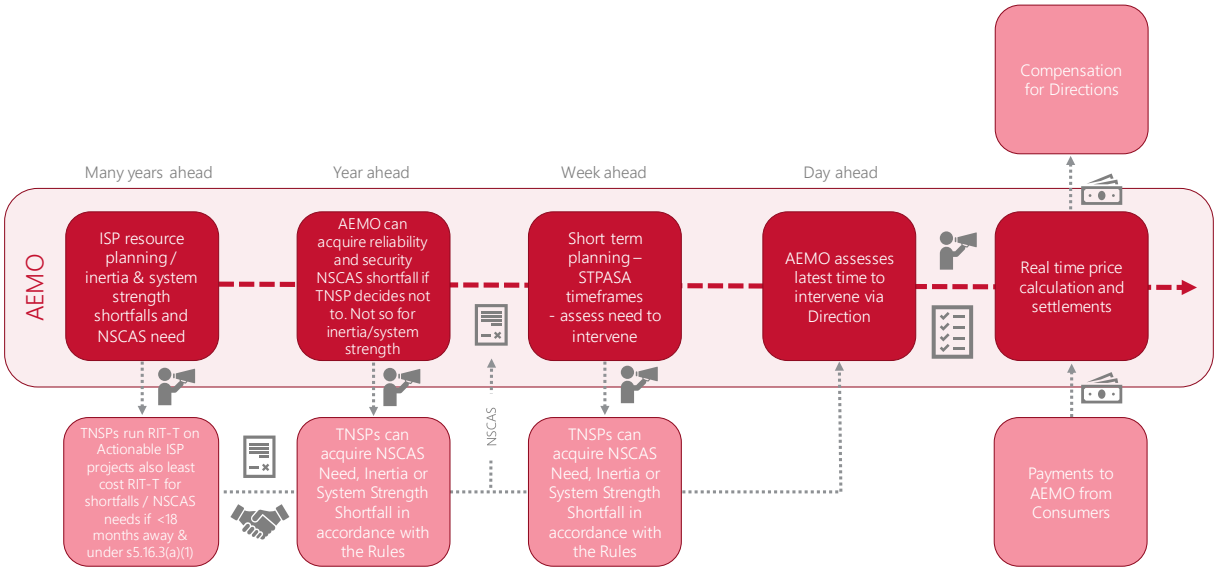
The system strength frameworks were developed in 2017 and were separated from the Network Support and Control Ancillary Services (NSCAS) framework on the premise that, separate to the minimum and do no harm requirements, economic amounts of system strength could be provided through further Rule changes. It was envisaged that the "minimum" rule would be a secondary framework, however they became the primary rule as no other rule to acquire economic amounts of system strength was implemented. The "do no harm" requirement also became a primary requirement because, even though it was economic to provide system strength to increase dispatch for generators, there was no clear objective or assigned responsibility to be able to do so, bar the generators themselves through the connection requirements.

Although the system strength frameworks had their limitations at the outset, they were originally designed with the expectation of a more dominant framework to be implemented in time, to make them less important. As a result, there is a plethora of provisions across the different services, from energy, system strength, inertia and operating limits.

The diagram below highlights the existing processes in chronological order (from years ahead to dispatch) for the acquisition of system services, including system strength[2]. AEMO's role in these processes is highlighted by the red boxes and other stakeholders' roles in pink.

Figure 1: Existing processes for the provision of system services

[2] Energy has been excluded.



In the planning timeframe, AEMO completes the Integrated System Plan (ISP) and assesses inertia and system strength shortfalls as well as NSCAS. These planning documents are used to advise each Transmission Network Service Provider (TNSP) who, in turn, may need to carry out a regulatory investment test for transmission (RIT-T), depending on the time of the need and satisfying any exemptions under the NER, to justify a particular solution. .

AEMO's role has changed somewhat through the Actionable ISP Rules, however it remains largely an advisory role (bar the arrangements in Victoria) with each TNSP responsible for proving the economic benefit of investing in, and operating, new assets.

