10 July 2026

Clare Savage
Chair
Australian Energy Regulator
GPO Box 520
Melbourne
Victoria 3001

Submitted via: aerinquiry@aer.gov.au

Dear Ms Savage,

Network resilience guidelines – Consultation paper

Erne Energy welcomes the opportunity to provide a submission to the AER on the Consultation paper covering the Network Resilience Guidelines.

Summary comments

Electricity resilience is a shared characteristic between resilience approaches that are funded by residents and businesses themselves, Local Government Authorities (LGAs), state and federal governments and DNSPs. While DNSPs have a critical role in facilitating electricity resilience, the advances in distributed energy resources, both behind and in front of the meter mean that non-DNSP led solutions may be more economically efficient than a DNSP-led network asset solution. This is particularly true for less dense rural feeders, that are typically more vulnerable to prolonged outages caused by severe weather.

Additionally, the ability of DNSPs to accurately identify the scale, location and timing of the risks presented by climate change exacerbated severe weather events is limited. Global climate modelling and current established downscaling approaches are not able to deliver high confidence outputs at network asset scales for the severe weather events that cause the most damage to electricity network assets: wind events, including severe convective winds (downdrafts).

Context

As we decarbonise our energy system consumers and businesses will become more reliant on electricity. Having reliable and resilient access to electricity is essential now and the dependence of critical infrastructure providers on electricity means that adapting to change in severe weather is a future necessity.

There needs to be a balance between investment that the DNSPs make in their electricity networks versus the investment that governments, businesses and individuals make in providing resilient access to electricity. The DNSPs' electricity networks are no longer the only source of electricity and the access to new technologies needs to be appropriately considered by both the DNSPs and the AER when assessing resilience expenditure.

The rapid advances in technology and the reductions in the cost of that technology, including rooftop solar PV, small-scale batteries and electric vehicles, also mean the current values for the Value of Customer Reliability (VCR)[1] and the Value of Network Reliability (VNR)[2] need urgent updating, particularly as these values will underpin business cases for resilience expenditure by the DNSPs. VNR

[1] https://www.aer.gov.au/industry/registers/resources/reviews/values-customer-reliability-2024/2025-vcr-annual-adjustment
[2] https://www.aer.gov.au/industry/registers/resources/reviews/value-network-resilience-2024

is based on a multiple of VCR, which has as it's upper limit the cost of a diesel generator, when newer, lower cost technologies are now available. The original VNR method was developed rapidly to meet the needs of the Victorian government and DNSPs and further work is now needed to ensure that VNR is fit-for-purpose.

Analysis of the actual cost[3] of weather events that negatively impact electricity assets indicate that costs of events are on a downward trend, albeit with a lot of variability as might be expected with the interannual variability within the long-term climate change trend (figure 1).

