

# **Review of forecasting provisions for intermittent generators – proposed Code amendments**

Consultation paper

11 October 2024

## Executive summary

The Authority expects most new generation in New Zealand to come from intermittent energy sources such as wind and solar. However, the Authority has found that forecasts of intermittent generation are often highly inaccurate and unreliable close to real time, which causes problems for the power system and risks increasing costs for consumers.

To address these problems, the Authority undertook a review of forecasting provisions for intermittent generators. In July 2024, the Authority published a [Decision Paper](#) that presented the key decisions from the Authority's review.

The Authority's key decisions are to put in place a hybrid forecasting arrangement and to amend the Code to give effect to the new arrangement. The hybrid forecasting arrangement will provide a centrally procured forecast of intermittent generation for each generation site. Intermittent generators will be able to submit offers using their own forecast if they have approval from the Authority to do so. This would require an intermittent generator to show that its forecast is consistently at least as accurate as the centralised forecast.

These decisions aim to enhance the accuracy of intermittent generators' offers throughout all trading periods, increasing confidence in the availability of that generation. This will improve the reliability, efficiency and affordability of the electricity system. The hybrid arrangement is also expected to foster competition and innovation by reducing barriers for new intermittent generation developers to enter the market.

The purpose of this paper is to consult with interested parties on proposed changes to the Code to implement the decisions to put in place a hybrid forecasting arrangement for intermittent generators. The Code will specify the process requirements for submitting offers. These offer requirements will apply to all intermittent generators, including intermittent generators who base their offers on their own forecast. These requirements relate to matters such as:

- When intermittent generators must submit their first offer for a trading period.
- When intermittent generators are permitted to adjust their forecasts of generation potential.
- How often forecasts of generation potential must be revised.
- Backstop requirements in the event that the centralised forecaster has not issued a forecast.
- Removing the current requirement on intermittent generators to provide a monthly report to the Authority specifying when and why a 30MW over forecasting situation occurred.

The Authority will specify in guidance information for intermittent generators wanting to base their offers on their own forecast. This will include information on generation accuracy standards and the process intermittent generators will be expected to follow to be permitted to base their offers on their own forecast.

Requirements for the centralised forecaster will be specified in the contract between the Authority and the centralised forecaster. Some of the key requirements are described in this paper as they provide context for understanding the proposed Code amendments. For example, the requirements in the contract will cover:

- The number of days ahead that forecasts must be provided.

- The frequency at which forecasts must be revised.
- The forecast performance standards that will apply to the centralised forecaster (which will also apply to intermittent generators who seek to use their own forecasts).
- Who the forecast information must be shared with.

The Authority expects that the hybrid forecasting arrangement will generate benefits of at least \$15.4m over five years. The 15-year net present value is assessed as in a range from \$151.5m to \$326.5m. This reflects that the proportion of intermittent generation in 15 years is expected to be considerably higher than it is today.

The main benefits will be derived from more accurate forecasts and offers leading to more accurate price signals. In turn, this will reduce risks to security of supply and support the efficient use of resources.

To implement the policy decisions, a number of changes to the Code are required which are set out in this paper. These Code amendments will require intermittent generators to change their offer practices (eg, revising offers to reflect the latest forecast).

One of the proposed changes will require intermittent generators to submit their initial offer six days before the relevant trading period (compared to 1.5 days under the current Code). This will provide the system operator and market participants with better information about potential security issues and forecast price signals up to a week ahead. The Authority welcomes feedback specifically on this proposal.

The Authority now considers the appropriate mechanism to recoup the costs of the centralised forecasting service and contract management is under its levy-funded appropriation rather than via the clearing manager.

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# 1. What you need to know to make a submission

## What this consultation is about

- 1.1. In July 2024, the Authority published a Decision Paper that presented the key decisions from our review of forecasting provisions for intermittent generators.
- 1.2. The Authority has decided to put in place a hybrid forecasting arrangement and amend the Code to put in place this new arrangement. The purpose of this paper is to consult with interested parties on the changes to the Code to give effect to the hybrid forecasting arrangement decisions.
- 1.3. Section 39(1)(c) of the Electricity Industry Act 2010 (Act) requires the Authority to consult on any proposed amendment to the Electricity Industry Participation Code 2010 (Code) and corresponding regulatory statement.
- 1.4. Section 39(2) of the Act provides that the regulatory statement must include a statement of the objectives of the proposed Code amendments, an evaluation of the costs and benefits of the proposed amendments, and an evaluation of alternative means of achieving the objectives of the proposed amendments. The regulatory statement is set out in section 8 of this paper.

## How to make a submission

- 1.5. The Authority's preference is to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix B. Submissions in electronic form should be emailed to [forecasting@ea.govt.nz](mailto:forecasting@ea.govt.nz) with "Consultation Paper—" in the subject line.
- 1.6. If you cannot send your submission electronically, please contact the Authority ([forecasting@ea.govt.nz](mailto:forecasting@ea.govt.nz) or 04 460 8860) to discuss alternative arrangements.
- 1.7. Please note the Authority intends to publish all submissions it receives. If you consider that the Authority should not publish any part of your submission, please:
  - a) indicate which part should not be published and explain why you consider we should not publish that part, and
  - b) provide a version of your submission that the Authority can publish (if we agree not to publish your full submission).
- 1.8. 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.
- 1.9. 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

- 1.10. Please deliver your submission by **5pm on Friday 15 November 2024**.

- 1.11. Authority staff will acknowledge receipt of all submissions electronically. Please contact the Authority at [info@ea.govt.nz](mailto:info@ea.govt.nz) or 04 460 8860 if you do not receive electronic acknowledgement of your submission within two business days.

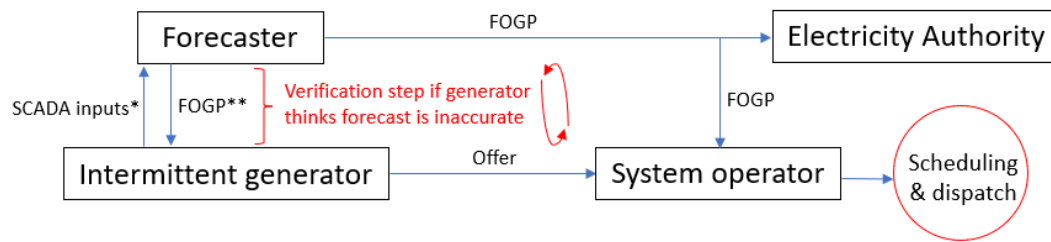
## 2. Recap of the Authority's policy decisions

- 2.1. In 2023, the Authority consulted on [an Issues and Options Paper](#) on the review of intermittent generation forecasting. This consultation informed the decisions published in the [Decision Paper](#), which are summarised below.

### **The Authority decided to implement a hybrid forecasting arrangement**

- 2.2. The Authority is implementing a hybrid forecasting arrangement because we are confident it will lead to consistently more accurate intermittent generation forecasts.
- 2.3. More accurate forecasts will increase the accuracy of price signals, which contributes to the most efficient and lowest cost sources of generation being dispatched. This is a key initiative to support affordable electricity for consumers.
- 2.4. A hybrid forecasting arrangement will provide a centrally procured forecast of intermittent generation for each generation site. Intermittent generators will be able to submit generation offers using their own forecast if they have approval from the Authority to do so. This would require an intermittent generator to show that its forecast is consistently at least as accurate as the centralised forecast.
- 2.5. The hybrid arrangement will foster innovation through creating competitive tension between the centralised forecaster and other providers. This will support the development of a market for generation forecasting and lead to more accurate forecasts, improving affordability for consumers.
- 2.6. The hybrid forecasting arrangement will apply to all intermittent generators that are required to submit offers by the system operator.
- 2.7. Intermittent generators who want to use their own forecasting arrangements will be required to submit 'mock' offers to the Authority based on their own forecast for a period of at least four weeks (alongside its real offers based on the centralised forecast). A longer period may be required to cover a range of weather conditions.
- 2.8. The Authority would be responsible for agreeing that an intermittent generator can base its offers on its own forecast if the Authority is satisfied that the mock offers meet the accuracy standards. The Authority will make this decision by comparing actual generation and the cumulative error of the intermittent generator's mock offers (based on its own forecast) versus its real offers (based on the centralised forecast) over a four-week period.
- 2.9. Figure 1 illustrates the forecasting and dispatch process that will apply under the hybrid forecasting arrangement.

**Figure 1: Simplified forecasting and dispatch process**



\* SCADA inputs include actual generation output, wind speed/irradiance, number of turbines/inverters available, and turbines in high wind cut-out. \*\* FOGP stands for 'forecast of generation potential'.

