Review of forecasting provisions for intermittent generators – final Code amendments

Decision paper

21 February 2025

ELECTRICITY AUTHORITY
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Executive summary

According to the Authority's 2023 generation investment pipeline survey, more than two-thirds of new generation in New Zealand will be from *intermittent* sources, such as wind and solar energy. The output from intermittent generation is not continuously available due to variations in weather, which can be hard to predict.

While intermittent generation is an increasingly vital part of our electricity supply and will contribute to lower prices for consumers over time, forecasting generation levels is a key challenge.

Our analysis shows intermittent generators' forecasts are often inaccurate and that this is affecting reliability, security of supply and can increase costs for consumers. For example, inaccurate forecasting of intermittent generation was a contributing factor to the grid emergency on 9 August 2021. The impact of unreliable forecasts will grow as the proportion of intermittent generation in our electricity supply increases.

Forecasts will never be perfect, but our analysis shows that material improvements are possible. Realising these improvements will reduce reliability and security of supply risks and reduce costs for consumers. Our July 2024 decision enabled new arrangements to realise these improvements and this paper details how those arrangements will be implemented.

A new hybrid forecasting approach for intermittent generators

In July 2024, we decided to implement a hybrid forecasting arrangement (and amend the Code to support this new approach) where:

- a centrally procured forecast will be provided for each intermittent generation site. This central forecast will materially improve forecast reliability, reducing risk and cost to electricity consumers
- intermittent generators can use their own forecasts — provided they can demonstrate these meet minimum performance standards.

These changes aim to improve the accuracy of intermittent generators' offers across all trading periods, increasing confidence in the availability of their generation. The hybrid arrangement is expected to foster innovation in intermittent generation forecasting and promote competition by reducing entry barriers for new developers of intermittent generation. This will improve the reliability, efficiency and affordability for electricity consumers.

Implementing the hybrid forecasting arrangement

In October 2024, we consulted on Code amendments to implement the hybrid forecasting arrangement. The updated Code will operate alongside:

a) a contract with the centralised forecaster

b) guidance issued by the Authority for intermittent generators who wish to use their own forecasts (the draft guidance was included in the Consultation Paper).

We received nine submissions, with broad support from all submitters for transitioning to the hybrid forecasting arrangement.

We received feedback on the timing of offers and implementation lead times. Some submitters agreed with the proposal for intermittent generators to submit their initial offers six

days ahead (compared to 1.5 days under the status quo). For those who supported this proposal, some supported a six-day ahead requirement and one suggested extending it to seven days. Some submitters did not endorse this requirement but indicated they would be able to comply with it.

Some submitters raised concerns about the timeframes for implementation and the administrative burden and costs associated with the need to provide offers further in advance and to revise offers more frequently. Several submitters also emphasised the importance of flexible and secure data requirements

After considering submissions, the Authority has decided to proceed with the Code amendments consulted on with some minor revisions reflecting feedback received.

Revisions to the proposals in our October 2024 Consultation Paper

Revisions to the proposals consulted on include (the relevant mechanism is in brackets):

- the first approved forecast will be issued seven days rather than six days in advance of the relevant trading period (forecaster contract)
- intermittent generators will submit their first offer within 25 minutes (rather than within 30 minutes) of receiving the first forecast, and must revise their offer within 25 minutes of receiving a revised forecast (Code amendment)
- intermittent generators must comply with dispatch instructions if their actual generation is more than 30MW below the forecast of generation potential (FOGP) in their final offer – this is in addition to the current requirement to comply with dispatch instructions when flagged by the system operator to constrain down (Code amendment)
- intermittent generators seeking approval to use their own forecast (draft guidance);
    - must demonstrate they meet the forecast performance standards the centralised forecaster is required to meet, rather than demonstrating that its own forecast is at least as accurate as the centralised forecast
    - will not be required to notify the system operator and the Authority when they adjust their FOGPs.

The Authority will agree with the centralised forecaster the frequency of forecast updates and when revised forecasts should be provided to intermittent generators. We expect that forecasts will be issued less frequently further out from real-time (ie, forecasts six or seven days out will be revised less frequently than forecasts one or two days out).

Implementation date

There is a balance between the desire to have the hybrid forecasting arrangement in place as soon as possible and the need for intermittent generators to update their systems to ensure they can comply with the new requirements.

The Authority has decided that the new forecasting arrangement will come into effect on 1 July 2025, as the benefits of the new arrangement coming into effect during winter are significant.

While most submitters did not have an issue with the proposed ‘winter 2025’ implementation date, some identified more time was needed to put necessary systems in place to comply

with the new requirements. In response to this feedback, the Authority proposes working closely with intermittent generators to support the required system changes from April 2025, ahead of the 1 July 2025 implementation date. Specifically, the Authority will run workshops in early April 2025 for intermittent generators, the centralised forecaster and other relevant stakeholders to define systems and protocols for the exchange of information.

Intermittent generators who wish to use their own forecasts can commence the approval process from mid-April 2025 (in readiness for the Code amendments coming into force). The Authority will publish final guidance in mid-April 2025, which will outline the process intermittent generators must follow to be permitted to base their offers on their own forecasts.

The Authority refers to the policy position and cost-benefit analysis set out in the Consultation Paper in support of the Code amendments. The focus of this Decision Paper is on submitters' feedback and the further revisions made.

Contents

1. Purpose

1.1. This paper presents the final amendments the Authority will make to the Electricity Industry Participation Code 2010 (Code) to give effect to the hybrid forecasting arrangement. It follows on from the:

a) Issues and Options Paper we published in June 2023 that sought feedback on proposed solutions to improve the accuracy and frequency of intermittent generation forecasts.

b) Decision Paper we published in July 2024 that presented the key decisions from our review of forecasting provisions for intermittent generators.

c) Consultation Paper we published on 11 October 2024 on the proposed changes to the Code to give effect to the hybrid forecasting arrangement decisions.

2. Background

The Authority decided to implement a hybrid forecasting arrangement

2.1. More than two-thirds of New Zealand's new generation will be from intermittent energy sources such as wind and solar.[1] The output from intermittent generation is not continuously available due to variations in weather, which can be hard to predict. The Authority has also identified that forecasts of intermittent generation are often inaccurate and unreliable, including close to real-time. This creates challenges for the power system and potentially increased costs for consumers.[2] [3]

2.2. The Authority is implementing a hybrid forecasting arrangement to improve intermittent generation forecasts and offers.

2.3. More accurate forecasts and offers will increase the accuracy of price signals, contributing to the most efficient and lowest cost sources of generation being dispatched. This is a key initiative to support security of supply and affordable electricity for consumers.

2.4. 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 forecasts if they have approval from the Authority to do so. This would require an intermittent generator to show that its forecasts meet the forecast performance standards that the centralised forecast must meet.

Benchmark for intermittent generators wishing to use their own forecasts

In the July 2024 Decision Paper and October 2024 Code Consultation Paper, the Authority stated that intermittent generators may use their own forecasts for submitting offers if they can demonstrate to the Authority that their forecasts are consistently at least as accurate as the centralised forecast.

[1] Investment pipeline | Tableau Public

[2] The root mean square error of some forecasts 12 hours ahead often exceeds 20%: https://www.ea.govt.nz/documents/2384/Accuracy-of-Wind-and-Load-Forecasts_jvF1BoL.pdf

[3] https://www.ea.govt.nz/documents/3150/Appendix_B_-_EY_Report.pdf

Given that the accuracy of the centralised forecast may vary over time, the Authority has decided to simplify this requirement. Intermittent generators will be permitted use their own forecasts if they meet the same forecast performance standards that are required of the centralised forecaster.

The Authority will establish these performance standards in consultation with the centralised forecaster. Once finalised, the standards and the process intermittent generators must follow to be permitted to use their own forecasts will be outlined in guidance. The Authority expects to publish this guidance in mid-April 2025.

The Code needs to be amended to give effect to the hybrid forecasting arrangement

2.5. Code changes are necessary to establish a hybrid forecasting arrangement. The Code provisions will apply to all intermittent generators, including those that base their offers on their own forecasts. A summary of the proposed Code amendments is included in section 3 of this paper.

2.6. The updated Code will operate alongside the following additional measures:

a) Contractual obligations placed on the centralised forecaster.[4]

b) Guidance issued by the Authority for intermittent generators who wish to use their own forecasts.

The Authority is undertaking a procurement process to select a centralised forecasting service provider

2.7. The Authority will work select our preferred provider in the coming months. We will hold workshops between the preferred provider and intermittent generators during April 2025 to discuss information exchange systems and protocols (discussed further below). The successful provider will begin providing services on 1 July 2025.

The Authority has implemented other complementary measures to improve forecasting performance

2.8. 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 FOGP should be interpreted. We have also reiterated our expectation that intermittent generators comply with these requirements until the proposed Code amendments come into effect.

2.9. Since July 2024, we have been publishing forecast accuracy for each wind generator and wind generation site across different timeframes (on a monthly scale). This aims to improve transparency of the difference between wind generators' FOGPs and actual generation.

2.10. In October 2024, we published an article to illustrate the performance of the forecasts of individual wind farms and to educate readers about the importance of more accurate intermittent generation forecasting.

[4] From this point on, we refer to the centralised forecaster as 'the forecaster'.

2.11. On 21 February 2025, we published our analysis that looked at the accuracy and bias of forecasts from the five main wind generators[5] over a three-year period. This will support the development of forecast performance standards under the hybrid forecasting arrangement.

2.12. The Authority is engaging with intermittent generators when necessary to understand the cause(s) of inaccurate forecasts and seeking assurance that intermittent generators are taking action to improve the accuracy of their forecasts and offers.

