

Omnibus of common quality Code amendment proposals

Consultation paper

31 March 2026

Executive summary

The Electricity Authority Te Mana Hiko (Authority) is committed to promoting the future security and resilience of New Zealand's power system by providing a solid regulatory foundation that will enable better outcomes for consumers. To help achieve this, we are proactively refining industry rules to support greater electrification while maintaining a stable and reliable power system for decades to come. As the sector evolves, it is critical that we, as a regulator, anticipate challenges and enable a smooth transition to a more electrified economy.

Our Future Security and Resilience (FSR) programme is a multi-year work programme that takes a forward-looking approach by enabling new and evolving technologies, addressing security and resilience risks, and building a power system that is reliable, flexible and future focused.

The highest priority activity in the FSR programme is the review of the common quality requirements¹ in Part 8 of the Electricity Industry Participation Code 2010 (Code). The review's purpose is to ensure these requirements enable evolving technologies, particularly inverter-based resources, such as wind generation, solar photovoltaic generation and battery energy storage systems, in a manner that is consistent with the Authority's statutory objectives.

We see these technologies as a key enabler of:

- (a) consumers having more choice and flexibility around their electricity use and supply
- (b) the electrification of parts of New Zealand's economy, such as transportation and process heat.

The review of the common quality requirements consists of several sub-projects that progress issues related to frequency, voltage, harmonics and information requirements.

This consultation paper sets out six Code amendment proposals² that span various common quality requirements in Parts 1, 7 and 8 of the Code such as updating definitions, clarifying obligations and removing inconsistencies. We expect these Code amendments would, collectively, help to maintain the security and resilience of the power system and keep downward pressure on consumers' power bills.

This is the second omnibus of common quality-related Code amendment proposals under the FSR work programme. We consulted on the first omnibus of Code amendment proposals in October 2024,³ with the resulting amendments to the Code coming into effect on 1 May 2025⁴.

We welcome your feedback on any or all of the proposals in this consultation paper.

¹ Common quality refers to those elements of the quality of electricity transported across networks that cannot be technically or commercially isolated to an identifiable person or group of persons.

² These six Code amendment proposals are summarised in Section 1

³ [Part 8 Code amendment proposal-Part 1 – Consultation paper](#)

⁴ [Part 8 Code terminology and network information – Decision paper](#)

Next steps

We will make our final decisions after carefully considering all submissions received. We will share our decisions and supporting rationale in the form of a decision paper, which we anticipate will be published in late 2026.

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1. What you need to know to make a submission

What this consultation is about

- 1.1. This consultation paper sets out proposed Code amendments to help address various common quality issues, including Code terminology and clarifying obligations in the Code. Proposed Code amendments are displayed as follows:
 - (a) added text or formatting is red underlined
 - (b) deleted text is ~~red strikethrough~~.
- 1.2. Each Code amendment proposal and its associated regulatory statement is set out in a separate section of this paper. Each regulatory statement contains a statement of the objective of the proposed Code amendment, an evaluation of the costs and benefits of the proposed amendment, and an evaluation of alternative means of achieving the objective(s) of the proposed amendment.
- 1.3. The regulatory statement for each Code amendment proposal also includes an assessment of the proposal against the requirements in section 32(1) of the Electricity Industry Act 2010 (Act), which says the Code may contain any provisions that are consistent with the Authority's objectives and are necessary or desirable to promote any or all of the matters listed in section 32(1).
- 1.4. We have assessed each proposal against the Authority's main objective under section 15(1) of the Act, which is to promote competition in, reliable supply by, and efficient operation of, the electricity industry for the long-term benefit of consumers.⁵
- 1.5. A summary of the proposed Code amendments is provided in the table below.

Summary of proposed Code amendments

Proposal number	Identified problem	Proposed solution
FSR-101	<p>The Code specifies a maximum frequency level for the South Island but not for the North Island.</p> <p>The Code also does not explicitly assign responsibility to the System Operator for ensuring frequency remains below the maximum level for both Islands.</p>	<p>Re-insert in Part 7 a principal performance obligation for the System Operator to ensure frequency does not exceed 52 Hertz in the North Island and 55 Hertz in the South Island.</p> <p>This would clarify the basis for the System Operator's over-frequency management actions under the Policy Statement, which is a document incorporated by reference in the Code.</p>

⁵ The Authority's additional objective under section 15(2) of the Act is to protect the interests of domestic and small business consumers in relation to their supply of electricity. As the additional objective applies only to the Authority's activities in relation to dealings between participants and these consumers, the additional objective does not apply to the Code amendment proposals in this paper.

Proposal number	Identified problem	Proposed solution
FSR-102	<p>The Code requires generating units connected to the transmission grid to have a voltage control system and a connection transformer. There is a lack of clarity as to the application of this obligation. Currently, it could be interpreted as applying to generating units that form part of a generating station with a point of connection to the transmission grid, but which do not themselves have a point of connection to the grid. This is not the intent of this clause.</p>	<p>Amend the Code to clarify that, for transmission-connected generating stations, the station can be equipped with a voltage control system instead of individual generating units, and the requirement to provide a connection transformer can apply at the point of connection between the station and the transmission grid.</p>
FSR-103	<p>The definition of ‘fast instantaneous reserve’ was amended in 2022. It removed the reference to interruptible load having to respond within one second and included ‘no later than 6 seconds and measured at 6 seconds’.</p> <p>This has created confusion for industry participants whether interruptible load must be provided within one second or six seconds.</p>	<p>Amend the definitions for ‘fast instantaneous reserve’ and ‘sustained instantaneous reserve’ in the Code, to refer to the Procurement Plan – a document incorporated by reference in the Code⁶.</p>
FSR-104	<p>The Code excludes wind generation from fault ride through obligations in certain circumstances. The current requirements give wind generation a competitive advantage over other variable and intermittent generation technologies facing the same challenges as wind generation.</p>	<p>Amend the Code to exclude other variable and intermittent generation from fault ride through obligations in the same circumstances as for wind generation.</p>
FSR-105	<p>The Code says compliance with fault ride through obligations is assessed through power system analysis, using study cases provided by the relevant transmission grid owner and power system assumptions provided by the System Operator. This does not reflect what happens in reality.</p>	<p>Amend the Code to reflect the actual arrangements in place to assess fault ride through compliance – ie, the System Operator provides network models to assess compliance.</p>
FSR-106	<p>The Code is inconsistent on what assets are excluded from the obligations to support frequency management in general and during under-frequency events.</p>	<p>Amend the Code to clarify what assets are excluded from the obligations to support frequency management in general and during under-frequency events.</p>

⁶ See clauses 8.42 and 8.43 of the Code.

How to make a submission

- 1.6. The Authority's preference is to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix A. Submissions in electronic form should be emailed to fsr@ea.govt.nz with "Consultation Paper— Omnibus of common quality Code amendment proposals" in the subject line.
- 1.7. If you cannot send your submission electronically, please contact the Authority (at fsr@ea.govt.nz or 04 460 8860) to discuss alternative arrangements.
- 1.8. Please note the Authority intends to publish all submissions we receive. If you consider that the Authority should not publish any part of your submission, please:
 - (a) indicate which part should not be published,
 - (b) explain why you consider we should not publish that part, and
 - (c) provide a version of your submission that the Authority can publish (if we agree not to publish your full submission).
- 1.9. If you indicate part of your submission should not be published, the Authority will discuss this with you before deciding whether to not publish that part of your submission.
- 1.10. However, please note that all submissions received by the Authority, including any parts that the Authority does not publish, can be requested under the Official Information Act 1982. This means the Authority would be required to release material not published unless good reason existed under the Official Information Act to withhold it. The Authority would normally consult with you before releasing any material that you said should not be published.

When to make a submission

- 1.11. Please deliver your submission by 5pm on Tuesday 12 May 2026

2. Background

- 2.1. New Zealand's power system is undergoing a significant transformation. As the economy becomes more electrified, managing peak demand fluctuations, increasing variability and intermittency of energy sources, and maintaining system resilience will become more difficult.
- 2.2. The power system needs to both support and respond to this electrification and the resulting increase in electricity demand. A critical challenge is to ensure reliability of supply during the transition, delivered at minimal cost to consumers.

