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Electricity Authority | Te Mana Hiko

By email to: fsr@ea.govt.nz



Tēnā koutou,

RESPONSE TO SUBMISSION ON OPTIONS TO ADDRESS A HARMONICS ISSUE

Unison Networks Limited (Unison) and Centralines Limited (Centralines) are consumer-owned electricity distribution businesses serving communities in Hawke's Bay, Taupō, Rotorua, and Central Hawke's Bay. We welcome the opportunity to submit on the Authority's consultation on options to strengthen the management of harmonics within the New Zealand electricity system.

As consumer-owned entities, we operate in the best interests of the communities we serve. Guided by our vision, and values, we strive to deliver economic benefits to both our customers and community shareholders, while championing a sustainable energy future. We are committed to maintaining the right balance between keeping electricity affordable and making strategic investments that secure the long-term reliability and resilience of our network. In all aspects of our operations, we place strong emphasis on meeting industry compliance requirements, ensuring we uphold all relevant standards. This approach not only supports New Zealand's transition to new energy solutions but also enables our communities to access cleaner, smarter, and more flexible energy options, now and for generations to come.

Executive Summary

We support the Authority's objective of improving reliability. However, achieving this outcome requires a framework that is both enforceable and practically implementable, particularly as inverter-based resources, electrification, and distributed connections materially increase harmonic risk across the system.

We support the Authority progressing Option 1 to strengthen the management of harmonics across the New Zealand electricity system.

Option 1 provides sufficient consistency, enforceability, and alignment with internationally recognised standards to manage increasing harmonic risk as inverter-based resources, electrification, and distributed connections continue to grow.

Options 2 and 3 would either undermine consistency and investment certainty (Option 2) or duplicate existing standards at unnecessary cost and delay (Option 3).

1. Codify planning levels only

The Code should be limited to enforceable harmonics planning levels and core obligations only. Extending the Code into prescriptive assessment, monitoring, or mitigation methodologies would:

- reduce the ability to respond to site-specific system conditions,
- increase compliance and connection costs, and
- risk inefficient or overly conservative outcomes.

Implementation detail should sit in guidance, not in the Code. This distinction is critical to maintaining flexibility while ensuring enforceability.

2. Hybrid regulatory / contractual model

The Authority should establish a clear hybrid model, where:

- the Code establishes minimum enforceable requirements, and
- connection-specific arrangements are addressed through bilateral agreements.

Without this clarity, there is a risk of:

- inconsistent interpretation across networks,
- increased negotiation burden for customers, and
- reduced certainty for investment decisions.

A clear delineation between Code and contract is essential.

3. Maintain alignment with international standards

The framework should be anchored in IEC and AS/NZS 61000 standards.

Departing from these standards would:

- increase costs for consumers and equipment suppliers,
- reduce compatibility with internationally available technology, and
- create unnecessary New Zealand-specific complexity.

Any adaptation should be limited, targeted, and clearly justified.

4. Implementation guidance is critical

Option 1 will deliver consistent outcomes if it is supported by clear, practical guidance at implementation. At a minimum, guidance should address:

- allocation methodologies and harmonic headroom,
- thresholds for screening versus detailed studies,

- treatment of legacy connections and non-compliance, and
- coordination between transmission and distribution networks.

Without this, there is an elevated risk of divergent practices emerging, undermining the objective of a nationally consistent framework.

5. Keep data arrangements proportionate

Current targeted data-sharing arrangements between network owners are generally effective and proportionate. Any move toward a centralised database should be carefully considered, as it introduces:

- cost, which will ultimately be borne by consumers, and
- a risk of misinterpretation where data is used without appropriate system context.

Absent unambiguous evidence of net benefit, existing approaches should be retained.

6. Customer impact

From a customer perspective, the primary objective should be to reduce connection uncertainty and avoid unnecessary cost. A well-designed framework will:

- provide clearer expectations at the point of connection,
- enable proportionate, risk-based assessment, and
- avoid inefficient mitigation requirements.

