

Making price forecasts more accurate

Decision paper

15 August 2017



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1 Decision

- 1.1 The Electricity Authority (Authority) is an independent Crown entity responsible for promoting competition in, reliable supply by and the efficient operation of, the electricity industry for the long-term benefit of consumers.¹
- 1.2 The Authority has decided to improve the accuracy of price forecasts by improving conforming load forecasts under existing incentive arrangements. This will be achieved by developing the Authority's preferred option (Option A) which was set out in the February 2017 *Making hours-ahead price forecasts more accurate* consultation paper (consultation paper).² Our decision to focus on improving the conforming load price forecast rather than develop an hours-ahead market is reflected in the decision paper's title, which differs from the consultation paper's title.
- 1.3 The next phase of work will be completed as part of project C6 in the Authority's 2017/18 work programme *Improving accuracy of spot price forecasts*.³ We will ensure that optionality to move to another option in the future is maintained. The Authority will also pursue the 'quick-win' improvements set out in the consultation paper as we expect they will complement the main aim of improving conforming load forecasts under existing incentive arrangements.

2 Background

- 2.1 In July 2015, we announced the Authority would explore two refinements to the spot market:⁴
- (a) settling prices based on system conditions in real time—real-time pricing (RTP)
 - (b) adding or facilitating an hours-ahead market.
- 2.2 We explained that priority would be given to RTP, as some hours-ahead options depend on decisions about RTP. The Authority has recently published the *Real-time pricing proposal* consultation paper, which seeks views on the detailed dispatch-based option.⁵
- 2.3 In the meantime, to progress hours-ahead market options, the Authority published a consultation paper on 9 February 2017. The consultation paper examined an hours-ahead market and also looked at the broader issue of how to improve the accuracy of price information in the hours leading up to real time. The consultation paper considered four options:
- (a) Option A: (the preferred option) improve inputs into price forecasts under existing incentive arrangements (administrative/beneficiaries pay arrangements)
 - (b) Option B: improve inputs into price forecasts and improve incentives (beneficiaries/exacerbators pay arrangements)
 - (c) Option C: encourage a voluntary hours-ahead market (market-like arrangements)
 - (d) Option D: pursue a formal hours-ahead market (market-like arrangements).

¹ This is the Authority's statutory objective. Refer to section 15 of the *Electricity Industry Act 2010*.

² See: <https://www.ea.govt.nz/development/work-programme/pricing-cost-allocation/exploring-refinements-to-the-spot-market/consultations/#c16353>

³ See: <https://www.ea.govt.nz/about-us/strategic-planning-and-reporting/our-work-programme/>

⁴ See: www.ea.govt.nz/dmsdocument/19860.

⁵ See: <https://www.ea.govt.nz/development/work-programme/pricing-cost-allocation/spot-market-settlement-on-real-time-pricing/consultations/#c16609>

2.4 This decision paper sets out the Authority's decision and reasons for pursuing Option A.

3 Why the Authority made this decision

3.1 After considering submissions to the consultation paper we continue to prefer Option A, improving conforming load forecasts under existing incentive arrangements. Accurate price forecasts are expected to encourage more efficient demand-response and generation scheduling. We also expect that it would benefit those parties looking to employ new technologies and business models. Broadly speaking, both consumers and producers can improve their decision making if they can rely on forecast prices produced hours in advance.

3.2 Improving the reliability of forecast prices available hours in advance of real time is expected to promote all three limbs of the Authority's statutory objective:

- (a) competition would be enhanced via an increased ability for consumers and generators to respond to price
- (b) reliability would be enhanced by reducing the need for involuntary load curtailment, when a more efficient alternative is available
- (c) efficiency would be promoted as accurate price forecasts would be expected to increase the pool of parties that can respond to the spot market. This would ensure that the lowest cost resources are employed in the short term and efficient investment and retirement decisions are made in the longer term.

3.3 The consultation paper provided a qualitative cost benefit analysis (CBA) of all four options, as well as a quantitative CBA of options A and D. The quantitative CBA showed that options A and D both generate net benefits under the base case assumptions, with Option D having higher net benefit than Option A in some scenarios. However, Option D was higher risk as it had a small net cost in one of the scenarios.

3.4 As well as promoting all three limbs of our statutory objective, the Authority prefers Option A because it is supported by the CBA, is low risk and does not preclude Option D (or other options) being implemented in the future. For example, one of the other options may become preferable if there is a rapid evolution of technologies and business models in the electricity sector.

