Subject: Cross-submission on *Improving Information on High-Voltage Network Capacity*

Dear Sir/Madam,

Please find attached the Centre for Smart Power and Energy Research (CSPER), School of Engineering, Deakin University's cross-submission in response to stakeholder submissions on the Electricity Authority Te Mana Hiko consultation, *Improving Information on High-Voltage Network Capacity*.

Prepared by Dr Alireza Ganjovi and Associate Professor Saman A. Gorji, this cross-submission builds on Deakin University's original submission and reviews the principal themes emerging from the stakeholder responses. Rather than revisiting the Appendix B consultation questions, it identifies areas of consensus, key implementation issues, and opportunities to strengthen the proposed framework and supporting technical specifications.

The submission recognises the broad support for improving high-voltage network visibility while acknowledging stakeholder concerns regarding proportionality, implementation costs, interoperability, and regulatory overlap. It proposes that the framework should evolve beyond information disclosure alone by prioritising decision-useful network information and system observability. In this context, the submission recommends nationally consistent technical specifications, adaptive implementation, staged capability development, and a pathway towards dynamic hosting capacity and improved utilisation of distributed energy resources, flexibility services, and non-network solutions.

Drawing on our research and regulatory engagement in digital power systems, regulatory observability, network planning, and inverter-dominated electricity systems, we hope the perspectives presented in this cross-submission will assist the Authority in refining the proposed framework and developing practical, interoperable, and future-oriented technical specifications.

We appreciate the opportunity to contribute to this consultation and 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]

Cross-submission: Responding to Stakeholder Submissions on the Electricity Authority Consultation

Improving Information on High-Voltage Network Capacity

Prepared by

Centre for Smart Power and Energy Research (CSPER)
School of Engineering, Deakin University
Dr Alireza Ganjovi and Associate Professor Saman A. Gorji

Submission Context

This cross-submission responds to stakeholder submissions on the Electricity Authority Te Mana Hiko consultation, Improving information on high-voltage network capacity [1]. It builds on Deakin University's original submission, which supported improved network visibility while emphasising system observability, dynamic hosting capacity, interoperability, and adaptive governance [2]. The purpose is not to repeat Appendix B responses, but to identify what the stakeholder record shows about implementation, proportionality, and technical design.

Executive Summary

Stakeholder submissions show broad support for improving high-voltage (HV) network visibility, but the main debate concerns implementation rather than the objective itself. Access seekers and technology providers emphasise faster screening, reduced connection uncertainty, and better use of distributed energy resources (DER), batteries, EV charging, and flexible demand [3-7]. Distributors and industry bodies support the objective but raise legitimate concerns about evidence, proportionality, regulatory overlap, data quality, and cost allocation [8-17].

Deakin's central contribution is that the framework should prioritise decision-useful network information, not maximum disclosure. Published data should be timely, comparable, interpretable, and actionable. The Authority should retain the reform direction, but refine it through nationally consistent technical specifications, aligned regulatory reporting, staged maturity levels, uncertainty indicators, and periodic review. The target outcome should be system observability: better planning, connection screening, flexibility procurement, and network utilisation, not publication for its own sake.

1. Introduction

Distribution networks are becoming data-dependent operating systems. Hosting capacity now depends on time-varying demand, embedded generation, topology, voltage limits, protection settings, outage conditions, power quality, and forecast growth [9-12]. In that context, network visibility is not a transparency exercise. It is an engineering capability that affects connection decisions, flexibility value, and asset utilisation.

The stakeholder submissions identify several implementation issues: data granularity, confidence levels, publication frequency, cyber-security, privacy, regulatory overlap, and the distinction between indicative screening information and formal connection studies [3-17]. These issues determine whether the framework reduces uncertainty or creates another compliance layer. This cross-submission reviews the main themes, areas of consensus, and refinements needed to strengthen the proposed Code amendment and technical specifications.

2. Emerging Themes Across Stakeholder Submissions

2.1 Support for improved visibility

Meridian, ERGANZ, GridQube, EA Technology, and SUPA largely support improved HV visibility. Their submissions frame visibility as a practical screening tool: it can reduce speculative enquiries, improve EV-charging and DER site selection, and lower early-stage engineering cost [3-7]. ERGANZ also emphasises standardised, machine-readable, API-enabled data to reduce information asymmetry and support competition [4]. GridQube and EA Technology point to digital network models, state estimation, and automated hosting-capacity analysis as practical implementation pathways [5, 6].

2.2 Regulatory justification and proportionality

ENA, Network Tasman, Westpower, Waipā, and WEL raise concerns about whether mandatory regulation has been justified by sufficiently quantified evidence [8-12]. These submissions do not reject visibility as an objective. They ask whether a uniform obligation is efficient for networks with different congestion levels, access-seeker demand, data maturity, and digital capability. This is a legitimate engineering-economic concern: a requirement that delivers high marginal value on a constrained urban network may deliver limited value on a small or unconstrained regional network.

