Sustainable Energy
Association New Zealand

28th September, 2021

Electricity Authority
PO Box 10041
Wellington 6143

RE: Consultation – Updating Regulatory Settings for Distribution Networks

Kia Ora

Please find attached our submission addressing the Electricity Authority's discussion document on the above. Both Word and PDF versions are attached, please use the PDF version for all viewing and external consumption.

Attached also in support of our submission is a real-world case study of the 100% electrification and decarbonisation of a commercial entity using DER and grid supply demonstrating flexibility services with local distributor and a retailer.

All information provided is not confidential and can be made public and shared accordingly. We seek the opportunity to discuss this in further detail.

Should you require clarification of any points please address them to me directly as per my details below.

Kindest regards

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Tomorrow's Energy Today
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SEANZ

SEANZ Submission to the
Electricity Authority discussion paper on

Updating the Regulatory Settings for Distribution Networks

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Sustainable Energy
Association New Zealand

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SEANZ is the peak organisation for DER

The Sustainable Energy Association New Zealand (SEANZ) is the peak organisation leading the distributed energy resources (DER) industry, contributing to the flexibility market space. SEANZ addresses stakeholder's advocacy interests around the technologies, standards, policy consultations and inputs, events and additional services specifically for those in the SEANZ group.

SEANZ stakeholders encompass the supply chain in its totality - business to end-users of DER, primarily solar PV (residential, commercial, industrial and utility scale) energy storage, smart energy and DER control, aggregation, mini/micro grid development as well as associated consumer-centric energy technology management tools.

This response to the Electricity Authority discussion paper on *Updating the regulatory settings for distribution networks* should be considered alongside the separate submission from SEANZ, Cortexo, Our Energy and Vector.[1]

[1] Cortexo, Our Energy and Vector are members of SEANZ.

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1. Our key points

- The electricity sector needs to be collaborating to support the electrification of as much economic activity as possible to support the Aotearoa New Zealand decarbonisation goals while delivering affordable, reliable, and safe electricity services.

- DER is the difference. The effects of electrification will be first observed by distribution networks, particularly in the low voltage networks, as existing connections use more electricity and more electric vehicle chargers, solar panels, battery storage, and smart devices (all DER) is connected. The central role of DER in accelerating electrification and decarbonisation means the focus must be to ensure regulatory settings for distribution networks, and the wider system and market, are designed to encourage connection of DER, plus make full use of the flexibility of that DER.

- Collaboration and partnership across the electricity supply chain will be necessary to develop fit-for-purpose regulatory settings. Working in siloes in a fragmented and uncoordinated way will not result in appropriately focused activity reflecting the relative priority of the actions required

- The overarching requirements to successfully update the regulatory settings for distribution, and the wider system and market, to accelerate electrification and uptake of DER are:
  - Explicit coordination between the Electricity Authority and Commerce Commission to ensure the Code and Input Methodologies made under Part 4 of the Commerce Act are aligned and complementary to accelerate electrification without imposing unnecessary costs on consumers.
  - An inclusive process based on building people power (the demand side) into the electricity market and obtaining a social licence will be important to establishing enduring arrangements which avoid the lack of public (and political) confidence that persists with the 'Bradford reforms' from the 1990's
  - A learning-by-doing approach with industry-led development of products practical solutions which are scalable across the market and using this to inform updates to the regulatory settings (analogous to how the wholesale market was set up).

We consider the next step from the Electricity Authority must be to support a series of whole-of-sector – and beyond – workshops alongside the Commerce Commission focused on building a coherent and comprehensive plan for accelerating electrification, uptake of DER and decarbonisation.

- Specific issues to consider are:
  - **Avoid perpetuating a supply-side bias with electricity supply standards** which do not accommodate the dynamic capability of DER. SEANZ considers adoption of the AS/NZS 4777.2(2020) standard must be paused until a considered consumer-centric process is undertaken to identify appropriate electricity supply standards which reflect two-way power flows, the dynamic capability of DER, and maximises the connection and use of DER.