AEMO may, later, advise the TNSPs whether they need to provide services to fulfil the needs for inertia, systems strength and NSCAS. There is a different provision for NSCAS if the TNSP decides not to provide the service, and AEMO steps in as procurer of last resort to acquire services to meet the NSCAS gap, up to a minimum secure amount.

Within shorter timeframes, AEMO has no opportunity to acquire services which have not already been acquired by TNSPs, or even if services have been acquired by TNSPs, there are no rules or mechanisms for scheduling those services efficiently. AEMO therefore starts to develop operating procedures to keep the power system secure, including assessing the latest time to intervene, and issues directions and pays compensation as required. Market Participants fund the compensation.

In essence, the existing process is characterised by AEMO assessing requirements, then relying on other parties to resolve any identified issue, first by TNSPs in the planning timeframes and then Market Participants in dispatch. This differs from the arrangements in the energy market

where AEMO has an additional role through the Reliability and Emergency Reserve Trader (RERT).

2. Consideration of the AEMC's models

AEMO found considering the issues of the current frameworks as opposed to the models as described by AEMC was challenging. There were too many ambiguities with Models 1 and 2 to be able to determine which one would be the most appropriate in practice, if at all. To resolve these ambiguities AEMO simplified them into either monopoly regulation (like transmission) or real-time pricing (like generation). In doing this, if system strength is treated like:

- transmission, the premise is system strength as being suitable for monopoly regulation; or
- generation, the premise is real-time marginal pricing of system strength.

Either, or both, premises may be unfounded. As a result, AEMO challenged the premise of both monopoly regulation and real-time marginal pricing.

Model 1 – Monopoly regulation

AEMO has considered a variation to the AEMC's Model 1, where a party is assigned the central role of planner, procurer and scheduler. We have considered whether system strength services can only be provided via monopoly regulation and would welcome further discussion on this with the AEMC and stakeholders.

In our reflection we have come across the following issues:

- There appears to be lack of coordination of system strength solutions both amongst generators and between TNSPs and generators;
- Separate TNSP and generator minimum requirements are not well coordinated[3] and can result in the proponent being forced to install expensive mitigation measures that is not needed at the time;
- Shortfalls being declared depend on information that is commercially sensitive to all parties, including AEMO and the TNSPs;
- Market Participants do not have the necessary information or access to power system models that would allow them to propose comprehensive solutions to remediate system strength issues;
- Acknowledgement that system strength services can be provided by more than just the regulated monopoly;
- Clarity is required on the relationship between AEMO, TNSPs and other providers of system strength services.

AEMO is of the view that there are benefits of a central coordinator, that being either AEMO or the TNSP. AEMO currently defines the requirements and justifies expenditure via centralised

[3] TNSPs calculate a minimum stable fault level, and then commit to provide this at all times. All connecting generators have to show they are stable at this level when they connect.

assessments through the ISP model. This is designed to drive more efficiencies in costs and outcomes for consumers. As such, there may be benefits of AEMO continuing the central coordinator role across the timeframes of system strength service provision rather than a TNSP for the following reasons:

- Sources of system strength (and other system services) might not be suitable solely for a regulated monopoly;
- Any conflict of interests from monopoly provision would be resolved;
- Incentives for the coordination of system strength solutions could be set appropriately;
- Increased competition from other service providers would be encouraged;
- Competition would inherently allow for more innovative solutions;
- Assessment of remediation measures would be assessed without bias; and
- Alignment of central coordination across multiple services and timeframes such as planning, procurement and scheduling would allow the use of these sources of system strength to be optimised.

Further, the above would complement a variation of the AEMC's proposed Model 2 (as described below) ensuring a more efficient framework. It may address issues identified in the AEMC's Discussion Paper including:

- The current reactive approach;
- Uncertainty in project development and consequential deterrent in investment;
- Lack of coordination of remediation works between generators, including the operation of synchronous condensers across the NEM; and
- Avoiding deficiencies of the current "minimum level" and "do no harm" frameworks.

In any case, for central coordination to be effective, the issues mentioned above need to be resolved in the first instance.