What do we mean by 'power system'?

It is all the components of the New Zealand electricity system underpinning the New Zealand electricity market, including generation, transmission, distribution, and consumption (load) assets.

- 2.3. The Authority considers evolving technologies, particularly inverter-based resources, to be a key enabler of electrification. Examples of inverter-based resources include wind generation, solar photovoltaic generation, and battery energy storage systems. These technologies will enable consumers to have more choice and flexibility around their electricity use and supply.
- 2.4. However, the uptake of these technologies will lead to a significant increase in variable and intermittent generation, and increase in bi-directional power flows. These will pose challenges to the co-ordination of New Zealand's power system.
- 2.5. The Authority wants to address these challenges to promote a reliable electricity supply for consumers. Our Future Security and Resilience (FSR) workstream is one of several initiatives supporting the electrification of New Zealand's economy. Key complementary workstreams the Authority is working on include:
 - (a) Ancillary services (multiple frequency keeping) review
 - (b) Improving network visibility
 - (c) Developing solutions for peak capacity issues
 - (d) More efficient connection prices and processes
 - (e) Enabling Multiple Trading Relationships (MTR) and switch process review
 - (f) The Power Innovation Pathway (PIP) programme.

The Authority is reviewing Part 8 common quality requirements

- 2.6. This paper is part of the Authority's multi-year FSR work programme which seeks to ensure New Zealand's power system remains secure and resilient as the country transitions towards a lower emissions economy.
- 2.7. The highest priority activity in the FSR work programme is a review of common quality requirements in Part 8 of the Code. The review's purpose is to ensure these requirements enable evolving technologies, particularly inverter-based resources, in a manner that is consistent with the Authority's statutory objectives.

- 2.8. For the purposes of the Part 8 common quality requirements review, the Authority is defining common quality to apply across all of New Zealand's connected transmission and distribution networks. This is broader than the Code's definition, which is limited to only the transmission grid. The broader definition being used in the FSR programmes acknowledges that various security and resilience challenges and opportunities will be common to the transmission grid and distribution networks.

What is 'common quality'?

'Common quality' means those elements of the quality of electricity conveyed across New Zealand's power system that cannot be technically or commercially isolated to an identifiable person or group of persons. An example is the frequency of electricity.

- 2.9. The Authority published an issues paper in April 2023 which set out seven key issues related to the common quality requirements.⁷ We have released several consultation papers on these seven key issues. These papers and more background about the FSR work programme can be found on our website.⁸

Frequency	Issue 1	An increasing amount of variable and intermittent resources, primarily in the form of wind and solar PV generation, is likely to cause more variability in frequency within the 'normal band' of 49.8-50.2 Hertz, which is likely to be exacerbated over time by falling system inertia.
Voltage	Issue 2	An increasing amount of variable and intermittent resources, primarily in the form of wind and solar PV generation, is likely to cause larger voltage deviations, which are exacerbated by changing patterns of reactive power flows.
	Issue 3	Increasing amounts of inverter-based variable and intermittent resources will reduce the transmission network's system strength thereby increasing the likelihood of network performance issues if inverter-based resources disconnect from the power system.
	Issue 4	Over time increasingly less generation capacity is expected to be subject to fault ride through obligations in the Code, as more generating stations export less than 30MW to a network.
Harmonics	Issue 5	There is some ambiguity around the applicability of harmonics standards and who manages harmonics (including the allocation of harmonics).
Information	Issue 6	Network operators have insufficient information on assets wanting to connect, or which are connected, to the power system to provide for the planning and operation of the power system in a safe, reliable, and economically efficient manner.
Code terminology	Issue 7	The Code is missing some terms that would help enable new technologies and has other terms that appear not to enable new technologies.

⁷ [Issues paper: Review of common quality requirements in Part 8 of the Code](#)

⁸ [Future security and resilience | Our projects | Electricity Authority](#)

2.10. In October 2024, we published a consultation paper ‘Part 8 Code amendment proposal – Part 1’, which contained an omnibus of Code amendment proposals related to two of the seven key issues.⁹ This consultation paper addressed information and Code terminology. The resulting Code amendments came into effect on 1 May 2025.¹⁰

This consultation’s Code amendment proposals

- 2.11. This current consultation paper sets out the next omnibus of common quality-related Code amendment proposals. The problems, proposed Code amendments, and associated regulatory statements are set out in the following chapters.
- 2.12. The Code amendment proposals would, in aggregate, promote all three limbs of the Authority’s main statutory objective. That is, they would promote competition in, reliable supply by, and efficient operation of, the electricity industry for the long-term benefit of consumers. The following table summarises the main way in which each proposal promotes the Authority’s statutory objective.

How the Code amendment proposals further our main statutory objective

Proposal number	Limb of main Authority statutory objective that is promoted
FSR-101	Promotes reliable supply by the electricity industry
FSR-102	Promotes efficient operation of the electricity industry
FSR-103	Promotes efficient operation of the electricity industry
FSR-104	Promotes competition in, and efficient operation of, the electricity industry
FSR-105	Promotes efficient operation of the electricity industry
FSR-106	Promotes reliable supply by, and efficient operation of, the electricity industry

The Authority has obtained technical input

- 2.13. In preparing these six Code amendment proposals, the Authority has sought technical advice from the Common Quality Technical Group¹¹. The knowledge and experience of this group collectively ranges from the operation of the power system at both the transmission and distribution levels to the operation of generation and demand-side management technologies.
- 2.14. This paper makes several references to the Policy Statement. This is a document incorporated by reference in the Code. It primarily sets out the policies the System Operator will use to meet its Code obligations, including the principal performance obligations, related to maintaining a stable and reliable power system.¹²

⁹ [Part 8 Code amendment proposal – Part 1.](#)

¹⁰ Decision paper: [Part 8 Code terminology and network information.](#)

¹¹ [Common Quality technical group \(CQTG\)](#)

¹² [Electricity Authority I Policy Statement.](#)

3. FSR-101: Align over-frequency limits between the Code and the Policy Statement

- 3.1. This chapter sets out a proposal to amend Part 7 of the Code to specify upper limits on electricity frequency to be maintained by the System Operator that align with the upper limits in the Policy Statement.
- 3.2. This proposal is expected to promote reliable electricity supply by, amongst other things, placing an explicit obligation on the System Operator to prevent frequency exceeding upper limits. This in turn clarifies the basis for the System Operator taking necessary actions to prevent over-frequency on the power system.

The existing arrangements

- 3.3. Transpower as the System Operator is responsible for coordinating and managing the real time supply of electricity across New Zealand's transmission grid.
- 3.4. Part 7 of the Code places high-level, output-focussed 'principal performance obligations' on the System Operator.¹³ These include maintaining the frequency of electricity across New Zealand's power system in the range of 49.8–50.2 Hertz (defined in the Code as the 'normal band'), except during frequency fluctuations caused by a contingent event or an extended contingent event.¹⁴
- 3.5. The principal performance obligations specify minimum frequency levels the System Operator must maintain during different events. During a contingent event, frequency must remain at or above 48 Hertz for the island in which the contingent event takes place. During an extended contingent event, frequency must remain at or above 47 Hertz in the North Island and at or above 45 Hertz in the South Island.
- 3.6. The principal performance obligations do not currently require the System Operator to maintain electricity frequency below a maximum level. Prior to May 2016 the System Operator was required to maintain frequency below 52 Hertz for the North Island and 55 Hertz for the South Island. The reason the North Island limit was 52 Hertz, lower than the South Island, was to cater for combined cycle gas turbines connected to the power system in the North Island. These could not operate at the South Island's higher frequency limit.
- 3.7. The Policy Statement requires the System Operator to procure over frequency reserves in accordance with the Procurement Plan¹⁵ and to dispatch these reserves

¹³ Clauses 7.2A to 7.2D in the Code set out the principal performance obligations.

¹⁴ A **contingent event** is an event affecting the power system where the impact, the probability of occurrence, and the estimated costs and benefits of mitigation are considered to justify implementing policies that are intended to be incorporated into the scheduling and dispatch processes pre-event. An **extended contingent event** is an event where the impact, probability, costs and benefits are not considered to justify the controls required to totally avoid demand shedding or maintain the same quality limits defined for contingent events. See clause 12 of the Policy Statement.