3. Summary of submitters' views

3.1. The Authority received nine submissions on the Consultation Paper from the following parties.

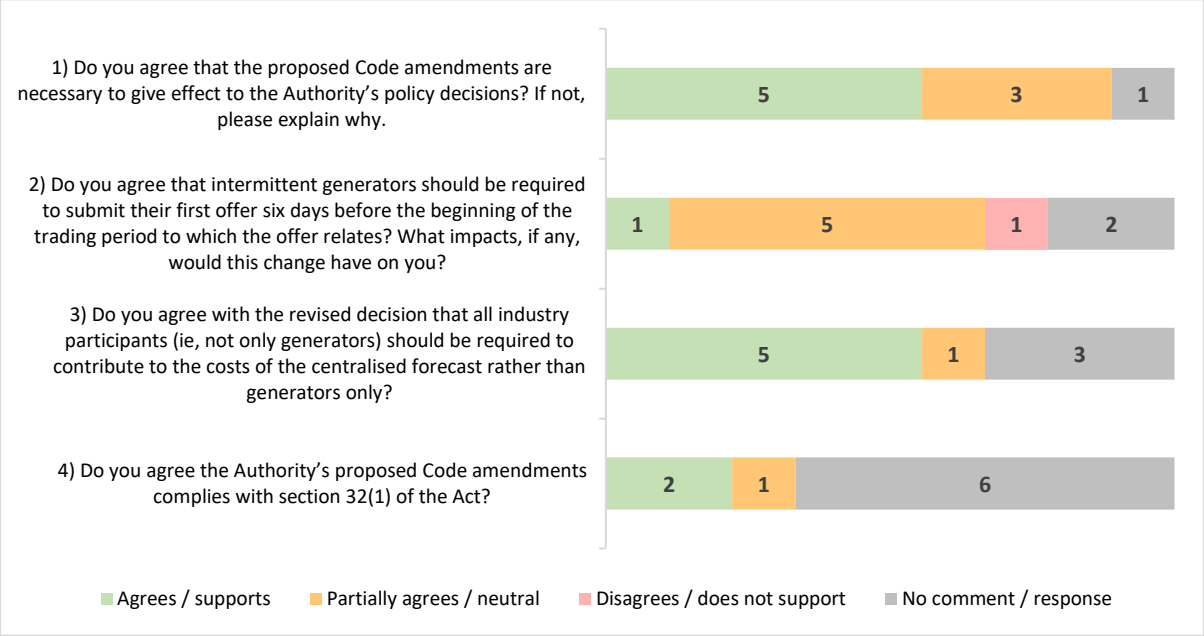
Submitter	Type
Genesis Energy	Intermittent generator (wind and/or solar)
Lodestone Energy	
Manawa Energy	
Mercury Energy	
Meridian Energy	
NewPower Energy Services Limited	Ancillary service agent, electricity generator, metering equipment owner and battery operator
NZX	Licenced securities exchange
Powerco	Gas and electricity distributor
Transpower	Grid owner and system operator[6]

3.2. The Consultation Paper contained six questions we sought submitters' feedback on. Four were agree/disagree questions. Figure 1 shows submitters' responses to the agree/disagree questions.

[5] Genesis, Manawa, Mercury, Meridian and NZ Windfarms

[6] In this instance Transpower submitted in its capacity as system operator. Therefore, we have referred to them in this paper as 'the system operator'.

Figure 1: Submitters' responses to agree/disagree questions (nine submissions were received)



3.3. Appendix 1 contains a list of submitters' responses to the six questions in the Consultation Paper. The main points are summarised below and addressed more fully in Section 4:

a) There continues to be broad support for a hybrid forecasting arrangement.

b) There was some support for requiring intermittent generators to submit their initial offer further in advance of the relevant trading period.

c) There are concerns about the added costs and increased burden that would be placed on intermittent generators.

d) Several submitters emphasised the importance of flexible and secure data requirements.

e) There were questions about the impact the hybrid arrangement would have on intermittent generators that also operated battery energy storage systems.

f) There was broad support for allocating the costs of the centralised forecast to generators and purchasers.

g) The proposed three-month transition period may not be long enough.

4. Response to submissions

4.1. This section outlines:

a) the Authority's response to the points raised in submissions, and

b) the Authority's final decision.

4.2. The structure follows the order of questions in the Consultation Paper.

Question 1: Do you agree that the proposed Code amendments are necessary to give effect to the Authority's policy decisions? If not, please explain why.

Submitters' views

Five submitters agreed with the proposed Code amendments, three submitters agreed in principle but noted some caveats, and one submitter did not respond specifically to this question.

Submitters raised a number of matters in response to this question. We have addressed each of these below.

Discrepancy between centralised and self-forecast requirements

The Authority's proposal

4.3. In the draft guidance, the Authority proposed that intermittent generators using their own forecasts for offers must notify the system operator and the Authority if they adjust their FOGP, along with the reasons for the adjustment (this would be a condition of approval). This requirement does not apply to intermittent generators using the centralised forecast.

Matter raised

4.4. The system operator noted that this proposal would create a discrepancy between intermittent generators' obligations when they adjust their FOGPs depending on whether they are using the centralised forecast or their own forecasts.

The Authority's response and decision

4.5. The Authority will amend the guidance to remove the proposal that an intermittent generator using its own forecasts must notify the system operator and the Authority if it adjusts its FOGP and the reasons for the adjustment.

4.6. This is because under proposed clause 13.9B(4)(b), an intermittent generator using its own forecasts must provide these forecasts and FOGPs to the system operator and the Authority. This information will enable the system operator and the Authority to determine whether the intermittent generator has adjusted its FOGP without additional information.

4.7. The Authority also agrees with the system operator that the same requirements should apply to all intermittent generators regardless of whether they use the centralised forecast or their own forecasts.

Specifying what intermittent generators must base their FOGP on in the unlikely event that the centralised forecast is unavailable or cannot be delivered

The Authority's proposal

4.8. The Authority proposed amending clauses 13.6 and 13.9B to specify that if an intermittent generator does not receive an approved forecast 72 trading periods before the relevant trading period, it must submit an initial offer 71 trading periods prior. In this case, the FOGP must use either:

a) the long-term seasonal average for that time of year for that intermittent generating station and trading period, or

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.

4.9. These proposed amendments aim to clarify what information intermittent generators should base their offers on in the unlikely event that the centralised forecast is unavailable or cannot be delivered (eg, due to technical issues).

Matters raised

4.10. The system operator stated that clarity is needed on the timing and usage of the backstop arrangement, considering that the last updated forecast may be more accurate than the seasonal average. Therefore, in these cases it would be logical for an intermittent generator to base its offer on the most recently updated forecast rather than the long-term seasonal average.

4.11. The system operator also suggested that the long-term seasonal averages could be provided periodically to each intermittent generator, so they are already available for use when needed (rather than waiting until after an issue with forecast delivery occurs to provide this information).

The Authority's response and decision

4.12. The proposed amendments to the Code require an intermittent generator to use the most recently updated forecast for a trading period. Accordingly, if any forecast has been issued for a trading period (even if the forecast is not further updated for some reason), that forecast must be used by the intermittent generator.

4.13. Where no centralised forecast has been issued 72 trading periods before the relevant trading period the intermittent generator must use the long-term seasonal average or other forecast information if the intermittent generator considers this is as least as accurate.

4.14. The Authority acknowledges that a centralised forecast for a previous trading period may be more accurate that than the long-term seasonal average.

4.15. However, the current proposed drafting already allows for the intermittent generator to use a centralised forecast for a previous trading period as a backstop if it considers that forecast is at least as accurate as the long-term seasonal average.

4.16. The Authority will discuss with the forecaster when the long-term seasonal average is likely to be more accurate than the most recently updated forecast, and vice versa. We will inform intermittent generators of the forecaster's view to assist intermittent generators make informed decisions.

4.17. The Authority also intends to require the forecaster to provide it with the long-term seasonal average periodically rather than waiting for an issue with forecast delivery to occur. The Authority will publish this information on its website, so it is readily available to intermittent generators.

The requirement for intermittent generators to provide the forecaster with information upon request

The Authority's proposal

4.18. The Authority proposed a new subclause 13.9B(5) to specify that an intermittent generator must, in response to a request from the forecaster, provide any information reasonably required by the forecaster for the purpose of providing an approved forecast, as soon as practicable after receiving the request.

Matter raised

4.19. The system operator suggested that there should be a requirement for intermittent generators to provide any information to the forecaster when necessary. For example, the forecaster may need to know when an intermittent generator was dispatched off so that its actual constrained generation during those time periods does not inform future forecasts.

The Authority's response and decision

4.20. The Authority agrees that intermittent generators should be required to provide information to the forecaster for the purposes of producing forecasts, including future forecasts. We consider this is already addressed by the addition of clause 13.9B(5), which requires intermittent generators to respond to requests from the forecaster. As drafted, this clause covers any information the forecaster reasonably requires for the purpose of approved forecasts.

Whether the forecaster should be a designated service provider

The Authority's proposal

4.21. The updated Code will operate alongside:

a) the contract with the forecaster, and

b) guidance issued by the Authority for intermittent generators who wish to use their own forecasts.

Suggested

4.22. NZX considers the proposed Code amendments will give effect to the Authority's policy decisions. However, NZX noted that many of the forecaster's functions and the requirements on intermittent generators will be included in guidance. NZX is concerned that the guidance is unenforceable under the Code, which could create ambiguity around operational processes and obligations on participants, including other service providers.

4.23. NZX recommended the forecaster should be a designated service provider because this would enable the forecaster to have:

a) mandated contractual and operational obligations

b) well defined procedures and controls that are subject to regular audit

c) greater oversight and compliance of its market facilitation activities.

4.24. NZX noted a designated service provider would ensure there is a visible and regulated pathway for compliance and dispute resolution under the Electricity Industry (Enforcement) Regulations 2010.

4.25. NZX also suggested that, in line with other service provider requirements, and for transparency and assurance to participants, the Authority should provide regular reporting of the centraliser forecaster's compliance with its contractual service level requirements, beyond just its forecasting performance.

The Authority's response and decision

4.26. The Authority recognises there are some advantages of designating the forecaster as a service provider. However, we are confident that the forecaster's obligations, service level requirements and performance and reporting expectations can be effectively managed through its contractual agreement with us.

4.27. The Authority will reassess the merits of making the forecaster a designated service provider after the initial contract term.

Question 2: Do you agree that intermittent generators should 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?

The Authority's proposal

4.28. The Authority proposed that intermittent generators should be required to submit their first offer six days before the relevant trading period, aligning with the system operator's Week-Ahead Dispatch Schedule (WDS).

4.29. This proposal aimed to standardise the offer timelines and:

a) lead to more accurate forecast price schedules, which will enable market participants to make better consumption and generation decision

b) enable the system operator to more easily determine whether potential security issues are likely to arise.

4.30. Currently, generators are encouraged — but not obligated — to provide offers for inclusion in the WDS.

Submitters' views

One submitter agreed with this proposed amendment. Five submitters did not explicitly agree to this requirement but indicated they would be able to comply with it. One submitter (NewPower) disagreed with this proposed amendment. Two submitters did not respond specifically to this question.

Matters raised

4.31. Initially, the Authority proposed a six-day lead time, but the system operator recommended extending this to seven days to align fully with the WDS.

4.32. Conversely, NewPower disagreed with the proposal to submit offers six days in advance, advocating instead for the current practice of submitting offers at least 1.5

days (71 trading periods) ahead. NewPower argued that extending the timeframe would increase costs for some intermittent generators, as their systems would need to be updated to accommodate the change (noting NewPower did not quantify the additional costs).

4.33. NewPower also questioned the value of requiring offers so far in advance, noting that forecasts made six or seven days ahead are often inaccurate and would need to be revised closer to real-time anyway. Genesis and Lodestone supported this view.

4.34. NewPower suggested that alternatively, the system operator could use the centralised forecasts to analyse generation levels and potential security issues, rather than relying on offers submitted further in advance.

The Authority's response and decision

4.35. The Authority has decided to require intermittent generators to submit their initial offers seven days in advance as suggested by the system operator to better align with the WDS timeframe.[7]

4.36. The Authority acknowledges that intermittent generation forecasts made six or seven days in advance may lack the precision of forecasts provided closer to real-time. However, analysis provided by the system operator has indicated that these forecasts are more accurate than the current practice of "rolling over" offers from equivalent trading periods from the same day of the previous week. These rolled over offers are applied when the generator has not provided an offer for a given trading period and are over-written as soon as an updated offer is provided.

