

Industrial co-generator dispatch arrangements

Consultation Paper

Submissions close: Wednesday, 8 October 2014, 5:00pm

22 August 2014

Executive summary

Industrial co-generators that offer into the wholesale electricity spot market are subject to Code provisions in relation to offer and dispatch, including requirements that their offer be accurate and their output close to what is dispatched. These Code provisions can be difficult for industrial co-generators to comply with because of the variability of their underlying industrial processes.

The Electricity Authority (Authority) considers that the Code provisions impose unnecessary costs on industrial co-generators. The Authority is proposing an amendment to Parts 1 and 13 of the Electricity Industry Participation Code 2010 (Code) to provide industrial co-generators with sufficient dispatch flexibility to avoid these costs.

The proposed amendment is intended to improve the operational efficiency of the market, and improve the accuracy of dispatch and final pricing schedules.

The Code amendment:

- would support the efficiency limb of the Authority's statutory objective, by reducing unnecessary costs of complying with dispatch rules and improving the accuracy of dispatch and final pricing schedules
- would support the competition limb by improving the accuracy of dispatch and final pricing schedules and by removing barriers to participation by industrial co-generators in the wholesale market
- would not detract from the reliability limb.

The amendment is not urgent, but postponing it would delay the stream of benefits that would result from making the amendment.

Industrial co-generators have indicated that they see this issue as a major issue for them. It is important for the Authority to demonstrate that it is able to address problems with the market design in a responsive and timely manner.

Having invested time and resource to investigate the issue and potential solutions, including completing investigation work with the system operator, the Authority is now able to propose a clear solution and considers it is appropriate to progress the issue at this time.

The system operator has advised that the costs of implementing the proposed Code amendment are expected to be minimal. In addition, the Authority estimates the measurable economic benefits of the proposed Code amendment to be around \$1 million dollars over a twenty year period.

These efficiency improvements will ultimately benefit all consumers, in that they will increase competition among generators and increase productive efficiency.

The purpose of this paper is to consult with affected parties.

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1. What you need to know to make a submission

1.1 What this consultation paper is about

- 1.1.1 The Authority has identified that industrial co-generators are incurring unnecessary costs in order to comply with existing Code requirements in relation to dispatch. To address this problem, the Authority proposes to amend Parts 1 and 13 of the Code to provide industrial co-generators with sufficient dispatch flexibility.
- 1.1.2 The proposed Code amendment is attached as Appendix A.
- 1.1.3 The purpose of this paper is to consult with participants and persons that the Authority thinks are representative of the interests of those likely to be affected by the proposed amendment.
- 1.1.4 Section 39(1)(c) of the Act requires the Authority to consult on any proposed amendment to the Code and corresponding regulatory statement. Section 39(2) provides that the regulatory statement must include a statement of the objectives of the proposed amendment, an evaluation of the costs and benefits of the proposed amendment, and an evaluation of alternative means of achieving the objectives of the proposed amendment. The regulatory statement is set out in Section 4 of this paper.
- 1.1.5 The Authority invites you to make a submission on the regulatory statement and the proposed amendment.

1.2 How to make a submission

- 1.2.1 The Authority would prefer to receive submissions in electronic format (Microsoft Word). It is not necessary to send hard copies of submissions, unless you cannot do so electronically. Submissions in electronic form should be emailed to submissions@ea.govt.nz with “Consultation Paper-Industrial co-generator dispatch arrangements” in the subject line.
- 1.2.2 The Authority is likely to make your submission available to the public on the Authority’s website. If you have attached any supporting documents, you should indicate this in a covering letter and clearly indicate any confidential information. However, all information provided to the Authority is subject to the Official Information Act 1982.
- 1.2.3 If possible, provide your submission in the format shown in Appendix A. If you do not wish to send your submission electronically, post one hard copy of the submission to either of the addresses provided below or fax it to 04 460 8879. You can call 04 460 8860 if you have any questions.

Postal address

Submissions
Electricity Authority
PO Box 10041
Wellington 6143

Physical address

Submissions
Electricity Authority
Level 7, ASB Bank Tower
2 Hunter Street
Wellington

1.3 Deadline for receiving a submission

- 1.3.1 Submissions should be received by **5pm** on **Wednesday, 8 October 2014**. Please note that late submissions are unlikely to be considered.
- 1.3.2 The Authority will acknowledge receipt of all submissions electronically. Please contact the Submissions' Administrator if you do not receive electronic acknowledgement of your submission within two business days.

2. Current offer and dispatch rules for industrial co-generation

2.1 Some industrial co-generation is offered into the market, at a price up to \$0.01/MWh

- 2.1.1 Each generator must offer its output into the wholesale electricity spot market, unless the relevant generating station produces 10 MW or less of electricity. Some generating units associated with industrial consumers must therefore be offered in, while others fall below the 10 MW threshold.
- 2.1.2 A generator that offers into the market can seek approval to be classified as a co-generator. Currently, the approved industrial co-generators are:¹
- (a) the generator at Carter Holt Harvey's Kinleith site ("Kinleith")
 - (b) the Kilns co-generation plant at Glenbrook, operated by Alinta Energy NZ ("Glenbrook")
 - (c) all five units at the Whareroa dairy factory, operated by a joint venture between Todd Energy and Whareroa Power ("Whareroa")
 - (d) all four units at Norske Skog Tasman's Kawerau site ("Kawerau").
- 2.1.3 Industrial co-generators may not offer their output at a price exceeding \$0.01/MWh.²

2.2 Industrial co-generators that offer into the market are subject to gate closure rules

- 2.2.1 Industrial co-generators that offer into the market are subject to gate closure rules. That is, subject to some exceptions, an industrial co-generator cannot revise or cancel its offers within a certain period before the trading period to which the offers apply. The gate closure period is:
- (a) 30 minutes before the beginning of the trading period, for embedded co-generation (currently including Kawerau, Kinleith and Glenbrook)³
 - (b) 2 hours before the beginning of the trading period, for grid-connected co-generation (currently Whareroa only).

¹ <http://www.ea.govt.nz/dmsdocument/10940>

² Clause 13.9(d) of the Code

³ This is because embedded co-generation is treated in the same way as embedded generation, and therefore the owner of co-generation that is embedded will come within the definition of an embedded generator, and accordingly the shorter gate closure period in clause 13.17(2) applies.

- 2.2.2 During the gate closure period, an industrial co-generator cannot change its offer *price*, and it may only change its offer *quantity*.⁴
- (a) for a bona fide physical reason
 - (b) if there is a grid emergency, or
 - (c) if a bona fide physical reason (such as an unplanned outage) finishes earlier than expected and has lasted for less than 24 hours.
- 2.2.3 An industrial co-generator that changes its offers during the gate closure period must report each cancellation or revision to the Authority in writing by the next business day. The Authority must consider every such report and determine whether the industrial co-generator complied with Code requirements and, if not, whether to take compliance action.⁵
- 2.2.4 A generator that changes its offers in the 15 minutes leading up to real time must immediately notify the system operator.
- 2.2.5 After the trading period begins, a generator cannot change its offers.

2.3 Industrial co-generators that offer into the market are subject to dispatch requirements

- 2.3.1 An industrial co-generator must generally comply with dispatch instructions issued by the system operator, except when doing so would:⁶
- (a) place personnel or plant safety at risk
 - (b) break the law, or
 - (c) change its output by less than 5 MW, relative to the last dispatch instruction that it complied with. This is referred to as “remaining within the ± 5 MW dispatch band”.
- 2.3.2 There are exceptions to this rule, however the situations in which the exceptions apply occur infrequently.⁷
- 2.3.3 Under clause 13.82(3) of the Code, an industrial co-generator that moves out of the ± 5 MW dispatch band for reason (a) or (b) above must immediately advise the system operator.
- 2.3.4 In practice, if the industrial co-generator does not contact the system operator when it deviates materially from its last dispatch instruction, the

⁴ Clause 13.19 of the Code

⁵ Clause 13.21 of the Code

⁶ Clause 13.82 and 13.86 of the Code

⁷ See clause 13.82 of the Code – for instance, a co-generator need not comply if it is acting to help restore frequency to the normal band, or if doing so would be impossible while following an approved commissioning plan.

system operator will phone the industrial co-generator and seek an explanation.

- 2.3.5 If the system operator is not satisfied with the explanation for the deviation given by the industrial co-generator, or the industrial co-generator does not take agreed actions to restore the plant to the dispatch setpoint, the system operator may lodge an allegation of a breach of clause 13.82 of the Code.

2.4 Co-generation offers are used in market schedules

- 2.4.1 Industrial co-generation offers are used in the following schedules prepared under subpart 2 of Part 13 of the Code:
- (a) forecast schedules prepared by the system operator, including the weekly dispatch schedule, price-response schedule (PRS), non-responsive schedule (NRS), and real-time pricing
 - (b) ex-post schedules prepared by the pricing manager, including interim, provisional and final pricing.

2.5 Offer and dispatch rules for co-generation were last considered in 2006

- 2.5.1 The Electricity Commission published a consultation paper entitled “Review of the offer and dispatch rules for co-generation plant” in 2006.⁸
- 2.5.2 Following that consultation, the Electricity Commission:
- (a) created the process for generators to apply to be industrial co-generators, and for the Electricity Commission to approve (or decline to approve) the application
 - (b) widened the dispatch band from ± 1 MW to ± 5 MW for co-generators
 - (c) restricted industrial co-generators from offering at a price of more than \$0.01/MWh.
- 2.5.3 The reasons given for the Commission’s proposal were:
- (a) the application of special rules requires a process for assessing the validity of parties’ applications for treatment under these rules
 - (b) the increased dispatch band was consistent with the existing exemptions, and was considered reasonable whilst still providing the ability for the system operator to meet its principal performance obligations

⁸ <http://www.ea.govt.nz/about-us/what-we-do/our-history/archive/dev-archive/consultations/wholesale-consultations/2006/review-of-the-offer-and-dispatch-rules-for-co-generation-plant/>

- (c) the restriction on offer price was selected to mitigate any possible gaming behaviour related to the wider dispatch compliance band.

2.5.4 Other ideas were considered at the time, and two of these were considered worthy of further investigation and were flagged as separate projects for later development. These were:

- (a) lowering the compliance cost associated with claiming that an incident is due to a bona fide physical reason
- (b) applying a 30 minute gate closure to all industrial co-generators.

2.5.5 Not all participants found the Electricity Commission's approach satisfactory. In submissions:⁹

- (a) Carter Holt Harvey (CHH) recommended that:
 - (a) if the Electricity Commission's proposal was adopted, the dispatch band should be wider than ± 5 MW providing this would not compromise system security
 - (b) it would be preferable to treat co-generation in the same way as wind generation
- (b) Alinta Energy indicated that it would prefer a wider dispatch band than ± 5 MW
- (c) Norske Skog considered the proposal to be fundamentally flawed, showing a lack of understanding of the inherent variability of co-generation.