This is particularly important to support electrification and distributed energy uptake, where unnecessary complexity or cost can become a barrier to participation.

Conclusion

Unison and Centralines support the Authority progressing Option 1 as the most effective pathway. To achieve the intended benefits, the Authority should ensure the framework:

- focuses on enforceable planning levels,
- maintains alignment with international standards, and
- supports flexible, guidance-led implementation.

We would welcome continued engagement as the detailed design progresses.

Ngā mihi nui,

JASON LARKIN / TARRYN BUTCHER

GM COMMERCIAL AND REGULATORY / REGULATORY MANAGER



Submission form

Promoting reliable electricity supply: Options to address a harmonics issue

Submitter	Unison Networks and Centralines
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Questions	Comments
Q1. Do you agree the Authority should be short listing Option 1 for further consideration? If you disagree, please explain why.	Yes, Option 1 allows for consistency and a means of enforcement rather than recommendation. The aligned with internationally recognised IEC standards will provide a well-established technical basis for defining planning levels, assessing harmonic emissions, and managing system interactions.
Q2. Do you agree the Code should not mandate harmonics management requirements, other than harmonics planning levels? If you disagree, please explain why.	Yes, enforce the planning limits. A case can be made for the allocation of harmonics on a distribution level to ensure fairness. In general, management/monitoring can take different forms, and freedom should be given to choose a best fit option from a set of available industry practices at the time, given the context site specific risk.
Q3. What regulatory instrument (i.e., the Code or the Electricity (Safety) Regulations) do you consider should be used to regulate installation standards for harmonics?	The Code is the most suitable regulatory instrument for installation standards because it governs the connection, operation, and interaction of assets within the power system, which is where harmonics management must be addressed. Installation-level harmonics are inherently a system integration issue, requiring coordination between network operators and connecting parties. As such, they are best managed within the Code's framework, which already governs technical standards for network connections and enables consistent application across transmission and distribution networks.
Q4. Which, if any, aspects of AS/NZS 61000 do you consider need substituting or adapting in order to accommodate New Zealand conditions?	As most fittings/appliances that are imported into NZ, that affect harmonics, are made as per IEC 61000 standards, it is logical to inherit and enforce the compatibility and planning limits of the IEC 61000 series standard in the interest of consistency/coherency and cost effectiveness. Cost effectiveness benefits are realized due to the larger landscape of products already made to IEC standard compared to having products made to a NZ specific standard and in that NZ does not have to reinvent the wheel in recreating its own set of standards. Options for simplification of management techniques provided in the IEC series would be worthwhile to ensure that cost /benefits measures balance, given the specific context and risk of NZ.
Q5. Do you consider the establishment, monitoring and enforcement of harmonics requirements should be a contractual matter between electricity network owners and their customers, or a Code-enforceable matter? Please give reasons with your answer.	A hybrid approach is preferred. The Code should establish the minimum mandatory framework, including harmonics planning levels, the right for network owners to require monitoring where justified, and an obligation for network owners to apply fair, transparent, and proportionate processes when assessing harmonic impacts. This would provide consistency across the industry and ensure that the core obligations are enforceable. The detailed implementation of those requirements should remain a contractual matter