4.37. A review of forecasting arrangements in international jurisdictions shows that intermittent generation forecasts up to seven days ahead is standard practice in several jurisdictions, such as in the Australian National Electricity Market, Alberta and Texas.[8]

4.38. The Authority recognises that requiring intermittent generators to submit their initial offers seven days ahead may necessitate system modifications with some associated cost.[9] However, we consider the benefits in terms of mitigating system security risks and better forecast price schedules further in advance are sufficient to justify this decision.

4.39. Regarding NewPower's suggestion that the system operator could use the centralised forecasts to analyse generation levels and potential security issues, the Authority notes that intermittent generators might not always offer their full generation capacity. This could lead to over-forecasting if the system operator relies solely on the centralised forecast, potentially jeopardising system security.

4.40. In response to concerns about system modification costs, the Authority's procurement of the forecaster will require it to be able to submit offers on behalf of intermittent generators on a commercial basis. This will provide intermittent generators with an additional, and potentially more efficient option (depending on their systems).

[7] This decision is contingent on the forecaster's ability to provide seven-day ahead wind and solar forecasts (which will be determined during contract negotiations).

[8] Appendix_A_-_Concept_Consulting_Report.pdf

[9] Some intermittent generators already submit their initial offer up to seven days ahead.

4.41. The Authority will agree with the forecaster the frequency of forecast updates and when it must send revised forecasts to intermittent generators. We expect that forecasts will be issued less frequently further from real-time (ie, forecasts six or seven days out will be updated less frequently than forecasts one or two days out). This would mean the frequency at which intermittent generators would need to revise their offers would also be less frequent further from real-time.

4.42. This change would not impact non-intermittent generators, as they would still be required to submit their first offer 71 trading periods before the relevant trading period begins. The Authority considers this reasonable since most non-intermittent generators, particularly thermal generators, depend on forecast price schedules to guide their generation decisions. These schedules are typically influenced by intermittent generators' offers.

Question 3: 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?

The Authority's proposal

4.43. In the July 2024 Decision Paper, the Authority stated that the costs of the forecasts would be allocated across all generators required to submit offers, as they benefit from improved forecast accuracy. The Authority also noted that the clearing manager would ensure these costs were appropriately distributed among generators.

4.44. After further consideration, as outlined in the Consultation Paper, the Authority now considers it is more appropriate to recover the forecasting costs through its levy-funded appropriation rather than via the clearing manager. This approach aligns with the following:

a) The Electricity Industry (Levy of Industry Participants) Regulations 2010, which define allocation requirements for services provided by the Authority, are based on public sector charging principles[10] and were developed through consultation.

b) The centralised forecasting services, and managing the contract with the forecaster, will become a permanent part of the Authority's annual work programme. Therefore, these costs should be integrated into our baseline funding.

4.45. Under the Levy Regulations, the costs of the forecasting service must be split equally between generators and purchasers.

Submitters' views

Five submitters agreed with the revised decision. One submitter (the system operator) suggested the original decision (ie, only generators should contribute to the costs) may be more appropriate. Three submitters did not respond specifically to this question.

[10] Guidelines for Setting Charges in the Public Sector - April 2017

Matters raised

4.46. The system operator expressed the view that the initial decision — requiring only generators to contribute to the costs — would have been beneficial. This approach recognises that the centralised forecast directly supports some intermittent generators' trading decisions and allows them to avoid the expense of procuring or developing their own forecasts.

4.47. The system operator also highlighted that allocating costs to intermittent generators using the centralised forecast could foster competition between the forecaster and the independent forecasters that the intermittent generators have already invested in and rely on for their offers.

The Authority's response

4.48. While allocating the costs to generators and purchasers is primarily a legal requirement,[11] in the Authority's view, allocating the costs to generators and purchasers also better reflects a beneficiary-pays principle.

4.49. The Authority will proceed with its decision that generators and purchasers will be required to contribute to the costs of the centralised forecast.

Question 4: Do you agree the Authority's proposed Code amendments complies with section 32(1) of the Act?

Submitters' views

Two submitters explicitly stated they agreed that the proposed Code amendments comply with section 32(1) of the Act. Six submitters did not respond specifically to this question.

Matters raised

4.50. The system operator questioned the ability for the forecaster (who would not be a participant) to be enabled (through the Code) to impose obligations on participants (for example, being able to request information from intermittent generators for the purposes of producing forecasts).

4.51. The system operator also raised concerns about the Authority's proposal that the forecaster be able to submit offers on generators' behalf on a commercial basis (this is a matter that would be addressed in the contract not the Code). The system operator questioned whether this would make the forecaster a participant and the reliability of offers submitted by a party not bound by the Code.

The Authority's response and decision

4.52. The proposed Code amendments do not allow a non-participant to use the Code to impose obligations on participants. Clause 13.9B(5) requires a participant to respond to a request for information received from the forecaster. However, this is within the scope of the Code making powers in section 32 of the Electricity Industry Act 2010 (Act) because:

[11] Under the Levy Regulations, the costs of the forecasting service must be split equally between generators and purchasers.

4.53. The forecaster is not imposing the obligation. Rather, it is the Authority requiring intermittent generators (ie, participants) to provide information to the forecaster upon request. If an intermittent generator fails to do so, the Authority, not the forecaster, would be responsible for taking action for a potential breach of the Code.

4.54. This clause does not impose an obligation on a non-participant, which the Authority must not do under section 32 of the Act.

4.55. In relation to concerns about the ability for the forecaster to make offers on behalf of intermittent generators, generators are already able to contract with a third party to submit their offers. The Authority will ensure that the ability for the forecaster to offer this service is enabled under the contractual terms.

4.56. The forecaster would not be a participant. Submitting an offer on behalf of the intermittent generator is primarily an administrative task and does not fall within the definition of participant in the Act or clause 1.5 of the Code (including the definition of 'trader'). The intermittent generator would provide the core offer information (such as the amount of generation to be offered and any required adjustments). The forecaster would send the offer, adding the approved forecast information, and would update the offer to reflect updated forecasts. The intermittent generator remains responsible for the wholesale market obligations.

4.57. However, these third parties are also participants and so are captured under the Code.

Question 5: 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?

Submitters' views

Eight submitters responded specifically to this question. Submitters' comments were focused on the data intermittent generators would need to provide to the forecaster, how data should be exchanged between parties, and the need to manage this commercially sensitive information appropriately.

Matters raised

4.58. Meridian stated that it was unclear whether a forecaster would need to request access to Supervisory Control and Data Acquisition (SCADA)[12] outputs from each wind farm. Meridian highlighted that some intermittent generating stations, including one of Meridian's wind farms, do not use SCADA.

4.59. Meridian also pointed out that granting the forecaster access to SCADA could raise security and cost concerns for intermittent generators.

[12] SCADA collects data from sensors and other devices to provide real-time visibility and the ability to automate power system operations and control devices remotely. Examples of SCADA inputs include actual generation output, wind speed/irradiance, number of turbines/inverters available, and turbines in high wind cut-out.

4.60. Manawa noted that some older intermittent generating stations will not have the same technologies, such as SCADA, than newer stations and that this should be taken into account when determining information requirements.

4.61. Lodestone and NewPower both suggested that the Authority establishes a "technical working group" with affected parties to agree on the information requirements and the design of the platform used to exchange information.

The Authority's response and decision

4.62. The Authority agrees that establishing a working group, or a hosting a series of workshops, would be beneficial.

4.63. The Authority will host a series of workshops to define and agree on the information requirements and the design of the platform for exchanging information.

4.64. This would include on:

a) the information intermittent generators must provide to the forecaster

b) the steps the forecaster should take to handle this commercially sensitive and confidential information appropriately

c) the most efficient way for the forecaster to deliver forecasts to relevant parties.

4.65. The following stakeholders will be invited to participate in the workshops:

- the forecaster
- intermittent generators
- the system operator
- the Authority
- the owner of the platform where aggregated forecasts will be published.

4.66. The Authority agrees that the forecaster must accommodate intermittent generators that do not use SCADA or have limited data to provide the forecaster. The Authority considers that the addition of clause 13.9B(5) addresses this, as it would not be reasonable to request SCADA inputs from an intermittent forecaster who does not use SCADA.

4.67. The Authority also agrees that there will need to be confidentiality agreements and secure data exchange agreements between parties to ensure the data is managed appropriately.

4.68. The Authority will contact the relevant parties in the coming weeks about participating the workshops. The Authority plans to schedule the workshops in April 2025, aligning with when the Authority will be undertaking contract negotiations with the forecaster.

Question 6: Do you have any comments on the drafting of the proposed Code amendments?

Submitters' views

Six submitters responded specifically to this question with a variety of comments and suggestions. We have addressed each of these below.

The process an intermittent generator must follow to obtain the Authority's approval to use its own forecasts

The Authority's proposal

4.69. In the draft guidance, the Authority proposed that to obtain the Authority's approval to use their own forecasts, an intermittent generator must submit 'mock' FOGPs to the Authority based on its own forecasts for a period of four weeks (albeit a longer period may be required to cover a range of weather conditions). An intermittent generator will not be required to submit mock FOGPs once the Authority has permitted it to use its own forecasts.

Matter raised

4.70. Mercury was concerned that the administrative burden for intermittent generators wanting to use their own forecasts was high. Mercury specifically referenced the burden of needing to submit 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.

The Authority's response and decision

4.71. The requirement for an intermittent generator to submit mock FOGPs to the Authority — 12 hours, 6 hours and 2 hours before the relevant trading period, along with a list of its actual FOGPs — will apply for a specified period. This will allow the Authority to assess the accuracy of the intermittent generator's mock FOGPs, which will be based on the intermittent generator's own forecasts. Once the Authority has approved the use of an intermittent generator's own forecasts, the intermittent generator will no longer be required to submit mock FOGPs.

4.72. The Authority acknowledges that an intermittent generator will incur some one-off upfront costs to undertake the process to seek the Authority's approval to use its own forecasts. However, a rigorous process is necessary to ensure the Authority can be confident that the intermittent generator's forecast will consistently meet the required accuracy standards.

4.73. In the draft guidance published alongside the Consultation Paper,[13] the Authority indicated that intermittent generators would need to submit mock FOGPs for a period of four weeks (though this period could be extended to account for various weather conditions).

[13] Refer to Appendix C of the Consultation Paper

4.74. After reviewing international literature[14] and analysing wind generators' forecast inaccuracies over various timeframes, the Authority has decided that intermittent generators will be required to submit mock FOGPs for eight weeks. A shorter period could lead to less reliable forecasts with greater error variation, potentially affecting the Authority's ability to assess whether an intermittent generator's own forecasts are sufficiently accurate. Consistent with our earlier draft guidance, this eight-week period could be extended to ensure a variety of different weather conditions have occurred during the trial period.[15]

The implementation date

The Authority's proposal

4.75. In the Consultation Paper, we stated that we would aim for the forecaster to begin providing services by winter 2025.

4.76. The Authority also proposed that a three-month transition period will take place from when the hybrid arrangement begins.