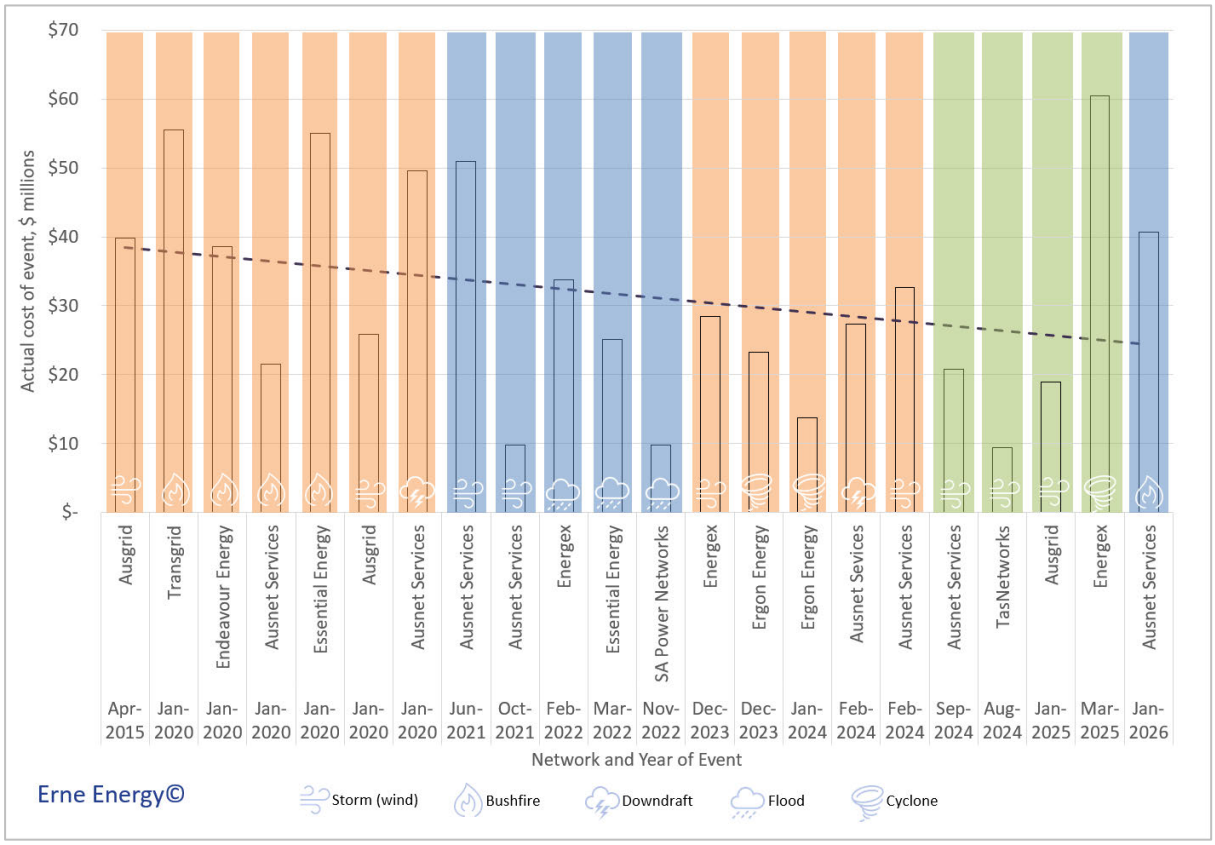

Figure 1: Actual cost of events 2015-2026

Notes: Orange represents an El Nino event; blue a La Nina event and green neutral conditions[4]

This decrease in costs to the DNSPs (as opposed to total cost of an event including insurance and costs to consumers) suggests that the ex-post approach to severe weather events, focusing on repair costs, is prudent and efficient. It would also be expected that as DNSPs adapt to climate change and the associated changes in severe weather, electricity network assets would also be better adapted to the weather resulting in lower costs post event.

Additionally, it is clear that the dominant weather events that result in electricity network damage are related to wind: storms, downdrafts and cyclones (64 %).

Severe winds themselves, with the exception of downdrafts, do not typically damage electricity network assets, but rather tree debris and falling trees hit or uproot power lines[5]. DNSPs manage extensive vegetation management programs that are largely designed to meet safety requirements[6].

[3] Taken from cost pass through applications found at https://www.aer.gov.au/industry/networks/cost-pass-throughs
[4] https://www.bom.gov.au/climate/enso/wrap-up/archive.shtml
[5] https://www.abc.net.au/news/2025-06-12/brisbane-council-trees-damage-cyclone-alfred/105374802
[6] https://www.energysafe.vic.gov.au/about-us/our-organisation/reports/electrical-safety-performance-reports

However, vegetation management for resilience is less well established and may not be currently supported by state regulators who focus primarily on safety. Vegetation management is a key element in Energy Queensland's seasonal preparedness, including encouraging customers to manage their own trees ahead of cyclone season.

A balance is needed in managing trees and power lines, since trees are valued for their aesthetic and environmental value as well as being a key approach to climate adaption by providing shade and cooling[7,8].

Asset management and asset age also has an impact on how well electricity network assets withstand severe weather and so a DNSP's replacement expenditure and asset management program are critical parts of the strategy to adapt to climate change.

Climate science limitations

In the pursuit of a solid resilience investment business case, DNSPs are expending significant sums of money on engaging consultants and scientists to undertake climate modelling to support the current requirement to identify a need shown by a causal relationship between the proposed resilience expenditure and the expected increase in extreme weather events[9]. This expenditure is ultimately funded by customers.