2.3 Consistency and interoperability

Powerco, Vector, Transpower, ERGANZ, and Orion converge on the need for consistency, standardisation, and interoperability [4, 13-16]. The technical specifications should define not only what is published, but how information is structured, labelled, updated, qualified, and exchanged. Without common schemas, geospatial identifiers, confidence indicators, metadata, and machine-readable formats, the proposal risks producing multiple local maps rather than a national information layer.

2.4 Regulatory overlap

Powerco, Vector, ENA, and Unison/Centralines identify potential overlap with Commerce Commission information disclosure, Asset Management Plans, and existing planning datasets [8, 13, 14, 17]. This is a data-architecture issue as much as a legal issue. Parallel reporting can create inconsistent definitions, update cycles, validation processes, and assurance obligations. The Authority should define only the additional information needed for connection screening, hosting-capacity interpretation, and flexibility-resource identification.

3. Areas of Consensus

The submissions collectively demonstrate several areas of convergence. First, HV visibility is becoming operationally necessary as DER, EVs, batteries, electrification, and flexible demand change load and export patterns [3-8]. Capacity is no longer a single static value. It varies with thermal limits, voltage profiles, contingency state, forecast growth, and operating conditions [18-23]. Visibility therefore supports planning, connection screening, congestion management, flexibility procurement, and non-network option assessment.

Second, an HV-first approach is broadly appropriate. HV networks generally have better asset records, planning models, protection data, SCADA coverage, and forecasts than low-voltage networks [3, 8, 9, 13, 14]. They also influence larger connection decisions, including industrial electrification, storage, distributed generation, and public EV charging. Starting with HV allows technical specifications, data governance, and confidence categories to mature before later expansion to lower-voltage systems.

Third, detailed requirements should remain in adaptive technical specifications, not be fixed rigidly in the Code. Hosting-capacity methods are evolving from static circuit ratings toward time-series, probabilistic, state-estimation, and digital-twin methods [19, 20, 23-25]. Specifications should therefore define minimum national requirements while allowing staged improvement in data quality, confidence, update frequency, and interoperability.

Fourth, information must be standardised. Standardisation should cover data schemas, circuit identifiers, voltage levels, capacity definitions, constraint categories, modelling assumptions, update frequency, confidence ratings, and API or downloadable access. For engineers and developers, comparability matters more than map aesthetics. The objective should be an interoperable national data layer, not visually similar but analytically incompatible maps.

4. Issues That Merit Further Refinement

4.1 Decision-useful network information

Publishing more data does not necessarily improve decisions. Network information becomes valuable when it reduces uncertainty for a defined decision: site selection, project sizing, connection timing, operational planning, constraint management, or flexibility procurement. Deakin recommends that the Authority adopt the concept of Decision-Useful Network Information. Such information should be timely, comparable, interpretable, and actionable. This is consistent with data-quality research, where value depends on fitness for use rather than volume alone [18, 19].

4.2 Observability, not disclosure alone

Most submissions discuss transparency. Fewer distinguish transparency from observability. Disclosure means publishing data. System observability means being able to infer network state, constraints, risks, and usable capacity from measurements, models, forecasts, and metadata. A capacity map may show a constrained feeder; an observability framework should also indicate whether the binding limit is thermal, voltage, fault-level, protection, or power-quality related, and whether flexibility could relieve it [20-22].

4.3 Beyond static hosting capacity

Hosting capacity is condition-dependent. A single value may support early screening, but it should not create a right to connect or replace project-specific studies. Future specifications should include constraint type, assumptions, confidence indicators, uncertainty bands, and scenario or time-series capability where data maturity allows. This aligns with EPRI's view that hosting capacity is a process, not a single calculation, and with engineering work on state estimation, dynamic operating envelopes, and digital-twin methods [20, 22-25].

4.4 Adaptive implementation pathway

A staged pathway would retain reform momentum while reducing implementation risk. Stage 1 should publish indicative current HV capacity using standard definitions, geospatial identifiers, metadata, and confidence categories. Stage 2 should add forecast capability linked to demand growth, committed augmentation, known connections, and Asset Management Plan assumptions. Stage 3 should introduce time-varying or scenario-based capacity indicators where data maturity allows. Stage 4 should link capacity information with flexibility opportunities, non-network options, and dynamic operating-envelope concepts.

5. Additional Recommendations

Table 1 summarises Deakin's proposed refinements. The recommendations focus on decision quality, technical consistency, and staged system observability.