4.77. This would enable the forecaster to make any adjustments to its processes to ensure they are working optimally. It would also give intermittent generators who wish to base their offers on their own forecasts sufficient time to demonstrate that their own forecasts are accurate enough, while they initially use the centralised forecast.

Matter raised

4.78. Some submitters interpreted the term 'transition' as meaning the Code amendments would not come into effect until three months after the new forecasting arrangement is in place (ie, three months after the date the forecaster starts providing services).

4.79. NewPower and Lodestone expressed concerns that the proposed three-month transition period to the new arrangement is too short for intermittent generators to implement the necessary changes. Lodestone noted that the time required to coordinate with the relevant software developers, design, implement and test the systems could take up to six months. NewPower also recommended that the Authority extends the transition period to at least six months.

The Authority's response and decision

4.80. There is a balance between the desire to have the hybrid forecasting arrangement in place as soon as possible and the need for intermittent generators to update their systems to ensure they can comply with the new requirements.

4.81. The Authority proposed a 1 July 2025 implementation date as tight supply situations tend to be more prevalent during winter. More accurate intermittent generation forecasts will help to support near-term security of supply during this time.

4.82. We acknowledge that some intermittent generators may not be able to make the system changes necessary to comply with a 1 July 2025 implementation date.

[14] For example: IEA Wind Recommended Practice for the Implementation of Renewable Energy Forecasting Solutions | ScienceDirect

[15] This will help to ensure the Authority can be confident an intermittent generator's own forecast will meet the required accuracy standards in different weather conditions (eg, high wind and low wind conditions).

However, the Authority considers the benefits of the new arrangement coming into effect during winter are significant. Therefore, we have decided on a 1 July 2025 implementation date (ie, the Code amendments will come into effect on this date and the forecaster will begin providing services on this date).

4.83. Intermittent generators that are not able to make the system changes necessary to comply with the new requirements from 1 July 2025 would need to apply for an exemption to the new Code. The Authority will work with relevant participants to ensure they can comply with the new requirements as soon as possible.

4.84. Under the initial proposal, an intermittent generator who wishes to base its offers on its own forecasts would have needed to initially use the centralised forecast while it went through the process of seeking the Authority's approval to use its own forecasts. This could be disruptive for the intermittent generator, who may need to change systems to use the centralised forecast and then need to update systems again for its own forecasts.

4.85. The Authority has decided that intermittent generators who wish to base their offers on their own forecasts will be able to commence the process to demonstrate that they can meet the required accuracy standards before the implementation date. This means that if the Authority determines that an intermittent generator's own forecasts are accurate enough, the intermittent generator will be able to use its own forecasts from the implementation date.

4.86. The Authority will publish the final guidance in mid-April 2025, which will outline the process intermittent generators must follow to be permitted to base their offers on their own forecasts.

How battery energy storage systems should be incorporated into the new arrangement

Matter raised

4.87. Lodestone and NewPower both queried how battery energy storage systems (BESS) should be incorporated into the new arrangement, and how this would affect generators' offer requirements. For example, whether a generator with intermittent generating assets and a BESS should modify the forecast it receives from the forecaster to account for how much electricity will be stored for later use.

The Authority's response and decision

4.88. The Authority has discussed this matter with the system operator.

4.89. Electricity from intermittent generation assets should be offered separately from electricity from a BESS (ie, a generator with intermittent generating assets and a BESS should submit two separate offers). This applies regardless of whether the intermittent generating asset is located at the same or a different location as the BESS.

4.90. This allows the system operator to better model and have greater visibility of the physical characteristics of each component at the site.

How quickly an intermittent generator must revise its offer after receiving a revised forecast

The Authority's proposal

4.91. The Authority proposed amending clause 13.18A to specify that intermittent generators would be required to revise offers within 30 minutes of receiving a revised forecast. This is to ensure that intermittent generators' offers consistently reflect the latest forecast.

4.92. The Authority also proposed amending clause 13.18A to prevent intermittent generators from submitting a revised offer after the start of the trading period to which the revised offer relates.[16]

Matter raised

4.93. The system operator raised concerns that a 30-minute turnaround would be too long in some situations, such as when the offer for a trading period is close to real-time or when the revised FOGP is significantly differs from the previous one.

4.94. The system operator highlighted the importance of receiving updated FOGPs during the current trading period, rather than relying solely on the intermittent generator's current generation, as this could lead to over-dispatching based on an outdated FOGP. The system operator also emphasised that timely FOGP updates are crucial for evaluating potential impacts on residuals and the risks in the forecast schedules.

The Authority's response and decision

4.95. While revising offers more quickly than 30 minutes after receiving a revised forecast would be advantageous, it is crucial that intermittent generators can comply with a shorter maximum timeframe. The Authority also recognises that intermittent generators will be responsible for ensuring the FOGP they receive appears accurate and to adjust it as necessary to account for any bona fide physical reasons or planned outages.

4.96. It is important to find a balance between ensuring FOGPs are accurate close to real-time (ie, within gate closure) for dispatch purposes and ensuring intermittent generators can comply with offer requirements.

4.97. The Authority has decided to revise the proposed amendment to clause 13.18A to require intermittent generators to revise offers within 25 minutes of receiving a revised forecast, instead of the initially proposed 30 minutes.

4.98. The Authority is intending to require the forecaster to issue a revised forecast on a half-hour (noting the frequency of forecasts for a trading period may be less frequent than every half hour). The 25-minute timeframe ensures that an intermittent generator can and must update its offer within the same trading period in which it receives a revised forecast. For instance, if an intermittent generator received a revised forecast for the 2.00pm trading period (trading period 28) at 1.30pm (the start of trading period

[16] The example the Authority gave in the consultation paper related to this clause was:

'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.'

27), it must submit its revised offer by 1.55pm. This ensures the offer for the 2.00pm trading period is accurate before the trading period begins.

4.99. In near real-time scenarios, the originally proposed 30-minute window could lead to offers not being updated in time for the start of the trading period (eg, if the half hourly revised forecast was delayed). The change provides a five-minute buffer to mitigate against this risk.

4.100. The Authority will finalise details with the forecaster during contract negotiations, including the frequency of forecast updates and when revised forecasts should be sent to intermittent generators. For instance, it may be agreed that revised forecasts are sent precisely on the half-hour (eg, 1.30pm), rather than slightly later (eg, 1.37pm) to enable an intermittent generator to update its offer within the same trading period in which it receives a revised forecast.

4.101. If the forecaster is unable to provide a revised forecast at the agreed time (eg, at 1.30pm), it should provide the revised forecast as soon as practicable thereafter (ie, the revised forecast should be delivered as close to 1.30pm as possible, with subsequent revised forecasts provided at the next scheduled time (eg, 2.00pm)).

4.102. In response to the system operator's feedback, the Authority has decided that intermittent generators should submit a revised offer even if this occurs after the trading period to which the revised offer relates. This decision means the proposed addition of clause 13.18A(3), which would have prevented intermittent generators from submitting a revised offer after the start of the trading period to which the revised offer relates, will be removed.

Whether the timeframe for revising offers should be the same for all intermittent generators, regardless of whether they use the centralised forecast or their own

The Authority's proposal

4.103. The Authority proposed amending clause 13.18A to specify that intermittent generators using their own forecasts would be exempt from the requirement to revise their offers within 30 minutes (now 25 minutes) of receiving a revised forecast.

4.104. This was to allow the Authority to agree on the frequency with which offers need to be revised by intermittent generators using their own forecasts. The frequency would likely align with that of intermittent generators using the centralised forecast.

Matters raised

4.105. The system operator noted that it will need regular revised offers from intermittent generators using their own forecasts, and the exemption provided by this clause does not fully address the gap in those intermittent generators' obligations.

4.106. The system operator suggested that instead of the Authority determining the frequency of forecast and offer revisions with intermittent generators that have been permitted to use their own forecasts, the timeframe for revising offers after receiving a revised forecast should be the same for all intermittent generators.

4.107. The system operator also sought clarity on whether a revised offer is required if the revised forecast is identical to the previous one.

The Authority's response and decision

4.108. The Authority agrees that to simplify the process and ensure intermittent generators clearly understand their obligations, it is preferable for all intermittent generators to have the same requirements, whether they are using the centralised forecast or their own.

4.109. As a result, the Authority has decided that the timeframe for revising offers after receiving a revised forecast will be the same for all intermittent generators, regardless of whether they use the centralised forecast or their own. This decision means the timeframes outlined in paragraph 4.97 will apply to all intermittent generators, and the proposed addition of clause 13.18A(2) will be removed.

4.110. If a revised forecast is identical to the previous forecast, an intermittent generator will still be required to submit a revised offer. In some cases, the FOGP in this offer may remain the same. However, in other cases, the intermittent generator may need to adjust the FOGP if it becomes aware of a bona fide physical reason or a planned outage that affects its generation capacity during that trading period.

Removal of the existing requirement for intermittent generators to submit monthly reports to the Authority explaining instances of 30MW over-forecasting

Matter raised

4.111. The Authority proposed removing clause 13.86A, which currently requires intermittent generators to submit a report to the Authority if an individual plant generates 30MW below the FOGP in their final offer.

4.112. This is because we did not consider it necessary for accuracy purposes. We also considered:

a) the '30MW' value to be outdated, and does not add to the information we will receive under the FOGPs (which enables us to assess the accuracy of FOGPs and whether an intermittent generator has adjusted them)

b) the reporting requirement did not effectively incentivise intermittent generators to align their actual generation with their final FOGP as closely as possible.

4.113. The system operator requested that clause 13.86A be retained. It explained that this clause did incentivise intermittent generators to align actual generation with the FOGP specified in their final offers. The system operator advised that this helped prevent intermittent generators from withdrawing generation in real-time rather than to incentivise accurate offers. In the system operator's view, the accuracy of the forecast metrics alone does not provide sufficient protection against the withdrawal of intermittent generation for commercial reasons. This was important for its system operator functions.

The Authority's response and decision

4.114. The Authority agrees that the underlying incentive for intermittent generators to submit accurate forecasts should be retained. In our view, the best solution is to refer to the 30MW threshold in clause 13.82, which deals will dispatch instructions. We consider this is more effective than the current reporting provision in addressing the

system operator's concern without adding additional burden on the intermittent generator compared to the status quo.

4.115. More specifically:

a) Currently, under clause 13.82(1)(d), intermittent generators are exempt from responding to dispatch instructions unless the system operator has flagged the dispatch instruction in accordance with clause 13.73(1A) (which is used to constrain down the output of an intermittent generator).

b) Clause 13.82(1)(d) will be amended so that the intermittent generator is exempt from complying with the dispatch instruction if the dispatch instruction is not flagged under clause 13.73(1A) **and** the intermittent generator generates at a rate that is not more than 30MW below the FOGP in its final offer for that trading period.[17] This amendment creates an incentive for the intermittent generator to update its FOGP in circumstances where their actual output is, or is likely to be, significantly lower than their last submitted FOGP value and where there is no bona fide physical reason requiring adjustment. Updating the FOGP to reflect the real-time reduction in generation output will ensure that the dispatch exemption continues to apply, and the generator will not be in breach of the dispatch compliance requirements of clause 13.82.

