From Regulatory Obligation to Delivered Megawatts: Assessing Essential Energy's Emergency Backstop Investment

Submission to the Australian Energy Regulator

Essential Energy-Emergency Backstop Mechanism Cost Pass-Through Application Consultation, August 2026

Authors

Dr Alireza Ganjovi

Associate Professor Saman A. Gorji

Centre for Smart Power & Energy Research (CSPER)

School of Engineering, Deakin University

1. Submission Context and Executive Summary

We support a technically robust NSW Emergency Backstop Mechanism (EBM) for minimum-system-load risk. This submission tests three Essential Energy-specific issues: attribution against the pre-existing Future Network Business Case (FNBC); delivery from CSIP-AUS, Solar Switch, SCADA and flexible-export pathways; and ex-post verification. Consumer-funded expenditure should be reconciled against the FNBC baseline and traced to available, timely and verified system-security response.

Decision question	Required assurance
What changed because of EBM?	Reconcile expenditure against the FNBC baseline
What capability is purchased?	Identify capability by control pathway
Can it deliver AEMO's requirement?	Measure available and verified MW
Does geography affect delivery?	Report regional communications and pathway performance
What do consumers receive?	Link funding to operational and customer outcomes
How does performance compare?	Benchmark consistently across NSW DNSPs

2. The Regulatory Question: What Changed Because of the EBM?

The NSW EBM requires Essential Energy to increase operational demand during minimum-system-load events, including remote curtailment of new or upgraded solar generation when directed by AEMO, together with flexible-export, connection and CER-integration functions [1, 2]. Essential forecasts $46.98 million (real 2023-24) of incremental expenditure during 2024-29: $41.99 million (89%) opex and $4.99 million capex [1]. The amount already incorporates a $13.8 million reduction for existing FNBC funding.

The FNBC already contemplated DER integration, flexible exports, DOEs, network visibility and hosting-capacity improvements; the EBM requires earlier and broader deployment [1]. The issue is therefore causal attribution rather than the existence of expenditure. As illustrated in Figure 1, the relevant investment boundary is the difference between Essential's original FNBC trajectory and the acceleration, scope change and additional capability attributable to the EBM. Consistent with the AER's Victorian EBM decisions and international output-based regulation, the governing counterfactual is therefore: what would Essential Energy have implemented, when, and at what cost, without the EBM [3-5]?

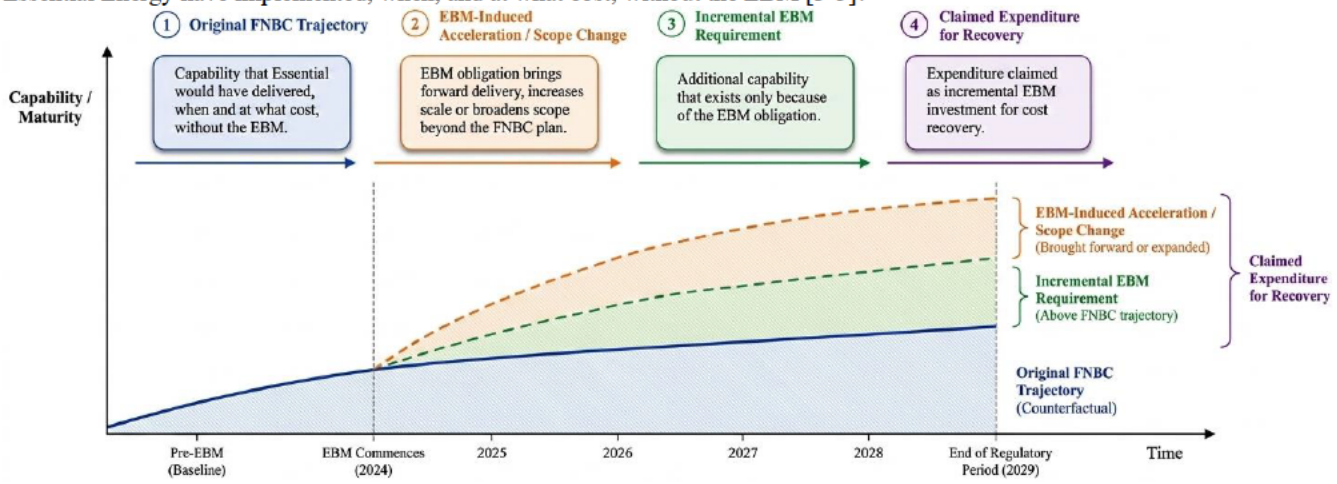

Figure 1. EBM-FNBC investment boundary, distinguishing Essential Energy's original FNBC trajectory from EBM-induced acceleration or scope change and the resulting incremental expenditure proposed for recovery.

