Submission on

Consultation Paper:
Managing locational price risk

by

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Executive Summary

1. The Electric Power Optimization Centre (EPOC) welcomes the opportunity to comment on the Electricity Authority consultation paper on managing locational price risk.
2. The proposal to implement a FTR mechanism indexed on Benmore and Otahuhu spot prices is much simpler than earlier proposals and corresponds well with established practice in FTR market design.
3. The simplicity of the proposal will encourage confidence in the mechanism, and lead to higher levels of liquidity in the auction for FTR instruments. Maximizing participation in the auction helps to maximize the revenue earned from the auction.
4. Some care is needed in the auction design to ensuring revenue adequacy for the instruments sold, especially in the presence of transmission losses.
5. It is important to bear in mind that encouraging competition in the FTR auction in order to maximize the FTR auction revenue is a secondary aim of this instrument, which is being introduced to reduce locational price risk. Monitoring (and possibly limiting) participation in the auction should be considered if this can be shown to improve price outcomes in the spot energy market.

Answers to specific questions

Q1: We agree that it is appropriate for FTR prices to reflect the true nodal prices as FTRs are designed specifically to hedge against nodal price volatility. The nodal prices as computed by SPD include loss costs and therefore it is appropriate for this to be reflected in the FTR prices. We believe that it is possible to devise FTR schemes that would include loss costs and would be revenue adequate. However ensuring the FTRs are revenue adequate when losses are included entails the sale of unbalanced FTRs. The calculations in the appendix demonstrate this point. If the FTRs available are balanced FTRs, as outlined in option (a), then unlike the lossless case, setting an upper limit on the volume of sold FTRs will not guarantee revenue adequacy. On the other hand, if a purchase of an FTR including losses, is interpreted as an unbalanced injection and withdrawal as outlined option (b) below, then revenue adequacy remains guaranteed (for obligation FTRs) even when nodal prices contain loss costs. It seems from paragraphs 3.4.17 to 3.4.20 of the consultation paper [1] that at least initially the aim is to have balanced FTRs (without any loss support contract provisions). We note that if simultaneous feasibility conditions that respect losses are enforced on balanced only FTRs, no FTR will be sold in the FTR auction (as balanced FTRs only, can not satisfy feasible flows that account for losses).

Paragraph 3.4.24 of the consultation paper outlines four options that are claimed to guarantee revenue adequacy of FTRs. As mentioned above, option (a) can not be guaranteed to provide revenue adequacy. Option (b) seems to combine balanced FTRs and FTR nodal swaps (in the form of loss support contracts). Allowing for both of these instruments would capture the same effect as trading unbalanced FTRs. The liquidity of the FTR market as whole in this case, will be contingent on the liquidity of the loss support contracts. Therefore another (conceptually simpler) FTR market design is to allow the trading of unbalanced FTRs. Here the bidders would specify an FTR in the form of an injection and an off take where the injection is different from the off take.

It may be argued that the bidders do not have a good estimate of how much their injection and off take quantities should differ by. If this is the case, then a bidder can specify a single quantity (exactly the same as the case of the balanced FTR,) with the proviso that the FTR auctioneer will ultimately determine an injection and an off take, different from, but close to the bid quantity. Both allowing unbalanced FTRs and this approach can be made to ensure revenue adequacy (for obligation FTRs) through imposing simultaneous feasibility conditions as proved in [2].

Q3: We support the authority's simple 2 node FTR for several reasons. Confining the FTR market to the OTA and BEN nodes will concentrate the volume of FTRs traded which will enhance the efficiency of the FTR market (see [3] on the efficiency issues of FTRs that are related to volume of trade). Furthermore if the FTR market involved many nodes and it allowed for option FTRs, then in order to guarantee revenue adequacy, the FTR market clearing problem would become a much more complex problem requiring integer programming. We should reiterate that setting an upper limit on the volume of FTRs sold will not guarantee revenue adequacy if price differences due to losses are allowed.

Although we acknowledge that the 2 node FTR market is the right start, we would like to point out that there are also issues due to significant price differences within the North Island that would not necessarily be resolved through a OTA-BEN (or BEN-OTA) FTR. It may not be too difficult to extend the 2 node model to a simple 3 node model over the OTA, HAY and BEN nodes.