4.116. While this further revision was not proposed in the Consultation Paper, we consider it is a relatively minor and consequential amendment compared to the status quo. Instead of being required to report instances when actual generation was more than 30MW below the FOGP in its final offer, an intermittent generator will now have an incentive to report to the system operator by way of an updated FOGP (before real-time). This will lead to better dispatch outcomes for the power system and reduce the compliance reporting burden on intermittent generators and the Authority.

4.117. The Authority will monitor the discrepancy between intermittent generators' FOGPs and actual generation and, if necessary, may seek an explanation from an intermittent generator if there are discrepancies.

Technical feedback on the proposed Code amendments

4.118. The system operator provided technical feedback on some of the proposed Code amendments. The system operator's feedback/suggestions and the Authority's response and decision are summarised below.

The system operator's feedback/suggestion	The Authority's response and decision
Clause 13.6: The definition of "approved forecast" in the sub-clauses in 13.6(1)(b) uses the term "issued", but this term may not sufficiently cover the full process of being produced, sent, and received, each of which is required.	We propose to amend the definition to add the words 'and available to the intermittent generator'. Details of how the information will be provided will be finalised in the contract with the forecaster. Because the information could be provided, for example, either directly or by a platform the intermittent generator can access, we consider the words 'available to' rather than

[17] For example, if the FOGP in an intermittent generator's final offer is 100MW, if actual generation is 69MW or less, the intermittent generator must comply with dispatch instructions.

	received, are appropriate. Note the definition provides that the forecast must be issued, and made available to an intermittent generator, in the format or manner prescribed by the Authority.
Sub-clause 13.9B(2): As above, clarification is needed on what occurs if it is issued but not received.	Addressed by change above.
Sub-clause 13.9B(4) seems redundant at least as far as providing the alternative forecast information to the system operator. The generator is already required to provide offers regardless of provenance.	The alternative forecast information is required so that the Authority and system operator can determine if adjustments have been made. Note that the Authority is amending the draft guidelines to remove a proposal that an intermittent generator using its own forecast provide us with details of any adjustment. This is because we can discern adjustments from the information provided under clause 13.9B(4).
Sub-clause 13.9B(5) may be more appropriate as a separate clause as the requirement to provide information to the approved forecaster is not an “offer requirement” as described in the clause title.	We agree. This will now become clause 13.9C.
Sub-clause 13.18A(4): The phrase ‘as soon as practicable’ for revising an offer contrast with the use of ‘immediately’ for other participants, raising concerns about consistency.	We consider the phrase ‘as soon as practicable’ is appropriate. The use of ‘immediately’ in relation to other participants’ offers or revised offers is distinguishable. For example, in clause 13.18 ‘immediately’ is applied to revised offers where the expected generation is more than 5MW less than the generation offered. In 13.82(3) it applies in circumstances where personnel or plant safety is at risk.
The definition of “offer” links to sub-clause 13.6(1) which does not include FOGP, while FOGP is added by the clause 13.9B saying each IG offer must include a FOGP. This raises the question of whether each offer update is also required to include a FOGP, as this is not explicitly clear.	We consider the requirement in clause 13.9B is effective in requiring intermittent generators to include a forecast of operating potential in any offer. However, for avoidance of doubt we will amend the definition of offer to refer to offers made under clause 13.9B(1).

5. Summary of the proposed Code amendments

5.1. A summary of the proposed Code amendments in the Consultation Paper, including the rationale for the amendments and related contractual proposals and guidance, are outlined in Table 1. Proposed further revisions are noted in red.

Table 1: Summary of Code amendments and related proposals

Current Part/clause	Proposed amendment / related contractual proposals and guidance
Clause 13.6 – Requirements for generators when submitting offers	Time of first offer: Intermittent generators must submit an offer within 25 minutes (rather than 30 minutes) of receiving the first approved forecast. The Authority intends to specify in the contract with the forecaster that the first approved forecast is issued seven days (rather than six days) ahead of the relevant trading period, meaning an intermittent generator must submit its initial offer seven days before the relevant trading period. Backstop if no approved forecast: 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. This is necessary to ensure the system operator still receives offers if an approved forecast is not issued. These amendments will not apply to intermittent generators basing their offers on their own forecasts as similar timing and backstop requirements will be set out in any conditions of approval to use their own forecast.
Clause 13.9B – Offer requirements for intermittent generators	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: • not exceed the nameplate capacity of the generating plant - include a forecast of generation potential for the trading period to which the offer relates. Forecasts of generation potential: Clause 13.9B will require that forecasts of generation potential must: a) use the most recent approved forecast applicable to that intermittent generating station and trading period 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.

Current Part/clause	Proposed amendment / related contractual proposals and guidance
	Ability to use alternative forecasts: **If** agreed with the Authority, an intermittent generator may use an alternative forecast in place of the approved forecast. The adjustment requirements will also apply to intermittent generators basing their offers on their own forecasts. The Authority intends to amend its draft guidance to specify that an intermittent generator must demonstrate it meets the forecast performance standards the centralised forecaster is required to meet (rather than demonstrating (at least) the same accuracy as the forecaster). Backstop: In the situation where there is no approved forecast 72 trading periods before the relevant trading period and a first offer is required 71 trading periods out (under clause 13.6(b)(iii)), each forecast of generation potential must use either: a) the long-term seasonal average for that time of year for that intermittent generating station and trading period, or • 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. For intermittent generators using their own forecasts, similar back up arrangements will be set out in conditions of any approval to use an alternative forecast. Requirement to provide information to approved forecaster: 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 the approved forecaster for the purpose of providing an approved forecast, as soon as practicable after receiving the request.
Clause 13.17 – Offers may be revised	Clause 13.17 currently specifies that a generator: 5.3. 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 - must not revise any of its offer prices during a gate closure period - in most cases must not revise the MW specified in any price band in an offer during a gate closure period - in most cases must not revise ramp rates or maximum output during a gate closure period. The Authority proposed to retain these requirements. The clause is further amended to reflect that, if a generator revises an offer, the requirements in clause 13.18A (below) also apply.

Current Part/clause	Proposed amendment / related contractual proposals and guidance
Clause 13.18A – Intermittent generators to submit revised offer following each approved forecast	Remove the requirements that intermittent generators must: • submit a revised forecast of generation potential at a minimum of two hours immediately preceding the trading period to which an offer relates a) base a revised forecast of generation potential on a resource persistence model. Timing of revised offers: Specify that within 25 minutes (rather than 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. This means that if an intermittent generator receives an updated forecast, it will be required to submit a revised offer to reflect the most up to date forecast. If a revised forecast is identical to the previous forecast, an intermittent generator will still be required to submit a revised offer. In some cases, the forecast of generation potential in this offer may remain the same. Revised offer adjustment requirements: 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: a) any bona fide physical reason b) any planned outage. 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. Revised offer adjustment for intermittent generators using their own forecasts: Specify that any issues with the delivery of the approved forecast does not affect revised offer requirements that apply to intermittent generators basing their offers on their own forecasts. This amendment is necessary to reflect that intermittent generators basing their offers on their own forecasts must continue to comply with offer requirements if there are issues with the delivery of the approved forecast.
Clause 13.86A(1) – Intermittent generators must not substantially reduce generation	**Remove** to reflect that: - 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

Current Part/clause	Proposed amendment / related contractual proposals and guidance
	- intermittent generators will not need to provide a monthly report to the Authority specifying when and why a 30MW over-forecasting situation occurred. This amendment reflects the decision to introduce forecast performance standards to ensure more accurate forecasting. The Authority will monitor compliance with the standards and take action if required. This amendment also reflects that: a) the '30MW' value is outdated, and does not add to the information we will receive under the FOGPs (which enables us to assess the accuracy of FOGPs and whether an intermittent generator has adjusted them) b) the reporting requirement does not effectively incentivise intermittent generators to align their actual generation with their final FOGP as closely as possible. Amend clause 13.82 to require intermittent generators to comply with dispatch instructions from the system operator unless the intermittent generator is generating electricity during a trading period at a rate that is not more than 30MW below the forecast of generation potential specified in the intermittent generator's final offer. This is to address implications arising from the removal of clause 13.86A. [See paragraph **Error! Reference source not found.** for the policy rationale]
Part 1, clause 1 – interpretations	Provide interpretations of the following terms: 5.4. An 'approved forecast' – a forecast issued by the approved forecast provider in respect of an intermittent generating station for a trading period, and made available to an intermittent generator, in a format and manner as prescribed by the Authority from time to time - An 'approved forecast provider' – the provider of forecast services as prescribed from time to time by the Authority. Change 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. 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, unless they have a bona fide physical reason. Not falling below 30MW of the forecast of generation potential is the 'level expected' referred to in clause 13.86A(1).

Current Part/clause	Proposed amendment / related contractual proposals and guidance
	The Authority proposes to remove the requirement in clause 13.86A(1) (see above). 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. Change definition of 'forecast of generation potential' to reflect that it must be determined in accordance with clause 13.9B(2) or (3). 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. Change the definition of 'offer' to refer to clause 13.9B(1).

6. Regulatory statement for the final Code amendments

6.1. The Authority did not receive any feedback specifically on the regulatory statement or cost-benefit analysis. The regulatory statement in the Consultation Paper and the cost-benefit analysis in the July 2024 Decision Paper continue to apply to the final Code amendments. Any changes to the Code amendments consulted on are minor or consequential and do not change the cost-benefit analysis. Any additional policy rationale or explanations is outlined in this Decision Paper.

7. Next steps

7.1. The Authority is currently undertaking a procurement process for the centralised forecasting service provider. We expect to be able to select our preferred provider in the coming months, and for the successful provider to begin providing services on 1 July 2025.

7.2. The Authority will amend the Code consistent with the decisions in this paper so that they come into effect on 1 July 2025. In the meantime, intermittent generators should continue to comply with the current Code requirements.

7.3. The key milestones are outlined below:

Action/milestone	**Required timeframe**	**Start date**	**End date**
Series of workshops to agree on the information requirements and the design of the platform for exchanging information	2 weeks	Early April 2025	Mid-April 2025
Intermittent generators make system changes necessary to comply with new requirements	10 weeks	Mid-April 2025	Late June 2025 *Note: Intermittent generators who require more time must apply for an exemption.*
Publish guidance[18]	-	Mid-April 2025	
Intermittent generators wanting to use their own forecasts go through the process of seeking the Authority's approval to do so	10 weeks	Mid-April 2025	Late June 2025

[18] The guidance will outline the process intermittent generators must follow to be permitted to base their offers on their own forecasts. The final guidance will reflect the forecast performance standards, and any other relevant matters, that will be agreed with the centralised forecaster.

Centralised forecaster begins providing services	-	1 July 2025

7.4. It is important that intermittent generators understand the new Code requirements. If an intermittent generator is uncertain about any of the new requirements or would like to apply for an exemption, they should contact the Authority well in advance of 1 July 2025.

