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Via electronic lodgement

Dear Ms Mollard

**Draft Determination: Efficient management of system strength on the power system**

AusNet welcomes the opportunity to make this submission in response to AEMC's Draft Determination (ERC0300), which evolves the current framework for system strength provision by making Transmission Network Service Providers (TNSPs) responsible for delivering an efficient amount of system strength at certain locations on their network.

AusNet is Victoria's largest diversified energy network business, owning and operating nearly \$13 billion of assets, which includes three core networks: electricity distribution, gas distribution and the state-wide electricity transmission network. We service over 1.5 million customers and also have a commercial energy services business called Mondo, focusing on contracted infrastructure and energy services.

The urgency and materiality of the issues considered in the AEMC's Draft Determination to National Electricity Market (NEM) participants should not be understated. Inadequate system strength is increasing the difficulty and cost of TNSPs obtaining planned outages to conduct routine maintenance and replacement of their assets, exposing them to higher operational costs and, in some cases, a need to contract costly network support to take an outage. It is also delaying (or preventing) renewable developers from connecting generation to the shared network and forcing them to procure expensive remediation solutions.

We endorse the overarching approach to move towards a centralised TNSP-led framework to proactively plan and deliver efficient levels of system strength rather than reactively require generators to address their individual adverse impacts on the power system.

While we support the draft Rule in principle, we stress the importance of the framework offering a timely, efficient and enduring solution to system strength provision. On this basis, there are two key areas where we recommend improvements.

Most critically, we recommend amending the system strength standard (or associated methodology) so TNSPs can undertake essential maintenance and planned outages. This will enable them to consider and act on the most cost-efficient remediation option for system strength well before operational timeframes.

We also request the AEMC provide a clearer pathway for System Strength Service (SSS) Providers to implement innovative emerging system strength solutions that provide less fault current but could provide greater overall system security and market benefits over their lifetime.

Our submission also addresses the Victorian-specific arrangements proposed in the draft Rule. These unique arrangements are necessitated by the Victorian framework – which splits responsibilities between AEMO as planner-procurer and AusNet as operator-maintainer. AusNet’s experience is that this functional split in the Victorian framework can contribute to delays, costs and complexity in relation to some transmission activity, and we expect planning and management of system strength as set out in the draft Rule, to be more challenging under the Victorian arrangements.

In this context, we highlight examples where the Victorian-specific arrangements proposed in the draft Rule present challenges to plan and manage system strength in Victoria with equivalent confidence to other jurisdictions.

We also note AusNet is a member of Energy Networks Australia and supports that submission.

The attachment provides further detail of position and evidence based on our experience operating and maintaining the Victorian transmission network. If you have any questions regarding our submission, please contact Jason Jina, Energy Policy Lead by email at [jason.jina@ausnetservices.com.au](mailto:jason.jina@ausnetservices.com.au).

We look forward to opportunities to continue to provide input into this Rule Change as it progresses.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Adrian Hill', with a stylized, cursive script.

Adrian Hill  
Acting EGM, Regulation and External Affairs  
**AusNet Services**

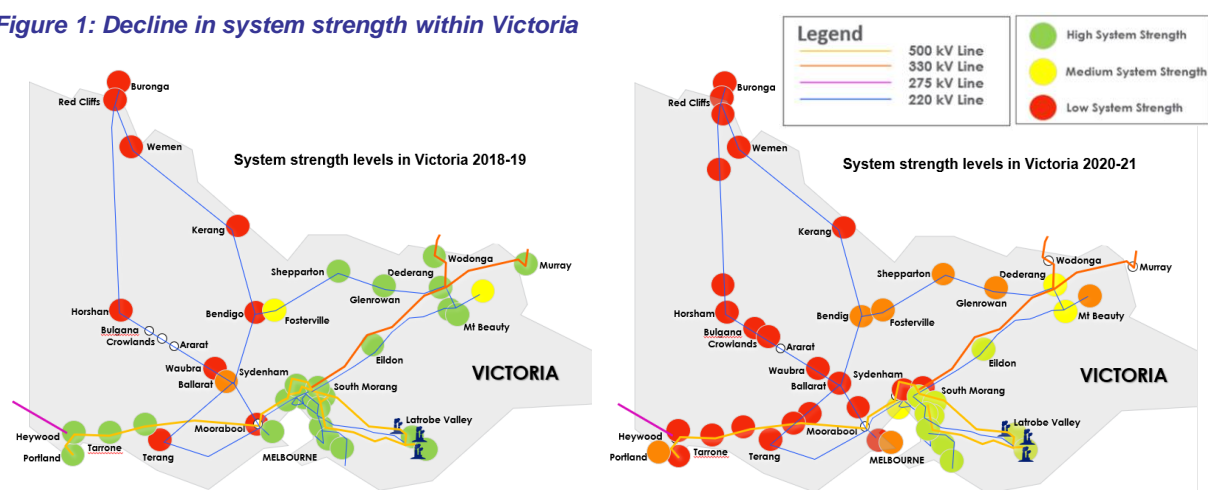
## Attachment supporting AusNet’s submission on the Efficient management of system strength on the power system: Draft Determination