4 Matters the Authority considered in making this decision

4.1 The Authority received submissions from the 15 parties listed in Table 1. All submissions and a summary of submissions prepared by the Authority can be found on the Authority's website at: <http://www.ea.govt.nz/development/work-programme/pricing-cost-allocation/exploring-refinements-to-the-spot-market/consultations/#c16353>.

Table 1: List of submitters

Major generator/ retailers	Other generators and retailers	Distributors	Consumers	Service providers and others
Genesis Energy Limited (Genesis)	Flick Energy Limited (Flick)	Orion New Zealand Limited (Orion)	Major Electricity Users' Group (MEUG)	Electric Power Optimisation Centre (EPOC)
Mercury Energy Limited (Mercury)	Nova Energy Limited (Nova)	Powerco Limited (Powerco)	New Zealand Steel Limited (NZ Steel)	NZX Limited (NZX)
Meridian Energy Limited (Meridian)	Pioneer Energy Limited (Pioneer)			Tesla Asia Pacific Limited (Tesla)
Trustpower Limited (Trustpower)				Transpower New Zealand Limited (Transpower)

- 4.2 Thirteen submitters agreed that Option A should be progressed at this stage. One submitter did not agree and one submitter did not express a preference for any particular option. The following section summarises our consideration of submitters' views.
- 4.3 The Authority has considered the matters raised by submitters in the context of our statutory objective and the matters fell into six areas:
- (a) the Authority's preferred option
 - (b) factors to be considered when improving hours-ahead price forecasting
 - (c) choosing between a proprietary or open source forecasting method
 - (d) quick-win improvements to the quality of forecast information
 - (e) option(s) to be investigated at a later stage
 - (f) the cost-benefit assessment.
- 4.4 Each of these matters is discussed below.

The Authority continues to prefer Option A: improving inputs to price forecasts under existing incentive arrangements

What the Authority proposed

- 4.5 The Authority considered Option A was the preferred option because:
- (a) Option A promotes the Authority's statutory objective, as it will improve conforming load forecasts which is expected to enhance the accuracy of price forecasting and improve generator and customer decision making
 - (b) Option A is lower risk as it does not fundamentally change current processes
 - (c) Option D is more complex than Option A and its benefits are more uncertain as they depend on subsequent increased participation in the wholesale market

- (d) advancing Option A would not preclude Option D (or other options) at a later date if they are judged to be worthwhile
- (e) more information is likely to be available on the incremental costs and benefits of an hours-ahead market once real-time pricing improvements have been implemented
- (f) preferring Option A is consistent with the following tie-breaker provisions in the *Authority's Code Amendment Principles*:⁶
 - (i) Option A is only changing one input to the price forecast so it can be considered small-scale, flexible, scalable, and relatively easy to reverse (Principle 4 – *preference for small-scale 'trial and error' options*)
 - (ii) Option A does not rule out later adoption of a market solution such as Option D (Principle 6 – *preference for market solutions*)
 - (iii) Option A is be expected to improve participant decision-making and does not prescribe specific participant behaviour (Principle 8 – *preference for non-prescriptive options*).

Submitters' views

- 4.6 Submitters offered broad support for Option A. Thirteen of the 15 submissions supported Option A being progressed at this stage in preference to the other identified options.
- 4.7 Genesis was one of the submitters that agreed Option A would be the most reasonable option in the short term. However, it considered that Option D would be a better option in the long term and recommended Option A should be implemented as a 'stepping stone' for Option D.
- 4.8 Mercury was the only submitter that did not prefer Option A in the short term. Mercury preferred a form of Option B because it thought it would improve intermittent generators forecasts, which they see as important.

The Authority's response

- 4.9 After considering submitters' views and our statutory objective, the Authority considers that Option A, improving inputs into price forecasts under existing incentive arrangements, remains the preferred option at this stage. Option A maintains optionality to consider further improvements to hours-ahead price forecasts in the future. The Authority's initial focus will be on improving the conforming load forecast because it is the largest existing source of price errors.
- 4.10 Mercury suggested that Option B should be progressed because of its likely positive impact on intermittent generation forecasting. The Authority notes that it will be examining the reasons for the apparent relative differences in forecasting performance among intermittent generators as part of the quick wins discussed in paragraph 4.25.
- 4.11 The Authority will soon consult on the following changes to wind offer arrangements:
 - (a) allowing wind generators to offer in at five price bands as opposed to a single band of \$0.01/MWh and provide associated hours-ahead price/quantity offers

⁶ Tie-breaker 1 (Principles 4 – 8) applies when quantitative CBA demonstrates a positive net benefit relative to the counterfactual, but is inconclusive about which is the best option. See <http://ea.govt.nz/dmsdocument/14242>.