8. Attachments

8.1. The following appendices are attached to this paper:

- Appendix A: Submitters' responses to questions in the Consultation Paper
- Appendix B: Approved Code amendments

Appendix A Submitters' responses to questions in the Consultation Paper

Question 1: Do you agree that the proposed Code amendments are necessary to give effect to the Authority's policy decisions? If not, please explain why.

Submitter	Response
Genesis Energy	It will be important to ensure clarity regarding the process generators need to follow to validate FOGPs as received from the forecaster, particularly where a generator disagrees with the generation forecast as provided. To help generators validate the generation forecast, we suggest that the forecaster be required to provide data inputs and key assumptions to generators as well as the generation forecast expressed in MW.
Lodestone Energy	In principle, we agree that the proposed amendments give effect to the policy decisions made by the EA. However, as noted above it is difficult for us to determine the degree of impact that the proposed Code amendments will have on Lodestone's existing offering processes, and the cost of changes that will be required to our existing infrastructure. Specific comments on proposed amendments below: 13.9B – the amendment that an *"intermittent generator 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 practical after receiving the request"* appears to be open-ended. Lodestone questions who will determine what is reasonably required and when will intermittent generators know what these requirements are?
Manawa Energy	Manawa supports the Authority's decision to put in place a hybrid forecasting arrangement and change the Code to give it effect. Whilst supportive, it is important to keep in mind that any changes to forecasting arrangements would also involve changes to Manawa's internal systems and processes and therefore incur additional costs

	– this would also hold true for most other generators. This cost is difficult to estimate for Manawa but there would be both a financial aspect to this cost as well as a compliance burden. This cost will be higher for smaller generators and new entrants who are less likely to have robust systems already in place. Given this cost, Manawa is supportive of requiring the central forecaster to submit offers on generators behalf. However, given this service is likely to be needed by smaller generators, or new entrants, the cost of this service will need to be monitored to ensure it is affordable. Manawa's support for this initiative is based on the cost estimates for the system provided in the Consultation Paper being realistic. That is, any significant change to these costs would warrant further consultation with industry.
Mercury Energy	We have been supportive of a hybrid method as we believe it would allow market participants and the system operator to develop forecasting models based on their individual requirements, and draw on different information sources available to them. However, we are concerned that the proposed Code changes may be overly complex, potentially creating barriers to entry and increasing operational costs – particularly in the compliance space for many of the smaller operators. With a centralised forecaster there is an opportunity to simplify the whole offer process which may particularly benefit new entrants. In Mercury's view, the end-future state should be one that reduces the operational burden on generators to frequently revise energy offers based on fluctuating forecasts.
Meridian Energy	We broadly agree the Code changes are necessary to give effect to the Authority's policy decisions, subject to the points in the body of our letter and our response to Question 6.
NewPower Energy Services Limited	NewPower agrees that the code amendments are necessary and believes that it should give the desired outcomes.
NZX	NZX considers the proposed Code amendments do give effect to the Authority's policy decisions. We note however that a significant portion of the Centralised Forecaster functions and the requirements on intermittent generators will sit within Authority drafted Guidelines. Our understanding is that Guidelines are unenforceable under the Code and therefore could give rise to ambiguity around operational processes and respective obligations on participants, including other service providers. Usual practice would be to incorporate these design settings into either the Code (as a rule, a schedule, or a methodology) or directly into a market operations service provider contract – which is a

	public document. A Code designated service provider model would have addressed that apparent regulatory gap.
Powerco	N/A
The system operator	Yes, but subject to our comments below and the comments relating to the proposed amendments. The Authority's proposal has investigation and implementation cost implications for the SO that must be funded through the established TAS (Technical Advisory Services) mechanism. Implementation of the proposed hybrid arrangement by the SO will require system changes not covered by the System Operator Service Provider's Agreement (SOSPA) fixed fee. The Authority indicates it is selecting a preferred provider in early 2025 and that the forecaster will begin providing services by winter 2025. We will need more information on this element of the design to understand the impact on our tools and our people, before we can assess the feasibility of that timeline. We have previously indicated that a more detailed assessment of this proposal and its impacts is required including (but not limited to) the following aspects. **Integrating the external forecast with the market system.** Ensuring the market system can receive the forecast data including system support and service level requirements, such as business hours or 24/7 support. **System changes.** • Developing a mechanism for the SO to detect differences of Forecast of Generation Potential (FOGP) between the centralised forecast and offers, to alert operators within gate closure period. This mechanism is needed because *the Authority is proposing that if an intermittent generator adjusts its FOGP, it will not need to notify the System operator*. We consider that without timely updates of revised FOGPs in real-time, there will be security risks including over dispatching intermittent generators and incorrect residual and risk assessment in the short-term schedules. (More detail in question 6, about clause 13.18A). • The ability to differentiate between the intermittent generators using the centralised forecast and those using their own forecast. This arises from the Authority's proposal that *if an intermittent generator <u>is</u> basing its offers on its own forecast, it will still need to notify the System operator and the Authority if a FOGP is adjusted and the reasons for the adjustment*.

	• Creating a mechanism to receive, store and update a backstop arrangement (e.g. long-term seasonal average), while still able to detect the differences against offers. Clarity is needed on the timing and usage of this backstop arrangement, considering that the last updated forecast may be more accurate than the seasonal average. The long-term seasonal averages can also be provided periodically to each intermittent generator so they're already available for use when needed. However, we would like to better understand any operational role for this long-term seasonal average.
	  • Receive from the central forecaster the percentile forecasts to understand the uncertainty in the intermittent generation forecast.
	  • Providing any information back to the centralised forecaster, when necessary, e.g. the forecaster may need to know the times when an intermittent generator was dispatched off for operation or price reasons, so that its actual (constrained) generation during those time periods does not inform future forecasts.

Question 2: 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?

Submitter	Response
Genesis Energy	We suggest the Authority should satisfy itself that forecasts can be provided up to 6 days ahead at a sufficient level of accuracy such that the benefits of collecting this information will outweigh the added administrative costs (from forecasters providing forecasts, and retailers revising their offers every 30 minutes). We note that the Authority's Issues and Options Paper published in June last year found that forecasts (for wind) are only accurate hours ahead.
Lodestone Energy	Lodestone currently submits offers six days ahead so this specific amendment does not impact us – except for the additional burden of having to revise such advanced offers for changes in weather forecast from the centralised forecaster. As per our original submission, we believe that it is unlikely that centralised forecasting of solar generation 6 days ahead will provide any degree of accuracy due to the non-linearity of weather systems. Our current offer process therefore assumes a sunny day profile for the time of year 6 days ahead (adjusted for known outages) as any attempt to model cloud impacts on generation that far out will inevitably be wrong. **Energy Storage** We anticipate that storage systems will soon be integrated behind grid connection points at generation sites. When this occurs, centralized forecasts may not accurately reflect generation expectations. Generation will depend on both the available resources and storage utilisation strategy at the time. It is essential to preserve storage flexibility across all users to support efficient market operations. We urge the Electricity Authority (EA) to provide guidance on this matter to avoid any unintended consequences that could restrict the use of embedded batteries due to the Code changes.
Manawa Energy	The implications of this change would require Manawa to develop new systems. To ensure compliance with the proposed Code, the only feasible option would be for an automated routine e.g. receiving the forecast could be the trigger to create and submit offers. Hence a first offer of

	6 days prior would not be a barrier and would be treated the same as a forecast delivered at any other time frame. A compliant system would require 24/7 monitoring and support, as well as system redundancy. Not all participants would have the capacity or appetite to develop/manage/maintain such system, hence we support the central forecaster to submit offers on generators behalf on a commercial basis. Manawa would consider utilising this option depending on the cost.
Mercury Energy	Mercury will be able to comply with the requirements as outlined including the decision to require intermittent generators to submit their offers six days before the beginning of the trading period to which the offer relates to.
Meridian Energy	Meridian does not object to intermittent generators being required to submit their first offer six days before the beginning of the trading period to which the offer relates. This is not dissimilar to our current practice. However, we note that in relation to wind forecasts such long-term offers are unlikely to be accurate. As such, these offers will not provide a strong basis for participants to make generation and consumption decisions, or for the system operator to determine potential security issues, as the Authority suggests.
NewPower Energy Services Limited	No, NewPower doesn't agree that intermittent generators should offer six days ahead. NewPower believes it should be 72 trading periods ahead as per the status quo with other generation. If the six days ahead requirement is implemented, NewPower believes that offering six days in advance should apply to all generators. NewPower would question the value of intermittent generation having offers six days in advance, as the Authority pointed out there is difficulties forecasting even in the shorter term for intermittent generation. So, the mentioned benefit of managing system security a week ahead is questionable due to the forecasting accuracy becoming less the further out the forecast is. Also, if other generators only offer 72 trading periods in advance, then the price forecasting for the period from 72 trading periods to six days will be inaccurate. Offering up to six days in advance adds extra complexity to generators offering systems. Rather than submitting 72 separate offers as per the status quo the intermittent generator would have to submit 288 separate offers each trading period. This extra number of offers will increase the complexity of the

	offering system and increase the time / computing power needed to execute the offering system. This is a cost on intermittent generation that is not being imposed on 'firm' generation. The solution is not technology agnostic and slants a competitive market in favour of firm generation. The major impact that this change will have on NewPower is the cost and effort to integrate the central forecasting into NewPower's generation offering system. If the six days ahead requirement is implemented there will be additional costs to modify our offering system. Also, there will be additional complexity with sanity checking when to change over from the central forecast to the back-up forecast, for example checking if central forecast values make sense etc. At this stage it is too difficult for NewPower to estimate the associated cost with integrating the central forecasting system into our generation offering system. NewPower would need more clarity of the requirements and central forecasting technology before estimating any costs. NewPower recommends that if the System Operator wants to look at generation 6 days out then the System Operator can receive the full 6 day forecast from the centralised forecaster and conduct its analysis of the generation levels that way (rather than these offers going through the market).
NZX	N/A
Powerco	N/A
The system operator	Since the goal is to provide market participants and the system operator with better information on potential security issues and forecast price signals up to a week ahead, it is suggested that all bids and offers should comply with the Week-Ahead Dispatch Schedule (WDS) timeframe. This would ensure consistency and improve the overall reliability of forecast and scheduling in WDS. To align the timeframes with WDS, the bids and offers must be made up to seven days in advance, as the WDS covers the trading periods from 14:00 of the day after WDS publication to the end of the seventh day after WDS publication. For example, the automatic WDS generated on October 31 covers trading periods from 14:00 on November 1 to 23:30 on November 6, 2024.

Question 3: 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?

Submitter	Response
Genesis Energy	Yes, we agree on the basis that all participants benefit from the forecasting service.
Lodestone Energy	We agree. Noting that intermittent generators will still be incurring (as yet unknown) upfront and ongoing costs to support the centralised forecasting system.
Manawa Energy	Yes, all participants would benefit from improved forecasting and should contribute to the cost.
Mercury Energy	N/A
Meridian Energy	We agree that both generators and purchasers should be required to contribute to the costs of the centralised forecast. In addition to being consistent with public sector charging principles, this approach is consistent with a beneficiaries pay approach, as both generators and purchasers will benefit from improved wind forecasting. We note, however that the proposed budget of $100,00-$120,000 per annum seems low given the complexity and responsibility of the role.
NewPower Energy Services Limited	NewPower agrees with the revised cost contribution decision - all market participants will benefit from more accurate forecasting, from both a security and price signal aspect.
NZX	N/A
Powerco	N/A
The system operator	We query whether the incremental cost for each generator using the service should be borne by the generator itself. That generator will benefit by the forecast informing its trading decisions, and by the opportunity to avoid costs of procuring or developing a forecast directly itself. Allocating the cost to intermittent generators who use the centralised forecast could also create competition between the

	centralised forecaster and the independent forecasters that the intermittent generators have already invested in and rely on for their offers.