1. A decline of system strength and increase in generation connecting to areas which have inadequate system strength is materially increasing the difficulty and cost of operating and maintaining the Victorian transmission network and delaying generator connections. It is critical that the AEMC’s final Rule provides a timely, efficient and enduring solution.

As owner-operator of the Victorian transmission network, AusNet is actively managing two critical system strength-related issues.

Firstly, the progressive closure of synchronous machines (including thermal generation) and rapid uptake of DER and grid-following generation has contributed to a significant decline in system strength in Victoria. As demonstrated by Figure 1 below, within an 18-month period Victoria’s transmission network has transformed from low system strength being largely concentrated in the North-West of the State, to being an issue being experienced broadly across the network.

Figure 1: Decline in system strength within Victoria



Source: AEMO Victorian Annual Planning Report, Jun 2019

Source: AEMO Victorian Annual Planning Report, Nov 2020

Secondly, the amount of generation that has connected and continues to connect to remote areas such as North-West Victoria is exposing the low system strength within the existing network topology and is ill-equipped to manage the waveform interactions between these devices. In other words, the existing system strength in some parts of the network is now inadequate to support new renewable generation and increasingly consequential to the secure and reliable operation of the system.

As acknowledged in the Draft Determination, these system strength issues have not been well addressed by the ‘do no harm’ obligation and minimum system strength frameworks. Due to their inability to effectively coordinate solutions, time consuming obligations and reactive nature, these frameworks do not work.

Inadequate system strength, combined with problems caused by falling minimum demand, is increasing the difficulty and cost of TNSPs obtaining planned outages to conduct routine maintenance and asset replacements. This increases costs (further commentary of AusNet’s experience is provided in Point 2). It is also delaying (or preventing) renewable developers from connecting generation to the shared network and forcing them to procure expensive remediation solutions.

The urgency and materiality of the issues being considered by the AEMC’s Draft Determination should not be understated. The system strength-related issues experienced by market participants create material energy market costs which ultimately impose significant costs on consumers. In this context, AusNet supports the intent of the AEMC’s proposal but stresses the importance of the framework offering a timely, efficient and enduring solution to system strength provision.

**2. The proposed system strength standard that System Strength Service Providers must meet for declared system strength nodes will not permit planning for business-as-usual planned outage activities. The standard should be set to achieve the most efficient overall cost for energy users, by including consideration of maintenance and other activities.**

The new framework is designed to provide greater certainty that efficient levels of system strength are available by allowing SSS Providers to effectively coordinate investment in assets to provide system strength and capture efficiencies of scale and scope. Not explicitly considering how system strength will be maintained during business-as-usual planned outages represents a critical shortcoming in the arrangements.

Under the system strength standard (specifically Clause S5.1.14) SSS Providers are only required to meet system strength standard specifications for declared system strength nodes under system normal conditions and credible contingencies. Critically, this system strength standard does not require the SSS Provider to ensure a secure power system for a range of normal foreseeable operational conditions, specifically planned outage conditions and their associated costs.