- (b) clarifying the meaning of “persistence offers” for wind generators to ensure the offers reflect a forecast of generation potential rather than being based on what is currently being generated and expected availability and capability of generating plant
- (c) preventing wind generators from withdrawing more than 30 MW without an allowable reason.

Factors, such as demand response, need to be considered when improving hours-ahead price forecasts

What the Authority proposed

4.12 Paragraph 6.7 of the consultation paper discussed a set of issues common to all the options:

- (a) while retailers are financially liable for the electricity used by conforming load, conforming load is forecast by the system operator and the accuracy forecast is subject to influence from:
 - (i) the actions of consumers that the load forecaster does not directly account for (for example, consumers responding to spot prices)
 - (ii) the level of output from unoffered embedded generation
 - (iii) load control activity by electricity distribution businesses for network management purposes
 - (iv) load control activity by aggregators for energy trading purposes (such as offering interruptible load)
 - (v) demand response managed by Transpower as part of its grid alternatives programme
 - (vi) the impact of new technology and business models.

Submitters' views

4.13 NZX and Orion submitted that there would be demand response issues to be aware of when improving hours-ahead demand forecasting:

- (a) NZX submitted that the adoption of demand shifting technologies could initially distort the ability to accurately predict consumption at different price levels.
- (b) Orion submitted that:
 - (i) load management can unknowingly materially impact on the accuracy of demand and price forecasts
 - (ii) if price forecasts were improved, consumers could use these ‘better’ forecasts to decide on their consumption behaviour, increasing the likelihood of material variations between forecast and actual prices
 - (iii) a good forecast should at least be unbiased and a consistent bias in demand forecasts should be easily addressed.
- (c) Nova submitted that an improved centralised demand forecasting methodology would be the best place to start when improving forecasts.

The Authority's response

- 4.14 The Authority will consider demand response issues when developing Option A. We are aware that increased demand response may impact negatively on the accuracy of price forecasts. However, we consider that developing greater demand response is important for promoting our statutory objective—competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers. Therefore, the Authority considers that demand and price forecasting processes should respond to these developments rather than discourage them.
- 4.15 As well as improving conforming load forecasts more generally, correcting for the apparent systematic average bias present in the conforming load forecast and making other low-cost incremental improvements to the conforming load forecast are two of the 'quick wins' (discussed below in paragraph 4.24) that the Authority plan to progress.

The Authority will consider submitters' views when it chooses between a proprietary or open source forecasting method

What the Authority proposed

- 4.16 In the consultation paper, the Authority considered an improved price forecast methodology could be progressed by either:
- (a) a proprietary methodology—a contract could be entered into with a forecaster to use their proprietary methodology to generate conforming load forecasts, or
 - (b) an open source methodology—a revised forecasting methodology could be implemented in a way where intellectual property rights are vested with the Authority on behalf of wholesale market participants.
- 4.17 The Authority noted that the proprietary methodology may offer a direct route for accessing specialist expertise in forecasting and should enable rapid improvements in load forecast accuracy. However, the Authority thought this approach may be less flexible in the longer run.
- 4.18 Using an open source methodology may take longer to obtain the same initial level of improvement, but would retain more control over the future development path.
- 4.19 The Authority noted that the introduction of a new conforming load forecast methodology could be progressed under the system operator contract, or by a separate service provider agreement.

Submitters' views

- 4.20 Meridian and Tesla supported a proprietary methodology over an open source methodology. Meridian submitted that the additional time it would take to pursue an open source methodology, and the greater uncertainty as to the level of improvements that such a methodology would ultimately deliver, made a proprietary methodology preferable. Tesla listed several benefits of a proprietary methodology over an open source forecast and noted that a good third party vendor would take into consideration the changing shape of energy use.
- 4.21 Pioneer supported the system operator, not a different service provider, implementing the new forecasting tool it had identified. However, NZX supported the creation of a new contestable independent forecaster role (separate from the system operator).