This extensive climate projection work is new for both DNSPs and their customers. It is not clear whether the DNSPs have a sufficient understanding of climate science and modelling limitations to recognise the appropriateness of the outcomes offered by consultants.

Very few of the studies undertaken by DNSPs on climate risk transparently articulate the uncertainties in the modelling results, including downscaling of Global Climate Models (GCMs) to smaller geographic areas.

GCMs typically have a grid scale of 100-150 km square. This means, for instance, that Tasmania is encompassed by 9 grid squares, which means that for any single weather variable, there are 9 data points available for Tasmania. These 9 data points are then used in dynamical downscaling models to generate higher resolution data, which for Tasmania is one data point per 10 x 10 km square (approximately 1200 data points)

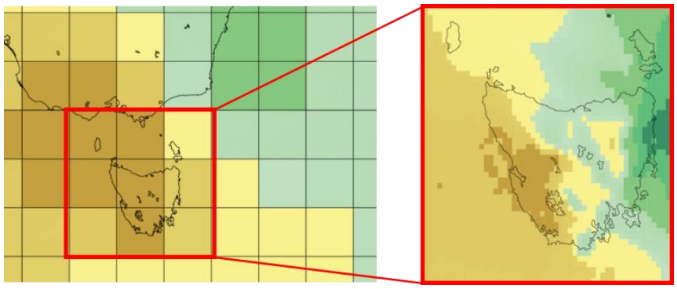

Figure 2: Dynamical downscaling[10]

Other established downscaling approaches (e.g. NARCliM) have a smaller downscaled grid of the order 4 x 4 km. However, these grid sizes are unlikely to be small enough to identify the impact of a particular severe weather variable on electricity network assets, particularly distribution poles and wires.

[7] https://www.planning.nsw.gov.au/policy-and-legislation/urban-greening/benefits-of-greening/shade
[8] https://meetings.cityofsydney.nsw.gov.au/mgDecisionDetails.aspx?IId=23584&Opt=1
[9] https://www.aer.gov.au/system/files/Network%20resilience%20-%20note%20on%20key%20issues.pdf
[10] https://climatefutures.org.au/climate-model-downscaling-explainer/

Downscaling beyond the established grid sizes cannot yet yield quantifiable outcomes that can be supported by the science and statistics that generates the results. That is, it may be technically possible to produce very fine scale gridded data, but the usefulness of that data and the cost to (customers) to generate it may not provide information that is any more robust than established methods (at a lower resolution) and is unlikely to underpin a resilience investment decision, with costs to consumers over the long life of a hardened asset.

GCMs produce projections for weather variables that have uncertainties[11] and some weather variables can be projected with high confidence (e.g. average ambient temperature), while others (downdrafts) are projected with low confidence. Wind, which causes the most network damage, is project to decrease across most of Australia and increase slightly over Tasmania, but confidence is low.

Confidence[12]	**Climate Hazard[13]**	**Projected change[6]**	**Impact on networks[14]**
High	Temperature	Substantial warming	Medium
High	Heatwaves & extreme heat	Continued warming, with more extremely hot days and fewer extremely cool days	Medium
High	Sea level	Ongoing sea level rise through this century and beyond, at a rate that varies by region but roughly follows the global average. Recent research on potential ice loss from the Antarctic ice sheet suggests that a scenario of larger and more rapid sea level rise this century or beyond cannot be ruled out	Low
High	Bushfire weather	A longer fire season for much of the south and east, and an increase in the number of dangerous fire weather days for many regions	**High***
Medium	Rainfall	A further decrease in cool season rainfall across many regions of the south and east More intense short-duration heavy rainfall events, even in regions where the average rainfall decreases or stays the same Likely increases in the average duration of drought and aridity in regions within the south and east	Very low
Low-Medium	East Coast Lows	Fewer east coast lows on average, particularly during the cooler months of the year, but a likely greater impact from those that occur due to heavier rainfall and higher sea levels.	**High**
Low-Medium	Tropical cyclones	Fewer tropical cyclones, but a greater proportion projected to be of high intensity, with ongoing large variations from year to year. The intensity of rainfall associated with tropical cyclones is also expected to increase and, combined with higher sea levels, is likely to amplify the impacts from those tropical cyclones that do occur	**Very high**
Low-Medium	Extreme wind	Small decreases in wind speed may be seen	**High**
Low	Downdrafts, thunder, lightning and hail	Severe convective storms may increase in frequency and intensity (downdrafts, hail, rain and lightning).	**High**