## Standards and process requirements will apply

2.10. The Decision Paper provided that the Authority will introduce:

### Forecast performance standards

- 2.11. These will apply to the centralised forecaster to ensure there is clarity around the level of accuracy required to meet the policy goals. These standards would be based on the difference between the forecast generation offer based on the centralised forecast and actual generation.
- 2.12. Forecast performance standards will be agreed with the centralised forecaster as part of contract negotiations and will be set out in the contract between the Authority and the forecasting provider. There may be multiple forecast performance standards across different timeframes, with performance obligations becoming more stringent closer to real time.
- 2.13. The forecast performance standards will also inform the generation accuracy standards that will apply to generators eligible to submit offers based on their own forecasts.
- 2.14. Other requirements for the centralised forecaster will be specified in the contract between the Authority and the centralised forecaster.

### Process requirements

- 2.15. The Code will specify process requirements, which will apply to intermittent generators required to use the centralised forecast and to intermittent generators basing their offers on their own forecast.
- 2.16. These requirements are intended to ensure intermittent generators follow the correct processes when submitting offers. Examples of process requirements include:
- when intermittent generators must submit their initial offer
  - when intermittent generators must revise an offer
  - situations when intermittent generators can adjust their forecast of generation potential.

### Generation accuracy standards

- 2.17. These will be agreed with intermittent generators as part of the approval process to allow them to base their offers on their own forecasts. Generation accuracy

standards will provide a similar level of accuracy as the forecast performance standards that apply to the centralised forecaster.

- 2.18. The application of generation accuracy standards will ensure that intermittent generators' own forecasts are consistently at least as accurate as the centralised forecast. If an intermittent generator's forecast is not as accurate as the centralised forecast, it will be required to base its offers on the centralised forecast.
- 2.19. Generation accuracy standards will be provided in guidance that the Authority will issue. The draft guidance, which explains the process intermittent generators will be expected to follow to be permitted to base their offers on their own forecast, is included in Appendix C. This will be updated as necessary to reflect the forecast performance standards, and any other relevant matters, once agreed with the centralised forecaster.

### **The Authority will monitor compliance with the standards and process requirements**

- 2.20. The Authority will regularly monitor the forecaster's compliance with forecast performance standards and intermittent generators' compliance with process requirements and generation accuracy standards. If an intermittent generator fails to comply with process requirements, the Authority may take action for a breach of the Code in accordance with its Compliance Strategy.

## **3. The Authority has identified the parts of the Code that need to be amended**

- 3.1. The Authority has identified the parts and clauses of the Code that need to be amended to specify the requirements intermittent generators must comply with under the hybrid forecasting arrangement.
- 3.2. A summary of the proposed Code amendments, including the rationale for amendments, are outlined in Table 1. The line-by-line proposed Code amendments are contained in Appendix A.



**Table 1: Summary of the proposed Code amendments**

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
<p><b>Clause 13.6 – Requirements for generators when submitting offers</b></p>	<p><b>Amend</b> to specify that intermittent generators must submit an offer within 30 minutes of receiving the first approved forecast.</p>	<p>This amendment will give effect to the decision that intermittent generators must submit an offer within 30 minutes of receiving the first approved forecast. This applies to intermittent generators using the centralised forecast and those basing their offers on their own forecast.</p> <p>When procuring a centralised forecaster, the Authority will specify that the forecaster will provide forecasts of wind and solar up to six days ahead. Therefore, the requirement that intermittent generators submit an offer within 30 minutes of receiving the first approved forecast means that intermittent generators would be required to submit their first offer to the system operator <u>six days</u> before the beginning of the trading period to which the offer relates.</p>
	<p><b>Amend</b> to specify that if an intermittent generator does not receive an approved forecast 72 trading periods before the relevant trading period, it must make an initial offer 71 trading periods before the relevant trading period.</p>	<p>This amendment is necessary to ensure the system operator still receives offers if intermittent generators are unable to receive the centralised forecast.</p> <p>This amendment would not apply to intermittent generators basing their offers on their own forecast because in most cases an issue with the delivery of the centralised forecast will not affect intermittent generators' ability to receive their own forecasts.</p>
<p><b>Clause 13.9B – Offer requirements for</b></p>	<p>Clause 13.9B currently specifies that each offer submitted by an intermittent generator must, in relation to the generating plant that is the subject of the offer:</p> <ul style="list-style-type: none"> <li>- not exceed the nameplate capacity of the generating plant</li> </ul>	<p>N/A</p>

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
intermittent generators	<ul style="list-style-type: none"> <li>- include a forecast of generation potential for the trading period to which the offer relates.</li> </ul> <p>The Authority is proposing to retain this requirement.</p>	
	<p><b>Amend</b> to specify that forecasts of generation potential must:</p> <ul style="list-style-type: none"> <li>a) use the most recent approved forecast applicable to that intermittent generating station and trading period</li> <li>b) be adjusted to account for any bona fide physical reason or any planned outage affecting the generating plant and trading period. A forecast of generation potential cannot be adjusted for any other reason.</li> </ul>	<p>This amendment is necessary to ensure intermittent generators' offers reflect the latest forecast, and are adjusted as necessary to account for matters that could cause it to generate more or less than what the forecast suggests.</p>
	<p><b>Amend</b> to specify that if agreed with the Authority, an intermittent generator may use an alternative forecast in place of the approved forecast, and that the requirements above will also apply to intermittent generators basing their offers on their own forecast.</p>	<p>This amendment reflects that intermittent generators will be permitted to base their offers on their own forecast if they can demonstrate that their own forecasts are accurate enough. It also reflects that the offer requirements that apply to intermittent generators using the centralised forecast will also apply to those basing their offers on their own forecast.</p>
	<p><b>Amend</b> to specify that in the situation described under clause 13.6 (when an intermittent generator must submit an initial offer if it does not receive an approved forecast), each forecast of generation potential must use either:</p> <ul style="list-style-type: none"> <li>a) the long-term seasonal average for that time of year for that intermittent generating station and trading period, or</li> </ul>	<p>This amendment is necessary to ensure that if intermittent generators are unable to base their offers on an approved forecast (either the centralised forecast or their own forecast), there is an alternative source of information to inform the offer(s).</p> <p>This amendment reflects that, if there are issues with the delivery of the approved forecast, if the intermittent generator has forecast information that it considers it to be</p>

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
	<p>b) other forecast information the intermittent generator has access to if the intermittent generator considers it to be at least as accurate than the long-term seasonal average.</p>	<p>at least as accurate than the long-term seasonal average, it can use that information to inform its offer(s).</p>
	<p><b>Amend</b> to specify that an intermittent generator required to use an approved forecast must, in response to a request from the approved forecaster, provide any information reasonably required by approved forecaster for the purpose of providing an approved forecast, as soon as practicable after receiving the request.</p>	<p>This amendment is necessary to ensure that the approved forecast has the necessary information to produce forecasts of generation potential.</p>
<p><b>Clause 13.17 – Offers may be revised</b></p>	<p>Clause 13.17 currently specifies that a generator:</p> <ul style="list-style-type: none"> <li>- may revise an offer at any time before the end of the trading period to which the offer relates by submitting a new offer to the system operator</li> <li>- must not revise any of its offer prices during a gate closure period</li> <li>- in most cases must not revise the MW specified in any price band in an offer during a gate closure period</li> <li>- in most cases must not revise ramp rates or maximum output during a gate closure period.</li> </ul> <p>The Authority is proposing to retain these requirements.</p>	<p>N/A</p>
	<p><b>Amend</b> to reflect that if a generator revises an offer, the requirements in clause 13.18A (below) also apply.</p>	<p>This amendment is needed to link clause 13.17 with the requirements in 13.18(A) that specify when intermittent generators must submit revised offers.</p>
<p><b>Clause 13.18A – Intermittent</b></p>	<p><b>Amend</b> to remove the requirements that intermittent generators must:</p>	<p>This amendment reflects that the Authority will not specify the forecasting method that must be used to inform offers.</p>