No.	Recommendation	Purpose
1	Prioritise decision-useful information	Define the decision function of each dataset before mandating publication.
2	Develop nationally consistent technical specifications	Use common schemas, geospatial identifiers, definitions, metadata, confidence ratings, and machine-readable access.

3	Maintain interoperability across regulatory frameworks	Align with Commerce Commission disclosures, Asset Management Plans, and existing planning datasets.
4	Adopt adaptive implementation with periodic review	Use staged maturity levels and review data use, costs, connection outcomes, and flexibility uptake every two to three years.
5	Progressively support dynamic hosting capacity and observability	Move from static HV indicators toward state estimation, uncertainty quantification, dynamic operating envelopes, and flexibility integration.

Figure 1 illustrates a staged pathway for evolving high-voltage network visibility from static capacity disclosure toward decision-useful system observability. Each stage progressively expands the scope of available information, analytical capability, and decision support, beginning with indicative high-voltage capacity and advancing through forecast capability and dynamic operating conditions to integrated system observability. The framework emphasises that the value of network visibility lies not in publishing more data, but in providing information that is timely, interpretable, and actionable for connection planning, operational decision-making, flexibility utilisation, and efficient network investment.

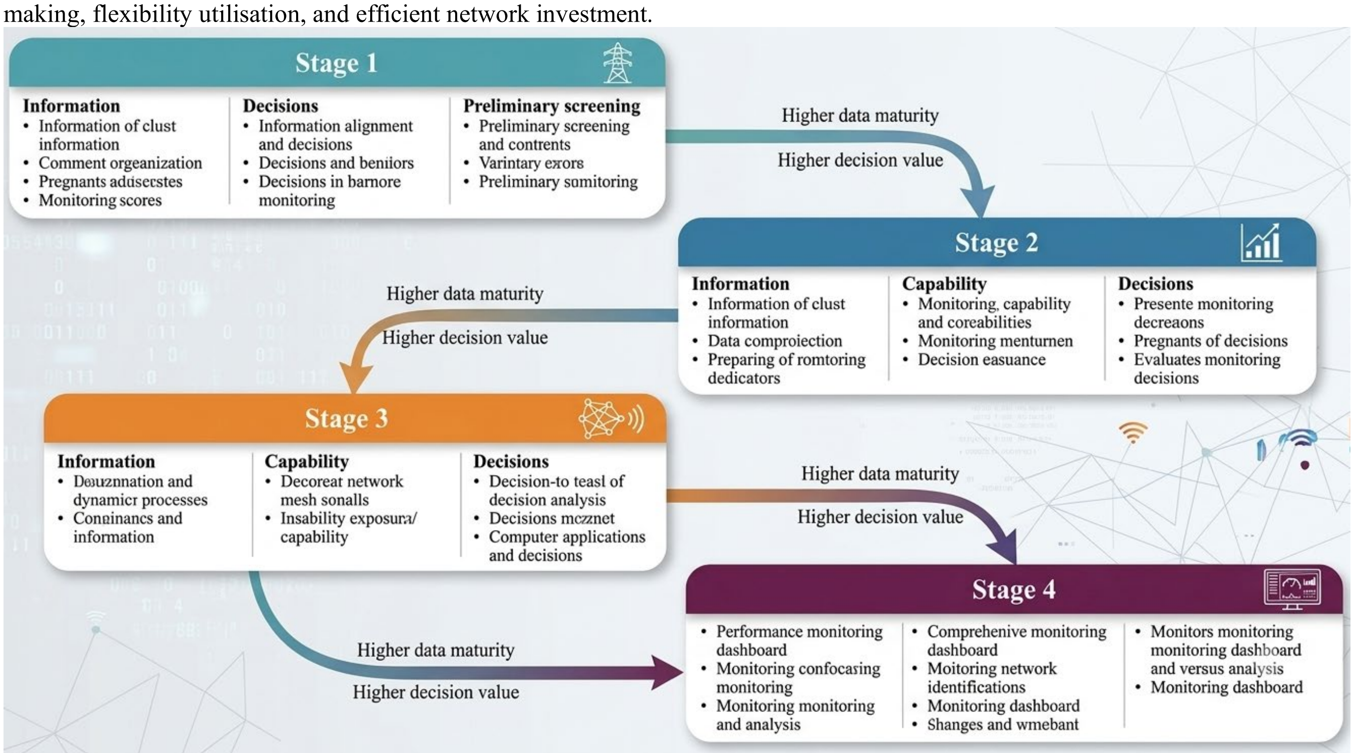

Figure 1. Staged pathway from HV visibility to system observability

The Authority should avoid treating the proposed framework as a one-off disclosure exercise. The long-term value lies in creating an information architecture that can evolve with DER penetration, electrification, network automation, and flexibility markets. This requires periodic review, explicit use cases, and a clear pathway from indicative HV visibility to dynamic system observability.