Excluding planned outages from the system strength standard presents a major challenge to effectively plan system strength. Planned outages are an essential business-as-usual function for a transmission network service provider and/or owner operator, and critical to the maintenance and replacement of transmission assets. They are also required to connect new generators to the network.

Undertaking planned outages requires supportive operational conditions. Importantly, TNSPs are unable to undertake planned outages during periods of low system strength or where AEMO has concerns relating to voltage management, minimum demand and solar shake off. During a planned outage, TNSPs must maintain a sufficient level of system strength (and other essential system services) so to keep the system secure.

To ensure a reasonable outage window is available, AEMO Operations has requested AusNet enters into network support agreements (NSA) to enable specific planned outages to proceed in weak parts of the network. This has not been done to date but we anticipate NSAs will be required to support critical works in the near future.<sup>1</sup>

While dependent on the outlook for wholesale prices, it is possible that an NSA could cost several million dollars for a major replacement project to go ahead – for example, AusNet has estimated NSA costs to support the Moorabool Terminal Station circuit breaker replacement project planned in the 2023-27 regulatory period could cost \$16 million. This cost would ultimately be borne by customers. AusNet is currently consulting with customer advocates on options to deal with potential NSA costs as part of our reset engagement program.

In addition to the potential cost impost associated with NSAs, the limited windows of opportunity to take outages also impact our ability to manage operational costs (e.g. avoid rescheduling costs associated with outage cancellations, including standing down crews) and respond to the AER's Market Impact Component (part of the AER's Service Target Performance Incentive Scheme (STPIS)). Our flexibility to take outages at times where no constraints will bind on our network - and therefore during the period where no incentive scheme penalties are incurred - is increasingly limited. Further information is provided in Box 1 below.

AusNet recommends that the AEMC amend the system strength standard (or associated methodology) to reflect a baseline level above the current 'system normal', to allow TNSPs to undertake essential maintenance and planned outages. We consider this approach will enable TNSPs to consider and act on the most cost-efficient remediation option for system strength well before operational timeframes.

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<sup>1</sup> We are currently working with AEMO Victorian planning to resolve accountabilities for entering into NSAs to support planned outages under the Victorian transmission arrangements and with the AER on cost recovery options under the NER.

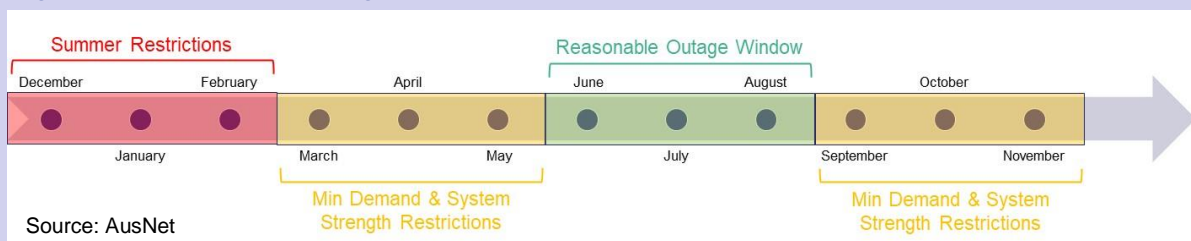
**Box 1: Increasing difficulty for AusNet to plan outages**

As noted earlier, undertaking planned outages requires supportive operational conditions. In order to manage system security issues arising due to the changing energy mix, AEMO has introduced new or modified existing constraints in Victoria. These changes have materially increased the likelihood of constraints binding and mean it is increasingly difficult for AusNet to plan outages in a window where no constraints bind.

Most notably, the closure of Hazelwood and Morwell Power Station has placed an increased dependence on Loy Yang to provide system strength. As a result, AEMO Operations has advised that outages in this part of the network should be planned to ensure there is sufficient synchronous generation in the rest of Victoria to maintain power system security in the event of a contingency.

Constraints such as this are increasing the difficulty for AusNet to plan outages. As illustrated in Figure 2, within the 12-month period of June 2019 and May 2020, the only possible times to schedule an outage on our network that satisfied AEMO’s minimum requirements were in the months of June, July and August, prior to the evening peak and without continuous outages. This already limited window of opportunity will further tighten as additional renewable generators come online. At present, there is no solution if an overnight planned outage is required.