Question 4: Do you agree the Authority's proposed Code amendments complies with section 32(1) of the Act?

Submitter	Response
Genesis Energy	Yes.
Lodestone Energy	No comment.
Manawa Energy	N/A
Mercury Energy	N/A
Meridian Energy	We agree.
NewPower Energy Services Limited	No comment. This is not for NewPower to assess.
NZX	No comment.
Powerco	N/A
The system operator	There are questions about regulatory provisions necessary to allow a non-participant to use the Code to impose obligations on participants. In paragraph 4.3, the proposal for the centralised forecaster to submit offers on generators' behalf on a commercial basis raises questions about whether this would make the forecaster a participant (e.g. trading agent), given that other intermittent generators would also be providing data to the forecaster, and receiving FOGPs from the forecaster. There is also the question about the ability to rely on offers made by a party that is not bound by the Code.

Question 5: 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?

Submitter	Response
Genesis Energy	The information for intermittent generators to provide will depend on whether it is solar or wind being forecast, and the forecasting method being used. Some methods use detailed on-the-ground engineering information (e.g. inverters, solar strings, solar irradiance, wind speed etc) whereas other methods source satellite and other information, actual generation and use machine learning techniques to produce forecasts and bring in outage information from POCP to determine capacity. These are both valid methods. However, there are costs involved in providing on the ground equipment, and there is a question as to who will pay for necessary equipment where required. Also, to provide SCADA information to the centralised forecaster will involve costs and considerations such as cyber security and what level of communications redundancy is required (which also involves costs). We suggest careful consideration and engagement with generators is needed to explore and help define this better.
Lodestone Energy	To produce accurate forecasts, the centralised forecaster will need additional plant capability information beyond what is provided in the Asset Capability Statement (ACS). The following factors will impact the accuracy of the centralised forecast of a solar farm. 1) Latitude / longitude and physical dimensions of the site. 2) Fixed tilt or tracking – this has a significant impact on the output profile. • Wind response – different types of trackers will stow at a fixed position (e.g. flat) in response to high wind speeds to protect the array. 3) Orientation of arrays – fixed or tracking arrays may not be oriented towards the north which changes the daily shape of the output. • Overbuild ratio – the ratio of installed DC capacity compared to AC capacity will impact the shape of the output on sunny days.

	How will the centralised forecaster establish its models to account for these factors? Or will it just assume a simplified fixed or tracking solar farm profile and not worry about those other factors? We see potential for significant work for intermittent generators to educate the centralised forecaster. In terms of real-time variables to be supplied by the intermittent generator, the following could potentially be provided for solar farms (subject to agreed / secure data transfer protocols): • Global horizontal irradiation (W/m^2) • Ambient temperature (°C) • Measured windspeed (m/s) – important for tracker wind stow. • No of inverters operating • Maximum output capacity (MW) – this will be reflective of the number of inverters operating and any externally imposed constraints from the lines company. The above weather related variables may be sourced from more than one weather station on site and whether these are averaged and accounting for data quality (e.g. loss of comms to a device) will need to be considered in implementation.
Manawa Energy	If the information requested is available in the intermittent generator control system, there would be no issues with providing this information. However, it's important to consider that existing intermittent generation sites are of different vintages and may not have the same information available as those built more recently or in the future. Manawa provides offers for couple of wind farms built in the 90's and early 00's that won't have the same information as more recent sites. Manawa would welcome working with the Authority to ensure that existing assets are not going to be adversely affected by information requirements.
Mercury Energy	It is ultimately up to the centralised forecaster to determine what inputs intermittent generators would need to provide to enable accurate generation forecasts. For the initial setup, the forecaster is likely to require machine locations, power curves and a period of historic data for model training purposes and on-going as a minimum we would expect power output, wind speed or irradiance, number of machines available and whether the intermittent generation constraint flag is active to be provided.

	However, some of the information in Figure 1 (for example, the number of turbines in high wind cut out) may not be available for some wind farms. We also note that this information differs from the SCADA indications required from intermittent generations under the Code, and thus we assume that the information would need to be provided via separate data communications with the centralised forecaster. There will be some time and cost associated with establishing these, depending on the format, protocols and communication method required for the data exchange with the centralised forecaster.
Meridian Energy	We anticipate that inputs will include information on wind farm/turbine capacity, wind speed, wind direction and planned outages. In addition, we expect intermittent generators may need to provide details on the power curve function of specific wind farms and/or turbines i.e. the mathematical relationship between wind speed/direction and power output. However, it may be that a centralised forecaster will derive their own power curve information. In general, we think it will be feasible to provide a centralised forecaster with this information. Where appropriate, the centralised forecaster should seek to draw information directly from existing systems; for example, extracting outage information from POCP. This will improve the efficiency of any information sharing requirements. It is unclear to us whether a centralised forecaster would require or demand direct access to SCADA outputs from each wind farm. This could give rise to potential security concerns and costs. We also note that one Meridian wind farm does not use SCADA. It would be helpful if the Authority could clarify how SCADA data is intended to be shared.
NewPower Energy Services Limited	The implementation of data transfer needs to be not cost prohibitive (i.e. utilising secure APIs etc). A technical working group could be used to establish the most cost-efficient data transfer solution, given this proposal impacts existing as well as new intermittent generators. The implementation of the system needs to be secure from a cyber security perspective as many generators will be connecting their systems to an external 3rd party. The Authority must have a confidentiality clause in the contract with the central forecaster that protects the data given to the central forecaster by generators. NewPower envisions the following inputs from generators would be required:

	• Initial solar farm information for the solar farm model to be set up in the central forecasters system • Local Irradiance / wind measurements if available • Local temperature measurements if available • Current maximum power limit for the generating unit(s) (considering all curtailment and outages) NewPower suggests that a technical working group is established to develop information requirements and technology choice for communication with the central forecasting service provider. The risk of not involving stakeholders in the decision process, is that the solution is not cost effective or fit for purpose.
Powerco	N/A
NZX	To create a MW value generation forecast, the Centralised Forecaster will be holding confidential data on the design and output characteristics of various intermittent generation units and sites. Given the Centralised Forecaster will not be a Code regulated service provider, nor it required to operate with a designated 'market information system', we consider that it will be important for the Authority to provide assurance to participants that both technical and operational best practice industry standards for data protection will be adopted by the provider. In line with other service provider requirements, and for transparency and assurance to participants, we recommend the Authority provides regular reporting of the Centraliser Forecaster's compliance with its contractual SLA's, beyond just only its forecasting performance.
The system operator	Providing onsite weather actuals, generation actuals, outage information, the efficiencies of individual wind turbines and solar PV panels to the centralised forecaster could improve the accuracy of the forecast in MW, and any constraints that could impact the output of the intermittent generator compared to its potential MW.

Question 6: Do you have any comments on the drafting of the proposed Code amendments?

Submitter	Response
Genesis Energy	N/A
Lodestone Energy	See the previous comment on embedded batteries. Drafting should allow for clarity of this situation. The proposed three month period to transition to the new arrangement is too short a period for intermittent generators to implement the system. The time that it would take to scope the changes with the relevant software developers / service providers, design, implement and test the systems could take up to six months, depending on the complexity of what is being proposed. We recommend that a Technical Working Group is established to agree on a cost effective and secure set of data transfer protocols.
Manawa Energy	N/A
Mercury Energy	Despite some apparent reporting relief, we note that intermittent generators who want to base their FOGPs on their own forecast will be expected to submit 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) even though: a) these intermittent generators could be using the same company that is developing the forecast for the centralised forecaster and; • they are already submitting their offers six days before the beginning of the trading period to which the offer relates to; b) the offers are likely to change depending on the forecast. The administration burden for intermittent generators is high, particularly for those who want to do their own forecasting, for potentially only incremental benefits. We question whether this data needs to be submitted daily or whether it would be more appropriate to provide the data on request (for example when forecast accuracy is being reviewed).

Meridian Energy	We have the following comments on the proposed Code drafting: • Clause 13.9B(3): This clause cross references 13.6(1)(b)(ii). We are not sure this is the correct reference. The Authority may be intending to refer to 13.6(1)(b)(iii). • Clause 13.18A(3): This clause includes a superfluous "a".
NewPower Energy Services Limited	Yes, NewPower believes that the drafting needs to consider how forecasting and offering of hybrid solar/wind and battery sites works. Does the generator just modify the central forecast to account for what they think the BESS will do? It will not be long until there is a co-located BESS on a solar or wind generation site. The Authority should use this opportunity to address this.
NZX	NZX notes that the period of time for functional implementation of the initiative by 1 July 2025 may be a constraint to the delivery of a solution that fully meets the intent of the Authority's Decision. Moreso, given Guidelines on final design and operational structure will not be available until selection of a Centralised Forecaster is made. Intermittent generators and service providers will need sufficient notice on the operational design in order to develop systems and processes in time for 1 July 2025.
Powerco	In testing these Code proposals, and establishing future Code review plans in response to evolving system architecture (including more/different intermittent output and a DSO role), we encourage the Authority to robustly assess if the amendments and implementation proposals best achieve the Government's expectations that the electricity system is: • An efficient wholesale electricity market with many different wholesale buyers and sellers of electricity, managing their own risks, responding to competitive pressures and accurate price signals, continually looking for ways to serve their current and potential customers more effectively than their competitors; a) Efficient transmission and distribution networks; and b) Effectively competitive markets for electricity retail services.

The system operator	We have also included all comments in the attached marked-up Word document.
	We have noted the following drafting and typographical issues:
	• **in clause 13.6:**
	  ○ The markup of sub-clause 13.6(3) initially referenced non-current Code, including the pricing manager, which was removed as of March 1, 2024. After contacting the Authority on October 31, 2024, the updated version now correctly refers to the clearing manager.
	  ○ Sub-clause numbering was initially incorrect – what was presented as unmarked up sub-clauses (2) and (3) were in fact 'original' sub-clauses (4) and (5). Further these clauses had not been renumbered to reflect the creation of new sub-clauses. After contacting the Authority on October 31, 2024, the updated version now correctly reflects the new numbering sub-clauses as (5) and (6).
	• The cross-references [using the correct sub-clause renumbering] in sub-clause (5) needs to be updated to sub-clause (3) as a result of the creation of a new sub-clause (2). It should also be considered whether the cross-references in sub-clauses (3) and (6) should be updated to include sub-clause (2) to capture self-forecasting participants as well as those using the central forecast.
	• The definition of "approved forecast" in the sub-clauses in 13.6(1)(b) uses the term "issued", but this term may not sufficiently cover the full process of being produced, sent, and received, each of which is required.
	• **in clause 13.9B:**
	  ○ sub-clause 13.9B(2), as above clarification is needed on what occurs if it is issued but not received.
	• sub-clause 13.9B(3), the condition "if clause 13.6(1)(b)(ii) applies" appears to be a misplaced cross-reference. This subclause should refer to the situation of using alternative forecast when 'there is no approved forecast', which is covered by clause 13.6(1)(b)(iii).
	• sub-clause 13.9B(4) seems redundant at least as far as providing the alternative forecast information to the System operator. The generator is already required to provide offers regardless of provenance.