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
<b>generators to submit revised offer following each approved forecast</b>	<ul style="list-style-type: none"> <li>a) submit a revised forecast of generation potential at a minimum of two hours immediately preceding the trading period to which an offer relates</li> <li>b) base a revised forecast of generation potential on a resource persistence model.</li> </ul>	
	<p><b>Amend</b> to specify that within 30 minutes of an approved forecast being received for a trading period to which an offer relates, each intermittent generator must submit to the system operator a revised offer for the relevant intermittent generating station for the trading period. An intermittent generator must not submit a revised offer after the start of the trading period to which the revised forecast of generation potential relates.<sup>1</sup></p> <p>This is discussed further in section 4 of this paper.</p>	<p>This amendment is consistent with what the Authority outlined in the Decision Paper:</p> <p><i>'If an intermittent generator receives an updated forecast that varies from its previously submitted offers, it will be required to submit a revised offer to reflect the most up to date forecast'.</i></p>
	<p><b>Amend</b> to specify that regardless of whether it has received a revised forecast, each intermittent generator must, as soon as practicable, revise any offer to account for:</p> <ul style="list-style-type: none"> <li>a) any bona fide physical reason</li> <li>b) any planned outage.</li> </ul>	<p>This amendment is necessary to ensure that even if they have not received a revised forecast, intermittent generators revise their offers to reflect reasons that may affect how much they expect to be able to generate.</p>
	<p><b>Amend</b> to specify that if there are issues with the delivery of the approved forecast, this would not affect revised offer requirements</p>	<p>This amendment is necessary to reflect that intermittent generators basing their offers on their own forecast must</p>

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<sup>1</sup> For example, if an intermittent generator receives a revised forecast of generation potential at 6:05pm (during trading period 36) that relates to trading period 37 (which begins at 6:30pm), the intermittent generator must not submit a revised forecast of generation potential for trading period 37 after 6:30pm.

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
	that apply to intermittent generators basing their offers on their own forecast.	continue to comply with offer requirements if there are issues with the delivery of the approved forecast.
<b>Clause 13.86A – Intermittent generators must not substantially reduce generation</b>	<p><b>Remove</b> to reflect that:</p> <ul style="list-style-type: none"> <li>- there will no longer be a specific focus on ensuring an intermittent generator does not generate more than 30MW below the forecast of generation potential</li> <li>- intermittent generators will not need to provide a monthly report to the Authority specifying when and why a 30MW over forecasting situation occurred.</li> </ul>	This amendment reflects the decision to introduce forecast performance standards and generation accuracy standards to ensure more accurate forecasting. The Authority will monitor compliance with the standards and take action if required.
<b>Part 1, clause 1 – interpretations</b>	<p><b>Amend</b> to provide interpretations of the following terms:</p> <ul style="list-style-type: none"> <li>- An ‘approved forecast’ – a forecast issued by the approved forecast provider in respect of an intermittent generating station for a trading period in a format and manner as prescribed by the Authority from time to time</li> <li>- An ‘approved forecast provider’ – the provider of forecast services as prescribed from time to time by the Authority.</li> </ul>	This change will make ‘approved forecast’ and ‘approved forecast provider’ legally defined terms.
	<p><b>Amend</b> the definition of ‘bona fide physical reason’ so that it does not include a situation in which variable resource conditions prevent the intermittent generator from generating at the level expected.</p>	The definition of ‘bona fide physical reason’ currently includes a situation in which variable resource conditions prevent the intermittent generator from generating at the level expected. This is because 13.86A(1) of the Code specifies that an intermittent generator must not generate electricity during a trading period at a rate that is more than 30MW below the forecast of generation potential specified in the intermittent generator's final offer for the trading period, unless they have a bona fide physical reason.

Current Part/clause	Proposed amendment	Policy decision the amendment will give effect to
		<p>The Authority is proposing to remove clause 13.86A(1) to reflect that there will no longer be a specific focus on ensuring an intermittent generator does not generate electricity at a rate that is more than 30MW below the forecast of generation potential (this is explained further below). Therefore, the definition of a bona fide physical reason needs to be amended so it does not include a situation in which variable resource conditions prevent the intermittent generator from generating at the level expected.</p>
	<p><b>Amend</b> the definition of 'forecast of generation potential' to reflect that it must be determined in accordance with clause 13.9B(2) or (3).</p>	<p>This amendment is needed to link the definition of 'forecast of generation potential' to the proposed changes to offer requirements that apply to intermittent generators.</p>

**Q1. Do you agree that the proposed Code amendments are necessary to give effect to the Authority's policy decisions? If not, please explain why.**

## 4. The proposed Code changes will affect intermittent generators' offer requirements

- 4.1. One of the proposed Code changes will require intermittent generators to submit their initial offer six days before the relevant trading period (compared to 1.5 days under the current Code). This will provide the system operator and market participants with better information about potential security issues and forecast price signals up to a week ahead. The Authority welcomes feedback specifically on this proposal.
- 4.2. The Authority recognises that the proposed changes to intermittent generators' offer requirements could act as a barrier to entry to smaller, less well-resourced intermittent generators.
- 4.3. Through the procurement process for a centralised forecaster, the Authority will specify that the provider must be able to submit offers on generators' behalf (on a commercial basis). We will determine how much the centralised forecaster would charge an intermittent generator for providing this service.

### 1) Intermittent generators will be required to submit their first offer six days before the beginning of the trading period to which the offer relates

- 4.4. When procuring a centralised forecaster, we will specify that the forecaster will provide forecasts of wind and solar up to six days ahead. This will:
  - a) lead to more accurate forecast price schedules, which will enable market participants to make better consumption and generation decisions
  - b) enable the system operator to more easily determine whether potential security issues are likely to arise.
- 4.5. This change would align the timeframes for intermittent generators' offers with the system operator's Week-Ahead Dispatch Schedule. The Week-Ahead Dispatch Schedule provides the system operator and market participants with information about potential security issues and forecast price signals up to seven days into the future. Currently, generators are encouraged (but not obligated) to provide the system operator with offers for inclusion in the Week-Ahead Dispatch Schedule.
- 4.6. This is different from the current requirement of at least 71 trading periods (1.5 days) before the beginning of the trading period to which the offer relates.
- 4.7. This change would not affect non-intermittent generators (ie, they would still be required to submit their first offer 71 trading periods before the beginning of the trading period to which the offer relates).

**Q2. Do you agree that intermittent generators will be required to submit their first offer six days before the beginning of the trading period to which the offer relates? What impacts, if any, would this change have on you?**

## **2) Intermittent generators must submit an offer within 30 minutes of receiving the first approved<sup>2</sup> forecast and must revise their offers within 30 minutes of receiving a revised forecast**

- 4.8. Consistent with the policy intent, intermittent generators' offers should consistently reflect the latest forecast of generation potential.
- 4.9. To give effect to this, the Authority is proposing to amend the Code to specify that intermittent generators required to base their offers on the centralised forecast must submit an offer within 30 minutes of receiving the first approved forecast. They must also revise their offers within 30 minutes of receiving a revised forecast.
- 4.10. These changes mean an intermittent generator may be required to submit an initial offer six days ahead of the relevant trading period and revise its offer every 30 minutes thereafter. The Authority and the centralised forecaster will negotiate the frequency at which forecasts must be revised. Forecasts further from real time may be revised less frequently.
- 4.11. For intermittent generators basing their offers on their own forecast, the timing of the initial offer and revised offers will form part of the agreement with the Authority. The timing will likely mirror the timing of approved forecasts agreed with the centralised forecaster.
- 4.12. An intermittent generator must adjust its forecast of generation potential to account for bona fide physical reasons or planned outages that will affect how much can be generated. If these circumstances arise, intermittent generators must revise their offer whether or not a revised approved forecast (or an intermittent generator's own forecast) has been issued.

## **3) There will be a backstop arrangement if an intermittent generator does not receive an approved forecast**

- 4.13. In the unlikely event that a centralised forecaster is unable to provide an intermittent generator with a forecast or the intermittent generator cannot receive the forecast (eg, due to technical issues), the Authority needs to specify when intermittent generators must make their first offer for a trading period and what they must base their offers on.
- 4.14. The Authority is proposing that if an intermittent generator does not receive an approved forecast 72 trading periods before the relevant trading period, it must make an initial offer 71 trading periods before the relevant trading period. In these circumstances, each forecast of generation potential must be based on either:
  - a) the long-term seasonal average for that time of year for that intermittent generating station, or
  - b) other forecast information the intermittent generator has access to, if the intermittent generator considers it to be at least as accurate as the long-term seasonal average.

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<sup>2</sup> An approved forecast will either be the centralised forecast, or an intermittent generator's own forecast if the Authority has allowed an intermittent generator to base its offers on that forecast.