Although having a uniform FTR product over a month will reduce the variety of the products and will possibly result in concentration volume, it is also true that tailored FTR products, such as peak only FTRs are preferred by participants. Therefore allowing such products is likely to encourage entry into the FTR market which is desirable for an auction.

Q4: Yes, nodes are preferable to hubs.

Q5: Making FTRs available at an auction 12 to 24 months prior to their effective date has advantages and disadvantages. The advantage is that parties interested in long-term contracts will have the opportunity to make FTR provisions at the same time as setting up their contracts. This is likely to have a positive effect on the contracts offered. On the other hand a long time horizon of 12 to 24 months introduces uncertainty about the network. It is entirely possible that the grid is reconfigured within a year or two and the assessment of the value of an FTR between 2 points of the grid is no longer necessarily valid. Multiple auctions pertaining to FTRs over the same time horizon can be a good solution here. It is useful for participants to be able to procure FTRs ahead of time and to be able to trade these closer to the time if need be.

We found the auction design description in need of clarification. In particular it is not clear whether there will be multiple auctions for FTRs (i.e. similar to NYISO's TCC market in which a certain portion of the available volume is sold one year ahead, then other fractions of the available volume become available 6 months and 1 month ahead), or if all available volume is to be sold at one auction.

Q6: The FTR auction design requirements are precisely the requirements that any efficient and fair auction must aim for. Nevertheless, the specific design of the market is what is critically important here. The final auction design ought to be open to scrutiny so as to ensure that the four design goals are met. Particularly important is goal (iii) ‘to minimise opportunities for the abuse of weak competitive pressure in the FTR auction’. For instance, while market monitoring, limiting FTR holdings, and transparency are likely to reduce opportunities for exploiting weak competitive pressure, they will not eliminate it. To start with, while it is fairly clear how some parties may abuse their situation (e.g. generators with generation assets concentrated in one island), the situation is far less clear for other participants (e.g. generators with assets spanning both the North and South Islands see [4]). Furthermore, given that many variants such the contract positions of various parties as well as measures such as the true value of water are unknown, it is quite difficult to diagnose if a seeming abuse of market power is truly just that or it can be explained through a different set of circumstances. (We would like to point out the complexity of what may be entailed here through the case of DC Energy LLC vs. H.Q. Energy as outlined in [5]).

Q7: If option (a) is selected, we agree that all relevant information regarding the configuration and capacity of the grid and contingencies should be provided by the system operator to the FTR auction provider, and that this information should be used to determine the allocation of FTRs.

Q8: Option (a) would be preferred if it can be done efficiently by adapting current software (SPD). The most compelling argument in its favour is that it can be subsequently extended to include losses and a greater number of nodes, if so desired. The simplicity of option (b) is only a positive if current software cannot be appropriately modified for this purpose or if the communication between Transpower and the FTR auction provider would be inadequate to ensure the network specification was correct.

Q9: Yes, removing barriers to entry will encourage participation, which is likely, in turn, to increase the volume of sold FTRs; this ought to increase the efficiency of the FTR auction (see [3]).

Q10: Revenue adequacy. Revenue adequacy can be achieved in principle by ensuring that the flow represented by all extant FTRs is feasible for the network used in the spot market ("simultaneous feasibility"). Simultaneous feasibility is not achieved by the proposed design, because the lossless flow implied by an unadorned collection of balanced FTRs is not feasible for a lossy network. This situation cannot be remedied by limiting the quantity of FTRs offered, unless one also makes assumptions about the physical flows. See the Appendix to this submission for a mathematical illustration.

Of the options in 3.4.24, only (b) makes a serious attempt to achieve simultaneous feasibility. Note that loss support contracts, at least, are effectively energy hedges, a product in which the likely providers are already well used to trading.

As an alternative to discrete loss support contracts, perhaps it would be possible to trade unbalanced FTRs in the main auction. For example, a buyer might bid for a 100MW FTR from BEN to OTA, but be awarded an unbalanced FTR entailing 102MW injection at BEN and 98MW off take at OTA. The adjustment fraction for losses (+/- 2% in this example) would be determined by the auctioneer so as to ensure simultaneous feasibility for all the FTRs awarded. This relatively simple approach achieves full-volume, full-price-difference LPR coverage.