Table 1: Climate model confidence, hazards, projected change and impact on networks

**Note: The increased likelihood of bushfire weather does not necessarily translate to a fire igniting. Forest Fire Danger Index (FFDI) is a more appropriate variable to assess and project the risk of a bushfire occurring.*

[11] https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-11/

[12] https://www.energynetworks.com.au/resources/reports/2022-reports-and-publications/electricity-networks-a-guide-to-climate-change-and-its-likely-effects/

[13] https://www.csiro.au/-/media/Environment/SOTC-2024/24-00239_REPORT_StateoftheClimate2024_241022.pdf

[14] https://energyconsumersaustralia.com.au/sites/default/files/wp-documents/report-consumer-electricity-resilience-jill-cainey.pdf

Additionally, scenario testing should be used to generate a range of outcomes (using different Shared Socio-Economic Pathways (SSPs), formerly Representative Concentration Pathways (RCPs). This provides a range of climate outcomes but still incorporating the original uncertainties from the GCM (±°C for instance for temperature).

Dynamical downscaling provides a beguiling increased level of detail for a given weather variable but will propagate the uncertainties from the original GCM input, while adding its own uncertainties to the results. Further processing, say to smaller grid scales, will add further uncertainty.

Understanding how the uncertainty propagates through using multiple models is important because it limits the ability of any climate modelling to accurately and precisely identify the location, scale (intensity and impact) and timing of a severe weather event.

The climate modelling may identify a feeder at risk, but there is a big difference in the degree of confidence needed for an investment decision between modelling that, for instance:

- Identifies a feeder location ±200 m versus identifying a feeder location ±5 km
- Identifies the timing of an event ±1 year versus identifying an event that could occur ±6 years

There will be situations where the location of network assets at high risk can be identified, such as next to watercourses or surrounded by forest. However, deep climate modelling, beyond what is already available, is unlikely to be necessary in these cases. There are already established suites of climate modelling and downscaling for Australia and its regions, which should be the primary source of information used by the DNSPs, their consultants and the AER to determine climate risk.

These uncertainties, complex as they are, need to be understood by DNSPs and their consumers. The uncertainties in modelling outputs need to be transparently articulated so that investment decisions are made only when all parties are fully informed.

As a result of the uncertainties in climate modelling, agile approaches to electricity network resilience that are independent of location and support responsiveness and recovery are likely to be more prudent than risk reduction investments.

<u>Likelihood of consumer paying multiple times for electricity resilience</u>
There is an increasing risk of consumers paying more than once for electricity resilience[15]:

1. Consumers fund routine electricity network business operation with aspects of routine reliability investments, such as routine maintenance, vegetation management and asset replacement, that also support resilience
2. Consumers fund electricity network business investment in a specific resilience solution (ex-ante)
3. Consumers fund repairs following an event that damages electricity network equipment (ex-post)
4. Consumers fund compensation for long outages, such as Guaranteed Service Level payments
5. Consumers invest in their own electricity resilience (regulator's "rational alternative")

This means that any DNSP-led resilience solution must consider other sources of electricity resilience through its own asset management activities and the degree to which customers and the community connected to a feeder earmarked for a DNSP resilience solution have invested in their own electricity resilience.

This means that the engagement that a DNSP undertakes as part of the investment decision for a resilience investment must be of a high quality.

[15] https://energyconsumersaustralia.com.au/sites/default/files/wp-documents/report-consumer-electricity-resilience-jill-cainey.pdf

The DNSP will need to identify whether the consumers it engaged had lived experience of prolonged outages or no lived experience of prolonged outages as DNSPs have identified significant differences in consumer preferences based on lived experience[16]. Those that have lived experience favour the DNSP focusing on responsiveness and recovery, while consumers with no lived experience favour DNSP investment in risk reduction.

Engagement with consumers must be open and explore all possible options, not just the options that the DNSP offers or prefers. The starting point should be an identification of the problems experienced by the community or consumers. This includes exploration of network versus non-network options, with the latter potentially being more cost-effective for less customer dense feeders.