2.6 The Authority is now reviewing offer and dispatch rules for co-generation

2.6.1 In November 2012, CHH submitted a Code amendment proposal, again recommending that co-generation should be treated in the same way as wind generation.¹⁰

2.6.2 In response, the Authority is reviewing offer and dispatch rules for co-generation.

2.6.3 The Authority is also currently undertaking in its 2014/15 work programme:

- (a) the gate closure review project, which is investigating a potential reduction in the gate closure period for all grid-connected generation¹¹

⁹ <http://www.ea.govt.nz/about-us/what-we-do/our-history/archive/dev-archive/consultations/wholesale-consultations/2006/review-of-the-offer-and-dispatch-rules-for-co-generation-plant/submissions-for-review-of-the-offer-and-dispatch-rules-for-co-generation-plant/>

¹⁰ <http://www.ea.govt.nz/development/work-programme/wholesale/>

- (b) a review of the Code provisions affecting the revision of bids and offers,¹² which is intended to make the rules relating to gate closure clearer and resolve some existing problems and inconsistencies
- (c) a review of the wholesale spot price discovery mechanism,¹³ which may have broader implications for how bids and offers are submitted and how prices are set
- (d) a review of the way in which wind generation is treated in final pricing.¹⁴

¹¹ Item 2.18 on the Authority's 2014/15 work programme

¹² Item 3.11 on the Authority's 2014/15 work programme

¹³ Item 2.11 on the Authority's 2014/15 work programme

¹⁴ Item 3.17 on the Authority's 2014/15 work programme

3. Problem definition

3.1 Co-generation output can be unpredictable

3.1.1 For some industrial co-generators, generation output can be unpredictable over short time frames.

3.1.2 At times generation can:

- (a) increase when the industrial process increases output
- (b) decrease when the associated industrial process decreases output or shuts down.

3.1.3 The industrial co-generator may not be able to predict its generation output with consistent accuracy, regardless of whether the time frame is minutes or hours.

3.1.4 In contrast, the output of a 'normal' large generating plant such as a gas turbine or hydro station is largely controllable, and hence predictable, over the same time frames.¹⁵

3.1.5 Norske Skog described its experience of this phenomenon in its response to the Electricity Commission's 2006 consultation paper, which included the following comment:¹⁶

"Co-generation output is very predictable as long as the associated process is stable. However when the process that is condensing the exhaust and/or pass-out steam from the turbine fails, the generator must drop its output immediately. Failure to do so would lead to catastrophe in terms of destruction of equipment and risk of serious harm to employees. Operators of co-generation plant have no ability whatsoever to predict failure of the associated industrial process, since these are random events."

3.1.6 CHH's submission also took up this theme, including the statement that:

"A true cogeneration plant within an industrial complex is designed to extract additional value from process heat by generating electricity. The determinant of the amount of electricity generated is the heat (usually steam) required by the industrial process. The rate of generation is not adjusted directly at all and in fact is a by-product of the industrial process. This is a fundamental difference [from other types of generation]."

¹⁵ There are exceptions – for instance, the output of a thermal power station may fluctuate as a result of equipment failures.

¹⁶ <http://www.ea.govt.nz/about-us/what-we-do/our-history/archive/dev-archive/consultations/wholesale-consultations/2006/review-of-the-offer-and-dispatch-rules-for-co-generation-plant/submissions-for-review-of-the-offer-and-dispatch-rules-for-co-generation-plant/>

3.1.7 Likewise, Alinta Energy commented:

“The industrial process that the Alinta co-generation plant is connected to can from time to time provide an unexpected increase in waste heat, temporarily increasing output.”

3.1.8 Information provided by individual industrial co-generator sites indicates that substantial disruptions to plant operation occur relatively frequently, around 10-15 times per year, and that many of these are related to electricity or steam supply problems.

3.2 Current offer and dispatch rules create economic costs for some industrial co-generators

3.2.1 Offer and dispatch rules for generation (other than wind generation) are based on the assumptions that:

- (a) generation output can be controlled, and hence predicted, on a time frame of either minutes or hours
- (b) a generator is capable of following dispatch instructions, except under unusual circumstances such as an unplanned outage of one or more generating units.

3.2.2 For some industrial co-generators, these conditions do not always hold. Sometimes an industrial co-generator’s generation output changes without warning – for instance, as a result of a mechanical failure at the site. This may result in a substantial deviation from the last dispatch instruction received by the industrial co-generator – in which case the industrial co-generator must:

- (a) promptly communicate the reason for the deviation to the system operator
- (b) revise its offers for the following trading periods
- (c) submit an explanation to the Authority as to how the reasons for the revised offers constitute “bona fide physical reasons” for those trading periods that fall within the gate closure period.

3.2.3 In order to meet these requirements, the industrial co-generator may need to divert its attention from key tasks such as:

- (a) dealing with the original event (e.g. mechanical failure) that caused the deviation
- (b) preventing consequential failures and process instabilities
- (c) keeping the industrial process running in order to avoid lost production costs.

- 3.2.4 Therefore, industrial co-generators may incur economic costs (such as lost production) in the course of complying with offer and dispatch rules.
- 3.2.5 Offer and dispatch rules can also give rise to compliance costs. When an industrial co-generator deviates from its dispatch instruction, it may be subject to compliance action under clause 13.82 of the Code. Dealing with an alleged breach of the Code creates costs for the industrial co-generator, the system operator, and the Authority.
- 3.2.6 The portion of these costs that supports reliability of supply by investigating genuine issues is efficient and necessary. The remaining portion, relating to known variability of the process, adds no value, and is therefore unnecessary and reduces productive efficiency.
- 3.2.7 In addition, by obtaining approval under Schedule 13.4 of the Code to be classified as industrial co-generators, industrial co-generators have already demonstrated that their generation output is a function of an integrated process and subject to the variability inherent to that process.
- 3.2.8 The costs of complying with offer and dispatch rules may also form a barrier to participation by industrial co-generators in the wholesale market. It is possible that current offer and dispatch rules could:
- (a) deter industrial consumers from offering existing onsite co-generation into the market
 - (b) deter industrial consumers from constructing new co-generation.
- 3.2.9 In its submission to the Electricity Commission's 2006 consultation, Norske Skog commented that the offer and dispatch rules that are now in force will discourage investment in co-generation.¹⁷
- 3.2.10 To the extent that the costs of complying with offer and dispatch rules discourage participation, they will reduce competition to the long-term disbenefit of all consumers.
- 3.2.11 Wind generation output is a useful parallel as it is also unpredictable over a time frame of either minutes or hours. The above problems are mitigated for wind generation by:
- (a) requiring wind generators to update their offer quantity routinely during the two hours prior to real time
 - (b) not requiring wind generation to comply with dispatch instructions, except when it is dispatched in response to a security situation.

¹⁷ <http://www.ea.govt.nz/dmsdocument/5058>

3.3 Schedules based on industrial co-generator offers may be inaccurate

- 3.3.1 The efficiency of the market is dependent on the accuracy of dispatch and pricing schedules, which in turn is dependent on the accuracy of inputs to those schedules.
- 3.3.2 Final industrial co-generator offers are not always an accurate measure of the amount of electricity the industrial co-generator is able to produce. The use of industrial co-generator offers in dispatch and pricing schedules may therefore reduce the accuracy of the schedules.
- 3.3.3 Possible consequences of inaccuracy in the dispatch schedule may include:
- (a) changes to dispatch in order to alleviate a transmission constraint, which would not bind if correct inputs were used
 - (b) a security constraint being exceeded in reality, while not appearing to bind in the dispatch schedule
 - (c) too much or too little generation being dispatched overall, resulting in increased demand for frequency keeping.
- 3.3.4 Possible consequences of inaccuracy in the final pricing schedule may include:
- (a) consumers overpaying generators in trading periods where supply is greater than final pricing indicates
 - (b) consumers underpaying generators in trading periods where supply is less than final pricing indicates
 - (c) price separation across a constraint that should not have bound, or conversely, price convergence across a constraint that should have bound.
- 3.3.5 In the dispatch schedule these problems are mitigated for wind generation by discarding the wind generator's offers and replacing them with administrative offers based on the wind generator's actual output. In the final pricing schedule they are mitigated by discarding the wind generator's offers and replacing them with a negative load equal to the actual metered output of the wind generator.
- 3.3.6 Such an approach to co-generation (for 'type B' co-generators – see below) would similarly result in these issues being mitigated or resolved.

4. Regulatory statement for the proposed Code amendment

4.1 The Authority's proposal

- 4.1.1 The proposed Code amendment (attached as Appendix A) would establish two categories of industrial co-generators, with different obligations associated with each. The proposed Code provisions would enable an industrial co-generator to be classified as either a 'type A' or a 'type B' co-generator. Existing industrial co-generators that chose not to apply would be deemed to be 'type-A' co-generators.
- 4.1.2 Type A co-generators would continue to operate under the current offer, dispatch and pricing rules (that is, there would no change for those industrial co-generators in respect of their Code obligations). Type B co-generators would be treated in the same way as intermittent generators for dispatch and pricing purposes. In particular:
- (a) type B co-generators would not be required to comply with dispatch instructions, except in a grid emergency or in a situation in which a system constraint affected them
 - (b) the dispatch setpoint for type B co-generators would be based on their current output
 - (c) a type B co-generator's offers would be—
 - (i) removed from the real-time dispatch schedule, and replaced by administrative offers based on the actual metered output
 - (ii) removed from final pricing and other ex post pricing schedules, and replaced by a negative load equal to their actual metered output
 - (d) type B co-generators would be required to supply metering information measuring their generation output to the pricing manager and the grid owner (in accordance with clause 13.137 of the Code).
- 4.1.3 Type B co-generators would be required to place and revise offers as they are required to currently. They would also still be subject to gate closure rules. However, unlike intermittent generators, they would not be required to place persistence offers in the two hours leading up to real time.
- 4.1.4 Transitional arrangements are proposed that would mean that existing industrial co-generators that did not apply to be (or new industrial co-generators that were not approved to be) type B co-generators would be classified as type A co-generators.
- 4.1.5 In addition to amending the Code, the Authority would specifically monitor the accuracy of offers placed by type B co-generators. The focus would be

on ensuring that these parties continued to make reasonable efforts to ensure their offers were a reasonable estimate of their ability to generate.

4.1.6 The Authority also proposes a number of minor amendments to the Code in relation to this proposal.

- (a) Forms 1, 2 and 3 of Schedule 13.1 contain an error where the relevant participant is required to be entered twice. The Authority proposes to change the first of each of these to participant identifier, where parties enter their four letter participant identifier.
- (b) The Authority proposes to alter the notification process in Schedule 13.4 from being a gazette notification to simply requiring the notification to be publicised. This is consistent with the notification process for dispatch-capable load stations and is considered appropriate for the purpose of Schedule 13.4.
- (c) Transitional provisions that deem existing co-generating stations to be type A co-generating stations under the amended Code. These stations may apply to the Authority to be changed to type B co-generating stations if they wish to.