- 4.15. In the situation outlined above, the centralised forecaster will be responsible for providing the long-term seasonal average to intermittent generators if it is able to do so.
- 4.16. If there are issues with the delivery of the centralised forecast, this will not affect offer requirements for intermittent generators basing their offers on their own forecast.
- 4.17. If an intermittent generator that has been permitted to base its offers on its own forecast experiences issues with its own forecast, it will be required to base its offers on the centralised forecast.<sup>3</sup>

#### **4) If an intermittent generator adjusts its forecast of generation potential, it will not need to notify the system operator**

- 4.18. Forecasts of generation potential can be adjusted to account for bona fide physical reasons or planned outages affecting the amount that can be generated.
- 4.19. In the Decision Paper, the Authority specified that if an intermittent generator's offer does not reflect the centralised forecast (because it is adjusted to account for these factors), it must notify the system operator.
- 4.20. The Authority is proposing that if an intermittent generator adjusts its forecast of generation potential, it will not need to notify the system operator. This is because the system operator will receive the forecasts directly (as well as offers), so it will be able to determine if an intermittent generator has adjusted its forecast of generation potential.<sup>4</sup>

## **5. Recovering the costs of the forecasting service**

- 5.1. In the Decision Paper, the Authority stated that the costs of the forecasts will be apportioned across all generators that are required to submit offers, as they all derive benefits from more accurate forecasts. The Authority also stated that the clearing manager will be responsible for ensuring costs are appropriately allocated to market participants.
- 5.2. Following further assessment of this issue, the Authority now considers it is more appropriate to recoup the forecast and contract management costs via its levy-funded appropriation rather than via the clearing manager. This is because:
  - a) The Levy Regulations set out the allocation requirements for categories of services provided by the Authority. These requirements were designed based on public sector charging principles<sup>5</sup> and were consulted on.
  - b) This forecasting service and management of the contract with the forecaster will become a permanent addition to the Authority's annual work programme.

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<sup>3</sup> The centralised forecaster will provide forecasts to all intermittent generators regardless of whether an intermittent generator will use it to inform its offers.

<sup>4</sup> Knowing whether an intermittent generator has adjusted its forecast of generation potential may assist the system operator in its security of supply assessments.

<sup>5</sup> [The Treasury, Guidelines for Setting Charges in the Public Sector, April 2017.](#)

Therefore, these costs of this new service should be incorporated into our baseline funding.

- 5.3. Under the Levy Regulations, forecasting services must be allocated one-half each to generators and purchasers.<sup>6</sup>
- 5.4. The Authority estimates that approximately \$100,000–\$120,000 per year will be required for the service itself, and approximately \$60,000 per year will be needed from 2025/26 onwards to pay for contract management costs. These costs equate to approximately \$0.08 per residential Installation Control Point per year.<sup>7</sup>
- 5.5. The Authority will determine more accurate annual costs of the centralised forecast through the procurement process to select a centralised forecasting service provider, which we will carry out in the coming weeks (refer to section 9 of this paper for more detail on the procurement process).

**Q3. Do you agree with the updated decision that generators and purchasers (ie, not only generators) should be required to contribute to the costs of the centralised forecast?**

## 6. Certain information will be specified in the contract with the centralised forecaster

- 6.1. The centralised forecaster will not be a market participant. Therefore, requirements that apply to the centralised forecaster must be included in the contract between the Authority and the centralised forecaster.
- 6.2. Table 2 outlines the details that will be included in this contract.

**Table 2: Details that will be included in the contract between the Authority and the centralised forecaster**

Information	Details
<b>The number of days ahead that the forecasts must be provided</b>	The Authority will specify that the forecaster should provide forecasts of wind and solar up to six days ahead. This will be specified in the contract.
<b>The frequency at which forecasts must be revised</b>	The Authority and the centralised forecaster will negotiate the frequency at which forecasts must be revised. Forecasts further from real time may be revised less frequently.
<b>Forecast performance standards that will apply to the centralised forecaster</b>	The Authority and the centralised forecaster will negotiate forecast performance standards.  Later this year, the Authority will publish its analysis that looks at forecast performance for the five main wind generators over a

<sup>6</sup> Forecasting services would fall under the 'market operations' activity. The costs of market operations services must be apportioned one-half each to generators and purchasers.

<sup>7</sup> This is based on there being 1,972,952 residential Installation Control Points as of 31 July 2024.

	24-month period. This will support the development of forecast performance standards.
<b>Who the forecast information must be shared with</b>	Forecast information must be provided to: <ul style="list-style-type: none"> <li>a) all intermittent generators – including those who submit offers based on their own forecast</li> <li>b) the system operator – so it can compare forecasts and offers to ensure system security is maintained</li> <li>c) the Authority – for monitoring and compliance purposes</li> <li>d) the owner of an information platform – for publication of some forecast information (see below).</li> </ul>
<b>Providing the long-term seasonal average (wind and/or solar) to intermittent generators</b>	The Authority is proposing that if an approved forecast provider fails to provide an intermittent generator with a forecast (eg, due to technical reasons), each forecast of generation potential must be based on either: <ul style="list-style-type: none"> <li>a) the long-term seasonal average for that time of year for that intermittent generating station, or</li> <li>b) other forecast information the intermittent generator has access to if the intermittent generator considers it to be at least as accurate than the long-term seasonal average</li> </ul> <p>The centralised forecaster will be responsible for providing the long-term seasonal average to intermittent generators if it is able to do so.</p>
<b>Information that must be published</b>	As outlined in the Decision Paper, the following forecast information must be published on a platform that is accessible to the public: <ul style="list-style-type: none"> <li>a) forecasts at the national and island level</li> <li>b) confidence intervals or the range/uncertainty of a forecast.</li> </ul> <p>Further details about what data should be published will be included in the agreement between the Authority and the approved publisher.</p>

## 7. The Authority will include certain information in guidance

- 7.1. The Authority will specify information in guidance for intermittent generators who want to base their offers on their own forecast. This will include:
- a) The process intermittent generators will be expected to follow to be permitted to base their offers on their own forecast.
  - b) The generation accuracy standards intermittent generators must meet. These will mirror the forecast performance standards that will apply to the centralised forecaster. As forecast performance standards will be agreed with the

centralised forecaster as part of contract negotiations, the Authority cannot yet specify what the generation accuracy standards will be.

- c) Other requirements, such as the frequency at which forecasts must be updated. These will also mirror the requirements that will apply to the centralised forecast.

7.2. The draft guidance is included in Appendix C. The final guidance will reflect the forecast performance standards, and any other relevant matters, that will be agreed with the centralised forecaster. We expect contract negotiations to take place in April 2025.

## 8. Regulatory statement for the proposed Code amendments

### Objectives of the proposed Code amendments

8.1. The *review of forecasting provisions for intermittent generators in the spot market decision paper* presents the policy decisions. The proposed Code amendments will give effect to the decisions that apply to intermittent generators.

### The benefits of the proposed Code amendments are expected to outweigh the costs

- 8.2. The *review of forecasting provisions for intermittent generators in the spot market decision paper* presents the net benefits of implementing to a hybrid forecasting arrangement.
- 8.3. The cost-benefit analysis estimated minimum benefits of \$15.4m over five years (\$3.1m per year) are available from moving to a hybrid arrangement and adopting forecast performance standards.<sup>8</sup>
- 8.4. The 15-year net present value is assessed as in a range from \$151.5m to \$326.5m. This reflects that the proportion of intermittent generation in 15 years is expected to be considerably higher than it is today.
- 8.5. The main benefits will be derived from more accurate forecasts and offers leading to more accurate price signals. In turn, this will reduce risks to security of supply, and enable the efficient use of resources in the long-term interests of consumers.

### The Authority has implemented other complementary measures to improve forecasting performance

8.6. The Authority has initiated three non-regulatory measures to improve forecasting performance.

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<sup>8</sup> The five-year net present value is assessed as in a range from \$15.4m to \$33.9m.

## 1) Educational approach to the interpretation of resource persistence forecasting and forecast of generation potential provisions in the Code

- 8.7. In July 2024, we published guidance to provide clarity to intermittent generators on how the provisions in the Code relating to resource persistence forecasting and forecasts of generation potential should be interpreted.
- 8.8. We have also reiterated our expectation that intermittent generators comply with these requirements until the proposed Code amendments come into effect.

## 2) Publishing performance data of intermittent generators' offers vs actual generation

- 8.9. From July 2024 onwards, we have been publishing forecast accuracy for each intermittent generator and generation site across different timeframes (on a monthly scale). This will improve transparency of the difference between intermittent generation forecasts of generation potential and actual generation.

## 3) Publication of analysis to support the development of forecast performance standards

- 8.10. Later this year, we will publish our analysis that looks at forecast performance for the five main wind generators<sup>9</sup> over a 24-month period. This will support the development of forecast performance standards.