6. Concluding Remarks

The stakeholder record confirms broad support for improving HV network visibility, while also showing that implementation must be proportionate, interoperable, and evidence-based. Deakin supports the direction of reform, but recommends that the Authority refine the framework around decision-useful information, adaptive technical specifications, regulatory alignment, uncertainty treatment, and staged maturity. This would preserve the benefits of transparency while reducing the risk of duplicative, low-value disclosure.

Deakin University welcomes continued engagement with the Electricity Authority during the development of the technical specifications and the future evolution of the network visibility framework.

References

1. Electricity Authority Te Mana Hiko. (2026). Improving information on high-voltage network capacity: Consultation paper. https://www.ea.govt.nz/documents/9804/Improving_information_on_high-voltage_networks_-_consultation_paper.pdf
2. Centre for Smart Power and Energy Research, Deakin University. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10275/Deakin_University_-_Improving_HV_network_visibility_submission.pdf
3. Meridian Energy. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10280/Meridian_-_Improving_HV_network_visibility_submission.pdf
4. Electricity Retailers' and Generators' Association of New Zealand. (2026). ERGANZ submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10278/ERGANZ_-_Improving_HV_network_visibility_submission.pdf
5. GridQube Pty Ltd. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10279/GridQube_-_Improving_HV_network_visibility_submission.pdf

6. EA Technology. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10276/EA_Technology_-_Improving_HV_network_visibility_submission.pdf
7. SUPA Energy. (2026). Submission to the Electricity Authority: Network visibility consultation. https://www.ea.govt.nz/documents/10284/SUPA_Energy_-_Improving_HV_network_visibility_submission.pdf
8. Electricity Networks Aotearoa. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10281/Network_Tasman_-_Improving_HV_network_visibility_submission.pdf
9. Network Tasman. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10281/Network_Tasman_-_Improving_HV_network_visibility_submission.pdf
10. Westpower. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10289/Westpower_-_Improving_HV_network_visibility_submission.pdf
11. Waipā Networks. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10290/Waip%C4%81_-_Improving_HV_network_visibility_submission.pdf
12. WEL Networks. (2026). Submission on improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10291/WEL_Networks_-_Improving_HV_network_visibility_submission.pdf
13. Powerco. (2026). Network visibility: An efficient approach for EDBs providing customer benefit. https://www.ea.govt.nz/documents/10283/Powerco_-_Improving_HV_network_visibility_submission.pdf
14. Vector. (2026). Improving information on high-voltage network capacity: Vector response to consultation paper. https://www.ea.govt.nz/documents/10288/Vector_-_Improving_HV_network_visibility_submission.pdf
15. Transpower New Zealand. (2026). Improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10286/Transpower_-_Improving_HV_network_visibility_submission.pdf
16. Orion New Zealand. (2026). Consultation paper: Improving information on high-voltage network capacity. https://www.ea.govt.nz/documents/10282/Orion_-_Improving_HV_network_visibility_submission.pdf
17. Unison Networks, & Centralines. (2026). Response to submission on improving information on high-voltage network capacity. UNL Letterhead for Blank Paper
18. Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. Journal of Management Information Systems, 12(4), 5–33. https://doi.org/10.1080/07421222.1996.11518099
19. Eppler, M. J. (2006). Managing information quality: Increasing the value of information in knowledge-intensive products and processes. Springer. https://doi.org/10.1007/3-540-32225-6
20. Primadianto, A., & Lu, C.-N. (2017). A review on distribution system state estimation. IEEE Transactions on Power Systems, 32(5), 3875–3883. https://doi.org/10.1109/TPWRS.2016.2632156
21. International Energy Agency. (2023). Electricity grids and secure energy transitions. IEA. https://iea.blob.core.windows.net/assets/ea2ff609-8180-4312-8de9-494bcf21696d/ElectricityGridsandSecureEnergyTransitions.pdf
22. Electric Power Research Institute. (2020). The hosting capacity process. EPRI. https://www.epri.com/research/programs/108271/results/3002019750
23. Rylander, M., Smith, J., & Sunderman, W. (2016). Streamlined method for determining distribution system hosting capacity. IEEE Transactions on Industry Applications, 52(1), 105–111. https://doi.org/10.1109/TIA.2015.2472357
24. Islam, M. T., & Hossain, M. J. (2023). Artificial intelligence for hosting capacity analysis: A systematic literature review. Energies, 16(4), 1864. https://doi.org/10.3390/en16041864
25. Blackhall, L. (2020). On the calculation and use of dynamic operating envelopes. Australian Renewable Energy Agency. https://arena.gov.au/assets/2020/09/on-the-calculation-and-use-of-dynamic-operating-envelopes.pdf