The DNSP has a critical role in identifying vulnerable feeders, but it may be more prudent for the DNSP to provide advice that would support islandable CER, rather than a DNSP-owned microgrid or battery (noting that poles and wires within the community still have to be intact for both of these options to provide electricity resilience).

It is clear in earlier AER decisions related to resilience expenditure that regardless of the quality of the engagement that the DNSP undertook, resilience expenditure has not been approved in full, even when consumers are strongly supportive of the investment. This failure to secure resilience investment largely appears to be caused by DNSPs providing poor investment business cases, including errors in modelling (economic and climate) and the value of the benefits. This means that the quality engagement that the DNSP undertook with consumers was based on a faulty business case such that consumers were not making an informed decision.

Quality engagement with consumers for resilience investment is an absolute necessity, but it is hard to see how that engagement can be purposeful, if the business case for the investment hasn't first been tested with the AER to ensure that it has merit. There is a risk that consumers will disengage if decisions continue to go against their preferences and so it is essential that the Guidance ensures the business case can be delivered to consumers with a high degree of confidence that it does not contain errors (or there must be early testing of the business case with the AER prior to presenting the option/s to consumers – noting that this may place additional burdens on AER staff). Because consumers should have been engaged prior to the development of the business case to identify the problem to be solved and evidence of a deep exploration of all the potential solutions both network and non-network, this suggests a multi-phase engagement approach is required.

<u>Resilience and reliability</u>

Resilience and reliability are not the same thing, nor are they on the same continuum of reliability with resilience representing "maximum reliability"[17]. This is why a definition of resilience is needed in the Rules and why additional clarity is needed on the difference between a reliability event and resilience event.

Currently, DNSPs are using the "inadequate level of service customer" metric as an indicator for the provision of resilience investment. However, the "worst-served" metric is a reliability metric based on SAIDI[18] and indicates that a customer is having poor reliability outcomes in comparison to other customers, not poor resilience outcomes.

[16] https://engage.powercor.com.au/90144/widgets/421911/documents/273220. Unfortunately, all CPPC-UE R36 documents are now offline or only accessible internally.

[17] https://energyconsumersaustralia.com.au/wp-content/uploads/report-consumer-electricity-resilience-jill-cainey.pdf

[18] https://www.aer.gov.au/system/files/2024-12/AER%20-%20Distribution%20reliability%20measures%20guideline%20-%20August%202022%20%28updated%20December%202024%29.pdf

There is a risk that if resilience is treated as "maximum reliability", then consumer will fund DNSP investments in improving reliability (as is the case with using "worst served" reliability customers as the basis for targeted resilience investment), switching from using VCR to VNR to assess the costs and benefits, since VNR is much higher value than VCR and lowers the bar for business case for a "resilience" investment.

There is already a very clear boundary established between reliability events and disruptive events in the Service Target Performance Incentive Scheme (STPIS)[19] through the Major Event Day (MED) threshold. The MED threshold is already used by DNSPs to exclude prolonged and disruptive events from the assessment of reliability performance and this threshold clearly indicates when an outage transitions from a reliability event to a resilience event.

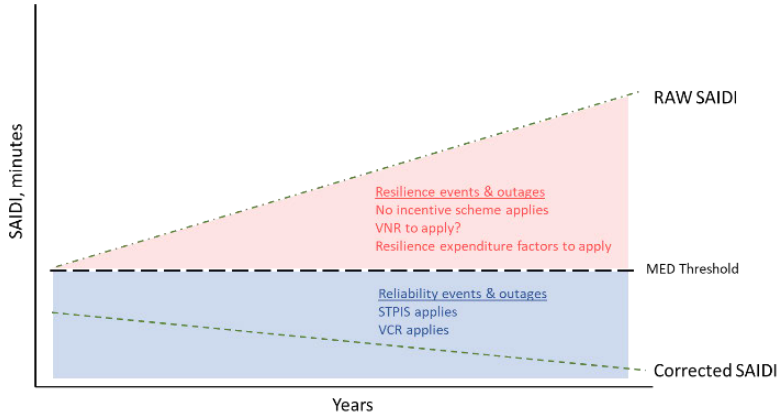

Figure 1: Conceptual diagram demonstrating the use of the MED threshold to differentiate between reliability and resilience events

Additionally, the MED threshold is specific to a DNSP, allowing local influences related to severe weather and climate change to be addressed, and is also feeder related as it is based on System Average Interruption Duration Index (SAIDI)[20,21], so can be used to identify specific customers that might be experiencing more minutes lost to MEDs as a result of increased severe weather events due to climate change.