	between electricity network owners and their customers. Connection-specific requirements, including monitoring arrangements, harmonic allocation, investigation processes, mitigation obligations, and ongoing operational requirements, need to reflect the size and type of the connection, system strength, network capacity, fault level, existing harmonic headroom, and the risk posed by the connected plant. This approach would preserve the flexibility needed for fit-for-purpose technical outcomes, while ensuring that the minimum expectations are clear and consistently applied across transmission and distribution networks.
Q6. Do you consider distributors should have a mandated responsibility to investigate and resolve security of supply or reliability issues caused by non-compliance with the harmonic levels specified for distribution networks?	Mandating investigation is reasonable as it will provide insights into what the most cost-effective solution (for all connected parties) would be to meet harmonic limits. Resolving security of supply or reliability related issues in the most cost-effective way may require that enforcement be done at an individual customer level. The process of enforcement should be defined in the code.
Q7. What guidance for industry participants do you consider would be necessary under Option 1?	Guidance would be required to ensure that Option 1 is applied consistently, fairly, and proportionately across transmission and distribution networks. This should include guidance on how harmonics planning levels are to be applied, how harmonic allocation should be undertaken, and how available harmonic headroom should be assessed and allocated where multiple parties connect to the same part of the network. Guidance should also clarify when a simplified screening assessment is sufficient and when a detailed harmonic study is required. This is important to avoid unnecessary studies or mitigation for small or low-risk connections, while ensuring that larger or higher-risk connections are assessed appropriately. The guidance should include practical criteria such as connection size, system strength, existing harmonic levels, network configuration, and the type of connected plant. Further guidance would be useful on the identification of large harmonic sources on existing networks, appropriate monitoring requirements, treatment of legacy connections, treatment of existing non-compliant plant, and the distinction between device-level standards and installation-level standards. Guidance should also address coordination between distributors and Transpower where harmonic issues may cross network boundaries.
Q8. What do you consider to be the main benefits and costs associated with Option 1?	The main benefits of option 1 is making use of existing industry learnings/insights/practice and avoids “reinventing the wheel” Benefits include: • consistency across transmission and distribution networks; • clearer and more enforceable planning levels; • alignment with internationally recognised standards; • reduced reliance on outdated NZECP 36:1993; • greater certainty for connecting parties and equipment suppliers;

	• reduced need for bespoke New Zealand requirements; and • a better balance between mandatory planning levels and flexible management methods. • Overall costs to consider include: • implementation effort for distributors and Transpower; • capability-building and training requirements; • the need for practical guidance; • potential adaptation of AS/NZS 61000 methods to New Zealand conditions; and • transition issues for legacy plant or existing connection agreements.
Q9. Do you agree the Authority should be short listing Option 2 for further consideration? If you disagree, please explain why.	No, option 2 can result in the inconsistent application of harmonics requirements across transmission and distribution networks. This inconsistency would create variability in connection requirements, particularly for asset owners and developers operating across multiple networks, thereby increasing complexity and cost while reducing certainty.
Q10. What do you consider to be the main benefits and costs associated with Option 2?	Option 2 does provide more flexibility than option 1. Requirements can be adjusted based on: • System strength at the point of connection • Size and type of generating plant or load • Existing harmonic headroom Option 2 may reduce the risk of: • Overly conservative limit • Unnecessary mitigation (e.g., installing harmonic filters where not required) Regarding costs: 1. However, the main cost of Option 2 is that flexibility may come at the expense of consistency and certainty. If harmonics requirements are only recommended rather than mandated, different network owners may apply different assessment methods, allocation approaches, monitoring requirements, and mitigation expectations. This could increase complexity and cost for connecting parties operating across multiple networks and reduce certainty for investment planning. 2. Option 2 may also increase the contractual and negotiation burden between network owners and connecting parties, because more matters would need to be resolved on a case-by-case basis. While the flexibility of Option 2 has value, these benefits would be better achieved through practical guidance and proportionate assessment pathways under Option 1, rather than through a primarily non-mandatory framework.
Q11. Do you agree the Authority should be short listing Option 3 for further consideration? If you disagree, please explain why.	No. Option 3 should not be shortlisted for further consideration because retaining and amending NZECP 36:1993 would be inefficient and would likely duplicate technical work already reflected in the IEC 61000 series, AS/NZS 61000 series, and the EEA Power Quality Guidelines. NZECP 36:1993 would require a substantial rewrite to address its known limitations, including its treatment of modern inverter-based resources, harmonic allocation, monitoring, roles, and responsibilities, supraharmonics, interharmonics, and application across voltage levels. Undertaking a full revision would require considerable time,