4.22 The remaining submitters did not express a preference for either a proprietary or open source forecast methodology.

The Authority's response

4.23 The Authority notes submitters' views on whether to use a proprietary or open source forecasting methodology. The Authority will consider these views further in the process of developing Option A.

The Authority will progress the identified quick-win improvements to forecasting

What the Authority proposed

4.24 The consultation paper outlined the following quick wins to improve the quality of forecast price information:

- (a) correcting the apparent systematic average bias present in the conforming load forecast
- (b) making other low-cost incremental improvements to the conforming load forecast
- (c) examining the reasons for apparent relative differences in forecasting performance among intermittent generators, and among non-conforming load sources.

Submitters' views

4.25 Genesis and Meridian suggested the Authority should focus on examining the reasons for the apparent relative differences in forecasting performance among intermittent generators, and among non-conforming load sources. However, Meridian also queried a comment made by the Authority in the consultation paper that wind generation forecasts submitted 2 ½ hours before real time appear to be less accurate than persistence forecasts.⁷

4.26 Nova submitted that it was important to remove any incentive for parties to build bias into their demand bids or projections. Also, there would be a need to improve wind generation forecasts, either through participants or centrally.

4.27 Orion agreed that the forecasting of conforming load could be materially improved and that this would improve price forecasts, in the absence of any change in unforecasted/unbid demand response.

4.28 Mercury submitted an additional 'quick win' initiative. They proposed that Transpower should disclose information on its demand response programme to the market as soon as possible after a demand response event is scheduled and programme participants have been contacted.

The Authority's response

4.29 The Authority intends to progress the three quick wins suggested in the consultation paper. The first two of these quick wins (correcting for bias in the conforming load forecast and making low-cost incremental improvements to the conforming load forecast) will be considered in the context of the wider project of improving conforming load forecasts. This is to ensure that the quick wins do not hold up the overall project.

⁷ See paragraph 5.4.6(6) of the consultation paper. Meridian submitted that this comment did not make sense because the forecast it submits 2 ½ hours before real time is a persistence forecast. Meridian said they would discuss this with Authority staff.

- 4.30 The Authority notes that the quick wins suggested in the consultation paper are consistent with initiatives (including some quick wins) recommended by the Wholesale Advisory Group in its report to the Authority on spot market improvements.⁸
- 4.31 The Authority currently has a project looking at how to incorporate Transpower's demand response platform into the spot market. It will further consider the merits of requiring Transpower to disclose information on its demand response programme to the market (the quick win suggested by Mercury) in this project.⁹
- 4.32 As part of analysis into the quick win regarding intermittent generation, the Authority will take into account further advice from Meridian regarding the persistence forecast.

Implementation of Option A does not preclude other options in the future

What the Authority proposed

- 4.33 The Authority considered that Option A would maintain the optionality to enable further improvements to forecast prices in the future, as well as providing a useful foundation for transition to other options if that becomes desirable.
- 4.34 The Authority noted that accurate forecast pricing may become more important in the future (and hence options B, C, and D may become more attractive) because:
- (a) increased uptake of batteries and other similar technology may shift energy consumption and production across time
 - (b) the quantity of load that responds to price signals may increase
 - (c) the proportion of uncontrollable or must-run generation is rising, which is likely to result in more volatile spot prices
 - (d) an increasing proportion of demand is price responsive, which will make forecasting more important for two reasons:
 - (i) price-responsive load is likely to desire more accurate forecasts to inform its decisions
 - (ii) load forecasts that do not take account of price-responsiveness will become less reliable
 - (e) the market for risk management contracts is continuing to evolve and develop over time, which could (although it currently appears unlikely) lead to Option C developing voluntarily in the future.

Submitters' views

- 4.35 Most submitters were supportive of maintaining optionality to move to another option at a later stage if conditions change.
- 4.36 Flick, Pioneer, Powerco, and Trustpower considered that further analysis and/or monitoring should be done over time to determine whether another option becomes more appropriate.

⁸ See: <https://www.ea.govt.nz/dmsdocument/17108>.

⁹ See also the Demand Response Operational Protocol at <https://www.transpower.co.nz/about-us/demand-response/demand-response-resources/demand-response-documents>.