4.1.7 In addition to the Code amendment described above, the Authority is also considering extending 30-minute gate closure to all industrial co-generators. At present Kawerau, Kinleith and Glenbrook already have 30-minute gate closure (because they are embedded), but Whareroa is subject to two-hour gate closure.

- (a) the Authority does not propose to amend the Code to provide for 30-minute gate closure for all industrial co-generators at this point, because the Authority is currently considering a move to shorter gate closure for all parties currently subject to two-hour gate closure, and the change will be considered as part of that work
- (b) the Authority will be able to make this change more easily after (or in conjunction with) a parallel project that will aim to simplify the Code provisions affecting revision of bids and offers in Part 13 of the Code.

4.1.8 Therefore, 30-minute gate closure for co-generators is not covered by this regulatory statement.

Q1. Do you support the Authority's proposal as described here?

Q2. Do you have any comments or suggestions regarding the Authority's proposal?

Q3. Do you have any comments on the Code drafting in Appendix A?

Q4. Do you agree with the Authority's proposed changes to forms 1, 2, and 3 of Schedule 13.1?

Q5. Do you consider that extending 30-minute gate closure to all co-generation would be consistent with the Authority's statutory objective? Please state your reasons.

4.2 The objective of the proposed amendment

4.2.1 The objectives of the proposal are to promote competition in, and efficient operation of, the electricity industry for the long-term benefit of consumers. The specific benefits expected from the proposal are:

Competition

- (a) reduction of barriers to participation by industrial co-generators in the wholesale market
- (b) improvement in the accuracy of dispatch and final pricing schedules

Efficiency

- (c) reduction of unnecessary costs incurred by industrial co-generators in the process of complying with dispatch rules
- (d) reduction of unnecessary costs incurred by industrial co-generators in the process of cooperating with investigations into alleged breaches of clause 13.82 of the Code
- (e) maintained or improved system security
- (f) reduced costs to consumers.

Reliability

No adverse impact on reliability is expected.

Q6. Do you agree that the objectives for the amendment set out in Section 4.2 are appropriate and consistent with the Authority's statutory objective? If not, why not?

4.3 The proposed amendment is expected to meet the objectives

Reduce barriers to industrial co-generators participating in the wholesale market

4.3.1 By reducing unnecessary costs for industrial co-generators (see below), the amendment would reduce a barrier to participation by industrial co-generators in the wholesale market.

4.3.2 Even if the proposed amendment did not reduce costs materially, it could assist existing and potential industrial co-generators to view the market more favourably, and to be more willing to participate.

Improve the accuracy of dispatch and final pricing schedules

4.3.3 The accuracy of dispatch and final pricing schedules is dependent on the accuracy of the input assumptions to those schedules.

4.3.4 If the generation offers used in dispatch and final pricing schedules do not accurately reflect the generator's ability to generate, the accuracy of the schedules may be reduced.

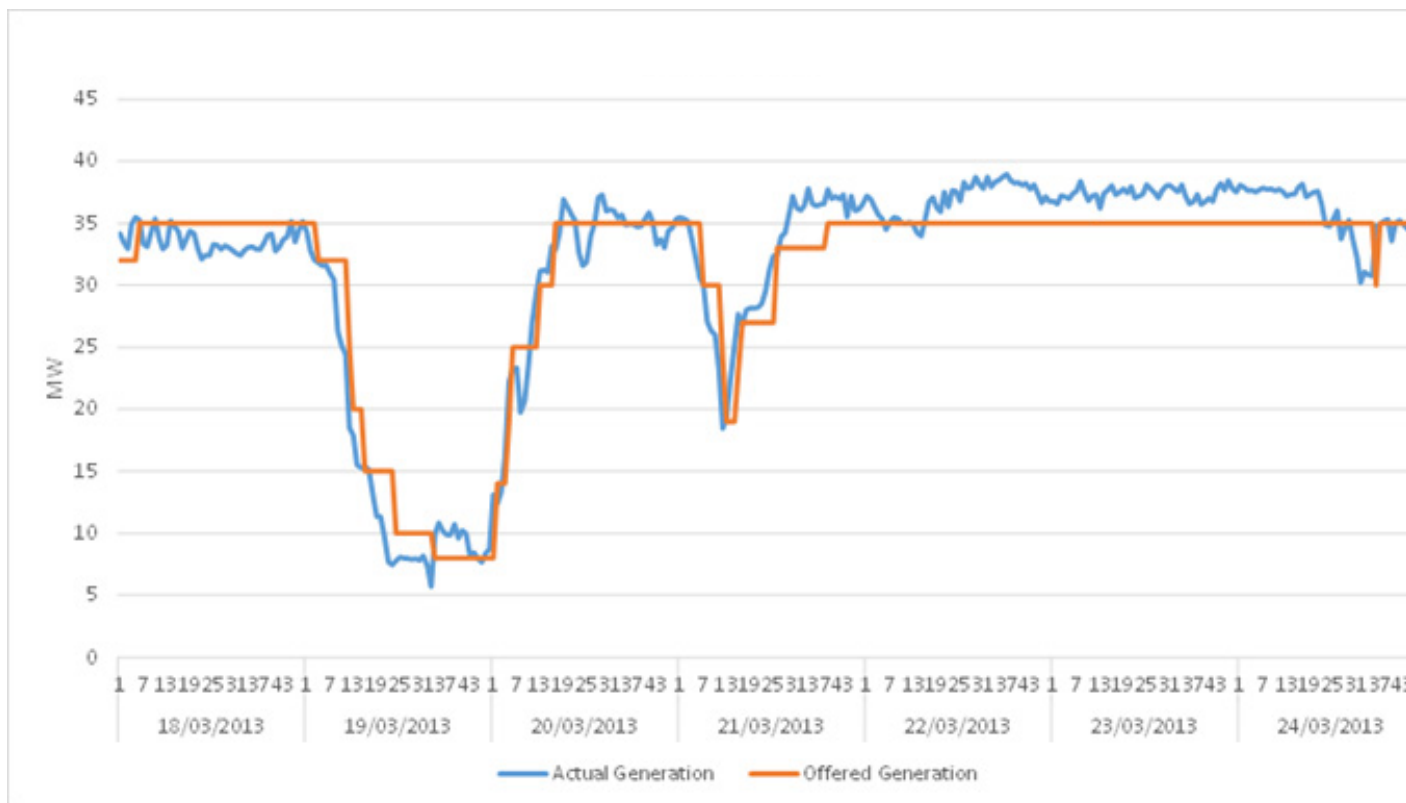
4.3.5 For most industrial co-generators, ability to generate in real time is better measured by actual output than by offers placed in advance.¹⁸

4.3.6 For example, consider Kinleith co-generation. Over the 2013 calendar year, the final offer quantity differed from actual generation output by an average of 1.7 MW.¹⁹ This is a material variance, relative to the generator's capacity of 40 MW. Figure 1 shows a period in which Kinleith's offer quantity differed markedly from actual output.

¹⁸ This is not true of other types of generation such as gas turbines, for which ability to generate often greatly exceeds actual output.

¹⁹ This is the mean absolute deviation.

Figure 1: Kinleith offer quantities can differ markedly from actual generation output



4.3.7 Using actual output quantities for industrial co-generators such as Kinleith would improve the information inputs into dispatch and final pricing schedules, and therefore the accuracy of those schedules.

Reduce unnecessary costs incurred in the process of complying with dispatch rules

4.3.8 The Authority expects the proposed amendment to reduce the costs incurred by industrial co-generators in the process of complying with dispatch rules. The amendment would have this effect by:

- (a) reducing the amount of time that key co-generator staff must spend on communicating the reasons for deviations from dispatch instructions to the system operator and the Authority
- (b) enabling these staff to focus on keeping their industrial process running at times of process instability, thereby avoiding lost production costs.

4.3.9 The Authority considers that lost production costs resulting from compliance with dispatch rules are unnecessary costs. The reason for this view is that the variability of the process is outside of the generating plant operator's control and therefore imposing a regulatory requirement on co-generators to comply with dispatch rules does not improve their actual ability to comply and therefore may act as a barrier to participation.

Maintain or improve system security

- 4.3.10 The system operator has advised (Appendix C) that the proposed amendment should not reduce system security – providing industrial co-generators are still required to:
- (a) ensure their offers are a reasonable estimate of their ability to generate²⁰
 - (b) revise their offer quantities if their ability to generate changes substantially²¹
 - (c) comply with dispatch instructions in a security situation.²²
- 4.3.11 Under the proposed amendment, these requirements would still apply. Further, the Authority would continue to monitor the accuracy of industrial co-generator offers.
- 4.3.12 The Authority therefore concludes that the proposed amendment should not reduce system security.

Reduced costs to consumers

- 4.3.13 To the extent that reduced compliance costs and more flexible dispatch arrangements will result in increases in overall co-generation output, there is a direct benefit to consumers because the marginal costs of providing energy from co-generation are almost always lower than providing energy from dedicated generating plants.

Q7. Do you agree that the proposed amendment would achieve the objectives set out in Section 4.2? If not, why not?

Q8. Do you consider that the proposed amendment would carry a risk of unintended consequences? If so, what are they?

4.4 Evaluation of costs and benefits

- 4.4.1 The Authority does not expect the proposed amendment to result in any material economic costs. The amendment is expected to yield economic benefits – some of which have been quantified, and are in the tens of thousands of dollars per year.

Costs

- 4.4.2 The system operator expects that it would not incur any material costs in implementing the proposed amendment (Appendix C).

²⁰ Clause 13.9(b) of the Code

²¹ Clause 13.18 of the Code

²² Clause 13.82 of the Code

- 4.4.3 The proposed amendment would require changes to the clearing manager's prudential security methodology. The clearing manager's high level estimate of the cost of making these changes is in the range \$85,000 to \$127,000.
- 4.4.4 The Authority is not aware of any material costs that industrial co-generators would incur as a result of the proposed amendment.
- 4.4.5 The Authority acknowledges that the costs are uncertain at this stage, and while it is confident they will be minimal, would like to point out that costs would need to exceed \$800,000 in order to exceed the assessed benefits of the proposal.

Benefits

- 4.4.6 CHH has provided the Authority with information about the expected economic benefits of the proposed amendment.
- 4.4.7 From CHH's perspective, the main benefit of the amendment would be realised when production problems occur at the Kinleith mill. At such times, CHH's Steam and Recovery Shift Manager must currently divide their focus between:
- (a) interacting with the system operator
 - (b) resolving the production problem.
- 4.4.8 Removing the requirement to comply with dispatch instructions (except for security of supply purposes) would allow CHH's Shift Manager to focus less on interacting with the system operator, and more on dealing with the physical problem.
- 4.4.9 Another benefit would be that the frequency of multiple trip events would be lessened. A single boiler trip can result in a reduction of CHH's generation. In CHH's words, "very expeditious actions are needed to avoid steam system instability, consequent multiple boiler and likely turbine trips, and eventual plant collapse". CHH advises that:
- (a) multiple boiler trips occur approximately twice a year at present
 - (b) the cost of a multiple boiler trip is approximately \$400,000
 - (c) the proposed amendment would reduce the rate of multiple boiler trips by 10%, by freeing up the Shift Manager to manage the plant in real time.
- 4.4.10 The implied economic benefit is assessed as \$80,000 per year. The Authority considers this to be a reduction in transaction costs, and therefore an operational efficiency gain under the efficiency limb of the Authority's statutory objective.
- 4.4.11 CHH considers that the amendment could also save the company 40 hours of staff time per year, by reducing the amount of time it spends on

investigations of alleged breaches of clause 13.82 of the Code. The value of this staff time is assessed as \$2,400 dollars per year.