    The network operating envelope – particularly the voltage supply thresholds – needs rethinking to ensure it maximises the value of DER to people, the network operator and environment. A key topic for review is the voltage supply thresholds to introduce a wider threshold appropriate for a high-DER environment, alongside development of a flexibility-services market.
  - **There is an opportunity to improve network connection processes** for DER. A dividend of digitalisation and improved network visibility must be streamlined connection processes for any type of connection, with online applications approved based on consistent criteria. Approval should be automatic if the DER has functionality to respond to signals and provide flexibility services.
  - **Faster progress on developing a flexibility services market is necessary** to ensure solar and battery storage are part and parcel of electrification and are available to reduce the life-time cost of electrification.

    Electricity distribution and transmission network operators, along with the wider electricity sector, including government and regulators, need to make sure that as people and businesses electrify, they are aware of the longer-term benefits from investing in solar and battery storage so that flexibility capability is available to provide a resilient and reliable network service and defer or avoid network upgrades and higher network charges in the future.
  - **Resolve inefficient treatment of DER through inefficient pricing** of distribution services and a failure by retailers to develop DER-specific pricing

    SEANZ considers export charges must be prohibited unless explicitly related to demonstrated network congestion caused by exported DER and accompanied by flexibility payments for DER which assists with addressing the network congestion problem.

    SEANZ considers instantaneous net metering should be introduced to increase pressure on retailers to hasten retail product innovation and offer pricing which appropriately values DER, including DER connected via a three-phase connection.

2. Collaboration is essential for accelerating electrification

SEANZ is committed to a collaborative approach to accelerating electrification, uptake of DER and decarbonisation

The electricity sector must adapt to accelerate electrification and decarbonisation.

No one part of the electricity sector, individual business or agency acting alone will deliver change at the pace and scale needed to for the electricity sector to help meet the decarbonisation goals of Aotearoa New Zealand.

A concerted and coordinated commitment to change is needed from government, regulators, sector participants - present and future, large and small - industry groups, and consumers.

SEANZ considers the next step from the Electricity Authority must be to support a series of whole of-sector workshops, alongside the Commerce Commission,

focused on building a coherent and comprehensive plan for accelerating electrification, uptake of DER and decarbonisation.

a) DER is the difference

DER is the difference. We know the effects of electrification will be first observed by distribution networks delivering more electricity to existing connections and connecting millions of electric vehicle chargers, solar panels, battery storage, and smart devices (all distributed energy resources), mostly on the low voltage networks supplying households and businesses.

Much of this DER will be able to modify its operation (ie, generation or consumption patterns) in response to a request or signal (such as a change in price) to provide a service within the electricity system.

The role of DER in accelerating electrification and decarbonisation means the focus must be to ensure regulatory settings for distribution networks, and the system and market, are designed to encourage connection of DER, plus make full use of the flexibility of that DER.

b) A coordinated approach to updating regulatory settings is needed

The regulatory settings governing the electricity sector – retailing, distribution, transmission, and generation – need to be fit-for-purpose across the board to support an acceleration of electrification and decarbonisation, plus achieve an affordable, reliable, and secure supply of electricity.

Regulatory settings for the electricity sector were designed in the 1990's to deliver safe, reliable and affordable power in circumstances which were quite different to now.

The ruleset determining how the electricity sector manages electrification are designed to deliver incremental improvement with decision-makers acting within clearly defined and distinct areas of responsibility. The impact of this approach during a transition state will be siloed decision-making, conflicting outcomes, inertia, and a slowed pace of transformation.

c) An inclusive process is needed

Electrification means households and businesses will increasingly rely on the electricity sector compared to now, as people use electricity to fuel their vehicles, power their machines, engines, and motors, and power their homes and businesses.

However, public confidence in the electricity sector is not high.