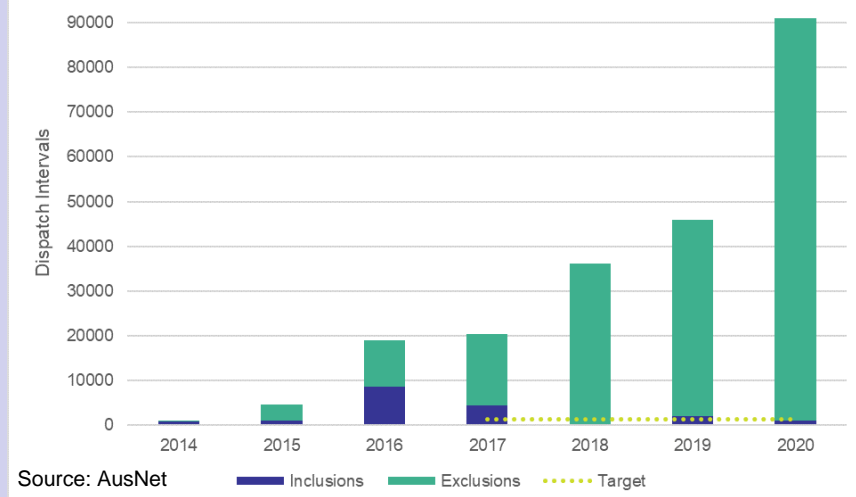
**Figure 2: AusNet planned outage window**



The limitations on taking outages is material to a TNSPs’ performance against the Market Impact Component (MIC) of the service target performance incentive scheme (STPIS).<sup>2</sup> This is because as the window of opportunity to take outages when constraints do not bind decreases, so too does the period where no penalties are being incurred under the MIC, which has not been updated to keep pace with these specific changes to the Victorian transmission network.

This is clear from the increased incidence of constrained market impact dispatch intervals counted under the scheme, highlighted by Figure 3. In percentage terms, in 2019 more than 98% of constrained dispatch intervals were excluded from the MIC calculation to keep the scheme workable. This represents a seven-fold increase in binding excluded market impact dispatch intervals between 2017-2019.

**Figure 3: Increase incidence of excluded market impact dispatch intervals in Victoria**



AusNet expects this issue to worsen during the next regulatory control period. AusNet is consulting with stakeholders and working with the AER on ways to increase our ability to respond to the scheme while maintaining an incentive to manage outages in a way which will lower whole-of-supply chain costs to customers.

### **3. Further work is required to ensure the final Rule accommodates for the provision of system strength within Victoria's market structure.**

The Draft Determination proposes specific arrangements for how the proposed system strength standard would apply in Victoria, which has a transmission framework that is unique compared to other NEM jurisdictions. Outside Victoria, AEMO's primary role is to determine the system strength requirements SSS Providers must meet by undertaking ISP modelling and publishing the system strength requirements methodology and annual system strength report. Planning and procurement of system strength is proposed to be a prescribed service through a single procurer-operator (i.e. the TNSP who is jurisdictional planning body for that region) and financial incentives through the economic regulation framework (i.e. AER's revenue determination process) are used to encourage efficient delivery of these services.

In Victoria, it is proposed that AEMO plan and procure system strength. Unlike other SSS Providers, AEMO does not have an AER approved revenue determination. Instead, AEMO in its capacity as the Victorian SSS Provider must consult on and publish its revenue methodology, have its pricing methodology approved by the AER and competitively tender identified system strength solutions to achieve efficient outcomes. We recognise this approach is consistent with Victoria's planning and investment framework (see high-level overview on right).

#### ***Transmission Planning and Investment in Victoria***

*Victoria is the only NEM jurisdiction where TNSP functions are split between the transmission planner-procurer and owner-operators, known as declared transmission system operators (DTSOs).*

*AEMO, acting as the Victorian TNSP, is responsible for network planning (excluding replacements), augmentations, and the provision of shared network services.*

*AusNet is the principal DTSO, owning and operating 99 per cent of Victorian shared transmission network assets. We also plan for network replacements.*

AusNet has reviewed the specific arrangements proposed in the draft Rule and has identified several areas where they present challenges to plan and manage system strength in Victoria with equivalent confidence to other jurisdictions. Each are discussed below.