	• sub-clause 13.9B(5) may be more appropriate as a separate clause as the requirement to provide information to the approved forecaster is not an “offer requirement” as described in the clause title. • **in clause 13.18A:** • sub-clause 13.18A(1), a turnaround time of 30 minutes for potentially important FOGP update is too long. For example, if approved forecast is received at 17:15pm submitting revisions at 17:44pm means the 17:33pm NRSS/PRSS, the 17:40pm NRSL/PRSL, and all RTD’s for the 17:30pm period would still rely on the FOGP from at least 16:45pm. • sub-clause 13.18A(2), we continue to require regular revised offers from generators using an alternative forecast. The exclusion to those generators afforded by this subclause doesn’t fill the gap in those generators’ obligations. The interpretation guidance states such revisions would be agreed with the Authority as condition of their approval to use an alternative forecast however this seems unnecessarily burdensome on the Authority and easily clarified by making the clause applicable to all intermittent generators. It is also unclear whether a revised offer is required in the event of receiving a new forecast which is the same as the previous one. • sub-clause 13.18A(3), it is important to receive updated FOGP for bona fide changes, simply relying on dispatch to SCADA in real-time poses a risk of over dispatching the intermittent generator based on outdated FOGP in certain situations during a dispatch cycle. With the expectation of considerably higher proportion of intermittent generation and some of them can set the island risk, timely FOGP updates are essential for assessing potential impacts on residuals and risks in the forecast schedules. There are security implications lasting up to 30 minutes without knowing the adjustments to FOGP in time and purely relying on the next cyclic reoffer. ○ sub-clause 13.18A(4) the phrase ‘as soon as practicable’ for revising an offer contrast with the use of ‘immediately’ for other participants, raising concerns about consistency. • **in clause 13.86A:** this clause should remain, its purpose was for dispatch management, not forecast accuracy. Currently there is no dispatch compliance for intermittent generators. This clause was created to prevent intermittent generators from withdrawing generation in real-time. Nothing in the proposal addresses this issue, so the clause needs to be retained. The accuracy of the forecast metrics is not sufficient protection to stop withdrawing intermittent generation for commercial reasons.

	Nothing in the proposal changes the IG dispatch which is dispatch to what it is currently doing unless dispatched down with a flag. The Authority has discussed about ‘generation accuracy’ but only apply to the intermittent generators basing theirs offers on their own forecast. Moreover, the term ‘generation accuracy’ is misleading as it implies tuning the forecast to align with actuals on the assumption actuals are only affected by natural factors like wind or sunlight. If an intermittent generator has a commercial incentive to withhold MWs in real-time, it may appear as a forecast error rather than a ‘dispatch compliance’ issue as no compliance exists unless constrained. The contract for forecast accuracy is with the provider and there is no Code based obligation around intermittent generation dispatch compliance. Even if such obligations were included in a guidance note, their practical implications for compliance remain unclear. • Definition of “offer” links to sub-clause 13.6(1) which does not include FOGP, while FOGP is added by the clause 13.9B saying each IG offer must include a FOGP. This raises the question of whether each offer update is also required to include a FOGP, as this is not explicitly clear.

Appendix B Approved Code amendments

This appendix shows changes the Authority will make to the existing Code, as well as changes that differ from those in the Consultation Paper. Code amendments in this appendix are displayed as:

a) added text or formatting as consulted on is black underlined

b) deleted text as consulted on is ~~black strikethrough~~

- additional added text or formatting compared to our Consultation Paper is red underlined
- additional deleted text compared to our Consultation Paper is ~~red strikethrough~~.

13.6 Requirements for generators when submitting offers

(1) Each **generator** with a **point of connection** to the **grid**, and each **embedded generator** required by the **system operator** to submit an **offer** under clause 8.25(5), must—

(a) for a **generator** other than an **intermittent generator;**

(i) submit to the **system operator** an **offer** for each **trading period** in the **schedule period**, under which the **generator** is prepared to sell **electricity** to the **clearing manager**; and ~~(b)~~

(ii) ensure that the **system operator** receives an **offer** at least 71 **trading periods** before the beginning of the **trading period** to which the **offer** relates~~.~~; and

(b) subject to subclause (2), for an **intermittent generator;**

(i) 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

(ii) ensure that the **system operator** receives an **offer** within ~~30~~ 25 minutes of the first **approved forecast** for a **trading period** and **intermittent generating station** to which the **offer** relates; or

(iii) 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.**

(2) Subclauses (1)(b)(ii) and (iii) do not apply to **intermittent generators** using an alternative forecast in accordance with clause 13.9B(4).

(3)~~(2)~~ Despite subclauses (1) and (2), a **generator** must give at least 5 **business days'** notice in writing to the **system operator** and the **clearing manager** before the **generator** makes an **offer** for the 1st time in respect of the **generating plant** that is the subject of the offer.

(4)~~(3)~~ The notice must state—

(a) the **point of connection** to the **grid** at which **electricity** generated by the **generator** is sold to the **clearing manager** under clause 14.3 or 14.4; and

(b) whether the **generating plant** is an **intermittent generating station**.

(5)~~(4)~~ A **generator** must comply with any request from the **system operator** for information concerning **generating plant** that is the subject of a notice under subclause ~~(2)~~(3) if the **system operator** requires the information for the purposes of scheduling and **dispatch** in accordance with this Code.

(6)~~(5)~~ Despite subclauses (1) and (2), if a **generator** intends to permanently cease to submit **offers** to the **system operator** in respect of any **generating plant**, the **generator** must give at least 5 business days' notice in writing to the **system operator** and the **clearing manager**.

13.9B Offer requirements for intermittent generators

(1) Each **offer** submitted by an **intermittent generator** must, in relation to the **generating plant** that is the subject of the **offer**,—

(a) not exceed the **nameplate capacity** of the **generating plant**; and

(b) include a **forecast of generation potential** for the **trading period** to which the **offer** relates.

(2) Subject to subclauses (3) and (4), each **forecast of generation potential** must use the most recent **approved forecast** for that **intermittent generating station** and **trading period**, adjusted as necessary to account for:

(a) any **bona fide physical reason**; or

(b) any planned outage

affecting the **intermittent generating station** and **trading period**.

(3) If clause 13.6(1)(b)(ii) applies, each **forecast of generation potential** must use either:

(a) the long-term seasonal average for that time of year for that **intermittent generating station** and **trading period**: or

(b) 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,

adjusted as necessary to account for the factors in subclause (2)(a) and (b) affecting the **intermittent generating station** and **trading period.**

(4) If agreed by the **Authority,** and subject to any conditions specified by the **Authority,** an **intermittent generator:**

(a) 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

(b) 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.

13.9C Information must be provided in response to an approved forecaster request

~~(5)~~ 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 the **approved forecaster** for the purpose of providing an **approved forecast,** as soon as practicable after receiving the request

13.17 Offers may be revised

(1) Subject to subclauses (2) to (4) and clause 13.18A, 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**.

(2) A **generator** must not revise any of its **offer** prices during a **gate closure period**.

(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.

(4) A **generator** must not revise any of the following **offer** parameters during a **gate closure period**, unless clause 13.19 applies:

(a) ramp rates:

(b) maximum output (including overload).

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~~ 25 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)~~(2) ~~An **intermittent generator** must not a submit a revised **offer** after the start of the **trading period** to which the revised **offer** relates.~~

~~(4)~~(2) 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).

13.82 Dispatch instructions to be complied with

(1) This clause applies to—

(a) **generator**; and

(b) (b) an **ancillary service agent**; and

(c) (c) a **dispatched purchaser**.

(2) Each **participant** to which this clause applies must comply with a **dispatch instruction** properly issued by the **system operator** under clause 13.72(1)(a) unless,—

(a) in the **participant's** reasonable opinion,—

(i) personnel or plant safety is at risk; or

(ii) following the **dispatch instruction** will contravene a law; or

(b) the **generating plant** or **dispatch-capable load station** is already responding to an automated signal to activate—

(i) **capacity reserve**; or

(ii) **instantaneous reserve**; or

(iii) **automatic under-frequency load shedding**; or

(iv) **over frequency reserve**; or

(c) the **participant** is a **generator** or **ancillary service agent** acting in accordance with clause 13.86; or

(d) **the participant is an intermittent generator and:**

(i) is generating **electricity** during a **trading period** at a rate that is not more than 30MW below the **forecast of generation potential** specified in the **intermittent generator's** final **offer**; and

(ii) the **system operator** has not flagged the **dispatch instruction** in accordance with clause 13.73(1A); or

…

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

~~(1) An **intermittent generator** must not generate **electricity** during a **trading period** at a rate that is more than 30**MW** below the **forecast of generation potential** specified in the **intermittent generator's** final **offer** for the **trading period** submitted under clause 13.18A, unless—~~

~~(a) the **intermittent generator** reduces the output of the relevant **intermittent generating station** in order to comply with a **flagged dispatch instruction** under clause 13.73(1A), or any other instruction issued by the **system operator**; or~~

~~(b) the **intermittent generator** has a **bona fide physical reason**.~~

~~(2) If an **intermittent generator** generates **electricity** during a **trading period** at a rate that is below the rate specified in subclause (1) for 1 or more **trading periods** in a calendar month, other than for one of the reasons specified in subclause (1)(a), the **intermittent generator** must provide a report to the **Authority** no later than the end of the next calendar month.~~

~~(3) A report provided to the **Authority** under subclause (2) must specify—~~

~~(a) the **trading periods** in relation to which the **intermittent generator** generated **electricity** at a rate that was below the rate specified in subclause (1); and~~

~~(b) in relation to each such **trading period**, an explanation of the reason for the **intermittent generator** generating **electricity** at a rate that was below the rate specified in subclause (1); and~~

~~(c) if the **intermittent generator** considers that one of the reasons in subclause (1) applies in respect of any of the **trading periods** specified in the report, the **intermittent generator's** reasons for that view.~~

1.1 Interpretation

(1) In this Code, unless the context otherwise requires,–

approved forecast means a forecast issued by the **approved forecast provider** in respect of an **intermittent generating station** for a **trading period**, and made available to an **intermittent generator**, in a format and manner as prescribed by the Authority from time to time

approved forecast provider means the provider of forecast services as prescribed from time to time by the **Authority**

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**

offer means the information that a **generator** submits to the **system operator** under clause 13.6(1), and clause 13.9B(1), and includes any **revised offer** that a **generator** submits under clauses 13.17 to 13.19

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