## The proposed Code amendments comply with section 32(1) of the Act

- 8.11. The Authority's main objective under section 15(1) of the Act is to promote competition in, reliable supply by, and efficient operation of, the electricity industry for the long-term benefit of consumers. 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. The additional objective only applies to the Authority's activities in relation to the direct dealings between participants and these consumers. The Authority considers the additional objective does not apply to the proposed Code amendments.
- 8.12. Section 32(1) of the Act says that 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).
- 8.13. The Authority considers that the proposed Code amendments are necessary or desirable to give effect to policy decisions that have been made to reduce risks to security of supply and improve the efficiency of the system.

**Q4. Do you agree the Authority's proposed Code amendments complies with section 32(1) of the Act?**

## The Authority has had regard to the Code amendment principles

- 8.14. When considering amendments to the Code, under its Consultation Charter the Authority is required to have regard to the following Code amendment principles (to the extent that the Authority considers that they are applicable). Table 3 describes

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<sup>9</sup> Mercury, Meridian, Manawa, Genesis and NZ Windfarms

the Authority's regard for the Code amendment principles in the preparation of the proposal.

**Table 3: Regard for Code amendment principles**

Principle	Comment
<p><b>1) Clear case for regulation</b> – the Authority will only consider amending the Code when there is a clear case to do so.</p>	<p>The Authority has implemented some non-regulatory measures to improve forecasting performance. However, Code amendments are necessary to give effect to the policy decisions that will lead to consistent and persistent improvements in forecasting performance.</p>
<p><b>2) Costs and benefits are summarised</b> – the Authority is required to include with any Code amendment proposal an evaluation of the costs and benefits of the proposed amendment. The Authority will also include a summary of this evaluation.</p>	<p>The results of the cost-benefit analysis show estimated minimum benefits of \$15.4m over five years (\$3.1m per year) are available from moving to a hybrid arrangement and adopting forecast quality standards. Net benefits increase in the longer-term as the proportion of intermittent generation increases.</p>
<p><b>3) Preference for small-scale 'trial and error' options</b> – the Authority will prefer options that are initially small-scale, and flexible, scalable and relatively easily reversible with relatively low value transfers associated with doing so. The Authority will monitor the implemented option and reject, refine or expand that solution in accordance with the results from the monitoring.</p>	<p>Based on its analysis of options, the Authority considers it necessary to implement a hybrid forecasting arrangement to achieve the desired consistent improvements in intermittent generation forecast accuracy.</p> <p>Ongoing monitoring arrangements will be established to oversee both forecaster and generator performance.</p> <p>The Authority will review the policy changes towards the end of the initial contract term with the centralised forecaster. The Authority will determine whether the transition to a hybrid arrangement has helped to achieve the policy objective and remains fit-for-purpose.</p> <p>There will be an opportunity to adjust components of the new arrangements as part of contract renewals and/or procuring a new centralised forecaster (eg, forecast performance standards and the frequency at which forecasts must be revised). The Authority will also be able to promptly update guidance if necessary.</p>
<p><b>4) Preference for greater competition</b> – the Authority will prefer options that have larger pro-competition effects, because greater competition is likely to be positive for economic efficiency, reliability of supply and, ultimately, for the long-term benefit of consumers.</p>	<p>Innovator-developers will benefit from the hybrid arrangement which will support competition by reducing regulatory and information barriers to participation by new entrants. Smaller intermittent generators that have previously been unable to enter the market due to the need to be responsible for their own forecasts may now be able to as a result of the centralised forecast being provided to them.</p>
<p><b>5) Preference for market solutions</b> – The Authority will prefer options that directly address market failure so as to facilitate efficient</p>	<p>When deciding which option to implement, the Authority has considered the impact each option would have on the efficiency and reliability of the market, and competition in</p>

<p>market arrangements. The Authority will discount options that subdue or displace efficient market structures.</p>	<p>the market. The Authority also considered the affordability and practicability of each option.</p> <p>Based on the Authority’s assessment of each option against these criteria, the hybrid forecasting arrangement scored the highest and was preferred over options that may subdue efficient market structures (eg, an ahead and balancing market).</p>
<p><b>6) Preference for flexibility to allow innovation</b> – the Authority will prefer options that provide industry participants with greater freedom and lower compliance costs, unless more restrictive options are justified such as where it may be more efficient to use a ‘one size fits all’ approach (for example, uniform standards).</p>	<p>Intermittent generators will be able to submit offers based on their own forecast if they can demonstrate that their own forecast is consistently at least as accurate as the centralised forecast. This will support the development of a market for generation forecasting and foster innovation through creating competitive tension between the centralised forecaster and other providers.</p>
<p><b>7) Preference for non-prescriptive options</b> – the Authority will prefer options that specify outcomes required of industry participants rather than prescribe what they must do and how they must do it, unless the benefits of prescription outweigh an outcomes-based approach.</p>	<p>The Authority has found that forecasts of intermittent generation are often highly inaccurate and unreliable close to real time, which causes problems for the power system and risks increasing costs for consumers. We consider it necessary to prescribe certain standards and process requirements to ensure:</p> <ul style="list-style-type: none"> <li>• the centralised forecaster (or intermittent generators when relevant) is incentivised to ensure their forecasts are as accurate as possible</li> <li>• intermittent generators follow appropriate processes when submitting offers.</li> </ul> <p>There is a degree of flexibility with the hybrid forecasting arrangement as intermittent generators will be able to submit offers based on their own forecast if they can demonstrate that their own forecast is consistently at least as accurate as the centralised forecast.</p>

## 9. Procuring the centralised forecaster

- 9.1. In the coming weeks, the Authority will undertake a procurement process to select a centralised forecasting service provider. When undertaking the procurement, the Authority will follow the Government Procurement Rules. This includes ensuring the service procured achieves the best public value.
- 9.2. The Authority will work towards selecting our preferred provider in early 2025 and for the forecaster to begin providing services by winter 2025.
- 9.3. There will be a three-month transition period. This will enable the forecaster to make any necessary changes to its processes, so it meets the Authority’s requirements. It will also give intermittent generators that want to base their offers on their own forecast sufficient time to demonstrate that their own forecasts are accurate enough.



- 9.4. As outlined in the Decision Paper, the centralised forecaster will be required to provide a generation forecast to intermittent generators (a MW value) rather than a resource forecast (a m/s or W/m<sup>2</sup> value).
- 9.5. Through the procurement process, the Authority will determine what inputs a centralised forecaster would need to produce accurate generation forecasts. We would also welcome feedback from intermittent generators about what information they think they will need to provide to the centralised forecaster to ensure the generation forecast is as accurate as possible.
- 9.6. We are particularly interested in whether intermittent generators will need to provide up-to-date information on plant outages to the centralised forecaster, and if so, whether there would be issues with intermittent generators providing this information.

**Q5. What inputs would intermittent generators need to provide to the centralised forecaster to produce accurate generation forecasts? Would there be issues with intermittent generators providing this information?**

- 9.7. Through the procurement process for a centralised forecaster, the Authority will specify that the provider must be able to submit offers on generators' behalf on a commercial basis – ie, the costs of this service will be paid for by intermittent generators who wish to use the service. The Authority will seek information from potential providers through the procurement process about the cost of providing this service.
- 9.8. If the centralised forecaster was able to submit offers on generators' behalf, the generator would need to confirm with the forecaster the price and quantity of generation it is willing to offer across all relevant trading periods (ie, the price and quantity elements cannot be separated). Under this approach, generators would still remain legally responsible for their obligations under the Code.

## 10. Next steps

- 10.1. The consultation period will close on 15 November 2024. The Authority will analyse submissions in response to the consultation paper and will publish a decision paper in February 2025 confirming the final Code amendments that will be made.
- 10.2. Subject to contractual agreements between the Authority and the centralised forecaster, the Authority will issue the final guidance for intermittent generators wanting to base their offers on their own forecast. This is expected to be finalised in May 2025.
- 10.3. The three-month transition period is expected to commence in mid-2025.
- 10.4. The Authority will communicate the final Code amendment with affected parties, so they have a clear understanding of the new requirements.