¹⁵ The Procurement Plan is a document incorporated by reference in the Code that sets out how the System Operator determines the quantity of ancillary services it needs to perform its role and arrangements for the purchase of these ancillary services. The System Operator may purchase the

when necessary to maintain frequency below 52 Hertz in the North Island and 55 Hertz in the South Island for contingent and extended contingent events.¹⁶

- 3.8. This is consistent with the System Operator planning to not let frequency rise above 52 Hertz in the North Island and 55 Hertz in the South Island, as set out in the security policy within the Policy Statement.¹⁷ It is also consistent with the maximum South Island frequency specified in Part 1 of the Code.¹⁸

Issue with existing arrangements

- 3.9. Part 7 of the Code does not specify a maximum frequency for the North Island – in contrast to the South Island. This means the Code does not provide the basis for the Policy Statement setting 52 Hertz as the over-frequency limit for the North Island during both a contingent event and an extended contingent event.
- 3.10. The Authority considers it preferable to specify in the Code itself an important operating standard like the maximum North Island frequency, as is done for the maximum South Island frequency. Having this standard in the Code clarifies the basis for the System Operator’s over-frequency management actions under the Policy Statement. Having this standard in the Code also better facilitates all industry participants being aware of the standard, in contrast to the Policy Statement, which is a document primarily used by the System Operator.

Proposal

- 3.11. To address the issue identified in the preceding section, the Authority proposes to re-insert in Part 7 a principal performance obligation for the System Operator to ensure frequency does not exceed 52 Hertz in the North Island or 55 Hertz in the South Island (during a contingent event and an extended contingent event). This would:
- (a) place an explicit obligation on the System Operator in the Code to prevent frequency exceeding these limits, in a manner consistent with the obligation on the System Operator to prevent frequency falling below 47 Hertz in the North Island and 45 Hertz in the South Island during an extended contingent event¹⁹
 - (b) clarify the basis for the quality levels related to over-frequency that the System Operator plans to achieve for contingent and extended contingent events – ie, that during the occurrence of a contingent event, frequency will not rise above 52 Hertz in the North Island or 55 Hertz in the South Island²⁰

following ancillary services – frequency keeping, instantaneous reserve, over frequency reserve, voltage support, black start.

¹⁶ See clauses 35 and 36 of the Policy Statement.

¹⁷ See clause 17.1.4 of the Policy Statement.

¹⁸ See clause 1.1(1) of the Code, which defines ‘maximum South Island frequency’ to mean the maximum frequency permitted in the South Island, which is 55 Hertz.

¹⁹ See clause 7.2A(6)–(7) of the Code.

²⁰ See clause 17.1.4 of the Policy Statement.

- (c) clarify the basis for the System Operator’s over-frequency management arrangements in the Policy Statement²¹
 - (d) clarify the basis for the requirement in Part 8 of the Code for generators to use reasonable endeavours to take the following immediate independent action to assist in restoring frequency when the over-frequency limit of 50.5 Hertz is reached and the frequency continues to rise:
 - (i) decrease the energy injection from electrically connected generating units if the generator is physically capable of decreasing such injection
 - (ii) report to the System Operator as soon as practicable after taking this action.²²
- 3.12. As part of the proposal, the defined terms ‘maximum South Island frequency’ and ‘over frequency limit’ would be removed from Part 1 of the Code. The first of these definitions is not used in the Code at present, and under the proposal would be described only in the principal performance obligations in Part 7 of the Code. The second of these definitions is used only once in the Code – in clause 9 of Technical Code B of Schedule 8.3. The readability of this clause would be improved by inserting the meaning of ‘over frequency limit’, which is “the maximum frequency of 50.5 Hz”. Accordingly, these two definitions are not required in Part 1 of the Code and can be removed.
- 3.13. The draft Code amendment for these proposed changes is set out below.

Part 1
Preliminary provisions

...

1.1 Interpretation

...

~~maximum South Island frequency means the maximum frequency permitted in the South Island, which is 55 Hertz~~

~~over frequency limit means the maximum frequency of 50.5 Hz~~

...

Part 7
System operator

...

7.2A System operator to maintain frequency

...

²¹ See clauses 35–36 of the Policy Statement.

²² See clause 9(b) of Technical Code B, Schedule 8.3 of the Code.

- (5) During a contingent event in the North Island, the **system operator** must ensure that, for the ~~that island in which the contingent event takes place~~—
- (a) frequency remains at or above 48 Hertz and at or below 52 Hertz during the contingent event; and
 - (b) frequency returns to or above 49.25 Hertz and to or below 51.25 Hertz within 60 seconds after the contingent event.

(5A) During a contingent event in the South Island, the **system operator** must ensure that, for that island—

- (a) frequency remains at or above 48 Hertz and at or below 55 Hertz during the contingent event; and
- (b) frequency returns to or above 49.25 Hertz and to or below 52 Hertz within 60 seconds after the contingent event.

- (6) During an extended contingent event in the North Island, the **system operator** must ensure that, for that **island**—
- (a) frequency remains at or above 47 Hertz and at or below 52 Hertz during the extended contingent event; and
 - (b) frequency does not drop to or below 47.1 Hertz for longer than 5 seconds during the extended contingent event; and
 - (c) frequency does not drop to or below 47.3 Hertz for longer than 20 seconds during the extended contingent event; and
 - (d) frequency returns to or above 49.25 Hertz and to or below 51.25 Hertz within 60 seconds after the extended contingent event.
- (7) During an extended contingent event in the South Island, the **system operator** must ensure that, for that **island**—
- (a) frequency remains at or above 45 Hertz and at or below 55 Hertz during the extended contingent event; and
 - (b) frequency returns to or above 49.25 Hertz and to or below 52 Hertz within 60 seconds after the extended contingent event.

...

Part 8

Common quality

...

Schedule 8.3

Technical codes

...

Technical Code B – Emergencies

...

9 Obligations of generators and ancillary service agents to take independent action

The following independent action is required of **generators** and **ancillary service agents** during the occurrence of extreme variations of frequency or voltage at the **points of connection** to which their **assets** are connected (such extreme levels of frequency or voltage are deemed to constitute a **grid emergency** and require a fast and independent response from each **generator** and each **ancillary service agent**):

...

- (b) when ~~the over frequency limit is reached and~~ the frequency reaches 50.5 Hertz and continues to rise, each **generator** must use reasonable endeavours to take the following immediate independent action to assist in restoring frequency:
 - (i) decrease the energy injection from **electrically connected generating units** if the **generator** is physically capable of decreasing such **injection**;
 - (ii) report to the **system operator** as soon as practicable after taking action in accordance with subparagraph (i):

Regulatory Statement

Objective of the proposed amendment

- 3.14. The objective of this proposed Code amendment is to:
 - (a) specify the basis for the Policy Statement setting 52 Hertz as the over-frequency limit for the North Island during both a contingent event and an extended contingent event
 - (b) clarify the basis for the System Operator's over-frequency management actions.

Evaluation of the costs and benefits of the proposed amendment

- 3.15. The proposed amendment is expected to promote reliable electricity supply to consumers by reducing reliability of supply risks. It does this in three main ways.
- 3.16. First, it provides regulatory certainty in the Code about the maximum frequency limit in the North Island, which is designed to ensure combined cycle gas turbines connected to the power system in the North Island do not trip off due to overly high system frequency.
- 3.17. Second, it clarifies that the System Operator's actions to manage over-frequency on the power system are permitted for the purpose of the System Operator planning to comply, and complying, with its principal performance obligations.
- 3.18. Lastly, it improves the readability of the Code, making it easier for industry participants to understand their obligations to support reliable electricity supply.
- 3.19. We expect the costs of the proposed Code amendment to be negligible. This is because the System Operator already manages over-frequency according to the over-frequency arrangements in the Policy Statement, which were developed when managing over-frequency was included in the System Operator's principal performance obligations.