3. Drawing the Boundary Between the FNBC and the EBM

Essential Energy has explicitly recognised overlap with the FNBC and deducted $13.8 million (real 2023-24), approximately $6.9 million each from capex and OPEX [1]. The remaining question is whether that adjustment fully reconciles the economic boundary between the programs. The counterfactual should identify which assets, software, labour and operating functions were already funded, their original timing, and how the EBM changed scope or delivery. This matters since DOE and DER-management infrastructure can continue to provide value through flexible exports, hosting-capacity management and DER coordination beyond emergency curtailment [6, 7].

$$C_{EBM}^{eligible} = C_{EBM-only} + C_{acceleration} + \alpha C_{shared} - C_{existing} - C_{avoided} \quad (1)$$

Cost category	Regulatory treatment
EBM-specific	Recover where prudent and efficient
Accelerated FNBC	Recover demonstrable acceleration increment
Shared EBM/FNBC	Allocate transparently
Displaced future FNBC	Recognise in future allowances
BAU/pre-existing	Exclude
Previously funded/duplicate	Exclude

The AER should reconcile existing capability, acceleration, shared functionality, displaced or avoided future FNBC expenditure and enduring flexible-export benefits. The $13.8 million offset should map transparently to the FNBC baseline, with the residual claim limited to the incremental obligation [3-5].

4. Can the Control Portfolio Deliver AEMO's Required MW?

Essential Energy's EBM is a portfolio rather than a single control mechanism: CSIP-AUS/Utility Server, Solar Switch, SCADA Backstop, flexible exports/DOEs and other authorised operational-demand measures [1]. AEMO's January 2026 advice provides an explicit physical target, with Essential Energy's additional backstop requirement increasing from approximately 86 MW to 132 MW and 170 MW over the relevant forecast dates. The regulatory test is therefore not nominal enrolment, but whether the combined pathways can deliver the required MW when called.

The pathways have different characteristics: CSIP-AUS provides digital control of compatible DER; Solar Switch offers an alternative where internet-based inverter control is unsuitable; SCADA addresses larger generating systems; and flexible exports/DOEs provide dynamic export management [1]. Their contributions should be measured separately before aggregation.

$$\eta_{delivery} = \frac{P_{verified}}{P_{available}} \tag{2}$$

$$\eta_{requirement} = \frac{P_{verified}}{P_{AEMO\ requirement}} \tag{3}$$

The first metric measures execution efficiency, while the second tests adequacy against AEMO's required response. High delivery efficiency alone is insufficient if available capacity remains below the required MW. Figure 2 shows this distinction by tracing Essential's multiple control pathways through available and verified capability to the AEMO requirement and resulting system-security response. This outcome-based approach is consistent with AEMO's emphasis on at-scale testing and international requirements for telemetry, coordination and delivered-performance verification [8-10].