**Q6. Do you have any comments on the drafting of the proposed Code amendments?**



## 11. Appendices

- Appendix A: Proposed Code amendments
- Appendix B: Format for submissions
- Appendix C: Draft guidance for intermittent generators who want to base their offers on their own forecast

## Appendix A Proposed Code amendments

Clause	What it does
<p><b>13.6 Requirements for generators when submitting offers</b></p> <p>(1) Each <b>generator</b> with a <b>point of connection</b> to the <b>grid</b>, and each <b>embedded generator</b> required by the <b>system operator</b> to submit an <b>offer</b> under clause 8.25(5), must—</p> <p>(a) <u>for a generator other than an intermittent generator:</u></p> <p>(i) submit to the <b>system operator</b> an <b>offer</b> for each <b>trading period</b> in the <b>schedule period</b>, under which the <b>generator</b> is prepared to sell <b>electricity</b> to the <b>clearing manager</b>; and</p> <p>(ii) ensure that the <b>system operator</b> receives an <b>offer</b> at least 71 <b>trading periods</b> before the beginning of the <b>trading period</b> to which the <b>offer</b> relates; and</p> <p>(b) <u>subject to subclause (2), for an intermittent generator:</u></p> <p>(i) <u>submit to the system operator an offer for each trading period and intermittent generating station in respect of which the intermittent generator is prepared to sell electricity to the clearing manager; and</u></p> <p>(ii) <u>ensure that the system operator receives an offer within 30 minutes of the first approved forecast for a trading period and intermittent generating station to which the offer relates; or</u></p> <p>(iii) <u>if there is no approved forecast for a trading period and intermittent generating station to which the offer relates 72 trading periods before the beginning of the trading period, ensure that the system operator receives an offer at least 71 trading periods before the beginning of the trading period.</u></p> <p>(2) <u>Subclauses (1)(b)(ii) and (iii) do not apply to intermittent generators using an alternative forecast in accordance with clause 13.9B(4).</u></p> <p><del>(3)(2)</del> Despite subclause (1), a <b>generator</b> must give at least 5 <b>business days'</b> notice in writing to the <b>system operator</b> and the <b>clearing manager</b> before the <b>generator</b> makes an <b>offer</b> for the 1st time in respect of the <b>generating plant</b> that is the subject of the offer.</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <ul style="list-style-type: none"> <li>An <b>offer must</b> be made for <b>every trading period</b> a generator intends to sell electricity</li> <li>Sets out <b>when</b> the first offer for a trading period must be made</li> </ul> </div> <p>The timing for the first offer for an intermittent generator is triggered by the first approved forecast issued for a period.</p> <p>There is a backstop if there is no approved forecast 72 trading periods in advance of the trading period to which the offer relates. In this circumstance, the first offer must be made 71 trading periods before the beginning of the trading period</p> <p>The requirements for <b>when</b> the first offer must be made do not apply to an intermittent generator basing its offers on its own forecast – the timing will be agreed with the Authority (likely linked to the timing of the approved forecast but not dependent on its issue)</p> <p>An intermittent generator basing its offers on its own forecast is still required to submit an offer for every trading period for which it is prepared to sell electricity (clause 13.6(1)(b)(i))</p>

<p><del>(4)</del>(3)</p> <p>(5)(4)</p> <p>(6)(5)</p>	<p>The notice must state—</p> <p>(a) the <b>point of connection</b> to the <b>grid</b> at which <b>electricity</b> generated by the <b>generator</b> is sold to the <b>clearing manager</b> under clause 14.3 or 14.4; and</p> <p>(b) whether the <b>generating plant</b> is an <b>intermittent generating station</b>.</p> <p>A <b>generator</b> must comply with any request from the <b>system operator</b> for information concerning <b>generating plant</b> that is the subject of a notice under subclause (2) if the <b>system operator</b> requires the information for the purposes of scheduling and <b>dispatch</b> in accordance with this Code.</p> <p>Despite subclause (1), if a <b>generator</b> intends to permanently cease to submit <b>offers</b> to the <b>system operator</b> in respect of any <b>generating plant</b>, the <b>generator</b> must give at least 5 business days' notice in writing to the <b>system operator</b> and the <b>clearing manager</b>.</p>	
<p><b>13.9B</b></p> <p>(1)</p> <p>(2)</p> <p>(3)</p>	<p><b>Offer requirements for intermittent generators</b></p> <p>Each <b>offer</b> submitted by an <b>intermittent generator</b> must, in relation to the <b>generating plant</b> that is the subject of the offer,—</p> <p>(a) not exceed the <b>nameplate capacity</b> of the <b>generating plant</b>; and</p> <p>(b) include a <b>forecast of generation potential</b> for the <b>trading period</b> to which the <b>offer</b> relates.</p> <p><u>Subject to subclauses (3) and (4), each <b>forecast of generation potential</b> must use the most recent <b>approved forecast</b> for that <b>intermittent generating station</b> and <b>trading period</b>, adjusted as necessary to account for:</u></p> <p>(a) <u>any <b>bona fide physical reason</b>; or</u></p> <p>(b) <u>any <b>planned outage</b>, affecting the <b>intermittent generating station</b> and <b>trading period</b>.</u></p> <p><u>If clause 13.6(1)(b)(ii) applies, each <b>forecast of generation potential</b> must use either:</u></p> <p>(a) <u>the long-term seasonal average for that time of year for that <b>intermittent generating station</b> and <b>trading period</b>; or</u></p>	<div style="border: 1px solid black; padding: 5px;"> <ul style="list-style-type: none"> <li>• <b>offer must include forecast of generation potential</b></li> <li>• <b>what</b> forecast of generation potential must use, adjusted for bona fide reason or planned outage</li> <li>• provision for Authority to agree use of an <b>alternative self-forecast</b></li> <li>• requirement to report when adjusted</li> </ul> </div> <p>Forecast of generation potential must use:</p> <ul style="list-style-type: none"> <li>• approved forecast, or</li> <li>• if there is no approved forecast, the long-term seasonal average or other forecast information that is at least as accurate, or</li> <li>• if agreed by the Authority, an alternative forecast,</li> </ul>

<p>(b) <u>if an intermittent generator has forecast information for that intermittent generating station and trading period that it reasonably believes is at least as accurate as a forecast under paragraph (a), that forecast information,</u></p> <p><u>adjusted as necessary to account for the factors in subclause (2)(a) and (b) affecting the intermittent generating station and trading period.</u></p> <p>(4) <u>If agreed by the Authority, and subject to any conditions specified by the Authority, an intermittent generator:</u></p> <p>(a) <u>may use an alternative forecast for each forecast of generation potential in place of the forecasts that are required to be used by subclauses (2) and (3), adjusted as necessary to account for the factors in subclauses (2)(a) and (b) affecting the intermittent generating station and trading period; and</u></p> <p>(b) <u>must provide such alternative forecast referred to in paragraph (a) to the system operator and the Authority as soon as practicable after the intermittent generator receives the alternative forecast.</u></p> <p>(5) <u>An intermittent generator required to use an approved forecast under subclause (2) must, in response to a request from the approved forecaster, provide any information reasonably required by approved forecaster for the purpose of providing an approved forecast, as soon as practicable after receiving the request</u></p>	<p>adjusted as necessary for any bona fide physical reason or planned outage.</p> <p>An intermittent generator must use an alternative forecast where this is agreed by the Authority and subject to conditions (which cover matters such as the timing of the first offer, frequency of revised offers, accuracy requirements – details will be provided in guidance issued by the Authority).</p> <p>An intermittent generator basing its offers on its own forecast must send each alternative forecast to the system operator and the Authority.</p> <p>The approved forecaster may request, and the intermittent generators must provide (if the use approved forecasts) information required to provide an approved forecast</p>
<p><b>13.17 Offers may be revised</b></p> <p>(1) Subject to subclauses (2) to (4) <b>and clause 13.18A</b>, a generator may revise an offer at any time before the end of the trading period to which the offer relates by submitting a new offer to the system operator.</p> <p>(2) A generator must not revise any of its offer prices during a gate closure period.</p> <p>(3) A generator must not revise the MW specified in any price band in an offer during a gate closure period, unless clause 13.18(1), 13.18(1A), 13.19 or 13.19C applies.</p> <p>(4) A generator must not revise any of the following offer parameters during a gate closure period, unless clause 13.19 applies:</p> <p>(a) ramp rates:</p> <p>(b) maximum output (including overload).</p>	<div style="border: 1px solid black; padding: 10px;"> <ul style="list-style-type: none"> <li>Allows offers to be revised at any time except for circumstances outlined</li> <li>Clarifies that this is subject to requirements in clause 13.18A</li> </ul> </div>

**13.18A Intermittent generators to submit revised offer following each approved forecast forecast of generation potential every trading period in last 2 hours**

- ~~(1) During the 2 hours immediately preceding the trading period to which an offer relates, each intermittent generator must submit to the system operator a revised forecast of generation potential for the relevant intermittent generating station for the trading period at a frequency of at least 1 revised forecast per trading period.~~
- ~~(2) A revised forecast of generation potential submitted under subclause (1) must be based on a resource persistence model, unless otherwise agreed with the Authority.~~
- ~~(3) For the purposes of this clause, a resource persistence model means a method for producing a forecast of the intermittent generator's generation for a trading period, in MW, that is derived from the expected availability and capability of generating plant forming all or part of the relevant intermittent generating station, on the assumption that the variable resource conditions at the time at which the forecast is prepared will persist throughout the trading period to which the forecast relates.~~
- (1) Subject to subclause (2) and (3), within 30 minutes of an approved forecast being received by an intermittent generator for a trading period to which an offer relates, the intermittent generator must submit to the system operator a revised offer for the relevant intermittent generating station for the trading period which complies with clause 13.9B.
- (2) Subclause (1) does not apply to intermittent generators using an alternative forecast in accordance with clause 13.9B(4).
- (3) An intermittent generator must not submit a revised offer after the start of the trading period to which the revised offer relates.
- (4) Notwithstanding subclause (1), each intermittent generator must, as soon as practicable, revise any offer to account for any change to one or more of the factors in clause 13.9B(2).