Evaluation of the alternative means of achieving the objective of the proposed amendment

- 3.20. The Authority has not identified any alternative means of achieving the objective of the proposed Code amendment.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 3.21. The Authority considers that the proposed Code amendment is consistent with the Authority's main statutory objective and with section 32(1) of the Act, because it

promotes reliable electricity supply by the electricity industry. The amendment does this by:

- (a) including in Part 7 of the Code an upper limit on frequency, and
- (b) providing a firmer regulatory basis for the System Operator to take actions necessary to prevent over-frequency on the power system, and
- (c) clarifying the basis for generators taking independent action to stop frequency rising too high.

Assessment against Code amendment principles

3.22. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent that they are relevant. In particular, the proposed Code amendment:

- (a) addresses a problem created by the existing Code, which requires an amendment to address
- (b) promotes reliable supply of electricity to consumers.

Q1. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q2. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

4. FSR-102: Clarify requirements for voltage control systems and connection transformers

- 4.1. This chapter sets out a proposal to amend Part 8 of the Code to clarify that, for transmission-connected generating stations:
- (a) a generating unit is not required to have a voltage control system if the generating station is equipped with a voltage control system
 - (b) the requirement to provide a connection transformer applies at the point of connection between the transmission grid and the generating station in instances where the generating units that form part of the station do not themselves have a point of connection on the grid.
- 4.2. This proposal promotes efficient operation of the electricity industry by improving the clarity and operation of the Code.

The existing arrangements

- 4.3. The Code requires generators to ensure that each of their generating units connected to New Zealand's transmission grid is equipped with:
- (a) a voltage control system—
 - (i) with a voltage set point that is adjustable over the voltage range in clause 8.23 of the Code, and
 - (ii) that operates continuously in the voltage control mode when synchronised, and
 - (b) to meet the asset owner performance obligations, either:
 - (i) a connection transformer with an appropriate range of taps together with an on-load tap changer, or
 - (ii) assets to give a dynamic performance equivalent to those required by subparagraph (i).²³

Issue with existing arrangements

- 4.4. The wording of these Code requirements is unclear. The requirements could be interpreted as applying to generating units that form part of a generating station with a point of connection on the transmission grid but where the units do not themselves have a point of connection on the grid. For example, the current wording of this clause could be interpreted to mean that each wind turbine of a wind farm connected to the transmission grid must have a connection transformer with an appropriate range of taps on each transformer together with an on-load tap changer.
- 4.5. This is not the intent behind the clause. Rather, the intent is as follows:

²³ See clause 5(2)(a) of Technical Code A, Schedule 8.3 of the Code.

- (a) Generating units that form part of a transmission-connected generating station, but which themselves do not have a point of connection on the transmission grid, are not required to have a voltage control system so long as the station has a voltage control system.
 - (b) The connection transformer requirement is intended to apply only in relation to the transformer(s) at grid connection points. In some cases, the connection transformer requirement will apply at a generating unit's point of connection on the grid (eg, in the case of a thermal power station with several large generating units). In other cases, the connection transformer requirement will apply at a generating station's point of connection on the grid (eg, a wind farm or a solar farm).
- 4.6. The purpose of these Code requirements is to help the System Operator manage voltages across the transmission grid. For grid-connected generating stations with generating units that do not have their own grid connection point (eg, wind farms and solar farms), this purpose can be achieved much more cost effectively by:
- (a) having a voltage control system for the generating station, rather than individual generating units
 - (b) having a connection transformer at the generating station's grid connection point(s) rather than at each individual generating unit.
- 4.7. In the absence of a clarification to the Code, new developers of electricity generation projects and the System Operator are likely to incur unnecessary transaction costs. These will be associated with the former seeking guidance from the latter on the meaning of these Code requirements. Such costs are inefficient and do not promote efficient operation of the electricity industry, for the long-term benefit of consumers.

Proposal

- 4.8. To address the issue described in the preceding section, the Authority proposes to amend clause 5 of Technical Code A of Schedule 8.3 of the Code to clarify that the requirement to provide a connection transformer applies at the point of connection between the transmission grid and a generating station or generating unit. This proposal does not apply for generators connected to distribution networks.

Schedule 8.3

Technical codes

...

Technical Code A – Assets

...

5 Specific requirements for generators

...

- (2) Each **generator** must ensure that for each of its ~~generating units~~ **generating stations** with a **point of connection on** ~~connected to~~ the **grid** ~~is equipped with,~~—
 - (a) if a **generating unit** is equipped with a voltage **control system**, the voltage **control system**—

- (i) ~~with has~~ a voltage set point that is adjustable over the range of ~~voltage voltages~~ set out in clause 8.23; and
 - (ii) operates continuously in the voltage control mode when **synchronised**; and
- (ab) ~~if a generating unit is not equipped with a voltage control system, then the generating station must be equipped with a voltage control system that—~~
- (i) ~~has a voltage set point that is adjustable over the range of voltages set out in clause 8.23; and~~
 - (ii) ~~operates continuously in the voltage control mode when synchronised; and~~
- (b) ~~in order to meet the asset owner performance obligations, the generating station has~~ either—
- (i) ~~a at least one~~ connection transformer, ~~located at the generating station's point of connection on the grid or between the generating station's point of connection on the grid and the generating units,~~ with an appropriate range of taps ~~on each transformer~~ together with an on-load tap-changer; or
 - (ii) **assets** to give a dynamic performance at least equivalent to those required by subparagraph (i).

...

Regulatory Statement

Objective of the proposed amendment

- 4.9. The objective of the proposed Code amendment is to clarify the obligations for the provision of voltage control systems and connection transformers at generating stations with a point of connection on the transmission grid.

Evaluation of the costs and benefits of the proposed amendment

- 4.10. The proposed Code amendment is expected to promote efficient operation of the electricity industry, for the long-term benefit of consumers, by reducing unnecessary transaction and compliance costs associated with interpreting and understanding the Code.
- 4.11. The Authority expects there to be negligible cost associated with this proposal since it is clarifying that no additional voltage control systems or connection transformers are needed for generating units that do not themselves have a point of connection on the transmission grid.

Evaluation of the alternative means of achieving the objective of the proposed amendment

- 4.12. The Authority has not identified any alternative means of achieving the objective of the proposed Code amendment.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 4.13. The Authority considers that the proposed Code amendment is consistent with the Authority's main statutory objective and with section 32(1) of the Act, because it promotes efficient operation of the electricity industry. The amendment does this by improving the clarity of obligations in the Code.

Assessment against Code amendment principles

- 4.14. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent that they are relevant. In particular, the proposed Code amendment:
- (a) addresses a problem created by the existing Code, which requires an amendment to address
 - (b) promotes efficient operation of the electricity industry, for the long-term benefit of consumers.

Q3. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q4. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

5. FSR-103: Amend the ‘fast instantaneous reserve’ and ‘sustained instantaneous reserve’ definitions

- 5.1. This chapter sets out a proposal to amend the definitions of ‘fast instantaneous reserve’ and ‘sustained instantaneous reserve’ in Part 1 of the Code to refer to technical requirements set out in the Procurement Plan.
- 5.2. This proposal promotes efficient operation of the electricity industry by improving the clarity and operation of the Code.

The existing arrangements

- 5.3. The System Operator is responsible for co-ordinating and managing the real time transmission of electricity on New Zealand’s transmission grid. The System Operator’s responsibilities include maintaining frequency, voltage, and system security. Clauses 7.2A–7.2D of the Code set out principal performance obligations the System Operator must meet and the Policy Statement sets out how the System Operator will meet those obligations.
- 5.4. The System Operator procures ancillary services to help meet its obligations. There are currently five categories of ancillary services – frequency keeping, voltage support, black start, over-frequency reserve, and instantaneous reserve. A sixth ancillary service – emergency reserve – will be implemented in the fourth quarter of 2026.²⁴ The Code sets out definitions for these various ancillary services.
- 5.5. Ancillary services are provided by generators, distributors, or other industry participants under contract to the System Operator. The Procurement Plan sets out the processes and mechanisms associated with the System Operator procuring ancillary services, as well as the technical requirements and key contractual terms applying to each service. The Procurement Plan is a document incorporated by reference in the Code.²⁵
- 5.6. Instantaneous reserve helps to arrest the fall in frequency in the event of a sudden loss of electricity supply by either a large generating plant or the High Voltage Direct Current (HVDC) link between the North Island and South Island, and to allow frequency to recover promptly to 50 Hertz. There are two main types of instantaneous reserve:
 - (a) fast instantaneous reserve
 - (b) sustained instantaneous reserve.
- 5.7. Part 1 of the Code defines ‘instantaneous reserve’, ‘fast instantaneous reserve’, and ‘sustained instantaneous reserve’ as follows:

instantaneous reserve means an **ancillary service** provided to balance the injection of **electricity** into the **grid** with the offtake of **electricity** from the **grid** following a