Further, very few DNSPs exhibit an increasing trend in minutes lost to MEDs (38 %), set against improving reliability[22]. An absence of an increasing trend in minutes lost to MEDs suggests there isn't a resilience problem. Most DNSPs demonstrate improving reliability (decreasing SAIDI) and decreasing minutes lost to MEDs. Where minutes lost to MEDs are increasing this appears strongly related to the average age of the network assets[23] and implies an issue with the DNSP's asset management and maintenance program.

Responses to AER questions

1. What are your views on the definition of network resilience?

   "A performance characteristic of a network and its supporting systems (e.g. emergency response processes, etc.). It is the network's ability to continue to adequately provide network services and recover those services when subjected to disruptive events."

[19] https://www.aer.gov.au/industry/registers/resources/schemes/service-target-performance-incentive-scheme-2018-amendment
[20] https://www.aer.gov.au/system/files/2024-12/AER%20-%20Distribution%20reliability%20measures%20guideline%20-%20August%202022%20%28updated%20December%202024%29.pdf
[21] https://ieeexplore.ieee.org/document/6209381
[22] https://energyconsumersaustralia.com.au/sites/default/files/wp-documents/report-consumer-electricity-resilience-jill-cainey.pdf
[23] ibid

The proposed definition needs to provide clarification on "adequately" and "disruptive events".

The Guideline strictly applies to "disruptive events" related to severe weather rather than a cyber security issue or any other disruptive event and it would be preferable to replace "disruptive events" with "severe weather" or "disruptive weather events".

Since new technology can deliver consumer, community and business electricity resilience without recourse to a DNSP-led resilience solution, care is needed in using "adequately". What is intended by "adequately"? The same level of reliability as in the past? Some diminished level of service to "get by" (e.g. DNSP provided diesel generator)?

2. What are your views on whether the network resilience guidelines should apply to transmission network service providers?

No, TNSPs currently build for resilience in line with the General Power System Risk Review (GPSRR[24]) and the requirements imposed on critical infrastructure by the Systems of National Significant (SoNS) requirements[25], which also apply to all the DNSPs.

3. What are your views on a standardised resilience template?

A standard template for resilience would support greater consistency in the information provided on resilience.

4. What are your views on implementing a requirement on DNSPs to provide actual resilience spend through Annual Information Orders?

Collecting relevant data is necessary as there is no evidence that ex-ante investment in risk reduction for electricity networks results in cost savings from avoided recovery and repair costs.

5. What are your views on the type of data that might be useful and publicly available?

The detail of resilience inclusions in the DAPR (or the new DNDP and/or annual update[26]) to support an assessment of the effectiveness of ex-ante resilience expenditure versus ex-post expenditure to minimise the cost impact of climate change exacerbated severe weather on consumers should include:

- Identify current and future climate risks
- Identify any current and future resilience expenditure and its value
- Whether a resilience solution has been tested by severe weather in the past year and how it performed
- Customer minutes lost during MED outages and trends (allows some assessment of DNSP "resilience" performance until development of a specific metric for resilience, which would be helpful to better understand the benefits of ex-ante resilience investment)
- Whether cost pass through applications, and their value, were required to address MED outages
- Whether the cost pass through application was to repair a previously funded resilience solution, regardless of the period in which the original resilience expenditure occurred (it would be interesting to understand the approach the AER will take for cost pass-through applications (ex-post) if a resilience solution (ex-ante) fails).

Additionally, it would be helpful for the DNSPs to transparently share the costs of the climate modelling they or their consultants undertake in an attempt to identify climate risk and support resilience expenditure.