An inclusive process for the updating of regulatory settings will be important to establishing enduring arrangements which avoid the lack of public (and political) confidence that persists with the 'Bradford reforms' from the 1990's.

Particularly important is for the electricity sector to obtain a social licence for access to consumer DER.

Gaining a social licence for control of DER and for the electricity market more broadly means building people power (the demand side) into the electricity market. Doing this requires a new approach to developing regulatory settings, including adopting a learning-by-doing process with trials and pilots to test new ideas and concepts and demonstrate real-world value to households and businesses.

Regulatory settings for the electricity sector were designed in the 1990's to deliver safe, reliable and affordable power in circumstances which were quite different to now.

SEANZ has four additional things to say

SEANZ has four points to make, in addition to those in the joint submission, regarding updating the regulatory settings affecting connection and use of DER.

- avoid perpetuating a supply-side bias with electricity supply standards which do not accommodate the dynamic capability of DER (related to theme two electricity supply standards)
- there is an opportunity to improve network connection processes for DER (related to theme two electricity supply standards)
- faster progress needed to develop a flexibility services market (related to theme three market settings for equal access
- resolve inefficient treatment of DER through inefficient pricing of distribution services and a failure by retailers to develop DER-specific pricing (related to theme six efficient pricing of distribution services).

a) Avoid a supply-side bias with electricity supply standards

The Electricity Act, Electricity Safety Regulations and other legislation provide the technical and performance requirements for operation of the network (by the network operator) and for use of the network (by parties connected to the network).

These technical and performance requirements (the operating envelope) largely reflect operating and asset management practices for a little-to-no DER environment.

SEANZ is concerned standards have been, and will continue to be, updated to address 'challenges' to network performance from uptake of DER building on traditional network design and operation practices without considering the dynamic capability of DER or the impacts on the value of DER to consumers and DER owners.

a.1 Changing network use requires rethinking operating envelopes, network design and operating practices

The supply-side bias to developing and applying standards is currently evident in technical requirements relating to voltage.

The Electricity Safety Regulations 2010 (ESR) require distributors to maintain supply voltage for low voltage networks of 230 volts +/- 6%, except for momentary fluctuations or agreed between a customer and distributor.

Network operators typically target the upper range of the voltage supply threshold to allow for voltage dropping and to maintain voltage levels within the thresholds at the end of longer feeders. Networks have not been designed or operated to deal with rising voltage from reverse flows.

We know use of the network by DER, for example PV, can lead to reverse power flows and voltage exceeding the standard. This is not currently a systemic problem in Aotearoa New Zealand.

Stopgap measures have been used to date to manage relatively isolated occurrence of reverse power flows. Practice to date by distributors has been to manage voltage issues created by reverse flows by limiting the connection of PV in nominated export congestion areas.[2] This practice is typically applied through a distributor's connection policy.

Recent changes to the AS/NZS 4777.2 (2020) standard for connection to the network via inverters have made a new option available to distributors – the standard requires invertors to automatically reduce PV or battery output in response to volt-watt and volt-var thresholds.[3]

This new inverter standard currently applies in limited circumstances after recent amendments to the Code to allow a distributor to require PV and battery inverters to meet the AS/NZS 4777.2(2020) standard for connection applications through the streamlined Part 1A process (in Part 6 of the Code).

The original AS/NZS 4777.1:2005 standard applies to PV connections outside this process as the primary standard referenced in the ESRs.

However, amendments to the ESRs are planned to reference AS/NZS 4777.2(2020) as the primary standard.

[2] Electricity Industry Participation Code, s6.3(2)(da) requires distributors to publish a list of locations on their network known or expected to become subject to export congestion. Export congestion means export of electricity would cause the network to operate beyond its capacity or cause an unacceptably high level of voltage at the point of connection.