²⁴ [Emergency reserve | Electricity Authority](#)

²⁵ See clauses 8.42 and 8.43 of the Code

drop in system frequency to the level specified in the **procurement plan**, comprising 1 or more of the following:

- (a) **interruptible load**:
- (b) **generation reserve**

fast instantaneous reserve means the increase in generation or reduction in **demand** (in **MW**) provided no later than 6 seconds, and measured at 6 seconds, after the start of a “Contingent Event” (as defined in the **policy statement**) and that is sustained until at least 60 seconds after the start of the “Contingent Event”

sustained instantaneous reserve means the average increase in generation or reduction in **demand** (in **MW**) provided by **instantaneous reserve** during the first 60 seconds after the start of a “Contingent Event” (as defined in the **policy statement**) and that is sustained for at least 15 minutes after the start of the “Contingent Event” (unless a new **dispatch instruction** is given before the expiry of that 15 minute period).

Issue with existing arrangements

- 5.8. The current definition of fast instantaneous reserve is the result of the following amendments to the previous definition, which were made in May 2022. These changes were to enable energy storage systems to offer instantaneous reserve.²⁶

fast instantaneous reserve means—

- (a) ~~for providers of **partly loaded spinning reserve and tail water depressed reserve**, the additional capacity~~ the increase in generation or reduction in **demand load** (in **MW**) provided **by instantaneous reserve** no later than 6 seconds, and measured at 6 seconds, after the start of a “Contingent Event” (as defined in the **policy statement**) and that is sustained until at least 60 seconds after the start of the “Contingent Event” for a period of at least 60 seconds;
and
- (b) ~~for providers of **interruptible load**, the drop in load (in **MW**) that occurs within 1 second of the **grid** system frequency falling to or below 49.2 Hertz that is sustained for a period of at least 60 seconds~~

- 5.9. The 2022 amendment to the definition of fast instantaneous reserve removed the reference to interruptible load having to respond within one second. This requirement is now set out only in the Procurement Plan.²⁷
- 5.10. The Authority understands the inclusion of “no later than 6 seconds, and measured at 6 seconds” has created confusion for industry participants, as to whether interruptible load must be provided within one second or within six seconds.
- 5.11. Separately, the inclusion of a performance requirement for generation and load in the definition of sustained instantaneous reserve in Part 1 of the Code means this definition also has the potential to cause confusion for industry participants. This is

²⁶ Electricity Industry Participation Code Amendment (Enabling Energy Storage Systems to Offer Instantaneous Reserve) 2022 - [Enabling-energy-storage-systems-to-offer-instantaneous-reserve-Final-Decision-paper.pdf](#).

²⁷ [Electricity Authority | Procurement Plan](#) – see clause B46.1.1.

because the performance requirements on interruptible load in the definition differ somewhat from the performance requirements on interruptible load set out in the Procurement Plan.

5.12. Specifically, the Procurement Plan requires that interruptible load, other than interruptible load provided by battery energy storage systems, must meet the following performance requirements:

- (a) The average drop in load (in MW) must occur over the first 60 seconds after the grid system frequency falls to or below 49.2 Hertz, or the trip frequency specified in the ancillary service agent’s ancillary service procurement contract, and must be sustained for a period of at least 30 minutes or until instructed by the System Operator, whichever is lesser. The ancillary service agent must use reasonable endeavours to maintain the sustained instantaneous reserve response after the 30-minute period for as long as the grid system frequency remains below the normal band.²⁸
- (b) In assessing the delivery of interruptible load, other than that provided from battery energy storage systems, the System Operator must apply the following methodology:

Sustained instantaneous reserve must be calculated as the average reduction in load that occurs over the first 60 seconds after either the grid system frequency falls to or below 49.8 Hertz or the trip time. The average reduction in load is to be calculated from the pre-event load. Sustained instantaneous reserve load is not to be restored until advised by the System Operator.²⁹

5.13. Additionally, Part 1 of the Code and the Procurement Plan differ in how they define sustained instantaneous reserve provided by load, as shown in the table below.

Definition in the Code	Definition in the Procurement Plan
The average reduction in demand (being the rate of consumption of electrical energy), ³⁰ in MW, during the first 60 seconds after the start of a contingent event.	The average drop in load, in MW, over the first 60 seconds after the transmission grid system frequency falls— <ul style="list-style-type: none"> (a) to or below 49.2 Hertz, or (b) to the trip frequency specified in the ancillary service agent’s ancillary service procurement contract (for interruptible load other than that provided by battery energy storage systems).

²⁸ See clause B37.2 of the Procurement Plan.

²⁹ See clause B40.2 of the Procurement Plan.

³⁰ See the definition of ‘demand’ in clause 1(1) of the Code.

- 5.14. These slightly differing requirements introduce ambiguity into the Code and create the potential for confusion for industry participants.
- 5.15. In the absence of clarifications to the Code in relation to these three issues, instantaneous reserve providers and the System Operator are likely to incur unnecessary transaction costs. These will be associated with the former seeking guidance from the latter on the meaning of these aspects of the Code. Such costs are inefficient and do not promote efficient operation of electricity industry, for the long-term benefit of consumers.

Proposal

- 5.16. To address the issues described in the preceding section, the Authority proposes to amend the definitions of **fast instantaneous reserve** and **sustained instantaneous reserve** in Part 1 of the Code. Under our proposal the performance requirements for these two forms of instantaneous reserve would be defined primarily in the Procurement Plan.

- 5.17. We propose amending the definition of **fast instantaneous reserve** as follows:

fast instantaneous reserve means ~~instantaneous reserve provided the increase in generation or reduction in demand (in MW) provided no later than 6 seconds, and measured at 6 seconds,~~ after the start of a “Contingent Event” or an “Extended Contingent Event” (both as defined in the **policy statement**) in accordance with the requirements for fast instantaneous reserve set out in the **procurement plan** and that is sustained until at least 60 seconds after the start of the “Contingent Event” or “Extended Contingent Event”.

- 5.18. We propose amending the definition of **sustained instantaneous reserve** as follows:

sustained instantaneous reserve means ~~instantaneous reserve provided the average increase in generation or reduction in demand (in MW) provided by instantaneous reserve during the first 60 seconds~~ after the start of a “Contingent Event” or an “Extended Contingent Event” (both as defined in the **policy statement**) in accordance with the requirements for sustained instantaneous reserve set out in the **procurement plan** and that is sustained until at least 15 minutes after the start of the “Contingent Event” or “Extended Contingent Event” (unless a new **dispatch instruction** is given before the expiry of that 15 minute period).

- 5.19. These proposed changes would first require an update to the Procurement Plan³¹ to specify the performance requirements for fast instantaneous reserve and sustained instantaneous reserve provided by generation and battery energy storage systems. That is, prior to the proposed Code changes taking effect, the Procurement Plan would need to state that generation and battery energy storage systems must provide:

³¹ The Code sets out the process by which any amendments to a system operation document, including the procurement plan, are to be made. The Authority has the power to direct the System Operator to consider an amendment proposal (cl 7.13(2)(a)). In practice the two organisations work closely on amendments

- (a) fast instantaneous reserve no later than six seconds after the trigger point for the reserve provision
- (b) sustained instantaneous reserve no later than 60 seconds after the trigger point for the reserve provision.

Regulatory Statement

Objective of the proposed amendment

- 5.20. The objective of the proposed Code amendment is to improve regulatory clarity for industry participants as to what is meant by fast instantaneous reserve and sustained instantaneous reserve.