#### **a) DTSOs bear cost of system strength shortfall but unlike TNSPs in other jurisdictions have limited options to manage associated risks**

The split in responsibilities within Victoria's planning and investment framework means that there are material differences in how AusNet can manage operational and revenue risks (or penalties) associated with the provision of system strength services compared to other TNSPs.

As the Victorian TNSP, AEMO has discretion to select a solution or combination of solutions that best satisfy the planning standard and system strength requirement at a defined system strength node. While this in itself is not an issue, there is a risk that the separation of planning, procurement and operational functions in Victoria could lead to the selection of solutions that

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<sup>2</sup> The STPIS provides a financial incentive to maintain and improve service performance for the benefit of consumers. Version 5 of the STPIS, which will apply to AusNet during the 2023-27 regulatory control period, comprises of three components: the service component, market impact component and network capability component.

The MIC provides an incentive to minimise the impact of transmission outages at times and on parts of the network that are most important to influencing the spot price in the wholesale market. Performance is measured based on the number of five-minute dispatch intervals (DIs) constrained when an outage constraint binds with a marginal value greater than \$10/MWh.

are sub-optimal from a system perspective, or which impose unaccounted-for costs on AusNet and energy consumers. For example, the Victorian TNSP may choose to focus on minimising capital cost and review a narrow set of benefits without having regard to a broader range of equally important commercial, operational and performance-based considerations (e.g. the ability of the preferred solution to provide a broad range of security and market benefits). This is because the Victorian TNSP does not own, operate or maintain the network, and therefore is not incentivised to choose a solution which better manages risks around revenue constraints and service level expectations.

This scenario is a particular concern for AusNet. As the principal DTSO in Victoria, we would bear the operations costs of any sub-optimal planning by the Victorian TNSP (including penalties incurred under the MIC parameter of the STPIS as discussed in Point 2). Unlike TNSPs in other jurisdictions, DTSOs have limited levers to manage the risk (as they are not responsible for planning system strength services). This raises questions around whether the framework should be more prescriptive when applied in adoptive jurisdictions such as Victoria.

**b) Requirement to apply a competitive tender process may slow delivery of system strength solutions in Victoria**

SSS Providers have three years to meet forecast system strength requirements set by AEMO at defined nodes. Based on recent experience, meeting this timeframe would require SSS Providers outside of Victoria to plan and procure service inputs early and simultaneously and would involve tight timeframes.

As noted earlier, in Victoria a contestable framework would apply for prescribed system strength services. This is consistent with the Victorian planning and investment framework that requires all separable projects with costs likely to exceed \$10m to be subject to a competitive tender process.

Depending on the size of the project, competitive tendering would add another 4-6 months to the Victorian process compared to other jurisdictions, and may slow down the remediation of system strength across the transmission network. It would also require complex multi-party contractual arrangements to be agreed, particularly if a DTSO other than AusNet was the successful proponent. This could further impact the timeframes for completing the competitive tender.

AusNet questions whether the potential benefits from contestability will outweigh the additional costs and complexity of the tender and contracting process. AusNet requests the AEMC consider, within the bounds of the Victorian framework, whether improvements can be made to the process to promote the timely delivery of system strength solutions, while maintaining the ability to identify and procure innovative and efficient solutions. This could include determining whether any steps may be able to be conducted in parallel rather than sequentially (e.g. both the investment test and the tender process involve elements of identifying, pricing and selecting the preferred option).

**c) Maintaining clarity in the allocation of functions and responsibilities between AEMO (in its capacity as a Victorian TNSP) and DTSOs**

AusNet welcomes the AEMC's explicit analysis of how the Rule will apply in Victoria and how the existing mechanisms in the NER will operate to assign functions and responsibilities under the new rule between AEMO (in its capacity as a Victorian TNSP) and AusNet (as a DTSO).