- 4.37 Nova and NZX both considered that Option C could be the next best step. However, Nova and NZX differed on the merits of Option D. Nova submitted that if a voluntary hours-ahead market developed sufficient liquidity, then additional investment could be made in the Scheduling and Pricing Dispatch model to introduce a formal hours-ahead market (such as Option D). NZX favoured a voluntarily hours-ahead market (Option C) over a mandated market (such as Option D).
- 4.38 Genesis recommended the Authority set a clear pathway for transition to a market-based approach, based on Option D because it is likely to:
- (a) address the underlying causes of pricing errors, as exacerbators would pay for the social cost of their action or inaction
 - (b) provide for a transparent framework as it would be mandated in the Code.
- 4.39 Mercury, NZ Steel, and Orion were hesitant about adopting Options C and D in the future. These submitters were concerned that Options C and D would be complicated, costly, and risky.
- 4.40 Four submitters (Meridian, MEUG, Tesla, and Transpower) had no comment on the process or specific options that should be developed in the future, but were open to further development.

The Authority's response

- 4.41 The Authority will ensure that Option A is implemented in such a way that one of the other options (B, C, or D) can be moved to at a later stage. If conditions change, the Authority will reassess the pros and cons of moving to a different option. Such an assessment will consider the range of views expressed by submitters on these other options.
- 4.42 The Authority will further consider whether:
- (a) metrics for ongoing monitoring of forecasting performance should be established and what these should be
 - (b) when and how price forecasting performance should be reviewed in the future.

The Authority's choice of Option A is supported by the cost-benefit assessment

What the Authority proposed

- 4.43 The consultation paper included a qualitative CBA of options A to D in section 7, along with a quantitative CBA of just options A and D in section 8.

Table 2 Qualitative assessment of the four options

	Option A	Option B	Option C	Option D
Size of potential benefit (qualitative assessment)	Worthwhile benefit expected from improving inputs—especially conforming load forecast	Likely to exceed benefit of Option A—but less than options C or D	Greater than A and B	Largest potential benefit
Cost (qualitative assessment)	Lowest	Between options A and D—depending on design details	Intermediate	Highest
Timing	Swiftest to implement	Intermediate	Unclear (may not occur voluntarily)	Longest lead time and implementation period
Degree of implementation risk	Little change required to existing arrangements	Between options A and D—depending on design details—unclear whether approach has been used to improve price forecasts in other jurisdictions	Modest—if implementation were to occur	Significant changes to existing arrangements—ahead-markets are a well-tested mechanism in other jurisdictions

4.44 From the qualitative assessment, the Authority determined that:

- (a) Option C appeared unlikely to develop voluntarily based on experience to date in New Zealand
- (b) Option B is somewhat intermediate between Option A and Option D in terms of benefits
- (c) in light of these factors, Options A and D should be subjected to a more detailed quantitative assessment.

Table 3 Quantitative assessment of options A and D

	Option A			Option D		
	Lower	Base	Upper	Lower	Base	Upper
Gross benefits	20	32	44	37	63	95
Costs	16	12	9	40	25	16
Net benefits	5¹⁰	20	35	(3)	38	79

4.45 The quantitative assessment of Options A and D concluded that:

- (a) Option D has a higher net benefit than option A under the base case assumptions
- (b) however, under the lower sensitivity scenario, Option D has a negative net benefit while Option A has a material positive net benefit.

Submitters' views

- 4.46 Three submitters (Meridian, Tesla, and Transpower) stated that they agreed with the CBA.
- 4.47 Genesis noted that they were unable to verify the figures provided by the Authority in the CBA. Mercury also said they had “no comments to make on the cost benefit analysis [...] as we do not have sufficient information to make such an assessment”.
- 4.48 Six submitters commented on the specific costs and benefits of each of the options. A summary of these comments is included in the summary of submissions.
- 4.49 MEUG, Nova, and Pioneer made more general comments on the CBA.

The Authority's response

- 4.50 The Authority notes broad support for the outcome of the CBA. In addition, it notes that no submitter argued that Option A would deliver negative net benefits.
- 4.51 The Authority notes there were divergent views on the value of options B, C, and D, with some submitters questioning whether these options would be an improvement on Option A (from a net benefit perspective). The Authority will reconsider submitters' views on the costs and benefits of options B, C, and D if and when price forecasting is further developed in the future.

¹⁰ This number appears overstated due to rounding.