Model 2 – Decentralised market

AEMO considers that a decentralised market, or real-time pricing arrangement alone is unlikely to work for system strength. This is because the difficulties in pricing the service, due to no marginal cost characteristics and the complexities presented by optimising security services in real-time, suggests that there needs to be benefits of a centrally coordinated optimisation of sources.

Real-time pricing arrangements in the dispatch (i.e. 5 minute) timeframe may not provide enough certainty to allow the power system to operate securely and reliably due to rapidly changing generation/supply mix and increasing consumer participation in energy.

AEMO recommends the AEMC recognise the ESB's post-2025 market design program, which aims to investigate how to acquire, optimise and schedule all system services, including system strength. One of the benefits of an ahead-cost optimisation, including essential security services, is that it will allow Market Participants to trade between the ahead and real-time schedules,

starting from a position where resources that provide essential security services are remunerated. An ahead market may also be used to provide above-minimum requirements to relieve constraints on asynchronous generation if it is economic where, hopefully through efficient cost allocation, asynchronous generators are exposed to the costs of the system services.

Model 3 – Mandatory service provision

This model can be described as "autarky" for the connecting generator. Should this be economical one would expect this to occur even under the above two models:

1. Under monopoly provision, the connecting generator would attempt to bypass the TNSP; or
2. Under a real-time market the connecting generator would attempt to avoid paying the real-time system strength price.

Additionally, AEMO notes existing challenges with the present framework, whereby investors are unable to self-assess requirements due to project and model confidentiality requirements in the NER, that is, AEMO is unable to share PSCAD models. As such, before any further consideration of Model 3, a review of other enabling changes to the NER is required. This also highlights another benefit of having a central coordinating body.

Model 4 – Access standard

This model may simply be an "outcome" or "desirable effect" of the other models, in that these models, if priced correctly, should encourage generators to reduce the need for system strength services.

In relation to AEMO's consideration of Models 3 and 4, an alternative model (see Section 3) that embodies a centrally coordinated provision of a system service required is likely to render Model 3 unnecessary under most circumstances. In some circumstances, it could be more economic for the generator to invest in the service required, however this situation is being considered as part of the broader framework for REZs, or they may tender to provide system strength services to AEMO.

Additionally, the desired effects of Model 4 are likely to be achieved via appropriate pricing signals (in terms of cost allocation) resulting from AEMO's alternative model, because there would be an incentive for asynchronous generators to avoid incurring the cost of system services. It is welcome therefore that the AEMC is considering the "who pays" aspect of system strength services.