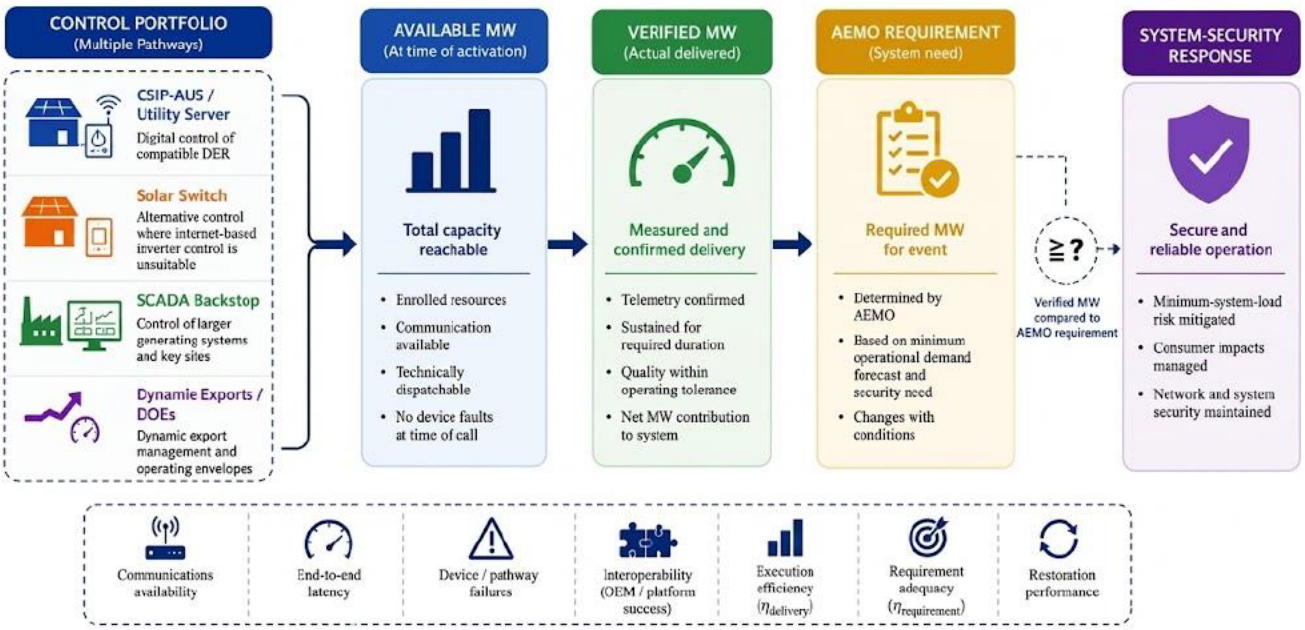

Figure 2. From control portfolio to delivered MW, linking Essential Energy's multiple EBM control pathways to available and verified capability, AEMO's required response, and the resulting system-security outcome.

5. Operating a Backstop Across a Dispersed Regional Network

Essential Energy identifies highly distributed radial topology, low customer density and reduced communications availability as implementation constraints [1]. Australian regional-network research reports similar limitations [11]. Network-wide averages can therefore conceal poor reachability on remote feeders or within particular OEM/control pathways.

Performance should be segmented, where practicable, by control pathway, geography and material OEM/platform, consistent with CSIP-AUS testing, locational DOE practice and TSO-DSO requirements for visibility and coordinated activation [12-14].

KPI	What it reveals
Communication-available MW	Reachable capacity
Verified MW by control pathway	Actual delivery
End-to-end latency	Response speed
Failed-device/pathway rate	Reliability
OEM/platform success	Interoperability
Restoration success	Recovery
Regional availability	Geographic performance

6. What Do Consumers Receive for the Additional Expenditure?

Essential Energy proposes recovery of $58.5 million nominal over the final two years of 2024-29, equivalent to about $20 per year for a typical residential customer and $40 for a typical small-business customer, or roughly 0.8% in each case [1]. Consumer value should therefore be assessed through observable outcomes, not platform completion alone.

For each actual activation, Essential Energy should retain AEMO-requested MW, available MW, verified MW, curtailed MWh, event duration, affected customers/geography, repeated exposure and restoration performance. AEMO-directed emergency action should be recorded separately from routine DOE/flexible-export operation; combining them would obscure both security value and customer impact. Australian evidence shows that PV curtailment can vary materially across customers and locations, so distributional monitoring should remain proportionate but visible [15-18]. Ofgem's requirement to report flexibility actually dispatched provides a useful international analogue [19]. The consumer-value chain is therefore: additional revenue → available capability → verified response → system-security benefit → observable customer impact.

7. Turning Three NSW Applications into a Regulatory Benchmark

The concurrent applications from Essential Energy, Endeavour Energy and Ausgrid create an unusual comparative dataset. They implement materially similar NSW EBM obligations but report different incremental costs: about $47.0 million, $35.9 million and $45.3 million, respectively [2]. A common benchmark should trace incremental cost → EBM-enabled MW → available MW → verified MW, supported by expenditure per required/available/verified MW, verified MW relative to AEMO requirement, communications availability, response latency and restoration success.

Raw $/MW comparisons should not be interpreted mechanically because geography, customer density, communications conditions, control-pathway mix and pre-existing capability differ across the three DNSPs. Thud, Figure 3 proposes a common cost-to-capability chain, linking incremental expenditure to enabled, available and verified MW, while retaining these structural differences as benchmarking conditions. This approach separates underlying network characteristics from implementation efficiency and supports comparison of actual capability delivered for consumer expenditure. Ofgem's common cost, volume and output reporting similarly demonstrates the regulatory value of comparable outturn metrics [4, 20, 21].