4.4.12 The Authority considers that the proposed amendment would bring similar types of benefits to other industrial co-generators. In order to be conservative, and because the Authority has not obtained the same level of detailed information from the other parties, these additional benefits are assessed as being 25% of the benefits identified by CHH.

4.4.13 As set out in Section 4.3, the proposal could also:

- (a) support competition by reducing barriers to participation by industrial co-generators in the wholesale market
- (b) avoid creating an inefficient incentive for industrial co-generators to connect new co-generation within their own site, rather than directly to a distribution or transmission network
- (c) support efficiency by improving the accuracy of dispatch and final pricing schedules.

4.4.14 The Authority has not quantified these additional benefits.

Net costs and benefits of the proposal

4.4.15 Table 1 summarises the expected costs and benefits of the proposal

Table 1: Costs and benefits of the proposal

Item	Value (PV)
Present value of productive efficiency benefits for reduction in CHH transaction costs	\$809 k
Present value of productive efficiency benefits for reduction in other industrial co-generator transaction costs	\$202 k
Additional benefits	> \$0
Present value of estimated costs of the proposal	\$127 k
Net present value of proposal	\$ 884 k

Notes: 20 year discounting period at 8% real discount rate

Q9. Do you agree that the proposed amendment would produce a net economic benefit? If not, why not?

4.5 The Authority has identified other options for addressing the objectives, but considers the proposed amendment is preferable

4.5.1 Other options considered by the Authority include:

- (a) treating some co-generation as intermittent generation
- (b) allowing some co-generation to switch in and out of 'persistence dispatch' mode
- (c) automatically switching some co-generation in and out of 'persistence dispatch' mode.

4.5.2 The subsections below explain why the Authority considers the proposed amendment is preferable to each of these options.

Option (a): treating some co-generation as intermittent generation

4.5.3 The key difference between option (a) and the proposal is that, under option (a), type B co-generators that were being treated as intermittent generators under the Code would be required to submit persistence offers during the two hours leading up to real-time.

4.5.4 The Authority prefers not to require industrial co-generators to submit persistence offers, because:

- (a) it would increase compliance and implementation costs, relative to the proposal, as industrial co-generators would need to develop and implement systems to develop and transfer this information, and the Authority would need to monitor compliance with this requirement
- (b) over a time frame of 30 minutes to two hours, industrial co-generators should be able to provide a forecast of their output that is more accurate than a persistence forecast. The same may not be true of some wind generators
- (c) submitting a persistence offer would require industrial co-generators to overwrite their offered estimates even if they know of an impending change in output. This would mean that less accurate information would be included in the schedules.

Option (b): allowing some co-generation to switch in and out of 'persistence dispatch' mode

4.5.5 The Authority has considered allowing industrial co-generators to choose to switch in real time between:

- (a) normal mode, in which the dispatch setpoint would be based on offers
- (b) persistence dispatch mode, in which the dispatch setpoint would be based on actual output.

4.5.6 This option would allow industrial co-generators to opt for normal mode in normal circumstances, and for persistence dispatch mode when variations in the industrial process cause unpredictability in generator output.

4.5.7 The Authority concluded that this option would be less preferable than the proposal, on the basis that:

- (a) the benefits of this option would be less than the proposal because industrial co-generators would still need to take action in the event of a plant disturbance
- (b) the system operator has advised that based on their initial investigations this option would cost more and take more time to implement as it would require substantive changes to the market systems to enable the switching functionality.

Option (c): automatically switching some co-generation in and out of 'persistence dispatch' mode

4.5.8 The Authority considered automatically switching industrial co-generators between:

- (a) normal mode, at times when their output appeared to be predictable
- (b) persistence dispatch mode, at times when their output appeared to vary unpredictably from their offered quantity.

4.5.9 Again, the Authority concluded that this option would be less preferable than the proposal, on the basis that:

- (a) the annual benefits of this option would be similar to the proposal although they would be deferred while system changes were implemented
- (b) the system operator has advised that based on their initial investigations this option would cost more and take more time to implement due to the changes needed to market systems to implement the switching functionality.

- (c) Table 2 below gives a comparison of the estimated costs and benefits of the different options considered

Table 2: Estimated costs and benefits of all options

Option	Status Quo	Preferred option	Option a	Option b	Option c
Present value of Costs		\$127k	\$177k	\$377k	\$277k
Present value of Benefits		\$1011 k	\$692k	\$747k	\$827k
Net Present value of benefits		\$884k	\$512k	\$370k	\$550k

Q10. Do you agree that the proposed amendment is preferable to other options? If not, please explain your preferred option in terms consistent with the Authority's statutory objective.

4.6 Assessment under section 32(1) of the Act

4.6.1 Section 32(1) of the Act provides that Code provisions must be consistent with the Authority's objective and be necessary or desirable to promote any or all of the following:

- (a) competition in the electricity industry
- (b) the reliable supply of electricity to consumers
- (c) the efficient operation of the electricity industry
- (d) the performance by the Authority of its functions
- (e) any other matters specifically referred to in the Act as a matter for inclusion in the Code.

4.6.2 Table 3 sets out an assessment of the proposed amendment against the requirements of section 32(1) of the Act.

Table 3: How the proposal complies with section 32(1) of the Act

Requirement	Comment
The proposed amendment is consistent with the Authority's objective under section 15 of the Act, which is to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.	The proposed amendment will promote competition in, and support the efficient operation of, the electricity industry.
The proposed amendment is necessary or desirable to promote any or all of the following:	
(a) competition in the electricity industry;	The proposed amendment will support competition by improving the accuracy of dispatch and final pricing schedules, and may also reduce barriers to participation by co-generators in the wholesale market.
(b) the reliable supply of electricity to consumers;	The proposed amendment is not expected to have a material effect on reliability of supply.
(c) the efficient operation of the electricity industry;	The proposed amendment will support efficiency by reducing unnecessary transaction costs.
(d) the performance by the Authority of its functions;	The proposed amendment will not materially affect the performance by the Authority of its functions.
(e) any other matter specifically referred to in this Act as a matter for inclusion in the Code.	The proposed amendment will not materially affect any other matter specifically referred to in the Act for inclusion in the Code.

Q11. Do you agree that the Authority's proposed amendment complies with section 32(1) of the Act?

4.7 Assessment under the Code amendment principles

4.7.1 Table 4 describes the Authority's consideration of the Code amendment principles in the preparation of the proposal.

Table 4: Regard for Code amendment principles

Principle	Comment
1. Lawful	The proposal is lawful, and is consistent with the statutory objective and with the empowering provisions of the Act.
2. Provides clearly identified efficiency gains or addresses market or regulatory failure	The proposal would provide clearly identified efficiency gains, as set out in Section 4.3.
3. Net benefits are quantified	The expected net economic benefit of the proposal has been estimated, as set out in Section 4.3.
<i>As the proposal satisfies the first three principles, there is no requirement to evaluate it against principles 4-9.</i>	

Q12. Do you agree that the Authority's proposed amendment complies with the Code amendment principles?

Glossary of abbreviations and terms

Act	Electricity Industry Act 2010
Authority	Electricity Authority
CHH	Carter Holt Harvey
Code	Electricity Industry Participation Code 2010
Co-generator	The owner of an industrial co-generating station, which means 1 or more generating unit • that is connected to the grid or to a local network • that is reliant on a co-located industrial process • that is tightly coupled to an industrial process, and that has been approved by the Authority under Schedule 13.4 of the Code
Dispatch setpoint	The number of MW that a generator is required by the system operator to generate in a dispatch instruction
Embedded generating station	One or more generating units that are directly connected to a local network or an embedded network and that inject into a local network or an embedded network at a single point of injection
Gate closure	Restrictions on changing bids or offers shortly before real time
Glenbrook	The Kilns Cogen plant at Glenbrook, operated by Alinta Energy NZ
Kawerau	All four units at Norske Skog Tasman's Kawerau site
Kinleith	The co-generator at Carter Holt Harvey's Kinleith site
NRS	Non-responsive schedule
Persistence offer	Revised offers that intermittent generators are required under clause 13.17(3) to make in the 2 hours immediately before the trading period to which an offer relates. The offers must be based on a persistence model using actual output from the generating station at the time the revised offer is submitted. Persistence offers ensure that intermittent generators do not breach clause 13.9(b), which requires that offers must not exceed the generator's reasonable estimate of the quantity of electricity capable of being supplied for the relevant trading period.
PRS	Price-responsive schedule

Type A co-generator	Under the proposal, a co-generator that continues to operate under existing offer and dispatch rules
Type B co-generator	Under the proposal, a co-generator that obtains approval to be treated in the same way as intermittent generation in some respects
Whareroa	All five units at the Whareroa dairy factory, operated by a joint venture between Todd Energy and Whareroa Power

Appendix A Proposed amendment

Changes to Part 1

~~co-generator~~ means the owner of an ~~industrial co-generating station~~. To avoid doubt, clauses specifying ~~co-generators~~ apply only to the ~~industrial co-generating stations~~ owned by the ~~co-generator~~

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**, and **type A co-generators**, and **type B co-generators**

industrial co-generating station means 1 or more **generating unit** that—

- (a) ~~that~~ is connected to the **grid** or to a **local network**; and
 - (b) ~~that~~ is reliant on a co-located **industrial process** because—
 - (i) it derives its fuel source from that co-located **industrial process**; or
 - (ii) it provides some or all of the **electricity** that it generates to that co-located **industrial process**; or
 - (iii) it provides some or all of any by-product of generating **electricity** to that co-located **industrial process**; and
 - (c) ~~that~~ is tightly coupled to an **industrial process**; and
 - (d) ~~that~~ has been approved by the **Authority** under clause 8(1)(a) or (b) of Schedule 13.4
- metering situation** means a situation in which—

- (a) the **metering information** to be given is incomplete or incorrect or is and remains an **initial estimate** for—
 - (i) a **grid exit point** or **grid injection point** specified on the **annual consumption list** as having **historical annual consumption** greater than 500 GWh; or
 - (ii) any 2 or more **grid exit points** or **grid injection points** specified on the **annual consumption list** as having **historical annual consumption** greater than 300 GWh; or
 - (iii) any 10 or more **grid exit points** or **grid injection points**; or
 - (iv) an **intermittent generating station** with a **point of connection** to the **grid**; or
 - (v) a **type B industrial co-generating station**; or
- (b) the **metering information** for a **dispatch-capable load station** given for a **trading period** is incomplete or incorrect or is and remains an **initial estimate** for a **grid exit point** at which a **nominated dispatch bid** has been submitted for the **trading period**

type A co-generator means the owner of a **type A industrial co-generating station**, in its capacity as owner of that **industrial co-generating station**

type B co-generator means the owner of a **type B industrial co-generating station**, in its capacity as owner of that **industrial co-generating station**

type A industrial co-generating station means an **industrial co-generating station** approved by the **Authority** under clause 8(1)(a) of Schedule 13.4

type B industrial co-generating station means an **industrial co-generating station** approved by the **Authority** under clause 8(1)(b) of Schedule 13.4

...