[24] https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/general-power-system-risk-review

[25] https://www.cisc.gov.au/how-we-support-industry/regulatory-obligations/enhanced-cyber-security-obligations

[26] https://www.aemc.gov.au/rule-changes/enhancing-distribution-network-planning-reporting

6. What are your views on the evidence that the AER has had regard to in assessing a business' preferred resilience solution?

We support the AER's three criteria for resilience expenditure proposal in the Consultation paper:

- An identified need shown by a causal relationship between the proposed resilience expenditure and the expected increase in extreme weather events
- Testing of the preferred option to ensure the proposed option has the greatest net benefit Submission to the AER: Network resilience guidelines, Consultation paper 10-Jul-2026 19
- Genuine consumer engagement on the range of network and non-network options
- In presenting the identified need, the network should be able to explain to the AER and its customers the degree of uncertainty in future projections of severe weather, including uncertainties in location of event, scale of event and timing of event and then how that has been used to determine particular asset investment.

The testing of all options should be based on the methodology agreed with the AER early in the reset process to ensure that further engagement with consumers on the business cases for resilience options are likely to have merit.

In presenting genuine consumer engagement, the network should be able to show how it ensured consumers were fully informed on the uncertainties around the identified need and were able to make informed conclusions on the range of network and non-network options presented during engagement.

7. What are your views on the key features of genuine consumer engagement on resilience proposals?

DNSPS should demonstrate quality engagement with their customers, based on the Better Resets Handbook. Engagement should start with understanding the problem to be solved (poor MED outcomes, demonstrated increasing climate risk) and an exploration of all options, including non-network alternatives. The engagement should include a broad range of stakeholders, such as LGAs, state governments and businesses given the shared nature of resilience.

DNSPs should clearly demonstrate that they articulated the uncertainties associated with any climate modelling (timing, location, scale of event) as part of the engagement process.

8. What are your views on the definition of community resilience?

It is not clear that "community electricity resilience", however defined, is the responsibility of the DNSP. The DNSP has a role in identifying communities that may be at risk of adverse outcomes on MED, but the solution to ensuring a resilience supply of electricity to the community is unlikely to be the sole responsibility of the DNSP. The DNSP may have an additional role in supporting the connection of a resilience solution to their network. Funding for community electricity resilience should not be borne by all customers of the DNSP but supported via government (all levels).

9. What are your views on the factors the AER has regard to when assessing community resilience?

Not sure the AER has a role in assessing community electricity resilience as it is not the DNSP's role to deliver.

10. What are your views on the type of information that should be included in the DAPR to better understand a DNSP's strategy to manage its resilience needs?

See answer to Question 5.

Any information requirements need to align with the new planning arrangements for DNSPs under the AEMC's Draft Determination for Enhancing distribution network planning & reporting[27], this includes the new annual report and the new distribution network development plan (DNDP).

The AER is currently tasked with developing a guideline to cover the content of the DNDP and the annual updates and it may be worth exploring whether the information requirements for resilience expenditure sit better in the DAPR, the DNDP and/or the annual update.

11. What are your views on of how this new information collection relates to the AER's existing information collection though the annual information orders?

The AER needs to have sufficient powers to collect data on resilience expenditure that will help inform whether ex-ante investment reduces costs for consumers when compared to ex-post expenditure related to severe weather events.

12. What are your views on how resilience expenditure should be addressed in the incentive schemes?

While a reliability investment may not improve electricity network resilience, an electricity network resilience investment should improve reliability and this must be accounted for in the Service Target Performance Investment Scheme (STPIS[28]) such that a resilience investment should result in a performance improvement and a reduction in SAIDI and SAIFI.

It may be useful to develop an incentive scheme explicitly for resilience, which would only apply once the MED threshold had been crossed. There are metrics used internationally to assess recovery following a severe weather event, with time to reconnect key percentages of customers typically used[29].

Many thanks for the opportunity to provide a submission to the Consultation Paper. Please contact me if you need further information.

Yours Sincerely

Dr. Jill Cainey MBE

[27] https://www.aemc.gov.au/rule-changes/enhancing-distribution-network-planning-reporting
[28] https://www.aer.gov.au/industry/registers/resources/schemes/service-target-performance-incentive-scheme-v6
[29] https://energyconsumersaustralia.com.au/sites/default/files/wp-documents/report-consumer-electricity-resilience-jill-cainey.pdf