Evaluation of the costs and benefits of the proposed amendment

- 5.21. The proposed Code amendment is expected to promote efficient operation of the electricity industry, for the long-term benefit of consumers, by reducing unnecessary transaction and compliance costs associated with interpreting and understanding the Code.
- 5.22. As the Procurement Plan would need updating should the proposed amendment be made, the System Operator would incur some costs associated with updating that document. To minimise these, the Authority proposes that, should we make the proposed Code amendment, we would set an implementation date that enabled the System Operator to make changes to the Procurement Plan as part of its next update. We consider this incremental cost of the proposed Code amendment would therefore be minor – certainly less than the identified benefit.
- 5.23. Other than this cost, the Authority expects there to be minimal added cost associated with this proposal as it is simply clarifying existing arrangements.

Evaluation of the alternative means of achieving the objective of the proposed amendment

- 5.24. An alternative means of achieving the objective of the proposed amendment would be to expand the definitions of fast instantaneous reserve and sustained instantaneous reserve in Part 1 of the Code, to include more detail rather than having this detail in the Procurement Plan.
- 5.25. We decided against this approach as it would cause duplication in the Code and the Procurement Plan and create the risk of future changes to the definitions of fast instantaneous reserve and sustained instantaneous reserve creating inconsistencies between the main body of the Code and the Procurement Plan, causing ambiguity for industry participants.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 5.26. The Authority considers that the proposed Code amendment is consistent with the Authority's main statutory objective and with section 32(1) of the Act, because it promotes efficient operation of the electricity industry. The amendment does this by improving the clarity of obligations in the Code.

Assessment against Code amendment principles

- 5.27. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent that they are relevant. In particular, the proposed Code amendment:
- (a) addresses a problem created by the existing Code, which requires an amendment to address
 - (b) promotes efficient operation of the electricity industry, for the long-term benefit of consumers.

Q5. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q6. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

6. FSR-104: Revise two fault ride through exclusions

- 6.1. This chapter sets out a proposal to amend Part 8 of the Code to extend to other forms of variable and intermittent generation an exclusion from an aspect of the fault ride through obligations that currently applies only to wind generation.
- 6.2. This proposal promotes:
- (a) competition in the electricity industry by removing a potential competitive advantage for wind generation over other types of variable and intermittent generation, that is created by the Code
 - (b) efficient operation of the electricity industry by avoiding costs associated with dispensations and compliance monitoring.

The existing arrangements

- 6.3. Earlier versions of the Code were drafted for a power system where the supply of electricity to consumers was dominated by large-scale hydro, thermal and geothermal controllable generation. Over recent years several Code amendments have been made to accommodate new and evolving technologies, such as wind and solar photovoltaic generation and battery energy storage systems.
- 6.4. Clause 8.25A requires generators to ensure their assets, when electrically connected to a network, are capable of remaining stable and electrically connected during transmission faults. This is referred to as fault ride through. This helps avoid 'sympathetic' tripping³² of generating units/stations that in turn results in power supply interruptions for consumers.

Issue with existing arrangements

- 6.5. Two clauses in the Code's fault ride through provisions exclude wind generation from the fault ride through obligations in certain circumstances:
- (a) clause 8.25B(3)
 - (b) clause 8.25D(a).
- 6.6. Clause 8.25B(3) states if a wind generating station's wind power source has reduced during the six seconds following the start of a transmission fault, the relative change in each of its generating units' active power output does not have to be in proportion to the transmission voltage for the six seconds immediately following the clearance of the fault.
- 6.7. The Authority considers the basis for clause 8.25B(3) extends beyond wind generation. By referring only to wind generation, clause 8.25B(3) does not cater for other forms of variable and intermittent generation that face the same challenge providing active power immediately following a transmission fault. For example, solar photovoltaic generation is also unable to actively restore power immediately

³² 'Sympathetic' tripping of a generating unit occurs when the generating unit's protection equipment disconnects the unit from the network because of a disturbance on the network.

after a fault. Therefore, clause 8.25B(3) may provide wind generation with a competitive advantage over other variable and intermittent generation technologies.

- 6.8. Clause 8.25D(a) states that the Code's fault ride through obligations do not apply to a wind generating station when it operates at less than 5% of rated MW.
- 6.9. Clause 8.25D(a) was introduced in 2016 when the fault ride through provisions were inserted in the Code. The reason for the clause was that wind generating units should only be required to comply with the fault ride through requirements when operating in a stable mode. Clause 8.25D(a) anticipates that when a wind generating station is operating at less than 5% of rated output, it is likely that wind speeds are within the range where wind turbines cut in and cut out (ie, start and stop generating electricity).
- 6.10. The Authority considers it very unlikely that a wind generating station would be electrically connected to the network if the station was operating at less than 5% of rated output. Therefore, we consider this exclusion to be unnecessary. Also, the system operator has advised the Authority that it is very difficult to monitor compliance with clause 8.25D(a).

Proposal

- 6.11. To address the issues described in the preceding section, the Authority proposes to amend clauses 8.25B(3) and 8.25D(a).
- 6.12. We propose amending clause 8.25B(3) to say all forms of transmission-connected variable and intermittent generation do not have to comply with clause 8.25B(2) if there is a reduction in the intermittent power source during the six seconds following the commencement of a transmission fault:

8.25B Reactive current and active power output

...

- (2) Each **generator** must ensure that each of its **generating units** provides **active power** output relative to pre-fault **active power** output at least in proportion to the **grid** voltage at the **grid injection point** for the period of 6 seconds immediately following the clearance of a fault on the **grid** of a type described in clause 8.25A(1).
- (3) Subclause (2) does not apply to **a wind an intermittent generating station** if there has been a reduction in ~~the its variable and/or~~ intermittent **wind** power source during the 6 seconds following the commencement of the fault.
- 6.13. We propose to delete clause 8.25D(a):

8.25D Application

Clauses 8.25A and 8.25B do not apply—

- ~~(a) to a wind generating station when it operates at less than 5% of rated MW; or~~
- (b) to any **asset** at an **excluded generation station**.

Regulatory Statement

Objective of the proposed amendment

- 6.14. The objective of the proposed Code amendment is to ensure that the exclusion from complying with certain fault ride through obligations in Part 8 applies consistently to all generation technologies that struggle to provide active power immediately following a transmission fault.

Evaluation of the costs and benefits of the proposed amendment

- 6.15. The proposed Code amendment is expected to promote competition in the electricity industry by better ensuring that generation technologies with the same technology-related challenges face the same regulatory obligations and associated costs. This facilitates a 'level playing field' across different generation technologies from a competition standpoint, which better enables the most efficient forms of electricity generation to deliver power to consumers at the lowest cost.
- 6.16. The proposal will also deliver an operational efficiency benefit, for the long-term benefit of consumers. This is due to:
- (a) generators and the System Operator not being required to incur costs associated with dispensations necessitated by the inability of a variable and intermittent generating station being unable to comply with clause 8.25B(3)
 - (b) the System Operator no longer monitoring compliance with clause 8.25D(a).
- 6.17. The Authority expects there to be negligible cost associated with this proposal since we are reducing, rather than increasing, the obligations for variable and intermittent generation. We consider that any cost associated with the System Operator managing the power system to accommodate variable and intermittent generation not complying with clause 8.25B(3) would not be an incremental cost of the proposal. We believe this cost would also arise under the status quo arrangements, due to generators applying for, and receiving, dispensations from clause 8.25B(3).

Evaluation of the alternative means of achieving the objectives of the proposed amendment

- 6.18. The Authority has not identified any alternative means of achieving the objective of the proposed Code amendment.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 6.19. The Authority considers that the proposed Code amendment is consistent with the Authority's main statutory objective and with section 32(1) of the Act, because it promotes competition in, and efficient operation of, the electricity industry. The amendment does this by:
- (a) placing the same Code obligations on generation technologies that face the same technology-related challenges, thereby facilitating a 'level playing field' across different generation technologies from a competition standpoint
 - (b) removing the need for dispensations in respect of clause 8.25B(3) and compliance monitoring in respect of clause 8.25D(a).

Assessment against Code amendment principles

6.20. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent that they are relevant. In particular, the proposed Code amendment:

- (a) addresses a problem created by the existing Code, which requires an amendment to address
- (b) promotes competition in the electricity industry
- (c) promotes efficient operation of the electricity industry, for the long-term benefit of consumers.