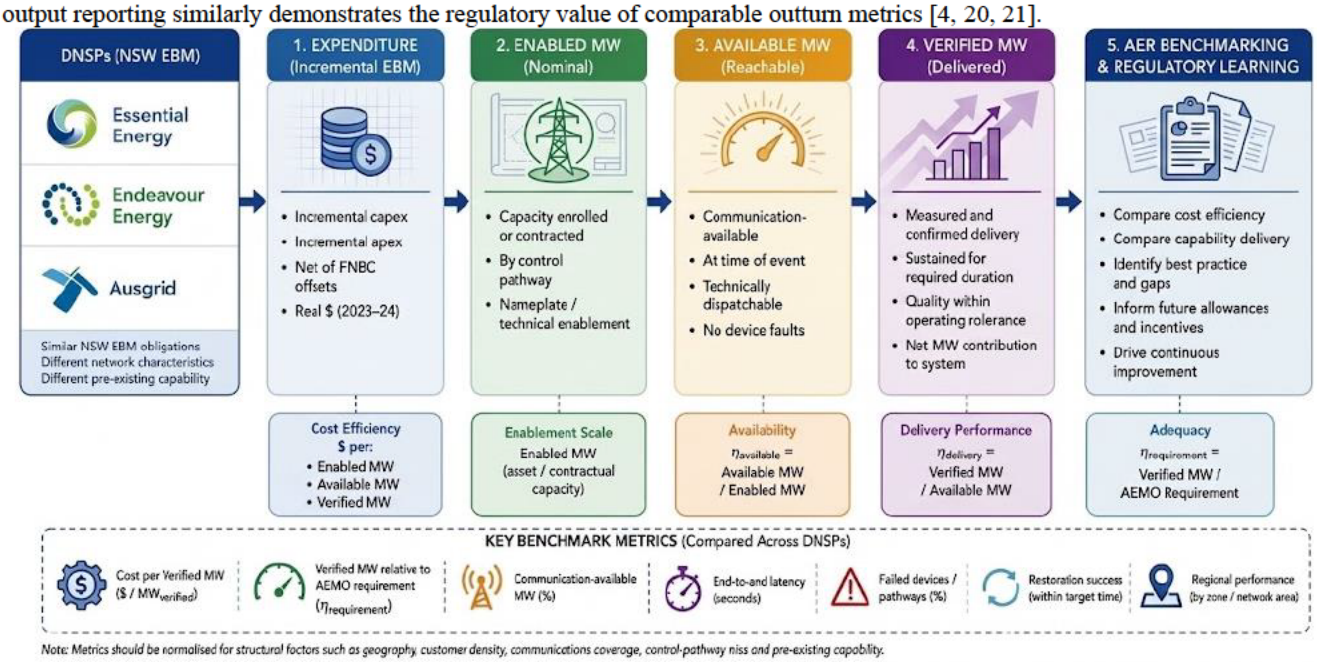

Figure 3. Cross-DNSP cost-to-capability benchmark linking incremental EBM expenditure to enabled, available and verified MW across Essential Energy, Endeavour Energy and Ausgrid, with structural network differences retained in the interpretation of comparative performance.

8. Recommendations and Conclusion

The AER should preserve recovery of prudent and efficient EBM costs while requiring a traceable link between incremental expenditure and operational outcomes [1, 3, 4, 8].

i. **Reconcile the $13.8 million FNBC adjustment.** Test existing, accelerated, shared, displaced and avoided expenditure, including future FNBC costs superseded by EBM delivery [1].

ii. **Report capability by control pathway.** Separate enabled, available and delivered MW from CSIP-AUS/Utility Server, Solar Switch, SCADA Backstop and flexible exports [1].

iii. **Test delivery against AEMO's required MW.** Report available and verified MW, not installed capability alone [8].

iv. **Measure regional operational performance.** Report communications availability, latency, failures and interoperability so geographic and pathway-specific weaknesses remain visible.

v. **Link consumer funding to observable outcomes.** Separate emergency from routine flexible-export intervention and report curtailment and restoration.

vi. **Establish common NSW EBM benchmarking.** Use consistent definitions across Essential, Endeavour and Ausgrid for expenditure, available MW and verified response [2].

The regulatory objective should be to ensure that Essential Energy's EBM expenditure is demonstrably additional to its pre-existing FNBC trajectory and converts into sufficient, timely and verifiable system-security response across its geographically dispersed network.