As the AEMC notes, a reference in Chapter 5 to a Network Service Provider and a Transmission Network Services Provider can be to either AEMO or a DTSO, depending on the subject matter of the rule or clause in question. In some instances, clauses 5.1A.1(d)-(g) stipulate which entity (AEMO or a DTSO) a specific reference is intended to capture.

However, clause 5.1A.1 does not cover the totality of Chapter 5. It gives no interpretative guidance for Parts C, D and E or the Schedules unless the specific clause is listed in clause 5.1A.1. Importantly, it also has no application outside of Chapter 5.

While AusNet's review of the draft Rule indicates that clauses 5.1A.1(d)-(g) are sufficient to enable AEMO and the DTSOs, as well as the AER and other market participants, to identify the party responsible for complying with the various obligations in the draft Rule, we urge the AEMC to remain mindful of the limitations of these interpretative clauses when preparing the final Rule.

We note that several references in the Draft Determination identify AusNet as an SSS Provider.<sup>3</sup> Given that clause 5.20.3(2) clearly assigns the role of SSS Provider in Victoria to AEMO, we expect these references are inadvertent errors and there is no intention to require AusNet to comply with the new pricing methodology rules.

#### **4. The use of a minimum fault level requirement within the system strength standard risks unintentionally excluding emerging system strength remediation solutions that are likely to be more innovative and cost-effective.**

AusNet strongly agrees with the intention of the system strength standard to support the effective planning for the provision of system strength in investment timeframes, including consideration of all system strength solutions. We also support the effort to build in a mechanism to adapt the system strength standard overtime based on the most current thinking (via the system strength requirements methodology).

However, we are concerned that the system strength standard outlined in the draft Rule is inextricably tied to a minimum fault level requirement – also referred to as the Short Circuit Ratio (SCR).<sup>4</sup>

We acknowledge that system strength is a complex engineering phenomenon for which no direct metric is currently available, and that fault level is the closest proxy that can be easily modelled in investment timeframes. However, fault level is an imperfect measure that does not capture key aspects of system strength such as a solution's waveform stabilising capability.

As the only measure defined in the draft Rule and easily measurable, SSS Providers are likely to rely on fault level as the primary measure to assess whether network and non-network options provide adequate system strength under the RIT-T.

Consider a scenario where within a system strength node, there may be sufficient fault current to ensure correct operation of protection systems, but a (relatively) soft voltage waveform is precipitating an inter-plant controller instability problem. Absent of further guidance, the reliance on a minimum fault level requirement is likely to result in SSS Providers being led down a path to select synchronous condensers as their preferred remediation solution on the supply-side – as they provide a significant amount of fault current and meet the “on paper” SCR requirement.

This approach risks unintentionally excluding emerging system strength remediation solutions on the supply-side, which provide less fault current compared to a synchronous condenser, but could provide greater overall system security and market benefits over their lifetime.

For example, innovative emerging solutions such as virtual synchronous machines and grid forming batteries can be deployed by the NSP, and can be incrementally expanded, retuned to offer different benefits and maintained through modular replacement parts. As a result, they can potentially be much more cost effective over the lifetime of the asset than synchronous condensers which as an older inflexible solution do not offer these benefits.

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<sup>3</sup> See footnote 36, and pages 160,164 and 166.

<sup>4</sup> We acknowledge that the AEMC has included a requirement to achieve stable voltage waveforms within S5.1.14(b)(2), but this is in addition (i.e. use of 'and') to the preceding clause, requiring provision of fault current despite what the actual need of the power system may be.



AusNet recognises that testing the extent to which these emerging solutions provide system strength during the investment timeframe requires detailed modelling that is more complex and time-consuming than for synchronous condensers (as SSS Providers cannot rely on using fault level as a proxy).

Despite this barrier, we see it in the long-term interests of consumers for the AEMC to provide a clearer pathway for SSS Providers to evaluate system strength in a more modular manner / by its constituent components, and for the AEMC to provide additional guidance on how emerging system strength remediation solutions (as described above) can be fairly evaluated against older synchronous condenser technology, based on the actual needs within a system strength node.

AusNet welcomes further engagement with the AEMC on this subject.