Changes to Part 13

13.1 Contents of this Part

This Part provides for processes by which—

...

- (e) ~~generators may apply for approval from to the Authority to have co-generator status~~ 1 or more generating units approved as—
 - (i) a type A industrial co-generating station; or
 - (ii) a type B industrial co-generating station; and

...

13.3 Approval process for industrial co-generating stations

A generator may apply to the Authority for approval for to have 1 or more generating units to be approved as—

- (a) a type A industrial co-generating station in accordance with under clause 8(1)(a) of Schedule 13.4; or
- (b) a type B industrial co-generating station under clause 8(1)(b) of Schedule 13.4.

...

13.9 Information that offers must contain

Each offer submitted by a generator must—

- (a) other than for ~~intermittent generators, and~~ type A co-generators and type B co-generators, contain all information required by Form 1 in Schedule 13.1; and
- (b) in relation to the **generating plant** that is the subject of the **offer**, not exceed, for each **trading period**, the **generator's** reasonable estimate of the quantity of **electricity** capable of being supplied at that **grid injection point** by the relevant **generating plant** for the relevant **trading period**; and
- (c) if the **offer** is submitted by an **intermittent generator** for an **intermittent generating station**,—
 - (i) contain the information required by Form 2 in Schedule 13.1; and
 - (ii) have a maximum of 1 price band for each **trading period**; and
 - (iii) specify a price of either \$0.00 (subject to clause 13.116) or \$0.01 for the price band; and
- (d) if the **offer** is submitted by a type A co-generator for an type A industrial co-generating station or by a type B co-generator for a type B industrial co-generating station,—
 - (i) contain the information required by Form 3 in Schedule 13.1; and
 - (ii) have a maximum of 2 price bands for each **trading period**; and
 - (iii) specify a price of either \$0.00 (in accordance with clause 13.116) or \$0.01 for the price band.

...

13.82 Dispatch instructions to be complied with

...

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

...

- (i) the **participant**—

...

- (iii) has no reasonable means of complying with the **dispatch instruction** while acting in accordance with the commissioning or test plan; or
- (j) the participant is a type B co-generator and the system operator has not advised that there is—
 - (i) a grid emergency; or
 - (ii) a system constraint that directly affects the type B co-generator.

...

13.86 Generators and ancillary service agents not obliged to comply with dispatch instructions below threshold

For any **generating plant, generating unit, block dispatch group or station dispatch group**, a **generator or ancillary service agent** is not required to comply with 1 or more **dispatch instructions** given by the **system operator** in accordance with clause 13.72(1)(a) if implementing the **dispatch instruction** or those **dispatch instructions** together would change by less than or equal to—

- (a) for **ancillary service agents**, 1 MW from the last **dispatch instruction** that the **ancillary service agent** complied with; or
- (b) for **generators** other than **type A co-generators**, 1 MW from the last **dispatch instruction** that the **generator** complied with; or
- (c) for **type A co-generators**, 5 MW from the last **dispatch instruction** that the **generator type A co-generator** complied with.

...

13.136 Generators to provide half-hour metering information

- (1) Each **generator** must give the **pricing manager**, and each **embedded generator** must give the **pricing manager** and the **grid owner** connected to the **local network** in which the **embedded generator** is located, **half-hour metering information** in accordance with clause 13.138 in relation to **generating plant** that is subject to a **dispatch instruction**—
 - (a) that injects **electricity** directly into a **local network**; or
 - (b) if the **meter** configuration is such that the **electricity** flows into a **local network** without first passing through a **grid injection point** or **grid exit point metering installation**.
- (2) To avoid doubt, subclause (1) excludes any **unoffered generation** or **electricity** supplied from—
 - (a) an intermittent generating station; or
 - (b) a type B industrial co-generating station.

13.137 ~~Unoffered and intermittent generation~~ Generators to provide half-hour metering information for unoffered and intermittent generation

- (1) Each **generator** must give the **pricing manager** and the relevant **grid owner** **half-hour metering information** for—
 - (a) **unoffered generation** from a **generating station** with a **point of connection** to the **grid**; and
 - (b) **electricity** supplied from an **intermittent generating station** with a **point of connection** to the **grid**; and
 - (c) electricity supplied from a type B industrial co-generating station.

- (2) To avoid doubt, each **generator** must give the **pricing manager** and the relevant **grid owner** the **half-hour metering information** required under this clause in accordance with the requirements of Part 15 for the collection of the **generator's volume information**.
- (3) If the **half-hour metering information** is not available, the **generator** must give the **pricing manager** and the relevant **grid owner** a reasonable estimate of such data.

...

13.141 Pricing manager to use certain input information

- (1) The **pricing manager** must use the following **input information**:
 - (a) for existing generation configuration—
 - (i) data specifying the instantaneous **MW injection** at the **grid injection point** at the beginning of each **trading period** for each **generating plant** and each **generating unit** that was the subject of **offers** for that **trading period**; or
 - (ii) if no such data is available, a reasonable estimate of such data:
 - (b) for actual **demand** over the **trading period**,—
 - (i) the **demand half-hour metering information** described as L_{MA} below must be calculated as follows:

$$L_{MA} = G_{EA} + L_{MX} - L_{DCLS} \text{ (for a grid exit point)}$$

$$L_{MA} = G_{EA} - L_{MI} - L_{DCLS} \text{ (for a grid injection point)}$$

$$L_{MA} = L_{MX} - L_{DCLS} - UIG_{EA} \text{ (for an intermittent generating station with a point of connection to the grid, and/or unoffered generation from a generating station with a point of connection to the grid, or a type B industrial co-generating station)}$$

where

 - L_{MA} is the adjusted quantity of **electricity** measured in **MWh** by a **metering installation** at a **grid exit point** or **grid injection point**
 - L_{MX} is the unadjusted **half-hour metering information** for the quantity of **electricity** measured in **MWh** at a **grid exit point**
 - L_{MI} is the unadjusted **half-hour metering information** for the quantity of **electricity** measured in **MWh** at a **grid injection point**
 - L_{DCLS} is the adjusted **half-hour metering information** for the quantity of **electricity** measured in **MWh** used by a **dispatch-capable load station** for the **trading periods** that the **system operator** listed under clause 13.138B
 - G_{EA} is the adjusted **half-hour metering information** given to the **pricing manager** under clause 13.136
 - UIG_{EA} is the information given to the **pricing manager** under clause 13.137:
 - (ii) if any of the **half-hour metering information** is not available, an **initial estimate** for each **grid exit point** or **grid injection point**:
 - (iii) to avoid doubt, each **grid owner** must provide the **half-hour metering information** to the **pricing manager** required under this clause in accordance with Part 15 for the collection of that **grid owner's volume information**:

- (c) the final **offers** for each **trading period** submitted by **generators** and provided to the **pricing manager** by the **system operator** in accordance with clause 13.63:
~~The **pricing manager** must remove all **offers** from **intermittent generators** from this information before using it in the pricing process:~~
- (ca) the final submitted **nominated dispatch bid** for each **trading period** that was provided to the **pricing manager** by the **system operator** in accordance with clause 13.63:
- (d) the final **reserve offers** for each such **trading period** as given by **ancillary service agents** in accordance with clauses 13.37 to 13.54:
- (e) the final information provided to the **system operator** by a **grid owner** under clauses 13.29 to 13.34 for each **trading period** that the **system operator** notifies in accordance with clause 13.63.

(1AA) The **pricing manager** must remove all **offers** from the following **participants** from the information specified in subclause (1)(c) before using it in the pricing process:

- (a) **intermittent generators** with a **point of connection** to the **grid**; and
- (b) **type B co-generators**.
- (1A) Each **grid owner** must give the **pricing manager** the information the **pricing manager** is required to use under subclause (1)(a)—
 - (a) by 0730 hours on each **trading day**; and
 - (b) for each **trading period** of the previous **trading day**; and
 - (c) in the manner and form agreed by the **pricing manager** and each **grid owner**.
- (2) Each **grid owner** must give the information required by subclause (1)(b) to the **pricing manager** by 0730 hours on a **trading day** for each **trading period** of the previous **trading day**. Each **grid owner** must provide this information in the form specified by the **pricing manager**.
- (3) The **pricing manager** must **publish** the information by 1000 hours on a **trading day** for each **trading period** of the previous **trading day**.
- (4) If the **pricing manager** receives revised demand **half-hour metering information** in accordance with clauses 13.135 to 13.140, and if the revised information resolves a **provisional price situation**, the **pricing manager** must **publish** the revised demand **half-hour metering information** no later than the time at which it is required to **publish interim prices** and **interim reserve prices**.
- (5) If the **pricing manager** receives the revised information after it has **published** information in accordance with subclauses (1)(b) and (2) to (4), it must **publish** the revised information by replacing the previously **published** information with the revised information.

Schedule 13.1

...

Form 1 Generator offer

Date: _____

Generator participant identifier: _____

Generator Name: _____

Grid Injection Point: _____

Generator Category (clause 13.10 of the Code): ☐ Unit ☐ Station
☐ Generator block (clauses 13.60 and 13.61 of the Code)

Block Name (if applicable): _____

Generator Maximum Output (including overload): _____ MW

Trading Period: _____ Starting at _____ : _____ 0 hours

Maximum Generator Ramp Up Rate: _____ MW/hr

Maximum Generator Ramp Down Rate: _____ MW/hr

Offer to sell electricity

Band 1: **From 0 MW to** _____ **MW @ \$** _____ **per MWh**

Band 2: **plus** _____ **MW @ \$** _____ **per MWh**

Band 3: **plus** _____ **MW @ \$** _____ **per MWh**

Band 4: **plus** _____ **MW @ \$** _____ **per MWh**

Band 5: **plus** _____ **MW @ \$** _____ **per MWh**

...

Form 2 Intermittent Generator Offer

Date: _____

Intermittent Generator participant identifier:

Intermittent Generator Name:

Grid Injection Point: _____

Generator category (clause 13.10 of the Code): ☐ Station

Generator Installed Capacity:

_____ **MW**

Trading Period: _____ Starting at _____ : _____ 0 hours

Maximum Generator Ramp Up Rate:

_____ **MW/hr**

Maximum Generator Ramp Down Rate:

_____ **MW/hr**

Offer to sell electricity

Band 1: From 0 MW to _____ MW @ \$ _____ per MWh

...