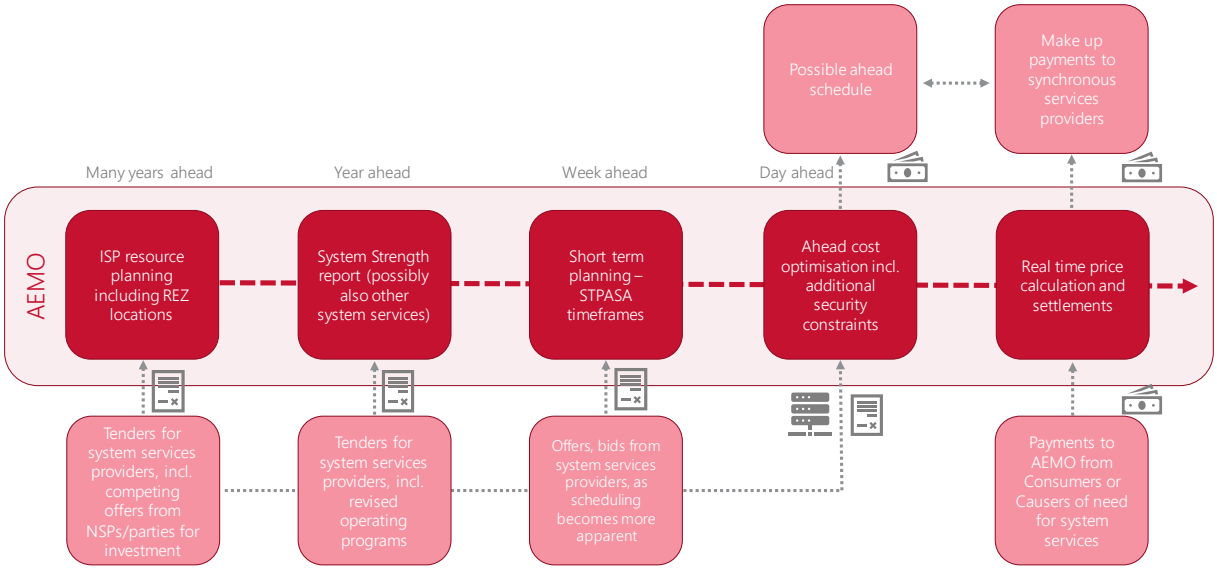
3. An alternative model

When deliberating over the appropriate framework for system strength, AEMO considered the following to be important:

1. Optimising system strength as far as practicable across a full suite of system services, including inertia, voltage, frequency control.
2. The need to acquire an economic level of services to avoid sliding to the estimate of the minimum secure amount, resulting in economic loss, intervention, costly remediation and a less secure network.
3. Understanding whether the service must, or can be, provided by a TNSP, rather than competitively.
4. Whether there are benefits of centrally coordinating the provision of system strength services.
5. Interdependencies with other current industry reviews/investigations.

After assessing the models against the four considerations identified in the AEMC's Discussion Paper, AEMO respectfully suggests an alternative 'hybrid' of Models 1 and 2, as shown in Figure 2, might be appropriate. By combining these models AEMO has attempted to achieve the benefits of coordination/optimisation from planning to dispatch, whilst also attempting to obtain the benefits of competition where possible.[4]

Figure 2: Alternative model



In the planning timeframe, AEMO would be responsible for assessing the need for system strength services in the context of the need for other services and could procure these services from a wide pool of possible service providers, including competing network service providers, generators, battery operators and merchant investors in system service equipment. This would encourage competition, innovation and investment in this timeframe. It would be necessary for AEMO to have flexibility in assessing the likely system strength requirements, as the specific

[4] AEMO notes that further detail on operational arrangements still needs to be worked through with this model.

generators that ultimately connect may be different to those that are pursuing applications to connect in the planning timeframe. It would also be necessary to make certain assumptions about the technical capability[5] of plant that may connect several years out.

In the shorter planning timeframe, that is, one to two years ahead, when the asset disposition is more widely known and operating plans, outages are being confirmed through the NOS and MTPASA, revisions to these acquisitions and more detailed assessments (similar to the annual System Strength Report required under the Actionable ISP Rules) would be made.

In the ST PASA timeframe, as dispatch becomes clearer, AEMO may receive shorter dated offers as parties assess the need for services, not just to be available, but to be used. These timeframes are like a short-term forward market.

In the operational timeframe (day before to within day), depending on the potential necessity for doing so, AEMO could run an ahead cost optimisation that includes additional security requirement for voltage, system strength and inertia based on non-marginal costs, such as commitment. This ahead cost optimisation could consider services contracted at the various timescales and optimise against the contracts and provision of energy and services traded on the spot market and result in binding positions.[6] Participants may trade from this position should conditions change; however, this trading starts from an optimisation where security services are included in dispatch and known risks are managed ahead of time.

In real-time, adjustments would be made, based on numerous changes, however if real time dispatch perfectly matched that of the ahead schedule, the real-time prices may not compensate the units committed ahead. Market Participants would be compensated for the provision of services as per the contracted terms or the prices in the dispatch markets. If possible, any additional costs that are not recovered through the spot market should be charged to causers of the need for the minimum level of system services. This is so there is a price signal that would encourage causers to minimise the system services required.

With regards to the current "do no harm" requirement, a similar mechanism could be retained under the alternative model, at least on a transitional basis[7]. That is, should a generator wish to connect in an area with insufficient system strength, despite AEMO's contracting, the generator could face the additional costs for ancillary plant within the facility or deep connection charges of remediating the requirements. This approach is also being considered as part of the ESB's work on the development of a REZ framework to provide streamlined connections to those generators that apply for connection in ISP-aligned REZs.