References

1. Essential Energy. (2026, June). *NSW emergency backstop mechanism: Cost pass through application*. https://www.aer.gov.au/industry/networks/cost-pass-throughs/essential-energy-cost-pass-through-application-ebm
2. Australian Energy Regulator. (2026, July 24). *Have your say on cost pass through applications from Endeavour Energy, Essential Energy and Ausgrid*. https://www.aer.gov.au/news/articles/communications/have-your-say-cost-pass-through-applications-endeavour-energy-essential-energy-and-ausgrid
3. Australian Energy Regulator. (2024, September). *Determinations on Victorian emergency backstop mechanism cost pass through applications*. https://www.aer.gov.au/system/files/2024-09/AER%20Determination%20-%20United%20Energy%20VEBM%20cost%20pass%20through%20-%20September%202024.pdf
4. Office of Gas and Electricity Markets. (2026). *RIIO-2 regulatory instructions and guidance and regulatory reporting packs*. https://www.ofgem.gov.uk/sites/default/files/2026-04/RIIO-GT2-Regulatory-Instructions-and-Guidance-version-2.5.pdf
5. European Parliament & Council of the European Union. (2024). *Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design*. *Official Journal of the European Union, L 2024/1747*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401747
6. Lankeshwara, G., Sharma, R., Yan, R., Tushar, W., & Saha, T. K. (2025). A review on network-aware control of distributed energy resources under the dynamic operating envelopes framework. *Renewable and Sustainable Energy Reviews, 217*, Article 115696. https://doi.org/10.1016/j.rser.2025.115696
7. Attarha, A., Noori, S. M. R. A., Mahmoodi, M., Iria, J., & Scott, P. (2024). Shaped operating envelopes: Distribution network capacity allocation for market services. *Electric Power Systems Research, 234*, Article 110639. https://doi.org/10.1016/j.epsr.2024.110639
8. Australian Energy Market Operator. (2025). *Learnings from industry implementation of emergency backstop mechanisms for distributed resources*. https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2025/2025-electricity-statement-of-opportunities.pdf?rev=8746cf0303364c34a31b7c740b6cb275&sc_lang=en
9. Federal Energy Regulatory Commission. (2020, September 17). *Participation of distributed energy resource aggregations in markets operated by regional transmission organizations and independent system operators* (Order No. 2222, 172 FERC ¶ 61,247). https://www.federalregister.gov/documents/2021/03/30/2021-06089/participation-of-distributed-energy-resource-aggregations-in-markets-operated-by-regional
10. ENTSO-E, CEDEC, E.DSO, Eurelectric, & GEODE. (2019). *An integrated approach to active system management*. https://eepublicdownloads.entsoe.eu/clean-documents/Publications/Position%20papers%20and%20reports/TSO-DSO_ASM_2019_190416.pdf
11. Dynamic Limits Pty Ltd, Essential Energy, SAGE Automation, Opto22, & University of South Australia. (2021). *Role of decentralised control for managing network constraints for DER*. Australian Renewable Energy Agency. https://arena.gov.au/knowledge-bank/role-of-decentralised-control-for-managing-network-constraints-for-der/
12. Distributed Energy Integration Program. (2025). *Common smart inverter profile: CSIP-AUS communications client test procedures*. Australian Renewable Energy Agency. https://arena.gov.au/knowledge-bank/common-smart-inverter-profile-australia/
13. Australian Renewable Energy Agency. (2026). *Dynamic operating envelopes workstream*. Distributed Energy Integration Program. https://arena.gov.au/knowledge-innovation/distributed-energy-integration-program/dynamic-operating-envelopes-workstream/
14. ENTSO-E. (2021). *TSO–DSO partnership and demand-side flexibility: Annual report 2021*. https://annualreport2021.entsoe.eu/tso-dso-partnership-and-demand-side-flexibility/
15. Australian Energy Regulator. (2022). *Customer export curtailment value methodology*. https://www.aer.gov.au/industry/registers/resources/reviews/customer-export-curtailment-value-methodology
16. Australian Energy Regulator. (2022). *DER integration expenditure guidance note*. https://www.aer.gov.au/industry/registers/resources/reviews/distributed-energy-resources-integration-expenditure-guidance-note
17. Stringer, N., Haghdadi, N., Bruce, A., & MacGill, I. F. (2021). Fair consumer outcomes in the balance: Data driven analysis of distributed PV curtailment. *Renewable Energy, 173*, 972–986. https://doi.org/10.1016/j.renene.2021.04.020
18. Gebbran, D., Mhanna, S., Ma, Y., Chapman, A. C., & Verbič, G. (2021). Fair coordination of distributed energy resources with Volt-Var control and PV curtailment. *Applied Energy, 286*, Article 116546. https://doi.org/10.1016/j.apenergy.2021.116546
19. Office of Gas and Electricity Markets. (2025). *Electricity distribution standard licence condition 31E: Flexibility procurement reports and supporting data 2024–2025*. https://www.ofgem.gov.uk/data/electricity-distribution-standard-licence-condition-31e-flexibility-procurement-reports-and-supporting-data-2024-2025
20. Office of Gas and Electricity Markets. (2026). *RIIO-2 electricity distribution: Annual report 2024 to 2025*. https://www.ofgem.gov.uk/transparency-document/riio-2-electricity-distribution-annual-report-2024-2025
21. Office of Gas and Electricity Markets. (2024). *RIIO-ED2 DSO incentive: Decision on outturn performance metrics*. https://www.ofgem.gov.uk/decision/riio-ed2-dso-incentive-decision-outturn-performance-metrics