	cost, and industry effort, while still risking reduced alignment with international practice. A more efficient approach is to adopt a modern framework based on existing internationally recognised standards and New Zealand industry guidance, as proposed under Option 1.
Q12. What do you consider to be the main benefits and costs associated with Option 3?	Rewriting NZECP 36 would allow harmonics requirements to be optimised specifically for New Zealand conditions rather than directly adopting international standards. The benefit of Option 3 compared to relying/referencing the existing EEA guide, which is effectively IEC adapted for NZ conditions, is questionable. Costs include: • Considerable time, effort, and cost to rewrite NZECP 36 • Duplication of work already reflected in IEC 61000, AS/NZS 61000, and the EEA Power Quality Guidelines Risk of reduced international alignment: Risk that the rewritten standard becomes outdated again unless actively maintained. Delayed regulatory improvement while the rewrite is undertaken. Leads to confusion and delay for customers who want to decarbonise. Hampers NZ decarbonisation
Q13. What do you consider to be the benefits and costs of the current arrangements for obtaining harmonics data from distributors and from Transpower, as a transmission network owner?	The current arrangements are considered broadly fit for purpose. Transpower and Unison have shared power-quality and harmonics data freely in the past where there has been a defined investigation or connection-related need. This targeted approach has the benefit of ensuring that data is provided with appropriate network context, including relevant operating conditions, network configuration, measurement limitations, and any known constraints that may affect interpretation. A key benefit of the current approach is that it reduces the risk of raw harmonic measurements being misused or misinterpreted. Harmonics data can be highly context-dependent, and interpretation often requires an understanding of system strength, switching configuration, connected plant, background distortion, resonance conditions, and measurement arrangements. Direct engagement between the relevant transmission and distribution operators helps ensure that the data is interpreted correctly and that conclusions are technically sound. The main costs of the current arrangements are that they may involve some manual effort, may not provide a fully standardised data format, and may depend on bilateral engagement between the relevant parties. However, these costs appear manageable and are likely to be lower than the cost of establishing and maintaining a centralised database. Overall, the current targeted approach provides a practical balance between data accessibility, correct interpretation, and administrative efficiency.
Q14. What do you consider to be the benefits and costs of a database of harmonics measurements?	A centralised database of harmonics measurements could provide some benefits, particularly where it improves consistency in data format, reporting, and access to relevant background harmonic information. It may also reduce repeated manual information requests and provide a common reference point for identifying

	longer-term harmonic trends across the power system. However, the practical benefit of a centralised database may be limited where network owners already maintain their own power-quality monitoring systems and where relevant data can be shared directly for defined investigations or connection assessments. Transpower has previously shared power-quality data with Unison where there has been a defined need, and Unison/Centralines and Transpower already manage their own power-quality datasets independently. The main costs and risks are likely to relate to establishing, maintaining, validating, contextualising, and securing the database. Harmonics data can be misinterpreted if it is separated from relevant network context, such as system configuration, switching state, measurement limitations, connected plant, and system strength. If the database duplicates existing arrangements or requires significant investment without materially improving decision-making, the additional cost may ultimately be passed on to consumers without providing a proportionate benefit.
Q15. Would access to raw harmonics measurement data be useful for your organisation? If so, why?	Unison and Centralines already install PQ meters at new substations as standard. Transpower has historically been open to sharing PQ information of their network with Unison, being relevant to a specific investigation. Collaboration is possible given a defined project scope definition. Interaction between the two parties ensure that the risk misinterpretation of data is minimised.
Q16. Who do you consider should host a database of harmonics measurement data? Please give reasons	The EA is the appropriate owner of such a database as it is the owner of the Code and oversees the participation aspects of all the different parties on the NZ electricity network. Hosting a PQ data base would be a natural extension of its existing role in facilitating transparency and efficient market operation