- Specifies **how often** forecast of generation potential must be provided

Previous requirements removed and replaced with the requirement to revise an offer within 30 minutes of an approved forecast

An offer must comply with clause 13.9B, (applying the latest approved forecast with permitted adjustments)

If there is no approved forecast issued, there would be no requirement to provide a revised forecast:

- unless and until an approved forecast is subsequently provided; or
- the factors in clause 13.9B(2) apply in which case a revised offer is required whether or not an approved forecast is issued

Subclause (1) does not apply to intermittent generators basing their offers on their own forecast as the frequency will be agreed with the Authority (likely mirroring the frequency of approved forecasts) – this is because intermittent generators' own forecasts will still be required even if there is no approved forecast.

~~**13.86A Intermittent generators must not substantially reduce generation**~~

<p><del>(1) An <b>intermittent generator</b> must not generate <b>electricity</b> during a <b>trading period</b> at a rate that is more than <b>30MW</b> below the <b>forecast of generation potential</b> specified in the <b>intermittent generator's final offer</b> for the <b>trading period</b> submitted under clause 13.18A, unless—</del></p> <p><del>(a) the <b>intermittent generator</b> reduces the output of the relevant <b>intermittent generating station</b> in order to comply with a <b>flagged dispatch instruction</b> under clause 13.73(1A), or any other instruction issued by the <b>system operator</b>; or</del></p> <p><del>(b) the <b>intermittent generator</b> has a <b>bona fide physical reason</b>.</del></p> <p><del>(2) If an <b>intermittent generator</b> generates <b>electricity</b> during a <b>trading period</b> at a rate that is below the rate specified in subclause (1) for 1 or more <b>trading periods</b> in a calendar month, other than for one of the reasons specified in subclause (1)(a), the <b>intermittent generator</b> must provide a report to the <b>Authority</b> no later than the end of the next calendar month.</del></p> <p><del>(3) A report provided to the <b>Authority</b> under subclause (2) must specify—</del></p> <p><del>(a) the <b>trading periods</b> in relation to which the <b>intermittent generator</b> generated <b>electricity</b> at a rate that was below the rate specified in subclause (1); and</del></p> <p><del>(b) in relation to each such <b>trading period</b>, an explanation of the reason for the <b>intermittent generator</b> generating <b>electricity</b> at a rate that was below the rate specified in subclause (1); and</del></p> <p><del>(c) if the <b>intermittent generator</b> considers that one of the reasons in subclause (1) applies in respect of any of the <b>trading periods</b> specified in the report, the <b>intermittent generator's</b> reasons for that view.</del></p>	
<p><b>1.1 Interpretation</b></p> <p>(1) In this Code, unless the context otherwise requires,—</p> <p><u><b>approved forecast</b> means a forecast issued by the <b>approved forecast provider</b> in respect of an <b>intermittent generating station</b> for a <b>trading period</b> in a format and manner as prescribed by the Authority from time to time</u></p> <p><u><b>approved forecast provider</b> means the provider of forecast services as prescribed from time to time by the <b>Authority</b></u></p>	

**bona fide physical reason** includes,

- (a) in relation to a **generator**, or a **purchaser**, or an **ancillary service agent** or a **grid owner**, a situation where personnel or plant safety is at risk; and
- (b) in relation to a **generator** or an **ancillary service agent** providing **generation reserve** or **frequency keeping**,—
  - (i) a **reasonably** unforeseeable change in generating capability, reserve capability, or **frequency keeping** capability (as the case may be) from an item of **generating plant** that is the subject of an existing **offer**, **reserve offer**, or offer to provide **frequency keeping** by that **generator** or **ancillary service agent**; or
  - (ii) a reasonably unforeseeable change in the level of expected uncontrollable water **inflows** into the head pond of a hydro station that is the subject of an existing **offer**, **reserve offer**, or offer to provide **frequency keeping** by that **generator** or **ancillary service agent**; or
  - (iii) a reasonably unforeseeable change in circumstances such that the **generator** or **ancillary service agent** will breach any consent held by it under the Resource Management Act 1991; or
  - (iv) a reasonably unforeseeable physical infeasibility that arises from a **price-responsive schedule**, a **non-response schedule**, or a **dispatch schedule**; and
- (ba) in relation to an **intermittent generator**, a situation in which—
  - ~~(i) variable resource conditions prevent the **intermittent generator** from generating at the level expected; or (ii) the **intermittent generator** reduces the output of an **intermittent generating station**—~~
  - ~~(i)(A)~~ to prevent an un-modelled transmission asset from exceeding its ratings; or
  - ~~(ii)(B)~~ in order to comply with an automated signal to maintain frequency; or
  - ~~(iii)(C)~~ in light of reasonably unforeseeable circumstances that require the output of the **intermittent generating station** to be reduced to enable the **intermittent generator** to comply with the conditions of a resource consent or other law; or
  - ~~(iv)(D)~~ in anticipation of the expected onset of a weather event that would be likely to cause the **intermittent generating station's** asset protection systems to shut down assets forming part of the **intermittent generating station**; and
- (c) in relation to a **purchaser**, or an **ancillary service agent** providing **interruptible load**,—

- (i) a reasonably unforeseeable full or partial loss of demand or reserve capability (as the case may be) at a **grid exit point** that is the subject of an existing **bid** or **reserve offer** by the **purchaser** or the **ancillary service agent**; or
- (ii) a reasonably unforeseeable change in circumstances such that the **purchaser** or **ancillary service agent** will breach any consent held by it under the Resource Management Act 1991; or
- (iii) a reasonably unforeseeable full or partial loss of generating capability from an item of **generating plant** owned by, or the subject of a supply contract with, that **purchaser** during the relevant **trading periods**; and
- (d) in relation to a **grid owner**, a reasonably unforeseeable loss of full or partial capacity on transmission plant forming part of the **grid**

**forecast of generation potential** means, in relation to an **intermittent generating station**, an **intermittent generator's** estimate of the **electricity** (specified in **MW**) it will generate during a **trading period**, determined in accordance with clause 13.9B(2) or (3), as applicable, if—

- (a) the system **operator** issues **dispatch instructions** to the **intermittent generator** for the intermittent **generating station** for the **trading period**; and
- (b) none of the **dispatch instructions** are **flagged** in accordance with clause 13.73(1A).

**generator** means a person who owns **generating units** connected to a **network**, or any person who acts, in respect of Parts 13, 14 and 15, on behalf of any person who owns such **generating units**, and includes **embedded generators**, **intermittent generators**, **type A co-generators**, and **type B co-generators**

**intermittent generating station** means a **generating station** that relies on a variable resource that is not stored and in respect of which a **generator** has not been approved by the **system operator** under clause 13.3F as a **dispatch notification generator**

**intermittent generator** means the owner of an **intermittent generating station**. To avoid doubt, clauses referring to an **intermittent generator** apply only to the **intermittent generating stations** owned by the **intermittent generator**

**schedule period** means the current **trading period** and the following 71 **trading periods**



## Appendix B Format for submissions

<b>Submitter</b>	
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Questions	Comments
Q1. Do you agree that the proposed Code amendments are necessary to give effect to the Authority's policy decisions? If not, please explain why.	
Q2. Do you agree that intermittent generators will be required to submit their first offer six days before the beginning of the trading period to which the offer relates? What impacts, if any, would this change have on you?	
Q3. Do you agree with the revised decision that all industry participants (ie, not only generators) should be required to contribute to the costs of the centralised forecast rather than generators only?	
Q4. Do you agree the Authority's proposed Code amendments complies with section 32(1) of the Act?	
Q5. What inputs would intermittent generators need to provide to the centralised forecaster to produce accurate generation forecasts? Would there be issues with intermittent generators providing this information?	
Q6. Do you have any comments on the drafting of the proposed Code amendments?	