Dear Sir/Madam,

Please find attached the Centre for Smart Power and Energy Research (CSPER), School of Engineering, Deakin University's submission to the Australian Energy Regulator (AER) consultation on Essential Energy's Emergency Backstop Mechanism (EBM) Cost Pass-Through Application.

Prepared by Dr Alireza Ganjovi and Associate Professor Saman A. Gorji, this submission provides technical, engineering, consumer-value, and regulatory commentary on Essential Energy's proposed recovery of expenditure associated with implementing the NSW Emergency Backstop Mechanism.

The submission supports the need for a technically robust emergency backstop capability to manage minimum-system-load risks and does not oppose recovery of prudent, efficient, and genuinely incremental expenditure. Rather, it focuses on a key Essential Energy-specific issue: the boundary between the new EBM obligations and capabilities already contemplated through Essential Energy's Future Network Business Case (FNBC).

Essential Energy has recognised this overlap by applying a $13.8 million adjustment for existing FNBC funding. Our submission recommends that the AER reconcile this adjustment against the underlying FNBC baseline, including existing capability, accelerated investment, shared functionality, displaced future expenditure, avoided expenditure, and enduring flexible-export benefits. The objective is to ensure that the residual EBM claim reflects expenditure genuinely attributable to the new obligation.

A second focus is operational deliverability. Essential Energy's EBM relies on multiple control pathways, including CSIP-AUS/Utility Server control, Solar Switch, SCADA Backstop, and flexible exports/dynamic operating envelopes. We recommend that these pathways be assessed separately and then collectively against AEMO's required operational response. In particular, the submission distinguishes between enabled capacity, operationally available MW, and verified delivered MW.

The submission also considers the engineering implications of operating an emergency backstop across Essential Energy's geographically dispersed regional network. Network-wide performance averages may conceal weaknesses associated with communications coverage, geography, particular control pathways, or OEM platforms. We therefore recommend proportionate reporting of communication-available MW, verified response by pathway, end-to-end latency, failures, interoperability, restoration performance, and regional availability.

Consumer value is assessed by linking additional revenue recovery to observable outcomes. The submission recommends reporting actual EBM activations, requested and verified MW, curtailed MWh, event duration, affected customers and geography, repeated exposure, and restoration performance. Emergency backstop activations should also remain clearly distinguishable from routine flexible-export and DOE interventions.

Finally, the concurrent applications from Essential Energy, Endeavour Energy, and Ausgrid provide the AER with an unusual opportunity for comparative regulatory learning. We propose a common cost-to-capability framework linking incremental expenditure to enabled, available, and verified MW across the three NSW DNSPs, while recognising differences in geography, customer density, communications conditions, control architectures, and pre-existing capabilities.

The regulatory objective should be to ensure that Essential Energy's EBM expenditure is demonstrably additional to its pre-existing FNBC trajectory and converts into sufficient, timely, and verifiable system-security response across its geographically dispersed network.

We appreciate the opportunity to contribute to this consultation and trust that the submission will assist the Australian Energy Regulator in its assessment of Essential Energy's application. We would welcome any further discussion or clarification if required.

Yours sincerely,

Associate Professor Saman A. Gorji, PhD, SMIEEE, FHEA
Director, Centre for Smart Power and Energy Research (CSPER)
School of Engineering, Deakin University
Victoria, Australia
Email: [redacted]
Phone: [redacted]