Form 3
Type A or type B Cco-generator Offer

Date: _____

Type A/type B
Cco-generator
participant identifier: _____

Type A/type B
Cco-generator Name: _____

Grid Injection Point: _____

Generator Category (clause 13.10 of the Code): Unit Station

Type A/type B Cco-generator Maximum Output (including overload):
_____ **MW**

Trading Period: _____ Starting at _____ : _____ 0 hours

Maximum Generator Ramp Up Rate:
_____ **MW/hr**

Maximum Generator Ramp Down Rate:
_____ **MW/hr**

Offer to sell electricity

Band 1: **From 0 MW to _____ MW @ \$ _____ per MWh**

Band 2: **plus _____ MW @ \$ _____ per MWh**

...

Schedule 13.3

The Modelling System

...

7 Dispatch schedule

For a **dispatch schedule**, the schedule must use—

- (a) ~~from **generators** and **ancillary service agents**, **generator offers** (clause 13.6(1) to (3), excluding **offers** made by **intermittent generators** under clause 13.6(3)) and revised **offers** (clause 13.17(1) and (2), excluding **offers** made by **intermittent generators** under clause 13.17(3)) and **ancillary service agent reserve offers** (clause 13.38(1)) and revised **reserve offers** (clause 13.46(1) and (2)), excluding the following:~~
 - (i) **offers** made by an **intermittent generator** under clause 13.6(3);
 - (ii) revised **offers** made by an **intermittent generator** under clause 13.17(3);
 - (iii) **offers** made by a **type B co-generator** under clause 13.6(1) or (2);
 - (iv) revised **offers** made by a **type B co-generator** under clause 13.17(1) or (2);
- and

...

Schedule 13.4

cl 13.3

Approval of as type A or type B industrial co-generating station

1 ~~Authority to approve industrial co-generating stations~~ Generators to apply to Authority

- (1) ~~A **generator** may apply to the **Authority** to have 1 or more **generating units** approved as for approval as an—~~
 - (a) a **type A industrial co-generating station**; or
 - (b) a **type B industrial co-generating station**.

2 ~~Applications for approval requirements~~

- (1) ~~Each application for approval as an **industrial co-generating station** must be in writing and—~~
 - (aa) be in writing; and
 - (a) ~~must state~~ **specify** each **generating unit** that the applicant wishes to have approved as an **industrial co-generating station**; and
 - (b) ~~must~~ include information related to any seasonal operation of the each **generating units**; and
 - (ba) ~~specify whether the applicant wishes the~~ **generating units** to be approved as—
 - (i) a **type A industrial co-generating station**; or
 - (ii) a **type B industrial co-generating station**.
- (2) ~~(c) An application may include any supporting information for the application that the applicant considers may assist the **Authority** to consider the application.~~

3 Authority must publicise each application for approval

On receipt of an application, the **Authority** must—

- (a) **publicise** the application; and
- (b) provide a copy of the application to the **system operator**.

4 Factors that Authority must consider

Before the **Authority** approves an application-generating unit, it must take into account—

- (a) the **system operator's** views as to the effect an approval would have on the **system operator's** ability to meet the **PPOs**; and
- (b) the cumulative effects, if the approval were granted, of all approvals granted under this Schedule on the **system operator's** ability to meet the **PPOs**; and
- (c) any views that may be made known to the **Authority** within the time specified by the **Authority** when it **publicised** the application in accordance with clause 3(a); and
- (d) ~~how whether each the application-generating unit that is the subject of the application comes within the requirements specified in~~ complies with paragraphs (a) to (c) of the definition of industrial co-generating station set out in Part 1; and
- (da) the implications of each generating unit that is the subject of the application being approved in accordance with the applicant's preference specified under clause 2(1)(ba), having regard to the obligations on type A co-generators and type B co-generators; and
- (e) section 15 of the Act.

5 Authority may require extra information

The **Authority** may require the provision of additional information at any stage during the application process and, if the **Authority's** requirements are reasonable, the applicant must provide that information to the **Authority**.

6 Authority may seek independent expert advice

In considering an application for approval, the **Authority** may seek technical advice from an independent person who is familiar with co-generation.

7 Applicant may withdraw or amend application at any time

- (1) The applicant may, at any time, withdraw or amend an application being considered by the **Authority**.
- (2) An amendment or withdrawal must be made in writing and submitted to the **Authority** and takes effect from the date of receipt by the **Authority**.

8 Authority's decision

- (1) The **Authority** must, no later than 6 months after receiving an application,—
 - (a) approve each **generating unit** that is the subject of the application as a **type A industrial co-generating station**; or

- (b) approve each **generating unit** that is the subject of the application as a **type B industrial co-generating station**; or
- (c) decline to approve the application.
- (2) If the **Authority** proposes to approve an application but does not consider that the applicant's preference specified under clause 2(1)(ba) can be accommodated, the **Authority** must consult with the applicant before approving the application.
- (3) The **Authority** must, as soon as practicable after ~~granting an approval~~, notify the granting of the approval, and conditions that apply to the approval, and the **Authority's** reasons for ~~granting the approval~~—
 - (a) to the applicant, in writing; and
 - (b) by notice in the *Gazette*.making a decision, advise the applicant in writing, and **publicise** its decision, including—
 - (a) the reasons for its decision; and
 - (b) any conditions that apply to an approved application.

9 Decision must be recorded

- (1) The **Authority** must keep a register of all current approvals granted under this Schedule available for public inspection free of charge during normal office hours at the offices of the **Authority** and on the **Authority's** website at all reasonable times.
- (2) The register must state, for each approval granted,—
 - (a) the name of the **type A co-generator** or **type B co-generator**; and ~~co-generator~~,
 - (b) the name of the **type A co-generator** or **type B industrial co-generating station**;
and
 - (c) the date of the approval; and
 - (d) the duration of the approval; and
 - (e) the nature of the approval, including any conditions.

10 Effect of approval

Approval of ~~an~~ 1 or more **generating units** as a **type A industrial co-generating station** or **type B industrial co-generating station** takes effect from the date specified in the approval (which may be no earlier than the date of the ~~*Gazette*~~ notice of decision **publicised** by the **Authority** under clause 8(3)).

11 Authority may impose conditions

The **Authority** may impose conditions on any approval it grants. Such conditions may include 1 or more of the following:

- (a) requirements to assist the **system operator** in meeting the **PPOs**;
- (b) requirements as to details of seasonal co-generation, including limitations on the being limited parts of the year during which the approval applies ~~generating units~~ are approved as **industrial co-generating stations**;
- (c) requiring requirements that the **type A co-generator** or **type B co-generator** must to comply with specific instructions from the **system operator** during a grid emergency.

12 ~~Authority must provide reasons for declining approval~~

~~If the Authority declines an application it must provide its reasons for doing so to the applicant.~~

13 Authority may rescind or amend approval

- (1) If the Authority considers a change of circumstance has led to a situation in which the continuation of an approval would significantly adversely impact on the **system operator's** ability to meet the PPOs, it may amend or rescind the approval.
- (2) The Authority may, at the request of a **type A co-generator** or **type B co-generator**, amend an approval so as to change a **type A industrial co-generating station** to a **type B industrial co-generating station**, or vice versa.
- (3) The Authority must consult with the **system operator** before amending an approval in accordance with subclause (2).

14 Notice and reasons for rescinding or amending approval

If the Authority amends or rescinds an approval, it must—

- (a) give the **type A co-generator** or **type B co-generator** 3 months' notice of ~~before~~ rescinding or amending the approval; and
- (b) advise the **type A co-generator** or **type B co-generator** of the reasons for rescinding or amending the approval.

Changes to Part 17

17.129 Approval process for industrial co-generating stations

- (1) ~~An application to the Board to be an industrial co-generating station in accordance with rule 3 of section I of part G of the **rules** that was not approved, declined, or rescinded immediately before this Code came into force, is deemed to be an application to the Authority to be an **industrial co-generating station** under clause 13.3 and must be continued and completed.~~
- (2) ~~A generator approved as an industrial co-generating station by the Board under rule 3 of section I or schedule G9 of part G of the **rules**, whose approval had not been rescinded immediately before this Code came into force, is deemed to be a **generator** approved by the Authority as an **industrial co-generating station** under clause 13.3 and Schedule 13.4.~~
- (3) ~~A notice issued by the Board of an amendment or rescission of an approval under rule 3 of section I or clause 14 of schedule G9 of part G of the **rules** immediately before this Code came into force, where the amendment or rescission is to take effect after this Code came into force, is deemed to be a notice issued by the Authority under clause 13.3 and clause 14 of Schedule 13.4.~~

17.129A Transitional provisions for co-generators

An approval granted by the Authority under Schedule 13.4 and in effect immediately before **[insert date]** is deemed to be an approval granted by the Authority under clause 8(1)(a) of Schedule 13.4 of 1 or more **generating units** as a **type A industrial co-generating station**.

Appendix B **Format for submissions**

Question	Comment
Q1. Do you support the Authority's proposal as described here?	
Q2. Do you have any comments or suggestions regarding the Authority's proposal?	
Q3. Do you have any comments on the Code drafting in Appendix A?	
Q4. Do you agree with the Authority's proposed changes to forms 1, 2, and 3 of Schedule 13.1?	
Q5. Do you consider that extending 30-minute gate closure to all co-generation would be consistent with the Authority's statutory objective? Please state your reasons.	
Q6. Do you agree that the objectives for the amendment set out in Section 4.2 are appropriate and consistent with the Authority's statutory objective? If not, why not?	
Q7. Do you agree that the proposed amendment would achieve the objectives set out in Section 4.2? If not, why not?	
Q8. Do you consider that the proposed amendment would carry a risk of unintended consequences? If so, what are they?	
Q9. Do you agree that the proposed amendment would produce a net economic benefit? If not, why not?	
Q10. Do you agree that the proposed amendment is preferable to other options? If not, please explain your preferred option in terms consistent with the Authority's statutory objective.	
Q11. Do you agree that the Authority's proposed amendment complies with section 32(1) of the Act?	
Q12. Do you agree that the Authority's proposed amendment complies with the Code amendment principles?	

Suggested format for providing drafting comments on the proposed Code amendment in Appendix A:

Clause reference	Submitter's comment	Submitter's alternative drafting

Appendix C **System operator report on implementation of the proposed Code amendment**

TASC 38 - Report

Phase 1 – Alternative proposal report

18/08/2014



*Keeping the lights on
24 hours a day, 7 days a week*

SYSTEM OPERATOR

Keeping the energy flowing

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NOTICE

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Version	Date	Change
1	5/5/2014	For the EA

	Position	Date
Prepared By: Scott Avery	Compliance Manager	5/5/2014
Revised by: Murray Henderson	Senior Market Services Analyst	18/08/2014

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1 Introduction

Carter Holt Harvey (CHH) proposed a Code amendment to modify the industrial co-generator rules to provide more appropriate and effective provisions for industrial co-generators to operate within the market.