Q7. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q8. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

7. FSR-105: Clarify who provides information to assess compliance with fault ride through obligations

- 7.1. This chapter sets out a proposal to amend Part 8 of the Code to reflect current practice for assessing compliance with fault ride through obligations.
- 7.2. This proposal promotes efficient operation of the electricity industry by improving the clarity and operation of the Code.

The existing arrangements

- 7.3. Clause 8.25A requires generators to ensure their assets, when electrically connected to a network, are capable of remaining stable and electrically connected during transmission faults. This is referred to as fault ride through. This helps avoid 'sympathetic' tripping³³ of generating units/stations that in turn results in power supply interruptions for consumers.
- 7.4. Clause 8.25A(1) sets out fault ride through obligations in relation to faults on New Zealand's high voltage (ie, 110 kiloVolt (kV) and 220kV) transmission grid. Generators must ensure that, if there is a fault on the 110kV or 220kV transmission grid,³⁴ their generation assets electrically connected in the island where the fault occurs are capable of remaining stable and electrically connected for six seconds when the transmission grid voltage is within the 'no trip zone' specified in Figure 8.1 or Figure 8.2 (as applicable) of clause 8.25A.
- 7.5. Clause 8.25A(2) sets out fault ride through obligations in relation to trips of the HVDC link. Generators must ensure that, if there is a trip of the HVDC link, their generation assets electrically connected to a network are capable of remaining stable and electrically connected for one second when the voltage at the Haywards substation in the North Island and the Benmore substation in the South Island is within the 'no trip zone' specified in Figure 8.3 of clause 8.25A.
- 7.6. The Code requires that compliance with clause 8.25A(2) be checked through power system analysis that uses study cases provided by the relevant transmission grid owner and power system assumptions provided by the System Operator.³⁵

Issue with existing arrangements

- 7.7. Although clause 8.25A(3) specifies that fault ride through compliance is to be assessed using study cases provided by the relevant transmission grid owner, this does not reflect what happens in reality. Instead, the System Operator (not the relevant grid owner) provides network models (not study cases) to assess compliance. This is for reasons of practicality and efficiency.

³³ 'Sympathetic' tripping of a generating unit occurs when the generating unit's protection equipment disconnects the unit from the network because of a disturbance on the network.

³⁴ A zero impedance three-phase short circuit fault or an unbalanced short circuit fault.

³⁵ See clause 8.25A(3) of the Code.

- 7.8. In addition, the power system analysis undertaken in accordance with clause 8.25A(3) is used to determine a generator's compliance with not only clause 8.25A(2) but also clause 8.25A(1).
- 7.9. The Authority agrees with the two current practices described above. This is on the basis that they result in good outcomes for consumers – promoting reliable supply by, and efficient operation of, the electricity industry. In the absence of a clarification to the Code, new developers of electricity generation projects and the System Operator are likely to incur unnecessary transaction costs. These will be associated with the former seeking guidance from the latter on the meaning of this aspect of the Code. Such costs are inefficient and do not promote efficient operation of the electricity industry, for the long-term benefit of consumers.

Proposal

- 7.10. The Authority proposes to replace clause 8.25A(3) with new clause 8.25AB to reflect the actual arrangements in place to determine compliance with clause 8.25A(1) and (2).

8.25A Fault ride through

- (1) Each **generator** must ensure that each of its **assets**, when **electrically connected** to a **network**, is capable of remaining stable and **electrically connected** when the **grid's** lowest **line-to-line** voltage is within the no-trip zone shaded and marked "No-trip zone" in Figure 8.1 (for an **asset** in the North Island) or Figure 8.2 (for an **asset** in the South Island) for the period of 6 seconds immediately following the commencement of a zero impedance three-phase short circuit fault, or an unbalanced short circuit fault, on any part of the **grid** at 110 kV or 220 kV in the **island** in which the **asset** is connected.
- (2) Each **generator** must ensure that each of its **assets**, when **electrically connected** to a **network**, is capable of remaining stable and **electrically connected** when the highest **line-to-line** voltage at Haywards 220 kV ~~bus-busbar~~ (for an **asset** in the North Island) or Benmore 220 kV ~~bus-busbar~~ (for an **asset** in the South Island) is within the no-trip zone shaded and marked "No-trip zone" in Figure 8.3 for the period of 1 second immediately following the commencement of a trip of the **HVDC link**.
- ~~(3) Whether a **generator** is complying with subclause (2) must be determined using power system analysis that uses—~~
 - ~~(a) study cases provided by the relevant **grid owner**; and~~
 - ~~(b) relevant system assumptions provided by the **system operator**.~~
- (4) A **generator** is not required to comply with subclause (1) in respect of an **asset** in the event of a fault of a type described in subclause (1) if the **asset** becomes isolated from the **grid** as a result of the fault.
- (5) A **generating unit** need not comply with subclause (1) to the extent that it is complying with a **special protection scheme** approved by the **system operator**.
- (6) The absolute **grid** voltage (per unit) shown on the Y axis of Figure 8.1 and Figure 8.2 is the ratio of **grid** lowest **line-to-line** voltage on a **line** to the nominal operating voltage of the **line** (that is, 110 kV or 220 kV).

...

8.25AB Assessing fault ride through compliance

- (1) The **system operator** must assess whether each of a **generator's assets**, when **electrically connected** to a **network**, meets the requirements of clauses 8.25A(1) and

8.25A(2) by reviewing the power system analysis the **generator** must undertake in compliance with the fault ride through study obligations in the **connected asset commissioning, testing and information standard**..

- (2) The power system analysis referred to in subclause (1) must use—
- (a) for any **generating station** with a **point of connection** on the **grid**, one or more network models provided by the **system operator**; and
 - (b) subject to subclause (3), for any **embedded generating station**, one or more network models provided by the **system operator** and the **distributor** to whose **distribution network** the **embedded generating station** is directly connected; and
 - (c) relevant system assumptions provided by the **system operator**.
- (3) If there is a material inconsistency between the software type or the configuration of the network models provided by the **system operator** and the software type or the configuration of the network models provided by the **distributor** under subclause (2), the **generator** and the **system operator** must use the software type and the configuration of the network models provided by the **system operator** to the extent of the inconsistency.
- (4) If the **system operator** considers that a **generator's asset** does not meet the requirements of clauses 8.25A(1) and 8.25A(2), the **system operator** and the **generator** must seek to reach agreement on—
- (a) any further power system analysis needed to prove whether the **asset** meets the requirements of clauses 8.25A(1) and 8.25A(2); and
 - (b) any measures needed for the **asset** to meet the requirements of clauses 8.25A(1) and 8.25A(2).

...

Regulatory Statement

Objective of the proposed amendment

- 7.11. The objective of the proposed Code amendment is to clarify and align with actual practice the Code requirements for assessing compliance with fault ride through obligations.

Evaluation of the costs and benefits of the proposed amendment

- 7.12. The proposed Code amendment is expected to promote efficient operation of the electricity industry, for the long-term benefit of consumers, by reducing unnecessary transaction costs. These costs are associated with understanding and following processes that, although resulting in good outcomes for consumers, differ from those specified in the Code.
- 7.13. The Authority expects there to be negligible cost associated with this proposal since it reflects current practice.

Evaluation of the alternative means of achieving the objectives of the proposed amendment

- 7.14. The Authority has not identified any alternative means of achieving the objective of the proposed Code amendment.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 7.15. The Authority considers the proposed Code amendment is consistent with the Authority's main statutory objective, and with section 32(1) of the Act, because it promotes reliable supply of electricity to consumers, and efficient operation of the electricity industry. It does this by clarifying what information is required, and who should provide this information, to assess compliance with fault ride through obligations.

Assessment against Code amendment principles

- 7.16. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent they are relevant. In particular, the proposed Code amendment:
- (a) addresses a problem created by the existing Code, which requires an amendment to address
 - (b) promotes efficient operation of the electricity industry, for the long-term benefit of consumers.

Q9. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q10. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

8. FSR-106: Clarify obligations related to frequency management and frequency support

- 8.1. This chapter sets out a proposal to amend Part 8 of the Code to clarify and make consistent the exclusions from the obligations to support frequency management and frequency during under-frequency events.
- 8.2. This proposal promotes efficient operation of the electricity industry by improving the clarity and operation of the Code.