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[5] AEMO has previously proposed introduction of a minimum access standard S5.2.5.15 which would help address cost inefficiencies that may arise due to incorrect assumptions.

[6] This is also being considered in the ESB's System Services and Ahead Markets work, see https://prod-energycouncil.energy.slicedtech.com.au/sites/prod.energycouncil/files/System%20services%20and%20ahead%20markets%20paper%20-%20COAG%20April%202020.pdf

[7] Or even merged into the pre-existing S5.2.5 schedules which include implicit do no harm provisions.

Additionally, the alternative model does not preclude, and in fact enables, the provision of system strength that is greater than the minimum level if economically efficient to do so. With AEMO planning for, procuring and dispatching the service/s needed, there can be assurance that should the system strength level required be greater than the identified minimum level, then the solution that allows for an economically efficient level of system strength, also taking into account the overall needs of system services, can be provided. Consider for example, in the operational timeframe, a resource that is available to provide an above-minimum level of system strength to relieve a constraint on variable renewable energy (VRE) output that would otherwise apply. This could be economic provided that the cost of the additional resource is lower than the value of the VRE output that would now not be spilled. In this case, an ahead market-based solution could facilitate the VRE receiving the benefit being able to fund the use of the resource that relieves the constraint.

Ultimately, the above model aims to provide system strength services, co-optimised with the provision of other system services, by realising the maximum potential benefits that can be delivered in a competitive manner by an independent entity in the role of central planner, procurer and optimiser/scheduler.

4. Short-term measures

While the above alternative model is likely to take some time to be fully developed as it is dependent on other work, namely the ESB's post-2025 project, AEMO is of the view short-term measures are required to address some of the more pressing current issues.

Recently, AEMO announced a system strength shortfall in North Queensland. System strength and optimising system resources more generally is a pressing requirement and is occupying AEMO's Real-Time Operations and Operation Planning teams. In this context it may be sensible to adopt some short-term measures to acquire services.

AEMO notes it is presently restricted from acquiring services for system strength and inertia, (even for a minimum secure level), and must instead rely on the power of direction. This differs from the NSCAS framework, where AEMO is restricted from acquiring services above a minimum secure level. Therefore, opportunities may exist to rationalise the multiplicity of frameworks for system services (such as minimum levels of system strength, inertia, NSCAS) and, instead, allow more flexibility for AEMO to acquire a combination of services to meet all identified needs. This way, AEMO can avoid exercising its powers of direction and focus on increasing economic benefits in dispatch.

These frameworks also differ from the framework for reliability, where AEMO can acquire services through RERT as insurance up to an economic level, which is the Reliability Standard. The anomalies between RERT, NSCAS, System Strength and Inertia could also easily be resolved with a simple procurer power across a combined services market. Clearly costs may be incurred

unnecessarily at times if this proposal is adopted, however this should be counterbalanced by recognising the economic costs if services, like system strength, aren't acquired. It may well be worthwhile assessing these economic costs.

Additionally, procurement approaches could be used to acquire system strength and, or other services in a similar manner to RERT. This may prove useful in developing contractual or pricing arrangements for the ESB's Essential System Services workstream of the post-2025 project, thereby constructively feeding into that work.

AEMO encourages the AEMC and other stakeholders to consider the more pressing issues with the existing frameworks and to further consider the feasibility of implementing the short-term measures AEMO have identified above.

5. Conclusion

AEMO believes there is a need to develop a revised framework for system strength, however we consider continuing to have a separate framework for this service would be inefficient. Further, the assumption that such a service can only be delivered by either a centrally coordinated approach that excludes market arrangements, or via a decentralised market-led approach that excludes any central coordination, should be revisited.

AEMO has, therefore, considered an alternative model, as depicted in Figure 2 that incorporates a combination of two of the AEMC's models. This alternative model may allow effective planning, procurement and delivery of system strength services to address the overall needs of the power system, namely, one that can be utilised for a range of system services. The model not only accommodates the other broader reform work underway to progress without disruption from the outcome of this review, but more importantly, complements that work, which will ultimately ensure the long-term interests of consumers are met.