[3] The volt-watt threshold reduces PV (inverter) output between 241V and 246V. By 246V the output is reduced to 20%. Volt-Var requires Vars to be absorbed from 235V, with the full 60% absorbed by 244V. By 244V the output is reduced by 20%.

a. 2 Keeping existing voltage limits will disadvantage consumers and DER owners

Consumers and DER owners would be disadvantaged in two ways by mandating 4777.2(2020) without also updating voltage supply standards.

- Reducing the value of DER to the DER owner. The proposed Volt-Var and Volt-watt response settings would reduce PV output without regard for the impact on the DER owner, the electricity market, or the economy, resulting in reduced renewable energy production and preventing batteries from being used to provide flexibility services.
- Increasing network charges to fund network capacity upgrades to provide extra hosting capacity to maintain reliability in a high-DER environment – tighter voltage thresholds will result in extra network investment.

The automated Volt-Var and Volt-Watt response settings are a blunt instrument which perpetuate the command-and-control approach of traditional network management without regard for the dynamic capability of DER and consumer value. Network operators must be required to use flexibility services to allow more granular value-driven options for managing within the operating envelope using flexibility from DER.

Additionally, the network operating envelope – particularly the voltage supply thresholds – needs rethinking to maximise the value of DER to people, the network operator and environment. This would be consistent with the approach being considered in Australia and elsewhere to adopt wider voltage supply thresholds (eg, 230V +/-10%).

Network operators must be required to use flexibility services to allow more granular value-driven options for managing within the operating envelope using flexibility from DER.

SEANZ considers adoption of the AS/NZS 4777.2(2020) standard must be paused until a considered consumer-centric process is undertaken to identify appropriate electricity supply standards which reflect two-way power flows, the dynamic capability of DER, and maximises the connection and use of DER.

The standards establishing the operating envelope must explicitly support development of a flexibility services market and service provision for stakeholders including distributors, needed to share, sell and value DER generated excess electricity, and the imperative to move to lower cost renewable generation and storage solutions.

Q.4 Have networks experienced issues from the connection or operation of DER?

The 'issues' experienced by networks from the connection or operation of DER must be considered in a broader context to determine the root cause of the 'issue'.

SEANZ is aware of several instances of a distributor facing 'issues' from the connection or operation of DER due to applying traditional planning and operating criteria which do not reflect the dynamic capability of the DER. The issue only existed because the distributor insisted on using outdated or inappropriate technical standards. The effect is to significantly increase the difficultly and cost of connecting DER to the detriment of the customer, the economy and the environment.

Q.5 Do the Electrical (Safety) Regulations require review? If so, what changes do you think are needed (a) in the near term and (b) in the longer term?

Yes. The Electricity Safety Regulations must be reviewed in the near term to ensure the technical and performance requirements for connecting to and operating networks provide an appropriate operating envelope which encourages uptake and use of DER.

A key topic for review is the voltage supply thresholds to introduce a wider threshold appropriate for a high-DER environment, alongside development of a flexibility-services market.

Q.6 Does Part 6 remain fit for purpose? If not, what changes do you think are needed (a) in the near term and (b) in the longer term?

Part 6 has been subjected to several reviews over the past decade. Before embarking on another, it would be useful to complete a comprehensive assessment of regulatory settings relating to connection to and use of electricity networks by all forms of DER, not just distributed generation to provide a comprehensive and coordinated scope for any further work.

Q.7 Is there a case to be made for minimum mandatory equipment standards for DER equipment, specifically inverter connected DER?

Not until voltage supply thresholds have been reviewed and adjusted to reflect two-way power flows, the dynamic capability of DER, and maximises the connection and use of DER.

Q.8 What standards should be considered to help address reliability and connectivity issues?

All 'standards' must be considered to ensure they recognise the dynamic capability of DER and support development of a flexibility services market.