## Appendix C Draft guidance for intermittent generators who want to base their offers on their own forecast

### Background and purpose

The Authority has decided to put in place a hybrid forecasting arrangement. This will provide a centrally procured forecast of intermittent generation for each generation site. Intermittent generators will be able to submit generation offers using their own forecast if they have approval from the Authority to do so. This would require an intermittent generator to show that its forecast is consistently at least as accurate as the centralised forecast.

The purpose of this document is to provide information for intermittent generators who want to base their offers on their own forecast.

**Note:** In this document, we sometimes refer to ‘offers’ and sometimes we refer to ‘forecasts of generation potential (FOGPs)’. An intermittent generator’s offer includes:

- a) the volume of electricity and the price it is willing to sell at, and
- b) a FOGP.

In other words, a FOGP forms part of an intermittent generator’s offer.

The volume and price components of an intermittent generator’s offer is generally not affected by how much wind or solar is forecast. The Authority has observed that intermittent generators generally offer all available capacity at \$0.01/MWh.<sup>10</sup>

Conversely, the FOGP should reflect how much wind or solar generation is forecast and, in most cases, will be different each trading period.

### How the centralised forecast will work

The centralised forecaster will convert resource forecasts (a m/s or W/m<sup>2</sup> value) to a generation forecast (a MW value).<sup>11</sup> In other words, the centralised forecaster will provide FOGPs to intermittent generators.

The centralised forecaster will provide forecasts to all intermittent generators regardless of whether an intermittent generator will use it to inform its offers (ie, if an intermittent generator has been permitted to base its FOGPs on its own forecast, it will still receive the centralised forecast). The centralised forecaster will also provide its forecasts to:

- the system operator – so it can compare forecasts and offers to ensure system security is maintained
- the Authority – for monitoring and compliance purposes

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<sup>10</sup> This does not necessarily mean the spot price will be \$0.01/MWh.

<sup>11</sup> As part of the procurement process for a centralised forecaster, the Authority will determine what inputs a forecaster would need to produce accurate generation forecasts (eg, determining if individual solar panel and/or wind turbine outages were required).

- the owner of an information platform – for publication of some forecast information

Before submitting its offers, intermittent generators must ensure the FOGPs they receive from the centralised forecaster “look” correct. Intermittent generators must ensure their FOGPs reflect the most recent forecast and if necessary are adjusted to account for any bona fide physical reason or any planned outage affecting the generating plant and trading period. A FOGP cannot be adjusted for any other reason.

### **Intermittent generators must follow a prescribed process for seeking approval to base their FOGPs on their own forecast**

If an intermittent generator wants to base its FOGPs on its own forecast, it must seek the Authority’s approval.

To obtain the Authority’s approval, an intermittent generator must submit ‘mock’ FOGPs to the Authority based on its own forecast for a period of four weeks. A longer period may be required to cover a range of weather conditions.

The intermittent generator would continue to submit real offers to the system operator via the Wholesale Information Trading System during this period.

Intermittent generators must submit a list of their mock FOGPs 12 hours ahead, 6 hours ahead and 2 hours ahead of the relevant trading period alongside a list of their real FOGPs to the Authority at the end of each day (48 trading period window) via its [Information Provision platform](#). These must be in a CSV file. The CSV file must also include the usual information that intermittent generators provide when submitting offers.<sup>12</sup>

### **The Authority will assess the accuracy of intermittent generators’ mock FOGPs over different timeframes using various metrics**

The Authority will use a suite of metrics to assess whether an intermittent generator’s mock FOGPs are as accurate, or more accurate, than its real FOGPs. These metrics include the:

- Mean squared error (MSE) – measures the average squared difference between predicted values and actual values.
- Root mean squared error (RMSE) – measures the average magnitude of the errors between predicted values and actual values.
- Mean absolute error (MAE) – measures the average magnitude of the absolute errors between predicted values and actual values.
- Mean bias error (MBE) – determines if the predicted values are above or below actual values (ie, the forecast bias).

The Authority will use the above metrics to calculate the accuracy of intermittent generators’ mock FOGPs 12 hours ahead, 6 hours ahead and 2 hours ahead of the relevant trading period.

The Authority will allow an intermittent generator to base its FOGPs on its own forecast if the Authority determines that its mock FOGPs over the four-week period are as accurate, or more

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<sup>12</sup> Refer to the ‘offer report’ section on page 88 of the WITS functional specification: [https://www.ea.govt.nz/documents/3115/WITS\\_FS\\_v12.0.pdf](https://www.ea.govt.nz/documents/3115/WITS_FS_v12.0.pdf)

accurate, than its real FOGPs. The Authority will take into account accuracy across all three time horizons (ie, 12 hours ahead, 6 hours ahead and 2 hours ahead) over the four-week period.

The Authority may require several weeks to carry out the required analysis before it can inform an intermittent generator that it is able to base its offers on its own forecast.

If an intermittent generator wants to change forecast providers or introduce new forecasting models, it must complete the above process.

### **Intermittent generators must also agree to other conditions**

**Note:** Some details in this section cannot be specified yet as they will reflect details that will be agreed between the centralised forecaster and the Authority. Placeholders have been included where necessary.

An intermittent generator wanting to base its offers on its own forecast must also agree to the following conditions:

- The provider of the intermittent generator's forecasts must provide forecasts of wind or solar up to six days ahead.
- The provider of the intermittent generator's forecasts must provide revised forecasts every [X minutes/hours] up to [X days] out, and every [Y minutes/hours] from [Y days] out.
- The intermittent generator must agree to meet generation accuracy standards. These will mirror the forecast performance standards that will apply to the centralised forecaster and will ensure an intermittent generator's own forecast is consistently at least as accurate as the centralised forecast. An example of a forecast performance standard is:

**[12 hours] before real time, [90%] of the time over a four-week period, forecast accuracy must be the greater of [10MW], or within [20%], of the FOGP specified in the generator's final offer**

For a 50MW wind farm that has a final FOGP of 40MW, 20% would equal 8MW. Given this is lower than 10MW, the 10MW standard would apply.

- An intermittent generator must send each forecast (MW value) and FOGP (if these are different things) to the system operator and the Authority.<sup>13</sup> This will ensure:
  - the system operator can issue appropriate dispatch instructions and undertake system security assessments
  - the Authority can monitor intermittent generators' compliance with process requirements.
- If the above conditions are not met, the intermittent generator will be required to base its offers on the centralised forecast.

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<sup>13</sup> The Authority will specify the process for doing this in due course.

- If an intermittent generator that has been permitted to base its offers on its own forecast experiences issues with its own forecast, it will also be required to base its offers on the centralised forecast.

### **Intermittent generators should monitor forecast accuracy**

- Intermittent generators that are basing their offers on their own forecast should continually monitor the accuracy of their forecast. If an intermittent generator determines its own forecast is not accurate enough, it should base its offers on the centralised forecast for the relevant trading periods (the centralised forecaster will provide forecasts to all intermittent generators regardless of whether an intermittent generator will use it to inform its offers).
- The Authority will also monitor the accuracy of offers based on intermittent generators' own forecasts. If the Authority determines that an intermittent generator's own forecast is not at least as accurate as the centralised forecast, it will inform the intermittent generator that it must base its offers on the centralised forecast until it can demonstrate its own forecast is accurate enough.

### **Some Code requirements will still apply to intermittent generators basing their offers on their own forecast**

Intermittent generators basing their offers on their own forecast will still be required to comply with process requirements in the Code. This includes:

- submitting an initial offer within 30 minutes of receiving the first forecast
- submitting a revised offer within 30 minutes of receiving a revised forecast
- if necessary, adjusting a FOGP to account for any bona fide physical reason or any planned outage affecting the generating plant and trading period
- notifying the system operator and the Authority if a FOGP is adjusted and the reasons for the adjustment.

FOGPs should be aligned with forecast generation to represent potential generation, regardless of changes in actual generation output due to dispatch instructions. This means forecasts that are adjusted based on constrained generation output may be non-compliant with the definition of FOGP in the Code.

The Authority will regularly monitor intermittent generators' compliance with process requirements in the Code. If an intermittent generator fails to comply with process requirements, the Authority may take action for a breach of the Code in accordance with its Compliance Strategy.