The existing arrangements

- 8.3. Clauses 8.17 and 8.19 of the Code set out generators' obligations to support frequency management in general and during under-frequency events.
- 8.4. The term 'excluded generating units' is used in clause 8.19(3) in relation to South Island generators' obligations to support frequency during under-frequency events. This is the only time this term is used in the Code.

Issue with existing arrangements

- 8.5. The Authority has formed the view that there is inconsistency across clauses 8.17, 8.19(1) and 8.19(3) in respect of what assets are excluded from the obligations to support frequency management and frequency during under-frequency events. Specifically:
 - (a) clause 8.17 refers to "generating units within an excluded generating station"
 - (b) clause 8.19(1) refers to "excluded generating stations" in their entirety
 - (c) clause 8.19(3) refers to "excluded generating units".
- 8.6. The use of the term 'excluded generating unit' adds unnecessary ambiguity to the application of clause 8.19(3) to South Island generators. The meaning of this term is unclear under the current drafting of clause 8.19(3). Read in isolation, it could be confused with the term 'excluded generating station', which is used several times in the Code and is defined in clause 8.21(1).³⁶
- 8.7. The Authority has also identified that a past reformatting of clause 8.19³⁷ resulted in the inadvertent removal of the obligation on South Island generators to sustain pre-event output at 47 Hertz. This is necessary to support the System Operator to plan to comply, and to comply, with the principal performance obligations set out in clauses 7.2A to 7.2D of the Code.

³⁶ Clause 8.21(1) reads as follows:

For the purposes of clauses 8.17, 8.19, 8.25D, and the provisions in **Technical Code A** of Schedule 8.3 relating to the obligations of **asset owners** in respect of frequency, an **excluded generating station** means a **generating station** that exports less than 30 MW to a **local network** or the **grid**, unless the **Authority** has issued a direction under clause 8.38 that the **generating station** must comply with clauses 8.17, 8.19, 8.25A, and 8.25B and the relevant provisions in **Technical Code A** of Schedule 8.3.

³⁷ This reformatting happened before the Code was introduced in 2010.

- 8.8. Lastly, clause 8.19 could be clarified by explicitly referring to North Island generators having the frequency support obligations under clause 8.19(1) and South Island generators having the frequency support obligations under clause 8.19(3). The current application of clause 8.19(1) to South Island generators is redundant because the obligations in this clause are less onerous than the obligations on South Island generators under clause 8.19(3).
- 8.9. In the absence of clarifications to the Code, new developers of electricity generation projects and the System Operator are likely to incur unnecessary transaction costs. These will be associated with the former seeking guidance from the latter on the meaning of these aspects of the Code. Such costs are inefficient and do not promote efficient operation of the electricity industry, for the long-term benefit of consumers.

Proposal

- 8.10. The Authority proposes to clarify and make consistent the drafting of clauses 8.17 and 8.19 in respect of what assets are excluded from the obligations in these clauses.
- 8.11. We propose to amend these two clauses as follows:

8.17 Contribution by injections to overall frequency management

(1) Subject to subclause (2), each ~~Each~~ generator ~~(while synchronised)~~ and the HVDC owner must ~~at all times~~ ensure that its assets, other than any ~~generating units within an excluded generating station,~~ at all times make the maximum possible injection contribution—

(a) ~~-to maintain frequency within the normal band;~~ and

(b) ~~-to restore frequency to the normal band)~~ when frequency is outside the normal band.

(2) Subclause (1) applies—

(a) to a generator only when its assets are synchronised; and

(b) to the HVDC owner only when the HVDC link is electrically connected.

(3) -Any ~~such~~ contribution made by the assets of a generator or the HVDC owner in accordance with subclause (1) must be assessed against the technical codes.

...

8.19 Contributions to frequency support in under frequency events

(1) ~~Subject to subclause (3), each~~ Each North Island generator must ~~at all times~~ ensure that, ~~while electrically connected,~~ its assets, other than any ~~excluded generating stations~~ ~~excluded generating station,~~ contribute to supporting frequency at all times while synchronised by ~~remaining synchronised,~~ ensuring that each of its ~~generating units remain synchronised~~ ~~can~~ and ~~does~~, at a minimum, sustain pre-event output—

(a) ~~at all times indefinitely~~ when the frequency is above 47.5 Hertz; and

(b) for at least 120 seconds when the frequency is 47.5 Hertz; and

(c) for at least 20 seconds when the frequency is 47.3 Hertz; and

(d) for at least 5 seconds when the frequency is 47.1 Hertz; and

(e) for at least 0.1 seconds when the frequency is 47.0 Hertz; and

- (f) at any frequencies between those specified in paragraphs (b) to (e) for times derived by linear interpolation.
- (2) If the **inherent characteristics** and design of a **generator's generating unit** are such that it is reasonably able to operate beyond the above requirements, the **generator** must declare such capabilities in accordance with clause 2(5) of **Technical Code A** of Schedule 8.3.
- (3) Each South Island generator must ensure that ~~each of its assets~~, other than ~~excluded generating units~~ any excluded generating station, contribute to supporting frequency at all times while synchronised by ensuring that each of its generating units remain remains synchronised, and ~~can and do~~, at a minimum, sustain pre-event output—
 - (a) ~~at all times indefinitely~~ when the frequency is at or above 47 Hertz; and
 - (b) for 30 seconds if the frequency falls below 47 Hertz but not below 45 Hertz.

...

Regulatory Statement

Objective of the proposed amendment

- 8.12. The objective of the proposed amendment is to make the Code clear and consistent in respect of what assets are excluded from the obligations to support frequency management and frequency during under frequency events.

Evaluation of the costs and benefits of the proposed amendment

- 8.13. The proposed Code amendment is expected to promote efficient operation of the electricity industry, for the long-term benefit of consumers, by reducing unnecessary transaction and compliance costs associated with interpreting and understanding the Code.
- 8.14. We also expect the proposed Code amendment would promote reliable supply by the electricity industry, to the extent that it provides regulatory certainty about the frequency management and frequency support obligations on asset owners.
- 8.15. The Authority expects there to be negligible cost associated with this proposal since it is clarifying existing practice.

Evaluation of the alternative means of achieving the objective of the proposed amendment

- 8.16. The Authority has not identified any alternative means of achieving the objective of the proposed Code amendment.

Assessment of the proposed Code amendment against section 32(1) of the Act

- 8.17. The Authority considers that the proposed Code amendment is consistent with the Authority's main statutory objective, and with section 32(1) of the Act, because it promotes reliable supply by, and efficient operation of, the electricity industry. The amendment does this by clarifying and making consistent the exclusions from the obligations to support frequency management and frequency during under-frequency events.

Assessment against Code amendment principles

- 8.18. The Authority considers there is a clear case for amending the Code, with there being a clear benefit. The proposed Code amendment is consistent with the Code amendment principles, outlined in the Authority's Consultation Charter, to the extent they are relevant. In particular, the proposed Code amendment:
- (a) addresses a problem created by the existing Code, which requires an amendment to address
 - (b) promotes reliable supply by, and efficient operation of, the electricity industry, for the long-term benefit of consumers.

Q11. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.

Q12. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.

Appendix A Format for submissions

Submitter	
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Proposal	Questions	Comments
FSR 101 Align over-frequency limits between the Code and the Policy Statement	Q1. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q.2 Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.	
FSR 102 Clarify requirements for voltage control systems and connection transformers	Q3. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q4. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.	
FSR 103 Amend the 'fast instantaneous reserve' and 'sustained instantaneous reserve' definitions	Q5. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q6. Do you agree with the analysis presented in this Regulatory Statement? If	

	not, please state why you do not agree.	
FSR 104 Revise two fault ride through exclusions	Q7. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q8. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.	
FSR 105 Clarify who provides information to assess compliance with fault ride through obligations	Q9. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q10. Do you agree with the analysis in this Regulatory Statement? If not, please state why you do not agree.	
FSR 106 Clarify obligations related to frequency management and frequency support	Q11. Do you agree the proposed Code amendment will achieve the objective? If you disagree, please explain why and give alternative options to achieve the objective.	
	Q12. Do you agree with the analysis presented in this Regulatory Statement? If not, please state why you do not agree.	