SEANZ is aware of several instances of a distributor facing 'issues' from the connection or operation of DER due to applying traditional planning and operating criteria which do not reflect the dynamic capability of the DER.

b) Opportunity to improve network connection processes

Network connection processes, particularly as DER uptake accelerates, are likely to become increasingly cumbersome and slower because they are premised on passive, one-way network use, not two-way and active network use. As noted in the discussion paper, additional effort will be required from distributors to assess network impacts as more DG and DER connect.

Connection processes for DG are described in Part 6 of the Code, with a specific process for applications up to 10 kW capacity (2 options, called Part 1 (comprehensive) and Part 1A (streamlined) and over 10 kW.

Processes for connecting 'load' are described in distributor connection policies. A dividend of digitalisation and improved network visibility must be streamlined connection processes for any type of connection, with applications online and approved based on consistent criteria. Approval should be automatic if the DER has functionality to respond to signals and provide flexibility services.

Q.9 Is there a case to look at connection and operation standards under Part 6 with a view to mandating aspects of these standards?

A comprehensive assessment of the regulatory settings is required to identify appropriate standards which support connection and use of DER, including DG. The review must be broader than 'Part 6' to provide a blank page perspective not anchored to traditional operating and connection practices.

As part of this review, consideration must be given to adopting a universal streamline connection process, including online application and automatic approval based on consistent criteria.

Faster progress on developing a flexibility services market is necessary to ensure solar and battery storage are part and parcel of electrification.

c) Faster progress needed to develop a flexibility services market

Faster electrification requires a flexibility services market which recognises the value of flexibility from DER.

SEANZ considers DER – particularly pairing of solar and battery storage – will reduce the life-time cost of electrification.

SEANZ has assessed the electrification journey taken by Forest Lodge Orchard, a newly developed commercial cherry orchard in central Otago. The key insights are:

- electric equipment is more expensive to buy than conventional fossil-fueled options, though costs are expected to fall
- the time and cost of upgrading the network connection, plus internal electrical works, further increases upfront capital costs
- operating costs are significantly lower because electricity costs less than the liquid fuels to deliver the equivalent output
- solar and battery storage reduce average electricity costs (below retail rates) compared to grid-only electrification and can reduce network charges if distribution pricing rewards load-shifting. In the near term, proposed changes to transmission pricing will reduce the benefit of load shifting because variable network charges are mostly set to avoid the variable transmission charge

Faster progress on developing a flexibility services market is necessary to ensure solar and battery storage are part and parcel of electrification.

Electricity distribution and transmission network operators, along with the wider electricity sector, including government and regulators, need to make sure that as people and businesses electrify, they are aware of the longer-term benefits from investing in solar and battery storage so that flexibility capability is available to provide a resilient and reliable network service and defer or avoid network upgrades and higher network charges in the future.

A detailed case study of the electrification journey taken by Forest Lodge Orchard, the financial and environmental benefits, and the challenges is attached separately.

Q.10 What flexibility services are you pursuing?

Flexibility services are not being routinely procured in Aotearoa New Zealand. The Aurora Upper Clutha demand response programme and the Transpower demand response programme are the only active procurers of flexibility services.

More investment in DER would occur if flexibility services become a feature of network management and operation.

Q.11 What options should be considered to incentivise non-network solutions?

Refer to the comments in the submission from Cortexo, Our Energy, SEANZ & Vector.

Flexibility will only become routine if the Commerce Commission upgrades its regulatory settings (via the Input Methodologies and however else necessary) so that flexibility services become a tool for ensuring network services are delivered according to reliability and quality thresholds.

Q.12 What options would encourage competitive procurement processes for flexibility services?

Refer to the comments in the submission from Cortexo, Our Energy, SEANZ & Vector.

Alongside the Commerce Commission updating its regulatory settings to make flexibility from DER a feature of network operation, the Electricity Authority could support industry collaboration to develop:

- flexibility services product specification, and product performance requirements
- consistent terms of trade
- pricing which reflects the value of the product.