Q15: See Q6 above. Moreover, the process by which limitations on FTR holdings are determined must be fair and transparent. As is noted in paragraph 3.4.226, such a limitation on one participant may further reduce competition in the auction for the remaining available FTRs, thereby reducing auction revenue; however, we should recall that the purpose of introducing FTRs is to manage locational price risk (and thereby increase competition) in the wholesale and retail markets, thus if allowing a single firm to control a large volume of FTR will lead to less competitive outcomes in the wholesale markets it should prevented.

Paragraph 3.4.227 cites loss and reserve support contracts as a disincentive to the exploitation of weak competitive pressure. However, the providers of these contracts are likely to view them as alternatives to conventional hedge contracts, which they would otherwise enter into instead. This would leave their incentives unchanged

[1] Consultation Paper, Managing locational price risk: Proposed amendments to Code, Prepared by the Electricity Authority, 28 April 2011.

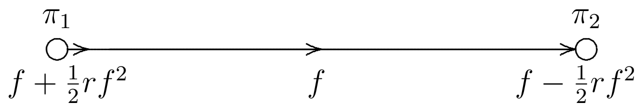
[2] Philpott, A. B. and Pritchard, G. "Financial transmission rights in convex pool markets", Operations Research Letters, Volume 32, 109-113, 2004.

[3] Deng, S. Oren, S. and Melikopoulos, A., "The inherent inefficiency of simultaneously feasible financial transmission rights auctions", Energy Economics, Volume 32, 779-785, 2010.

[4] Zakeri, G. and Downward, A., "Exploring the strategic behaviour of FTR holders with market power", July 2010, Stochastic Optimization Ltd on behalf of Mighty River Power. http://www.electricitycommission.govt.nz/wholesale/Hedge/transmission-hedges.

[5] FERC ruling on the case of DC Energy LLC vs. H. Q. Energy Services Inc. Docket No. EL-0767-000 Downloadable from http://www.ferc.gov/enforcement/market-manipulation/hydro-quebec.pdf , 2008.

Consider a single-line network. We assume quadratic losses for simplicity, although the same results will hold for other convex loss models, e.g. piecewise linear as in SPD.



Let the loss coefficient be r, so that with physical flow f the lost power is rf^2. The losses are apportioned equally between the two ends of the line, so that the power sent from node 1 is $f_1 = f + \frac{1}{2}rf^2$ and the power received by node 2 is $f_2 = f - \frac{1}{2}rf^2$. (We take the positive sense of power flow to be from node 1 to node 2; throughout this analysis, negative flow values can be used to represent flow in the reverse direction, without changing any of the algebraic expressions.)

If the line is not capacity-constrained, the effect of the losses on nodal pricing is determined by marginal quantities:

$$\frac{\pi_2}{\pi_1} = \frac{df_1}{df_2} = \frac{df_1}{df} \bigg/ \frac{df_2}{df} = \frac{1 + rf}{1 - rf}.$$

The loss rental (i.e. the spot market revenue surplus) for this situation is

$$\pi_2 f_2 - \pi_1 f_1 = \pi_1 \left(\frac{1 + rf}{1 - rf} \right) (f - \frac{1}{2}rf^2) - \pi_1 (f + \frac{1}{2}rf^2) = \frac{\pi_1 rf^2}{1 - rf}.$$

Now suppose that balanced FTRs with total net quantity F have previously been allocated. Their total coupon payment is $(\pi_2 - \pi_1)F$. After the loss rental has been used to fund this payment, the remaining surplus is

$$\left(\frac{\pi_1 rf}{1 - rf} \right) (f - 2F).$$

This quantity could be negative, i.e. revenue inadequacy. Moreover, there is no simple limit that can be placed on F (absent assumptions about f) to ensure revenue adequacy.

It is well-known that revenue adequacy can be achieved by ensuring that the flow represented by the totality of the FTRs is feasible for the network used in the spot market. For the single-line example, this would require (at least some) unbalanced FTRs, such that the total coupon payment is

$$\pi_2 \left(F - \frac{1}{2} r F^2 \right) - \pi_1 \left(F + \frac{1}{2} r F^2 \right) = \frac{\pi_1 r F}{1 - r f} (2f - F),$$

corresponding to lossy flow. After the loss rental has been used to fund this payment, the remaining surplus is

$$\frac{\pi_1 r (f - F)^2}{1 - r f},$$

which is always non-negative.