The Electricity Authority reviewed the proposal and established sufficient merit to investigate further. This project was approved to be added to the joint work plan on 5 September 2013.

Investigations by Authority staff, including discussions with industrial parties, informal discussions with System Operator staff, and reviews of correspondence and historical consultation material have led to the development of an alternate solution to that proposed by CHH. The strawman design of the proposed alternative is attached in Annex A.

The revised proposal is considered by the Authority to have greater overall net benefits and a reduction in actual or potential detrimental effects, with early assessment of the initiative indicating that it is CBA positive and consistent with the Authority's statutory objective. This report outlines the results of an initial investigation into the proposal.

2 Design

2.1 Modified Strawman Design

Key design elements (full details in Annex A):

- Co-generators must continue to offer based on reasonable estimates in order to provide good security schedules (as per now)
- Change to 30 Minute gate closure to allow timely revision and provision of additional information.
- Add a new provision to allow for "dispatch as intermittent". The System Operator will set the qualifying co-gen stations as intermittent in RTD and will use the current SCADA output of the plant as its dispatch setpoint for the next 5 minute RTD dispatch period.

The original strawman design contained various options and triggers for the use of persistence offers and "dispatch as intermittent". These options would have required more System Operator tool changes to implement than the modified strawman approach. Due to constraints on Transpower IST resources the modified strawman design was developed and will, currently, be the only option explored in depth.

The modified strawman design was developed collaboratively between the Authority and the System Operator.

3 Evaluation –Design

3.1 Commentary on the original Strawman

In concept the System Operator supports the development of Code rules that are more responsive to the particular characteristics and operational needs of industrial co-generating stations. The present inability to submit revised offers for a trading period after the commencement of that trading period makes mismatches between generation output and offer quantities more difficult to manage for both the System Operator and the generator concerned. While this issue can affect other forms of generation, we acknowledge it presents particular challenges where the level of generation output is tightly coupled to an industrial process.

The original strawman sought to address this by allowing more flexibility to the co-generator when process changes impact their offer inside gate closure. This change has merit and aligns co-generators with a similar obligation for intermittent generators.

A new provision in the code requiring the system operator to change the type of dispatch for a particular co-generator will be difficult to incorporate into the market tools. The system operator can see that for the co-generator this allows them to more easily address the unplanned event which created the disruption. However, this likely means change to the market tools to allow, in real time, the ability to modify a generator type ie: from co-gen to intermittent. Additionally this selection should be done by the co-gen themselves and not the system operator. This would require changes to WITS and interface changes between WITS and the market system; adding complexity and cost to the proposal.

It is important to note that the system operator does not under any circumstances change generation offers. When the system operator is advised by a generator that it cannot meet its dispatch the system operator applies a constraint in the market system reflecting the revised capabilities so that the power system remains securely dispatched. If the issue will affect future trading periods then the generator must submit a bona-fide offer revision. There is no ability, currently, under either the Code or the market system for a generator to revise offers for the current trading.

Intermittent generators are required to provide revised offer quantities within gate closure. These must either be based on a persistence model or another methodology agreed with the Authority. The submission of persistence offers is the responsibility of the generator. This is important to note with regard to the modified strawman design.

3.2 Modified Strawman Design

As part of the Strawman a proposal for the co-generator to be treated permanently as an intermittent generator in the market system was voiced but initially dismissed. The system operator and the Authority have pragmatically reviewed this aspect and believe that this could be a simple and less complicated way of providing the proposed benefits. The System Operator supports this approach.

The modified strawman design limits the changes to the way that a co-generator is treated to a shorter gate closure period and dispatch.

To make the intended dispatch change in the market system the co-generator can be simply flagged and then treated as an intermittent generator. Care should

be taken to understand what this intermittent generator flag does and does not do. This is detailed further in the relevant sections and in Appendix 1.

Concern was raised as to the impact of using the existing intermittent generator flag with regard to final pricing and the impact on security. The system operator has, with approval from the EA, investigated the impacts within the market system of treating co-generators as intermittent. Detail of the testing is included in Appendix 2.

The Authority has proposed that this would be an opt-in treatment of co-generators. This is because at least one existing co-generator has indicated they would prefer to stay “as is”. However this may change once they understand that they will not pick up the persistence offer obligations under the modified strawman design.

Security

To support the System Operator’s ability to manage system security it is vital that the co-generators, as intermittent generators, make all reasonable efforts to ensure the accuracy of their offers before and after gate closure. It is important that any amendment to the Code does not reduce the obligations and incentives on generators to submit accurate offers.

We note in the existing Code:

- clause 13.9(b) requires generators (including intermittent generators) to ensure each offer they submit does not exceed the generator’s reasonable estimate of the quantity of electricity capable of being supplied for the trading period;
- clause 13.17(3)(a) requires intermittent generators to revise the quantity of each offer made during the two hours immediately before the trading period in respect of which the offer is made in order to comply with 13.9(b); and
- clause 13.18 specifies circumstances under which generators must submit revised offers in order to maintain offer accuracy.
- clause 13.82(d) of the Code sets out circumstances in which an intermittent generator is exempt from complying with dispatch instructions. Intermittent generators are exempt in all circumstances other than where the System Operator has advised that a grid emergency or system constraint exists that directly affects the intermittent generator. An intermittent generator may also be constrained by the System Operator in circumstances where the exemption does not apply.
- Clause 13.86(c) affords co-generators with a $\pm 5\text{MW}$ dispatch compliance tolerance. All other generation, including intermittent generators, have a $\pm 1\text{MW}$ threshold. However clause 13.82(d) effectively removes dispatch compliance from intermittent generators in normal operating conditions.

As long as these provisions remain then the security aspect of this change, the system operator believes, will remain secure and it will be able to meet its Principal Performance Obligations.

When tested, the ability of the market system to dispatch the co-generators remained unaffected and functioned as it should without incident.

Treatment of intermittent generators in the schedules

In the NRS and PRS schedules intermittent generators are scheduled on the basis of the offers in existence at the commencement of the schedules. For trading periods within gate closure these offers are based on the persistence offers submitted by the intermittent generator; NB this is NOT a function of the intermittent generation flag setting within the market system. It is simply a function of the schedules using the latest offer for each period submitted prior to the schedule commencing, as per the Code requirements for intermittent generation.

For RTD schedules parts of an intermittent generator's offers are replaced so that the offer has 9,999MW as the quantity, an up ramp rate of 0MW, and a down ramp rate of 9,999MW/hr. The MW Max and price remain as offered¹. Offers are cleared in the market system in accordance with the objective function and the physical limitations of the generator (as offered). The range within which a generator can be scheduled is set by the ramp-rates, their current output (from SCADA), their offered quantity and their MW Max (absolute upper limit). The changes made to an intermittent generator's offers for RTD mean that it cannot be dispatched up, it can be dispatched down if needed, or it can be dispatched back to what it is currently doing. If dispatched down a flag is issued with the dispatch instruction. This flag highlights the need to follow the dispatch instruction to the intermittent generator in accordance with clause 13.82(d). If this flag is not sent then the intermittent generator has 'free licence' under clause 13.82(d) to generate as they wish.

The treatment of an intermittent generator's offers for RTD is a function of the intermittent generation flag in the market system; i.e. if a co-generator has this setting applied then its offers would be treated similarly in RTD. The System Operator has successfully tested this and the functionality performed as expected.

For RTP schedules intermittent generator's offers are treated almost identically to the way they are in RTD. The one difference is that their current output is the average from the last 5 minutes.

Final Pricing

The treatment of co-generation in final pricing was not described in the strawman proposal. It is therefore a design issue to be resolved. Observations and issues concerning final pricing follow.

In the final pricing schedule intermittent generator offers are removed per clause 13.141(1)(c) of the Code. This is a function of the intermittent generation setting in the market system. System testing showed that this occurred as expected.

To account for the effect of the actual intermittent generation in the final pricing schedule their generation is netted off against the load at the GXP. The load used in the calculation comes from the metered MV90 data provided by the grid owner. Again this is stipulated in the Code; clauses 13.137 and 13.141(1)(b)(i). This is not a function of the intermittent generation setting in the market system. This calculation is performed by the Grid Owner prior to the metering data being provided to the Pricing Manager for the calculation of final prices.

For final pricing there are 3 options for including co-generation:

¹ See Appendix 3 – Structure of a generation offer for more details

1. Use the intermittent generation flag as currently built. This will remove the offer entirely. To account for the generation output changes would be required to the Code to allow the metering inputs (13.141(b)(i)) to be adjusted to a 'net-load' position similar to the calculation of metering inputs when a wind farm is present. {No cost}{time to implement - 3-4 weeks}
2. Clone the intermittent generation flag so that a 'co-generator' flag can be created. This would deliver the functionality described of the intermittent generation flag in the RTD and RTP schedules but would not remove the co-generator offers for final pricing. Without further intervention the offers used in final pricing for a co-generator would be the latest submitted prior to the start of the trading period. {Cost – yet to be calculated}{time to implement, not known but substantially longer than option 1}
3. Alter the treatment of all intermittent generators in final pricing such that the offer submitted prior to the start of the trading period is replaced by either the average generation over the trading period or the actual generation over the trading period. {Cost – yet to be calculated}}{time to implement, not known but substantially longer than option 1}

Note that the third option is already an item on the Authority and System Operator's Joint Work Plan (JWP). It makes little sense to implement the third option for co-generation in isolation of other intermittent generation. Given the likely efficiencies of addressing the JWP item "treatment of wind in final pricing" and this proposal to treat co-generators similarly to intermittent generators the System Operator recommends that both items are progressed together if Option 3 is the preferred approach for final pricing.

Code 'drafting' comments

No draft Code was needed nor provided at this stage, nevertheless the System Operator has noted that depending on how this proposal is implemented in the Code there may be some issues. If co-generators who opt-in to "dispatch as intermittent" are included in the definition of **intermittent generating station** within the Code issues may arise over which clauses apply to a generator who is both a co-generator and an intermittent generator. The instances where there are distinct properties for co-generators and intermittent generators for the same aspect of the Code follow:

- The ability of co-generators to offer in 2 bands while intermittent generators can only offer a single band.
- The offer forms in Sch. 13.1 may need similar attention to reflect any changes made in relation to the previous point.
- The interaction between clauses 13.82(d) and 13.86(c). Clause 13.82(d) allows intermittent generators to not follow dispatch unless specifically instructed to. Clause 13.86(c) allows co-generators a dispatch compliance threshold of $\pm 5\text{MW}$.

4 Costs

4.1 Strawman Design cost

The system operator began assessing the cost to implement these changes, but halted the estimation when it was identified that a more simple solution may provide the desired outcomes. This simplified, low-cost approach is being investigated first.