Encouragement for and funding of trials will also support emergence of a flexibility services market.

d) Inefficient treatment of DER through distribution pricing and lack of retail innovation

d. 1 Export charges must be accompanied by flexibility payments

SEANZ is aware of three distributors which introduce export charges on DG as part of their 2021 distribution pricing methodologies. The effect of these export charges is to discourage uptake of PV and DER by inefficiently shifting costs to PV owners.

- Top Energy increased its DG export charge from nil to 0.5c/kwh[4]
- Counties Power introduced a 1.03c/kwh injection charge[5]
- Nelson Electricity introduced a 0.05c/kwh export charge.[5]

The reasons provided for introducing these charges are not consistent with the Electricity Authority pricing principles – the charges are not cost-reflective.

Top Energy is charging DG owners for a business-as-usual asset management function. The same reasoning could be extended to impose specific charges on EV owners to pay for investigating issues for managing EV impacts. Further, the costs Top is incurring are fixed which makes applying a volume-based charge even more inappropriate – the charge inefficiently distorts connection and use decisions.

For Counties Power and Nelson Electricity, it isn't clear how the costs referred to are additional to BAU activities, or even exist after the initial connection. In any event, the costs are fixed and it is not efficient to recover them via a volume-based charge. Doing so distorts use of DER and the network. As with Top Energy, the reasoning provided by Counties and Nelson would justify imposing a similar extra charge on EV owners.

SEANZ considers export charges must be prohibited unless explicitly related to demonstrated network congestion caused by exported DER and accompanied by flexibility payments for DER which assists with addressing the network congestion problem.

d. 2 Lack of DER-specific retail product offers

Uptake of DER is being held back by a lack of DER-specific retail products.

SEANZ considers the existing approach to metering and reconciliation disadvantages current and prospective owners of DER, particularly those with 3-phase connections.

From a consumer perspective, the 'industry' is unfairly stopping DER owners with a 3-phase connection from receiving the full benefit of DER (ie, solar). DER owners with a single-phase connection are not affected because power flows are always in one direction in each period. From an industry and regulatory perspective, the alignment of physical power flows and financial payments means DER owners (with 3-phase connections) do not benefit at the expense of other consumers.

The difference between the import charges and export prices set by each retailer provides people with incentives to maximise self-supply.

DER owners with 3-phase connections are unable to capture all this value due to the physical characteristics of their installation and connection to the network. Generally, a DER owner with

[4] Top Energy 2021 Distribution pricing methodology, page 11.

[5] Counties Power 2021 Distribution pricing methodology, page 26.

[6] Nelson Electricity 2021 Distribution pricing methodology, page 29.

a 3-phase connection can offset about a third of their import charges each half hour, with the remaining two thirds of power generated exported to keep phases balanced (for which they receive the export price set by the retailer).

Part of the underlying problem preventing DERs owners from realising the full value of their DER is a lack of competition between the DER owner and the retailer to supply power to that location.

The lack of competition between the DER owner and the retailer occurs because the retailer sets both the import charge and export price. An efficient import change would align with the wholesale price, plus any other volume-related costs, for example an insurance margin. An efficient export price would align with the wholesale price. However, the retailer has the ability and incentive to set a bundled price which under-values the DER.

The DER owner has little bargaining power, other than to switch to another retailer with similar incentives.

Providing DER owners with the freedom to sell their surplus power to another party (ie, enabling the DER owner to have the unfettered ability to buy from one trader and sell their surplus to another supplier) would strengthen incentives on retailers to set import charges which align with volume-related costs and to set export prices which reflect the actual value of the exported power.

SEANZ considers a solution to adopt instantaneous net metering, described as a situation where the amount of exported solar power is subtracted by the amount of imported power during every half hour interval to arrive at the total amount owing.

Doing so would put pressure on retailers to hasten retail product innovation and offer pricing which appropriately values DER connected via a three-phase connection.

Appendix A: Case Study: 100% electrification of Forest Lodge Orchard

Case study attached separately.

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