4.2 Modified Strawman cost

If the intermittent generation flag is used 'as is' the costs associated with change are minimal. Changes to the market system would be very minor and have no cost associated with them. They would be a BAU modelling change. Similarly changing the metering inputs for final pricing to treat "dispatch as intermittent" co-generators the same as intermittent generators should have little or no cost to implement. The metering value required to effect this change is the net GXP value, which is already available.

That net GXP value already includes the effect of the co-generation, either reducing the GXP offtake or creating an injection into the Grid if the generation exceeds the load. Net GXP metering is used for offered wind farms and their offers are removed by the market system for final pricing so that their generation is only counted once, in the metering data. Currently the co-generation metered output is added on to the net metering value so that the generation is not double counted via the metering and the offer. This step in the metering data processing would become redundant if the intermittent generation flag is used to effect this proposal. A Code change to 13.141(1)(b)(i) may be required to implement this metering change.

It should be noted that the current treatment of intermittent generation in final pricing is sub-optimal (hence planned project to change on JWP) however treating co-generation identically is the only no cost option. No variations that would deliver alternative treatment/functionality in final pricing have been costed at this stage.

In addition there may be costs for any changes required of WITS. Changes to WITS are out of scope of this TASC.

5 Interaction with other market initiatives

The system operator does not believe that there will be any negative impacts with other industry initiatives or possible future development options if opt-in co-generation is treated as intermittent generation for dispatch purposes. Some potential market developments may require a solution to deal with intermittent generation (ie ex-ante pricing). However this is true of the status quo and is wholly unchanged by the possible treatment of some co-generation as "dispatch as intermittent".

The system operator notes that there are items on the [Authority's Work Programme](#)² addressing aspects of intermittent generation treatment in the final pricing schedule and the restrictions imposed on intermittent generation offers. Opt-in "dispatch as intermittent" co-generators must be included in the changes proposed for more efficient treatment of intermittent generation in final pricing. The relaxation of offer restrictions applying to intermittent generators will need to be carefully implemented in the Code to avoid any unintended consequences.

² Pending projects 3.13 and 3.17 on page 26.

6 Annex A: Electricity Authority preferred option

Modified Strawman design

6 December 2013

Amend specific Code provisions for industrial co-generators to allow flexibility while still achieving “best possible system information”

- Co-generators must continue to offer based on reasonable estimates in order to provide good security schedules (as per now)
- Change to 30 Minute gate closure to allow timely revision and provision of additional information.
- Add a new provision to allow for “dispatch as intermittent”. The System Operator will set the qualifying co-gen stations as intermittent in RTD and will use the current SCADA output of the plant as its dispatch setpoint for the next 5 minute RTD dispatch period.

Discussions with industrials raised the potential for three different versions of persistence dispatch application:-

- 1) **Permanent**, effectively generators would run in this dispatch mode all the time. Easiest for the generators to comply with however we would need to assess the impact on market prices and security and this is likely to be unfavourable.
- 2) **Requested**, similar to existing bona-fide process whereby the co-generator identifies and issue and notifies the SO energy co-ordinator to request persistence dispatch status. This is the form originally envisaged and was considered to be a useful option by industrials, but had the problem that staffing limitations might leave a degree of residual exposure.
- 3) **Automatic**, this approach would have a trigger level for a dispatch deviation that would trigger the use of persistence dispatch by the SO, to be followed up by communication for the co-generator. This has the advantage of slightly better accuracy for some sites, and allowing for sites with limited staffing. Would require appropriate definition of trigger levels and potentially a substantial amount of additional systems work and therefore cost.

Current constraints on availability of IST resource have prompted the SO and the EA to consider ‘no tool change’ solutions, so at least in the initial instance, the only one of the three options considered here is option 1) permanent.

- A change to the Code to allow SO to ignore offers for plant qualifying for intermittent dispatch to absolve them from any resulting non-compliance with unoffered generation rules.
- The Authority or System Operator Compliance teams may request explanation if concerned that parties are not making reasonable endeavours to maintain offers as a reasonable estimate of output or misusing the intermittent dispatch status in any way (e.g. consistently high or low during times of high or low prices etc.)
- A provision to resolve any security constraint violation problems.

- Co-generators wanting to use persistence dispatch provisions must supply reliable SCADA quality real time generation data to the SO.
- Note that this strawman differs from the CHH proposal primarily in the requirement to provide generator offers comprising a reasonable estimate of generating capacity. If full intermittent generator treatment was applied then this requirement would have been replaced with a persistence offer requirement, which would have reduced the quality of information in the market.

7 Appendix 1 - The intermittent generation flag

This table details exactly what the intermittent generation flag in the market system does and does not do.

Action/process	Does	Does not
Submission of persistence offers	-	Submit persistence offers
NRS/PRS schedules	-	-
Dispatch/RTD	Substitute parts of offer as follows: • 9,999MW quantity • 0MW/hr up ramp rate • 9,999MW/hr down ramp rate	• Guarantee dispatch • Change submitted MW Max • Change current generation level (SCADA)
RTP schedule	Substitute parts of offer as follows: • 9,999MW quantity • 0MW/hr up ramp rate, • 9,999MW/hr down ramp rate Substitute current output as follows: • 5 min average generation as current output (SCADA)	Change submitted MW Max
Final pricing	Remove offers entirely	Adjust metering to account for the intermittent generation

8 Appendix 2 – Testing performed

In one of the System Operator's test environments the intermittent generation flag (the IG flag) in the market system was selected as 'yes' for 2 co-generator locations; Kawerau (Norske Skog Tasman) and Kinleith (Carter Holt Harvey). The environment was then left to observe how the application of the IG flag affected the treatment of the offers at these locations in the automated schedules. Market schedules³ are triggered in the test environment with the same settings as in production. To observe the impact of the IG flag in final pricing a final pricing schedule was solved.

All behaviour observed was as expected. It is detailed in the table below:

Test area	Observation
Final pricing	Offers at Kawerau and Kinleith removed automatically. No adjustment to metering data as a result of the flag.
RTD	Substitute parts of offer as follows: • 9,999MW quantity • 0MW/hr up ramp rate • 9,999MW/hr down ramp rate
RTP	Substitute parts of offer as follows: • 9,999MW quantity • 0MW/hr up ramp rate, • 9,999MW/hr down ramp rate Substitute current output as follows: • 5 min average generation as current output (SCADA)
NRSL/NRSS	No impact – half hour offers used as submitted
PRSL/PRSS	No impact – half hour offers used as submitted
Persistence Offers	No offers created as a result of flag setting

³ NRSL/NRSS Non-Response Schedule Long/Short
PRSL/PRSS Price-Responsive Schedule Long/Short
RTP – Real Time Prices
RTD – Real Time Dispatch

9 Appendix 3 – Structure of a generation offer

Offers consist of several components that all have a bearing on how the offer is scheduled within the market system.

Bands (Also called tranches)

A band is a pairing of a MW quantity and a price (\$/MWh). Intermittent generators are restricted to a single band at either \$0/MWh or \$0.01/MWh. Co-generators can use up to 2 bands at either \$0/MWh or \$0.01/MWh. All other offered generation can use up to 5 bands. Band 1 contains the lowest priced offered capacity and each subsequently offered band includes an increase in offered quantity at increasing prices.

Ramp rates

Down and up ramp rates are offered per trading period by the generator. These are offered on a MW/hr basis and represent the physical ability of that generator to alter its output in each direction. Therefore for a 30min solution (NRSS, PRSL, final pricing etc) the generator is able to move by half of the offered ramp rate in each period. For a 5min solution (RTD and RTP) the change in scheduled generation must be within 1/12th of the offered ramp rates.

Ramp rates, in combination with the 'current' output level of each generator set the range within which that generator can be scheduled. The 'current' output value to which the ramp rates are applied to determine the range varies by schedule and by trading period within forward looking schedules. All values are derived from SCADA data:

Schedule	'Current' output value used
RTD	actual output at schedule commencement
RTP	actual output at commencement of the 5min period which is being solved
NRSS NRSL PRSS PRSL	1 st trading period, actual output at commencement of that period. 2 nd and subsequent periods, scheduled output from previous trading period.
Final Pricing	actual output at start of each trading period

When the flag is set for a generator the up ramp rate is set to zero and the down ramp rate is set to 9,999 MW/hr. In practice what this means is that the market system cannot schedule the generator up, irrespective of the offers or MW Max. The generator can be scheduled down should either the optimal lowest cost solution or a security situation require reduced output.

MW Max

Is a value submitted by the generator as part of their offer. It represents the maximum output possible from that generator in each trading period. The market system will not clear generation in excess of the MW Max value. The way that the MW Max is used in the market system can be represented by the following equation:

$$\text{MW Max} \geq \sum \text{scheduled MW} + \sum \text{scheduled reserve}$$

Looking at MW Max another way the inter-relationship between MW Max and the offer bands submitted can be represented by the following equation:

$$\text{Max quantity available} = \text{Min (MW Max, } \sum \text{ offered MW)}$$

It is because of this constraint within the market system that the IG flag value of 9,999MW can be substituted for the offered quantity at an intermittent generator by the market system; the offered MW Max will set the limit to which the intermittent generator can be scheduled.

10 Appendix 4 – Current list of co-generators

Electricity Industry Participation Code 2010 **Register of Generators approved as Industrial Co-generators**

Updated: 15 October 2013

The Authority has approved the following generators as industrial co-generators under Schedule 13.4 of the Code:

Approval Number	Generator Name	Co-Generating Unit	Date Approved	Duration of Approval	Conditions
1	Carter Holt Harvey Pulp and Paper Ltd	Kinleith Mill Turbine Generator	31 July 2007	Ongoing	▪ Grid Emergency. The co-generator must comply with dispatch instructions where the system operator has issued a formal notice as defined in part A of the Rules.
2	Alinta Energy (NZ) Ltd	Kilns Cogen Plant, Glenbrook Power Station	31 July 2007	Ongoing	▪ Grid Emergency. The co-generator must comply with dispatch instructions where the system operator has issued a formal notice as defined in part A of the Rules.
3	Todd Energy Ltd and Whareroa Power Ltd Unincorporated Joint Venture	All 5 units at the Whareroa Co-generator	31 July 2007	Ongoing	▪ Deviation for one trading period: Deviation from the dispatched quantity of greater than $\pm 1\text{MW}$ may not continue for longer than one trading period without a revised offer. ▪ Grid Emergency. The co-generator must comply with dispatch instructions where the system operator has issued a formal notice as defined in part A of the Rules.
4	Norske Skog Tasman Ltd	All 4 units at the Kawerau site	14 October 2013	Ongoing	Norske Skog Tasman must comply with dispatch instructions if: ▪ the system operator has issued a formal grid emergency or warning notice applicable to the area supplied by grid exit points in the Kawerau area; or ▪ a constraint situation, which is directly impacted by the Norske Skog industrial co-generating station, exists within the area supplied by grid exit points in the Kawerau area.

The following generators have applied to be industrial Co-generators and the application is under review: