

**Clearing Manager Financial Transmission Rights  
Prudential Security Assessment Methodology Review**

Consultation on proposed methodology in accordance with the  
Electricity Industry Participation Code of 2010

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## Glossary

ASX future prices	Prices from the ASX New Zealand electricity futures, option and strips market.
Daily Settlement Price (DSP)	The Clearing Manager's assessment of the Hedge Value of an FTR on any given day prior to settlement.
EMS	Energy Market Services, a business unit of Transpower New Zealand Limited.
FAP	FTR Allocation Plan.
Final FTR Payment	The payment due on an FTR after FTR Payment Scaling has been applied.
Final Prices	Final wholesale electricity prices as published by the pricing manager for every trading period in a day and for every node on the grid. Expressed in \$/MWh to 2 decimal places.
FTR	Financial Transmission Right. FTRs are allocated to FTR Participants (who then also become FTR Holders) in an FTR Auction or through assignment.
FTR Assignment	The assignment of an FTR from one FTR Participant to another, in accordance with clause 13.248 of the Code.
FTR Assignment Price per MWh	Price per MWh, if disclosed in accordance with clause 13.249 of the Code, at which an FTR has been assigned. Expressed in \$/MWh to 2 decimal places.
FTR Auction Clearing Price	Price for each FTR Type and FTR Direction at which an FTR Auction for a particular FTR Period clears. Expressed in \$/MWh to 2 decimal places.
FTR Acquisition Cost	<p>The FTR Acquisition Cost is the amount which an FTR Holder owes the Clearing Manager for the acquisition of the FTR. Any FTR Hedge Value is offset against the FTR Acquisition Cost at settlement.</p> <p>When FTRs are assigned at auction, the FTR Acquisition Cost is determined from the auction:</p> <p>Initial FTR Acquisition Cost = FTR contract volume (in MWh) × FTR Auction Clearing Price (in \$ per MWh).</p> <p>Subsequent assignments will alter the FTR Acquisition Cost where the FTR Assignment Price is disclosed.</p> <p><i>Note: The Code currently uses the term 'FTR Payment' in place of 'FTR Acquisition Cost'. A proposal to revise this term is with the Authority.</i></p>
FTR Hedge Value	The FTR Hedge Value is defined by the FTR Manager in the FAP for FTR options and obligations. It depends on the FTR contract volume (in MWh) and FTR hub differential price difference (in \$ per MWh).
FTR Holder	An FTR Participants that holds an FTR. Every FTR has an FTR Holder.
FTR Participant	A party who has been approved and registered by the FTR Manager to participate in an FTR auction or to be assigned FTRs

FTR Payment	<p>Either Provisional FTR Payment or Final FTR Payment according to the context.</p> <p><i>Note: The Code currently uses the term 'FTR Payment' in place of 'FTR Acquisition Cost'. A proposal to revise this term is with the Authority.</i></p>
FTR Payment Scaling	<p>The process of scaling down Provisional FTR Payments in cases of Revenue Inadequacy.</p> <p>Where there is Revenue Adequacy, there is no FTR Payment Scaling .</p>
FTR Product	An FTR of specific FTR Period, FTR Type and FTR Direction.
FTR Rentals Amount	The amount calculated by the FTR Manager for a specific FTR Period in accordance with Schedule 14.6 of the Code, that the Clearing Manager assigns to the FTR Account and uses for FTR Settlement.
FTR Reserve Value	The maximum value the Clearing Manager will apply to an FTR during or immediately following an auction. The initial (i.e. at auction) prudential security requirement for an FTR is the difference (if any) between the Acquisition Cost and the lesser of the FTR Reserve Value or the Auction Clearing Price. The FTR Reserve Value is provided by the Clearing Manager to the FTR Manager.
FTR Type	An FTR can be either an Obligation FTR or an Option FTR.
Hub	<p>Has the same meaning as "hub" under the Code.</p> <p>Each FTR has a 'From Hub' and a 'To Hub'. For example, for an Otahuhu to Benmore FTR, the From Hub would be Benmore and the To Hub would be Otahuhu.</p>
Initial Margin	In the example of a derivatives market, the security required by a clearing house to cover the potential movement in the value of an instrument prior to the clearing house being able to demand and receive a Variation Margin payment. Often the amount relates to the 'worst case 'one day movement.
Instrument	A financial instrument is a tradable asset, evidence of ownership interest, or contractual right or obligation. Cash instruments are financial instruments valued directly by markets. Derivative instruments derive their value from the value and characteristics of underlying entities.
Margin	A Margin is the amount calculated by a clearing house as necessary to cover the risk of financial loss on an options or futures contract due to an adverse market movement.
Mark to Market	The process by which a position in an instrument is valued with reference to market price of the underlying physical asset.
Mark to Model	The process by which a position in an instrument is valued at a price determined using a financial model. It is often used in markets with low liquidity.
Price Setting Trade (PST)	Price Setting Trade. Where an FTR has been traded at a price that is deemed by the Clearing Manager to be reflect the market value of the FTR.
Provisional FTR Payment	The Clearing Manager calculated payment due on an FTR prior to the application of any FTR Payment Scaling.

Reference Price	Refers to a value (of an instrument, commodity, etc) derived from a market price or a model which is referenced by the Clearing Manager to adjust the DSP for an FTR when the DSP cannot be set directly using a Price Setting Trade.
Side Payments Relating to Assignments	The payments between the Assignor and the Clearing Manager required for Assignments where there is Disclosed Assignment Price not equal to the FTR Acquisition Cost pre-assignment.
Side Payment Assignor to Clearing Manager	In cases of an FTR Assignment with an FTR Disclosed Assignment Price, then if the FTR Disclosed Assignment Price is less than the FTR Acquisition Cost, a side payment of the difference is made by the Assignor to the Clearing Manager.
Variation Margin	An increase in prudential security requirements due to an adverse change in the current value of the FTR.

## A. Introduction

The Electricity Authority is implementing a Financial Transmission Rights (**FTR**) market with the first auction of FTRs scheduled for October 2012.

FTR Participants can purchase FTRs to hedge locational wholesale price risk or simply for speculation.

Energy Market Services (**EMS**) has been appointed as the FTR Manager and is consulting with the Industry on its draft FTR Allocation Plan (**FAP**). The EMS consultation document provides an overview of the FTR market design, the specifications of the make-up of the FTRs themselves, and the plan for auctioning the FTRs to the market.

NZX, as Clearing Manager, is charged with developing, consulting on, and implementing a methodology for assessing prudential security requirements for FTRs acquired by FTR Participants. The Clearing Manager also maintains prudential security accounts, provides prudential security information to the FTR manager, and settles the FTR market alongside the spot market.

The Clearing Manager is coordinating closely with the FTR Manager during the stand-up of the market in order to ensure a successful and efficient implementation for the industry.

## B. Scope

Part 14 of the Electricity Industry Participation Code (the **Code**) provides for the assessment and management of prudential security by the Clearing Manager. Clause 14.19B of the Code specifically requires the Clearing Manager to prepare a draft methodology for determining the minimum level of security required in respect of FTRs, consult on it with market participants and have the final form of the methodology approved by the Authority.

This document presents the Clearing Manager's draft prudential security assessment methodology with respect to the FTR market. This document should be considered alongside the FAP consultation document released on 10 April 2012. In this document we seek to avoid duplicating the material introduced in the FAP and concentrate on the prudential security methodology for the FTR market.

In order to provide the industry context in which to evaluate the proposed methodology, this document provides:

- a. background information on prudential security as it stands now;
- b. overall treatment of FTR prudential security;
- c. discussion of advantages and disadvantages of potential FTR valuation methodologies;
- d. timing of assessments, calls, and processing of deposits as they relate to the FTR Manager's plan and spot market transactions;
- e. details of required further development of the draft methodology and information availability and transparency of that process; and

- f. pros and cons of the proposed approach

## C. Consultation process

The Clearing Manager invites participants to submit on the draft methodology presented in this paper.

Written responses in electronic form are preferred. The consultation period begins on 10 April 2012. Responses should be emailed to [cmanager@nzx.com](mailto:cmanager@nzx.com). If you do not wish to send your submission electronically, you should send one hard copy of the submission to the address below.

Postal address	Physical delivery
Clearing Manager c/o NZX Energy NZX Limited P.O. Box 2959 Wellington 6140	Clearing Manager c/o NZX Energy NZX Limited NZX Centre 11 Cable Street, Level 2 Wellington

Responses should be received by 09:00 on 22 May 2012 for full consideration. The Clearing Manager will acknowledge receipt of all submissions electronically. Please contact the [cmanager@nzx.com](mailto:cmanager@nzx.com) if you do not receive electronic acknowledgement of your submission within two business days.

Please identify any confidential information. Your submission is likely to be made available to the general public on the Authority's website. Submitters should indicate any documents attached, in support of the submission, in a covering letter and clearly indicate any information that is provided on a confidential basis.

As required by sub-clause 14.19B(3) of the Code, all information received as part of submissions will be made available to the Authority. Please note that all information provided to the Authority is subject to the Official Information Act 1982. Please identify any information in your submission that you consider commercially sensitive.

A list of questions that the Clearing Manager would like feedback on is provided for in Section N. Participants are welcome, though, to provide feedback on other areas within the scope of this paper.

The main points of contact for the consultation process and the subsequent development of the methodology are as follows:

Process Step	Date
LPRTG Meeting	16 March
Initial FAP out to consultation	10 April
Draft Prudential methodology out to consultation	10 April



## D. Background

The specifications for FTRs and the associated auctions are included in the FTR Allocation plan prepared by the FTR manager. The draft allocation plan is currently under consultation.<sup>2</sup>

In this section we describe the participant cash flows associated with FTRs as well as supporting communications from acquisition to settlement. We also introduce FTR settlement and side payments—Clearing Manager tasks which are not the subject of this consultation.

This information is provided in order to assist the reader to understand the overall cash flows of the FTR market and as background for the draft FTR prudential security assessment methodology.

The implementation details described in this section are subject to Electricity Authority approval of changes to the Clearing Manager's functional specifications.

### ***Cash Flows***

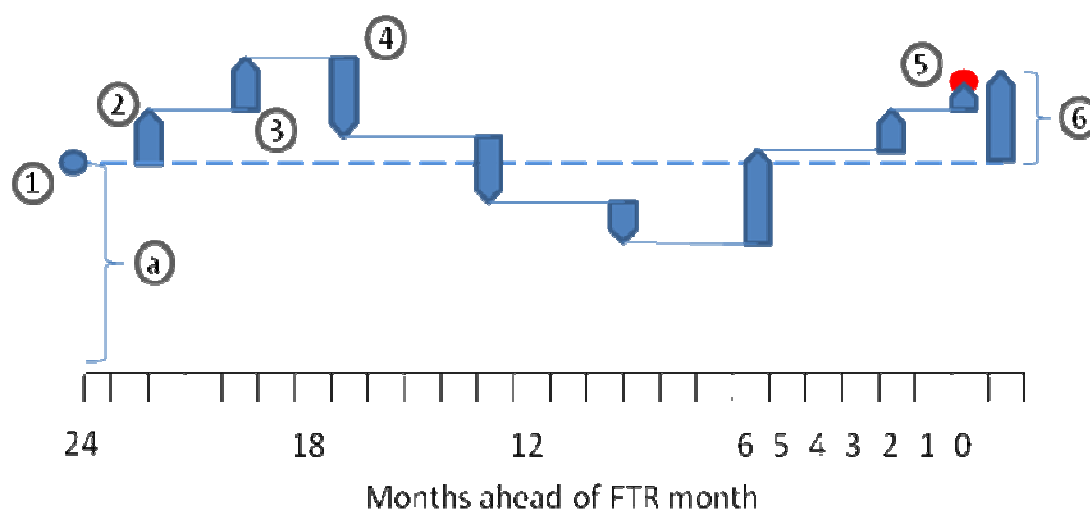
The Clearing Manager is charged with assessing wholesale electricity market prudential requirements and verifying FTR Participants have lodged sufficient prudential security before purchasing FTRs and at all times FTRs are held. The Clearing Manager is also responsible for settlement of FTRs. The figure below shows illustrative cash flows between the Clearing Manager and an FTR Participant for a single FTR. See the FTR Financial Flows section in the FTR Manager's draft allocation plan consultation document for additional detail and an excel model.

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<sup>1</sup> Tentative date. Check [www.nzxgroup.com/energy](http://www.nzxgroup.com/energy) for updated workshop information.

<sup>2</sup> See [www.ftr.co.nz](http://www.ftr.co.nz)

**Fig. 1 Clearing and Settlement flows**



- ① Participant purchases an FTR at auction for price 'a'. The auction clearing price becomes the FTR value for prudential purposes and an offsetting obligation "acquisition price" 'a' is recorded. No funds change hands.<sup>3</sup>
- ② Clearing Manager subsequently assess that the value of the FTR has declined. The Clearing Manager calls the participant to make up the difference so the market is covered in case of default. Payment due within three business days.<sup>4</sup>
- ③ Clearing Manager assesses further reduction in value of the FTR triggering another call.
- ④ FTR value increases. Surplus funds can be returned to participant upon request.
- ⑤ FTR month is completed and Clearing Manager calculates settlement amount. Clearing Manager calls participant for difference between the calculated settlement and the previous assessment. Payment due within three business days.
- ⑥ Participant pays Clearing Manager amount due upon settlement (the FTR Acquisition Cost less the Hedge Value).

There are three types of payments represented in Figure 1 above: a payment to satisfy a call from the Clearing Manager, a refund of surplus prudential security to a participant, and a Final FTR Payment to the Clearing Manager at settlement. A fourth type of payment is a Final FTR Payment to the participant from the Clearing Manager.

Each of the payments, with the exception of the refund of excess prudential security, is triggered by the Clearing Manager and communicated using existing channels.

The Clearing Manager issues

- a call notice when additional prudential security is required--participants have three business days to meet the call,
- an invoice including Final FTR Payments due to the Clearing Manager as a line item, and
- a pro forma invoice including Final FTR Payments due from the Clearing Manager.

#### **Timing of information flows**

<sup>3</sup> The participant would have been required to post sufficient prudential security to cover the new position prior to bidding in the auction.

<sup>4</sup> For simplicity, the FTR assessed value is shown to change only eight times in Figure 1. The proposed frequency of assessment is discussed in Section K.

The timing of the Clearing Manager notices to participants is described in Table 1 below. The daily provision of FTR Hedge Value, price, and a participant's exposure through a secure web portal is a new feature. FTR settlement details are to be provided to participants on the 5<sup>th</sup> business day just as hedge settlement details are currently provided to participants who have hedges lodged with the Clearing Manager. The other communications listed are currently utilised for the spot market.

Table 1: Timing of information flows to industry

Time	Name	Method
Daily	FTR Hedge Value, price, FTR Participant exposure	Secure web portal
5 <sup>th</sup> business day	FTR settlement details, Hedge Value, Acquisition Costs, scaling	Emailed to designated addresses, secure web portal
9 <sup>th</sup> business day	Invoices including net FTR Payments (final payments)	Emailed to designated addresses
20 <sup>th</sup> of the month (if business day) or next business day (settlement day)	Payment, advice of default or market notice of default if required	Payments into designated accounts, Notices by email
On or after settlement day	Buyer created tax invoices	Email
Ad hoc – as required up to daily	Call notices	Email to designated addresses. Courtesy phone call to designated contact

### **Settlement**

After the FTR period, the Clearing Manager will calculate the Provisional FTR Payment for each participant. This value includes the FTR Hedge Value and the FTR Acquisition Cost. The payment is scaled if the FTR market is not revenue adequate for the month. The payment for each FTR at settlement, the Provisional FTR Payment net of any scaling, is the Final FTR Payment. The Final FTR Payment will be invoiced to participants on the 9<sup>th</sup> business day of each month.

The Provisional FTR Payment is described in detail in Section C2.7 of the FTR Manager's Draft Allocation Plan Consultation Paper. FTR Acquisition Cost is the FTR Acquisition Cost at auction updated by any assignments with a disclosed Assignment Price.

In the event of default, any payment made by a defaulting participant is prorated between the participant's FTR Payment obligations and all other obligations (spot market purchases, hedge settlement, etc) in accordance with Section 14.48B of the Code. FTR associated payments from the Clearing Manager are pro rated to the extent of any shortage. This pro rating is accomplished by recalculating the scaling factor prescribed in Section 14.47A of the Code.

Any payments due to the Clearing Manager associated with the settlement of the FTR are due by 2:00 pm on settlement day along with spot market payments. Any amounts due to the FTR Participant from Clearing Manager are initiated in same day cleared funds payment by 4:30 pm on settlement day. FTR Payments are not netted and an FTR Holder may both pay to and receive payment from the Clearing Manager on settlement day. For example if the participant holds a BEN-OTA obligation FTR and a OTA-BEN option FTR, and the

participant is to receive a payment on the BEN-OTA obligation but must pay the clearing manager for the OTA-BEN option FTR, the participant must pay the full amount due for the OTA-BEN option into the Clearing Manager's account by 2pm.

### ***Scaling of payments***

The Clearing Manager is required to scale payments<sup>5</sup> where the sum of Provisional FTR Payments and Side Payments Clearing Manager to FTR Holder exceeds the total amount expected to be available from the FTR account to make payments.

The total amount available is, for each FTR month, the sum of:

- the FTR Rentals Amount (a portion of loss, constraint, and reserve rentals, as determined by the FTR manager),
- anticipated FTR Payments from participants to the Clearing Manager, and
- any payments to be received from assignors as a result of an assignment (Side Payments FTR Holder to the Clearing Manager).

The Clearing Manager scales all Provisional FTR Payments and Side Payments Clearing Manager to FTR Holder to the extent required, given the available funds. Payments owed to the Clearing Manager are not scaled.

Scaling is detailed in the Final FTR Payment Section (C2.9) of the FTR Manager's Draft Allocation Plan Consultation Paper.

### ***Side Payments associated with assignments***

When an FTR Participant secures an FTR at auction, that participant becomes obligated to pay the auction price, the FTR Acquisition Cost, to the Clearing Manager. The FTR Acquisition Cost is netted against any Hedge Value when invoiced. Because the FTR Acquisition Cost is not related to the Hedge Value, an FTR's Acquisition Cost is associated with each FTR.

An FTR may also be transferred, or assigned, between FTR Participants outside of the auction process. Where an FTR is assigned the price may be disclosed or not disclosed. If price is disclosed, the FTR Acquisition Cost associated with the FTR is updated so that the assignee is responsible for the updated cost on settlement day. If no price is disclosed, the assignee becomes responsible for the existing FTR Acquisition Cost.

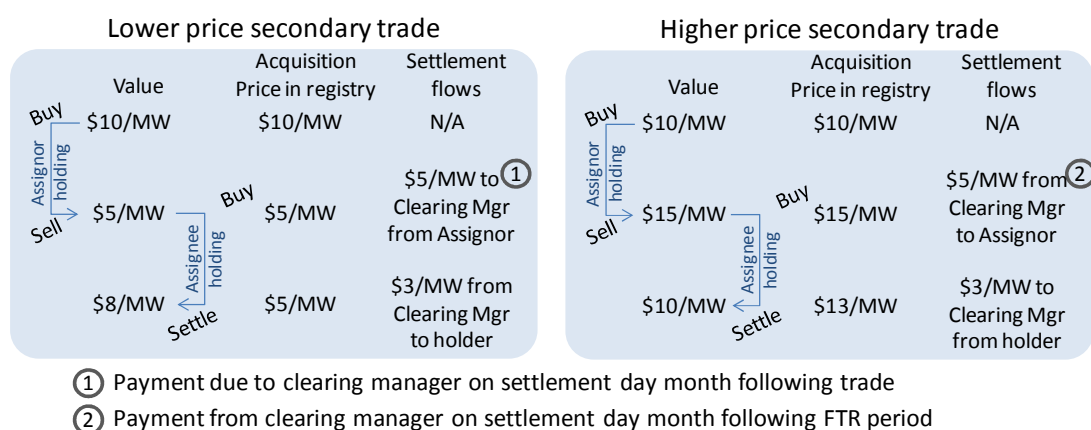
While a price may be disclosed when an FTR is assigned, there is no requirement in the Code for that price to represent either party's view of the value of the FTR and there is no explicit prohibition on side payments or other adjustments.

Cash flows between two assignees and the Clearing Manager is shown for each option in Figure 2 below.

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<sup>5</sup> Refer to Clause 14.47A of the Code.

**Fig. 2 Assignment – disclosed price**



Where price is disclosed, and that price is less than the FTR Acquisition Cost at auction, the registry is updated with a lower FTR Acquisition Cost. As a result, the Clearing Manager will receive less of a payment associated with the Acquisition Cost upon settlement than would have been the case if the FTR was still owned by the assignor. The Clearing Manager will invoice the assignor for the difference in the invoice for the month of the transfer—that is payment is due around the 20<sup>th</sup> of the next month. Effectively, this can be thought of as the assignor realising a ‘loss’ on the sale.<sup>6</sup>

Where a disclosed price is above the Acquisition Cost held on the register, the transfer results in an increase in the Acquisition Cost. Upon settlement, the assignee will owe the Clearing Manager more for the FTR than was the case previously with the assignor. In this case, the assignor effectively realises a ‘gain’ upon transfer. The Clearing Manager ‘rebates’ the difference between the new, higher Acquisition Cost figure and the earlier one to the assignor when the FTR is settled after the end of its term. While the assignor realises the ‘gain’ upon transfer, it is not paid out until after the term of the FTR.

#### **Possible code change relating to scaling methodology**

The scaling methodology prescribed in the Code may introduce some unintended consequences.

As the methodology scales Provisional FTR Payments rather than Hedge Value, the hedging effectiveness of an FTR depends on the purchase price where scaling is required. For example, if an option FTR is purchased at the initial FTR auction for an amount that turns out to be equal to the Hedge Value, then the Provisional FTR Payment would be zero and no scaling would apply. However, the same FTR, if purchased for less at a subsequent auction, would be subject to scaling and loss of hedging effectiveness. In other words, only ‘in the money’ FTRs are subject to scaling.

The effect described in the previous paragraph applies to FTR Holders where the FTRs were purchased at auction or where the transaction price was disclosed. Where an assignment takes place without disclosure of price, or where the disclosed Assignment Price is greater

<sup>6</sup> While the assignor can recognise a ‘loss’ upon assignment as the acquisition price is adjusted (the assignor may need to pay an amount), the Clearing Manager employs a separate methodology to establish FTR value for prudential security purposes.

than or equal to the initial FTR Acquisition Cost, then no scaling occurs and there is no reduction in hedge effectiveness.

The Clearing Manager considers this effect may discourage disclosure of price, or actual price, for assignments and may negatively impact secondary market liquidity.

In discussions around this issue, it became apparent that a different method of scaling may have advantages. That is, rather than scale the positive Provisional FTR Payments and the Side Payments Clearing Manager to FTR Holder, scale the FTR Hedge Values. The calculation of the FTR Payment Scaling Factor would be modified to ensure the balance with the FTR Rentals Amounts and FTR Acquisition Costs is maintained. This issue is also covered in the FTR Manager's draft FAP.

The FTR Manager and Clearing Manager believe that this approach has merit. The Authority considers that such a Code change would not be minor, and thus would have to go through a full consultation process with participants. The Authority intends to get advice on the pros and cons of this approach compared to that provided for in the Code, and take the issue to the LPRTG.

## **E. FTR Prudential Security Requirements: Problem definition**

In this section of the document, begin our discussion of the requirements for the draft FTR prudential security methodology. In our view the development of a FTR prudential security assessment methodology should take into account the following:

- relevant provisions within the Code,
- submissions from potential FTR Participants,
- provisions of the FTR allocation plan,
- potential future developments in the FTR market,
- best practice principles, as assessed by the Clearing Manager and outlined below, and
- the technical challenges associated with FTR prudential security assessment.

While the first two of these factors are mandatory, all factors must be recognised if a fit for purpose, future proofed methodology is to be developed.

### ***Relevant code provisions***

Key Code requirements relevant to the assessment of FTR prudential requirements include Clauses (or sub-clauses) 14.19(da), 14.19A, 13.243, 13.244, 13.248(3), 13.251(4) and 13.251(7).

Clause 14.19 stipulates the amounts (or matters) that should be taken into account by the Clearing Manager when assessing a participant's overall minimum security requirements. Specifically, Clause 14.19(da) states that this will include "the Clearing Manager's estimate of

an amount to be required by that payer in respect of any FTR in respect of which the payer is named in the FTR register, calculated in accordance with the methodology approved by the Authority under clause 14.19B”.

Therefore, the Clearing Manager must be able to value a participant’s FTR holdings as part of its overall prudential security assessment for that participant. In relation to this, Clause 14.19A requires that:

- (1) The Clearing Manager must formulate and publish a methodology for determining the minimum level of security required from a payer in relation to a matter set out in clause 14.19(da),
- (2) The methodology formulated by the Clearing Manager under subclause (1) must comply with the principle that the amount taken into account under clause 14.19(da) is **an estimate of the value** (being an amount that may be positive or negative) of the FTR at the time that the estimate is made and **the potential for that value to change** prior to settlement.”

Sub-clause 14.19(A)(2) limits the discretion of the Clearing Manager by requiring that the FTR prudential security assessments are based on an estimated value and "the potential for that [FTR] value to change prior to settlement."

Clause 13.243 states that “The FTR manager must not allow a person to participate in an FTR auction unless the FTR manager is satisfied that the person meets the prudential security requirements in Part 14.”

Therefore in order register as a FTR Participant (allowing a participant to bid in an auction), the prudential security requirements in Part 14 must be met. The FTR manager has also proposed other requirements to be met if a party is to successfully register as an FTR Participant. These are detailed in the initial FTR allocation plan consultation document.

Clause 13.244 requires that:

- (1) The FTR Manager must not accept a bid in an FTR auction if the FTR Manager considers that the bid, if accepted, would cause the person making the bid to incur an obligation for which it does not have sufficient acceptable security under Part 14,
- (2) For the purposes of subclause (1), the FTR Manager must, based on information received from the Clearing Manager, determine the maximum liability that each person can incur in respect of its bids in the auction.

Sub-clause 13.248(3) of the Code states, with respect to the assignment of FTRs from one FTR Participant to another that “ the FTR manager must not register an assignment in the FTR register unless the FTR manager is satisfied that the assignee meets the prudential security requirements in Part 14”.

Sub-clause 13.251(4) requires that the Clearing Manager must advise the FTR Manager:

- (a) whether a person who has applied to participate in an FTR auction meets the prudential security requirements in Part 14; and

- (b) the amount of security that a person who has applied to participate in an FTR auction has provided that exceeds that person's other obligations under Part 14.

Also sub-clause 13.251(7) requires that “the Clearing Manager must inform the FTR manager, as soon as practicable after receiving a request from the FTR manager, whether an assignee of an FTR meets the prudential security requirements in Part 14”.

To summarise, the Clearing Manager provides the FTR Manager with each FTR Participant’s ‘credit limit’ (the difference between security held and minimum security required) ahead of each FTR auction. The Clearing Manager also verifies that an FTR Participant can meet the prudential security requirements set out Part 14 during the FTR registration process, and prior to the assignment of FTRs.

To enable the FTR Manager to calculate the liability of a participant in respect of its auction bids, as per Clause 13.244, the Clearing Manager will also provide an estimate of the value (on a per unit basis) of an FTR product prior them being traded at auction.

### ***Best practice principles***

The Clearing Manager has developed the following principles to govern its approach to FTR prudential security:

- identify a **robust** and **efficient** method for determining the levels of prudential security required for a participant to hold (and to bid on) FTRs.
- seek to **protect the broader FTR market** from default **without discouraging entry into the market by unreasonably burdening** FTR Holders with excessive requirements,
- seek to minimise **assessment volatility** and thus allow FTR Participants to efficiently manage their prudential requirements,
- ensure that the methodology is **transparent** and able to be understood by FTR Participants and potential FTR Participants, and
- **align**, where possible, with other prudential security requirements of the market.

We define a robust method as one that provides consistent, accurate assessments over a range of operating scenarios such that the risk of over or under exposure is minimised. Over-assessment which, if applied to 24 months of holdings, could significantly challenge the cash flows of purchasers. Where inaccuracy leads to under-assessment, future corrections are likely to have a material impact on participants in the form of sudden and unexpectedly large calls, especially if those corrections are unexpected or apply to FTRs of multiple vintages.

The twin goals of robustness and efficiency may mean that trade-offs between assessment accuracy and cost must be made. This may not always follow, as complex models do not necessarily buy increased accuracy with the increased cost.



## Technical challenges

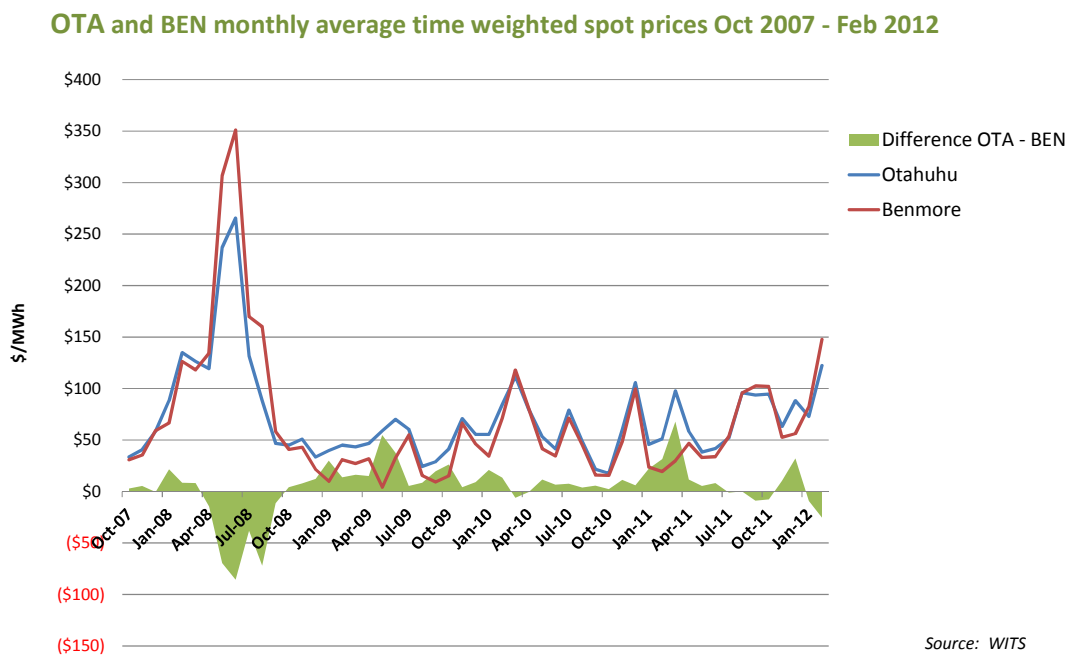
In the case of valuing FTRs, valuation is complicated by the fact that the instruments to be valued:

- are settled up to 24-months in future,
- may be illiquid, and
- derive their value from congestion, capacity, power flows, overall price levels and participant behaviour.

These factors will influence the cost and robustness of the methodology selected by the Clearing Manager.

For reference, and to provide an indication of the variation in FTR value, the historical price difference between Benmore and Haywards is provided in Figure 3 below.

Figure 3. Historical price difference between Benmore and Haywards.



## F. Current prudential security requirements

New Zealand electricity market participants currently face a diverse array of prudential security requirements from the spot market to lines agreements, from the ASX futures market to bi-lateral hedges. Each of these areas has its own risk environment and its own distinct prudential security methodology. The introduction of the FTR market occurs at a time when the foundations of the spot market methodology are under review.

The selection of an appropriate methodology for FTRs necessitates not only reference to the FTR risk environment but also consideration of the overall market environment. Relevant methodologies are summarised below.

### ***Spot market***

The prudential security requirements for spot market participants specified in Part 14 of the Code have been implemented by the Clearing Manager by applying administrative methods to calculate participants' net exposure.

For the spot market, the Clearing Manager estimates the dollar value of electricity which has traded but not settled using available price information, participant supplied bid information, and cleared offer information from the system operator.

In addition to considering purchases and sales which have not yet settled, the Clearing Manager also projects a net value associated with trading until seven days beyond the next settlement day. These projections are administrative projections—they follow pre-determined procedures—and are implemented to ensure consistency rather than accuracy. The administrative projection methodology provides an acceptable estimation of future exposure market exhibiting stable prices and load and generation patterns. Where volume or prices are changing, the administrative method either under or over estimates exposure resulting in an exposed market or an excessive prudential security burden for the participant.

One effect of the 'seven days beyond settlement day' requirement is that the duration of the security buffer varies. If a participant defaults on settlement, the Clearing Manager would in the case of steady state prices and steady state generation, hold funds for electricity traded plus seven days' security. Immediately after settlement, the Clearing Manager holds approximately 37 days' worth of security beyond electricity traded.

In summary, the spot market prudential security requirements are based upon an administrative assessment of an expected exposure based upon historic averages (rearward facing). While there are no explicit requirements for Initial Margin or coverage for volatility, the variable nature of the security buffer described above does, to some degree, serve as an Initial Margin.

It should be noted that the prudential security requirements for the spot market are currently undergoing a fundamental review by the Wholesale Advisory Group. As such, the spot market methodology may be altered prior to or soon after the inception of the FTR market.

### ***Bilateral hedges(lodged with the Clearing Manager)***

Participants who lodge hedges with the Clearing Manager under a hedge settlement agreement are required to provide prudential security (or are relieved of the obligation to provide security) for the same period covered by the spot market assessments. Quantities are specified by the hedge contracts, and projected prices are administratively set in the same manner as with the spot market assessments. Beyond the Clearing Manager's requirements, there may be bi-laterally agreed prudential security requirements to cover exposure beyond the Clearing Manager's 57-day assessment window.

## ***ASX futures***

In order to trade or hold futures positions on the ASX New Zealand Electricity Futures market, participants are required to meet Initial Margin requirements and supplement the account to meet Variation Margin requirements which result from changes in the value of the instruments. The Initial Margin covers the clearing house from loss given default where the price may move adversely before the clearing house can either secure additional prudential security or liquidate the relevant positions.

## ***Discussion***

Both spot market clearing and ASX clearing can be thought of in the context of the standard securities clearing model. In each case, the system is designed to protect the market from a defaulting party until a safe outcome can be achieved. Prudential security for the spot market is assessed on a 'mid-point' basis for the net amount of electricity consumed. That is the Clearing Manager attempts to value the current holding (called current exposure). In addition to posting security to cover the current holding, the participant posts an additional amount to cover seven to 37 days of net consumption. This additional amount takes the place of an Initial Margin and is the cushion available to protect other participants from loss for the time it takes to exit a defaulting participant from the market. One difference is that this 'initial' or 'additional margin' is calculated on a 'mid-point' basis....or a straight line projection. In other markets, the initial or additional Margin required is calculated so as to cover the worst case one-day movement. Should a participant default, the respective clearing house can liquidate the defaulting party's position.

In the ASX, participants must post prudential security for all futures held. In other words, if a participant holds 3MW of Benmore futures for each quarter from Q3 2012 to Q3 2014, that participant would need to maintain prudential security for 27 months worth of instruments. This requirement encompasses the Initial Margin requirements as well as the Variation Margins. A major shift in expectations for the South Island price, should the smelter shut down for example, could lead to a significant margin calls for the derivative holder. This is due not only to the potential magnitude of the ensuing price movement, but because of the mismatch in prudential requirements between the spot and futures market. While the purchaser of a future may have purchased the hedge to offset spot market risks, only 57 days of spot market risk is considered by the Clearing Manager at any given time.

A similar time frame mismatch will occur with FTRs. While the Clearing Manager is required to hold an appropriate level of security for each of a participant's FTRs, only 57 days of spot market exposure are considered. As a result, a participant holding FTRs over a significant period are exposed prudential security calls due to fundamental changes in expected price differences between nodes.

## **G. Overall treatment of FTR prudential security**

The main requirements for the Clearing Manager with respect to prudential security for FTRs, as identified in section D are:

- to provide the FTR Manager with security requirements for each FTR to be auctioned,
- to provide the FTR Manager with each FTR Participant's 'credit limit' ahead of each FTR auction,
- verification of FTR Participants' prudential security holdings ahead of assignment (or transfer) of FTRs and during the FTR Participant registration process, and
- ongoing prudential security assessments with respect to FTRs held by each participant.

Under Clause 14.19A, the Clearing Manager's FTR prudential security assessment methodology is required to consider FTR value at the time an assessment is made, taking into account the potential for the FTR value to change prior to settlement.

When an FTR purchaser acquires an FTR at auction, the purchaser incurs a liability for the payment of the auction clearing price for the FTR secured. This liability is offset, at least partially, by the current value of the FTR (an asset). The Acquisition Cost, and how the Acquisition Cost may change as the result of an FTR Assignment, is covered in more detail in the FTR Manager's consultation document.

The current value of the FTR is determined by multiplying the quantity of the FTR times the MWH Daily Settlement Price<sup>7</sup> as established by the Clearing Manager. The draft methodology for establishing this Daily Settlement Price is covered in section K.

Prior to auction, the Clearing Manager assesses the prudential security requirement associated with each FTR to be auctioned. The draft methodology for this process is discussed in Section L. FTR Participants must have sufficient prudential security lodged with the Clearing Manager in order to submit a valid bid for an FTR to the FTR manager.

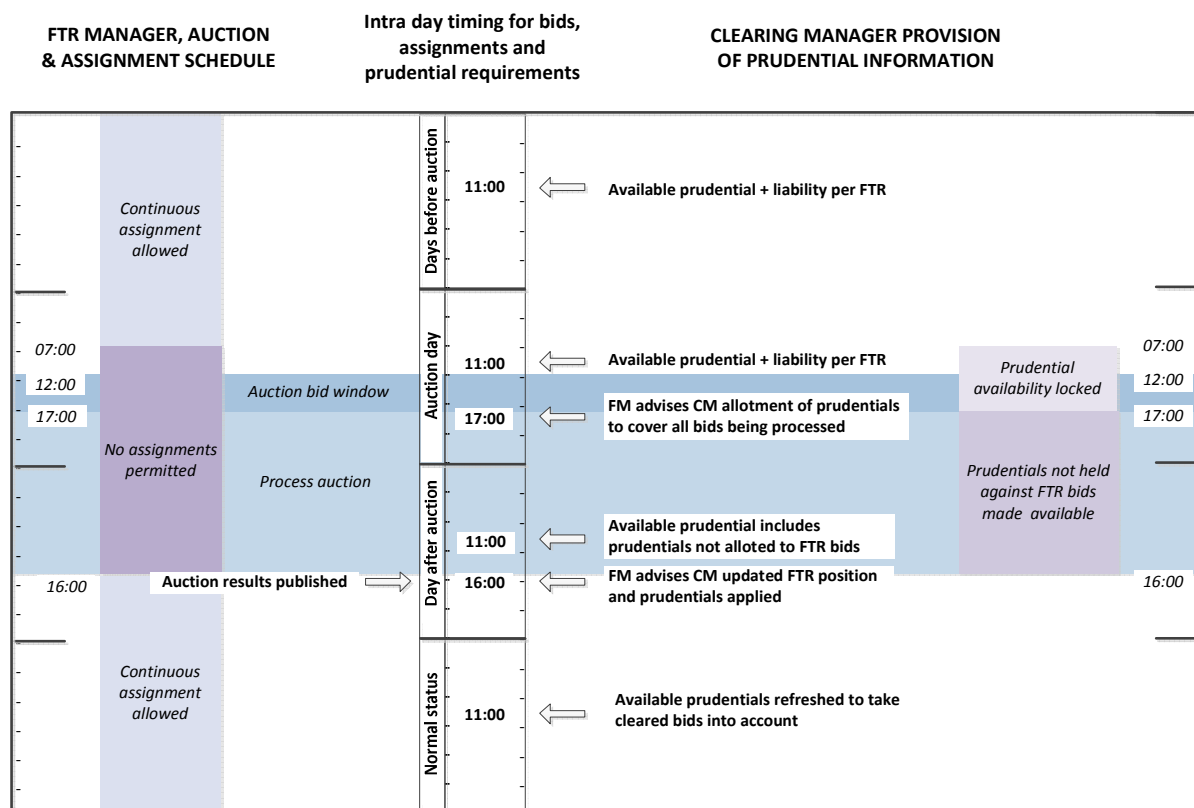
FTR Participants can lodge security up until 1000 hrs on the day of the auction. The Clearing Manager provides a final update to the FTR manager at 1100 hrs. The FTR manager will not process any prudential security adjustments<sup>8</sup> by FTR Participants during the auction. Upon notification of auction results by the FTR manager on the following day, security not required to support winning bids will be released upon request by the Clearing Manager. See Figure 4 below for an illustration of this timeline.

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<sup>7</sup> The Daily Settlement Price is the Clearing Manager's assessment of the hedge value of an FTR on any given day. The terminology is consistent with other derivative markets where clearing houses employ margining and daily settlement. While the FTR market settles monthly along with the spot market, the Clearing Manager has retained the industry standard term. The FTR market is cleared in a manner somewhat similar to the futures market.

<sup>8</sup> Including requests for withdrawal of security. The Clearing Manager will continue to receive security, but this additional security will be available for the auction.

Figure 4. Synchronisation between the Clearing Manager and FTR Manager and impact on prudential security.



The Clearing Manager processes the release of funds not required to cover prudential security assessments within two business day of the request.

The Clearing Manager is required, under Part 14 of the Code, to assess prudential security at least weekly. With the advent of FTRs, the Clearing Manager will also be required to provide assessments to the FTR Manager two days ahead of each auction. The Clearing Manager also has to verify to the FTR Manager (on an ad-hoc basis) that sufficient security is held by FTR Participants prior to allowing FTR Participants to transfer FTRs. Based upon these requirements, the Clearing Manager needs to be able to assess security on any given business day.

The Clearing Manager anticipates FTR Participants will wish to check their security holdings and exposure prior to applying for transfer and while preparing bidding strategies. Additionally, FTR Participants may wish to reference the Clearing Manager's Daily Settlement Price values on a regular basis to assist with risk management, etc.

For these reasons, the Clearing Manager plans to calculate and make available prudential security assessments on a daily basis via a secure website.

## H. Experience in comparable systems

It is useful to consider existing practice in markets which operate in a similar environment to that which we expect to apply to the FTR market in New Zealand. Other jurisdictions, such as the Eastern Interconnection (United States) and NEM (Australia) operate instruments similar to New Zealand Financial transmission rights.

### ***PJM***

The Eastern Interconnection grid is operated by the Regional Transmission Organisation PJM Interconnection LLC. PJM also operates a sophisticated FTR market. PJM member organisations are required to meet credit requirements as outlined by the PJM subsidiary, PJM Settlement, Inc.

The example of PJM is very appropriate to consider as PJM has had to consider many of the same issues that we are now addressing as we stand up the New Zealand FTR market. PJM has wrestled with the tension between “making market entry attractive to new participants” while recognising that doing so “may expose other members to the risk of defaults for under-collateralized positions”<sup>9</sup>. In fact, PJM suffered two FTR payment defaults in late 2007 valued at nearly USD 85 million.

As a result of the defaults, PJM engaged in a lengthy process with the regulator to reform the prudential security methodology specifically applied to FTRs to protect the market. Currently, for certain classes of FTR Participants, PJM Settlements requires documentation of risk governance procedures and policies, and it reviews these policies to ensure that adequate policies and processes include:

- designated risk managers in the organisation structure,
- documented risk policy covering market, credit, and liquidity risks,
- clearly documented and limited trading authority,
- demonstration of FTR trader training,
- a risk reporting mechanism which reports throughout the organisation,
- independent reviews of trading activities, and
- periodic valuation of Mark to Market risk.

PJM also audits 20% of the participants in this category annually.

Financial requirements include a requirement for FTR Participants to meet a minimum net worth documentation (in excess of \$1M tangible) or face the requirement to post additional collateral beyond what is required of other traders. FTR bidders are assessed for an FTR credit limit (based on collateral or other credits) that is distinct from credit available to cover other purchases.

FTR valuation occurs as follows:

- 1) A monthly historical value is calculated for each FTR path for which a bid is submitted. The value is a weighted average of the past three calendar years' prices (weighted 50% last year, 30% prior year, 20% two years prior).

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<sup>9</sup> PJM press release <http://www.prnewswire.com/news-releases/pjm-completes-analysis-of-recent-market-payment-default-and-announces-steps-to-mitigate-future-risk-exposure-58908777.html>

- 2) The historical value is adjusted by 10% in order to provide some protection against year-to-year changes in value. The adjustment is a reduction for positive historical values and an increase in magnitude for negative historical values.
  - a) For options only, a further adjustment is made as follows: if the option is a buy and the historical value is less than zero, it is set to zero; if the FTR is a sell and the historical value is greater than zero, it is set to zero.
- 3) The adjusted historical value of each FTR is subtracted from the total price for that FTR for each month.<sup>10</sup>

During the clearing process for each auction or auction round, a check is done for undiversified portfolios, and an additional credit requirement may be assessed.

The Clearing Manager considers that many of the provisions of the PJM requirements are not applicable to the New Zealand market. Some provisions, such as the differential participant requirements, are not accommodated under the Code. Other provisions, such as use of historical payouts to set and adjust prudential requirements, may have greater utility in networks with power flows which adhere to predictable patterns (as compared to the opposing to dry winter, wet winter conditions experienced in the New Zealand markets)

## **AEMO**

A discussion of the AEMO methodology was included in the Electricity Authority's 2011 Proposal paper. See paragraph 3.4.179.<sup>11</sup>

## **Illiquid markets**

Another issue is assessment and valuation of instruments in illiquid markets. In the FTR Manager's draft FAP, the FTR Manager proposes to auction the majority of FTRs for a particular month at once, and then subsequently auction additional quantities as they become available. Under this model, the Clearing Manager cannot rely on regular auctions of each FTR type and vintage to establish a market price. FTRs are thus likely to be categorised as low liquidity instruments. Valuation of low liquidity instruments requires special consideration and often relies on indirect valuation methods.

### ***Milk powder futures: A low liquidity example***

NZX operates the Global Dairy Futures and Options market. It also provides clearing and settlement for the market. The market has been characterised, especially at the outset, by infrequent futures trading across a number of maturities. The general clearing methodology is standard for derivative instruments. As with the trading of futures on the ASX, participants who hold positions must maintain an Initial Margin (to cover worst case daily movement) and must post a Variation Margin (when the instrument value moves against them).

The Initial Margin for derivative products is derived from the Standard Portfolio Analysis of Risk (SPAN) system.<sup>12</sup> SPAN assesses the risk of a portfolio by computing the maximum likely

<sup>10</sup> Some additional provisions apply as well. See PJM Settlements credit note: <http://www.pjm.com/markets-and-operations/etools/oasis/~media/documents/agreements/pjm-credit-overview.ashx>

<sup>11</sup> <http://www.ea.govt.nz/document/13334/download/search/>

loss that could be suffered by the portfolio. The core of SPAN risk analysis is to simulate a few scenarios based on potential market movements and then calculate the profit or loss for individual contracts.

All open positions in each futures contract are subject to a mark-to-market process to derive the Variation Margin. In valuing these positions, the clearing system will compare the weighted average buy or sell price of the contract with the daily contract settlement price (DSP). These mark-to-market values will be settled on a day to day basis. Settlement instructions for mark-to-market profits and losses will be sent to participants on a daily basis. The related cash settlement will occur on the morning of the next business day following the trade day.

A key requirement of this system is the DSP. Where no trading has occurred, bids and offers are used to determine a contract's Daily Settlement Price. Where there have been no active bids or offers, carrying cost is determined from Fonterra's Global Dairy Trade auction. Where no history is available from any other sources, or if the analyst deems it necessary, Daily Settlement Price can be set manually at the complete discretion of the NZX risk analyst.

Additional Margin can be optionally charged to a participant in a form of either a percentage or a fixed amount. Additional Margin will be added to the initial and Variation Margin to derive the total Margin requirement for the participant. Circumstances in which additional Margins will be imposed include, but are not limited to, the following:

- When the local market is closed for holidays while other international markets are open, the Initial Margin which was supposed to cover one-day price movements may be insufficient to cover the market risk. This is especially so when the international market experiences volatility which may be felt when the local market opens and leaves participants' Margins eroded dramatically; and
- When the participant is financially weak, to cover the potentially higher credit risk.

It should be noted that there is a key difference between the risk management systems of the ASX electricity futures market and the NZX dairy futures markets and the New Zealand FTR market. ASX Clear and the New Zealand Clearing and Depository Corporation Limited bear the residual risk each position—that is the risk that is not covered by the participant's prudential security holdings. As a result, concepts such as worst possible daily movement and additional Margin are the norm.

In the New Zealand electricity market, the residual risk is borne by the participants collectively. As such, administrative mechanisms and somewhat less robust cover may be acceptable.

## **I. Potential approaches to FTR prudential security assessment**

The Clearing Manager is required to develop and consult on a methodology for assessing prudential security for FTRs. We have divided this task into two subtasks:

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<sup>12</sup> SPAN was developed in 1988 by Chicago Mercantile Exchange ("CME"). Since then, SPAN has become a recognised standard for portfolio risk assessment and is used as the official margining mechanism of over 50 exchanges, clearing houses, service bureaus and regulatory agencies.



- assessing security for FTRs ahead of auction to assist the FTR manager to determine trading limits, and
- assessing FTR security requirements on an ongoing basis.

A broad range of approaches were reviewed to value FTRs for the purpose of informing FTR prudential security assessments. Below we summarise this range. We discuss advantages and disadvantages of each approach in the following section.

### ***Administrative assessment (and adjustments)***

For the purpose of this paper, an administrative assessment of prudential security requirements is one which is pre-established, rigid in application, and involves no discretion by the Clearing Manager. Additionally, we define an administrative assessment to be one which does not seek to most closely value the FTR position but rather is focused on consistency or some other objective.

### ***Maximum cost to carry***

Option FTRs have a minimum payoff of zero. The maximum exposure for an option FTR is the auction price paid or the disclosed price in the secondary market. An administrative approach would be to require option FTR Holders maintain full auction price as security. This could be reduced as prices become known in the month ahead of settlement—that is as the Clearing Manager calculates pro forma settlement amounts during the FTR month.

### ***Default product value***

Each FTR is assigned a default value that is used for exclusively for setting prudential security levels. This value could be established based upon historical price differences, location factors, rulings panel decisions, etc. The value would be static for the term of the FTR.

### ***Use of discretion by the Clearing Manager***

The Clearing Manager (or the Clearing Manager as approved by the Electricity Authority) could apply a value at its discretion. This is utilised in other markets.

### ***FTR value assessment – Market price***

A valid market price is the value of an FTR at a point in time.

The market price can be extracted from:

- an auction price,
- a secondary trade price, and
- bid and offer information.

While a market price may seem like the ideal indicator of value, prices can be manipulated, subject to significant movement upon trading due to liquidity issues, and infrequent. As a result, trades are typically assessed to determine if they are 'Price Setting Trades' prior to considering them for prudential security assessments.

### ***Comparative price conversion***

Prices of similar FTRs can be referenced in setting values. For example, an OTA – BEN FTR can be referenced to assess value (or update an assessed value) of an SFD – BEN FTR.

In a market where reconfiguration auctions are available, any FTR pair can be traded when a particular vintage is up for auction. Even where there is no trading in a particular FTR pair, FTR values may be discernible from the results of the auction optimisation.

### ***Carrying cost / Mark to Model***

This approach considers the value at settlement, the probability distribution and volatility of that value, and a discount rate.

When using a carrying cost/Mark to Model approach, the Clearing Manager estimates the value of an FTR by reference to the future value of an underlying security or index. In the case of FTRs, such an approach may reference:

- the locational price difference between the two FTR nodes and
- the sufficiency of the expected or calculated auction payments and rentals.

The probability distribution and volatility of the underlyings may convert to an ‘insurance premium’.

In addition, the value of the payout also may be discounted to provide a net present value.

The locational price differences between nodes can be modelled based upon:

- Historical prices/price differences/location factors
- Stochastic modelling for prices (such as with PSR’s SPPD model)
- Modelling of prices through a dynamic model (incorporating feedback and calibration)
- Modelling of network states (flow conditions) and resulting price differences in a tailored model
- ASX futures prices for the relevant quarter

### ***Initial Margin***

In this consultation, for the most part, we have focused on assessing FTR prudential security requirements by determining the current value of the FTR product. This approach does not take into account the risk of changes in the values of an FTR prior to settlement, due to factors that may be unknown by the market (or Clearing Manager) at the time of assessment.

This approach is contrary to other options and futures markets, which require participants in these markets to hold an Initial Margin (to cover the worst case daily movement in the value of the instrument) as well as post Variation Margins (when the instrument’s value moves against them).

In a similar manner to other markets, the Clearing Manager could also require FTR Holders to provide an Initial Margin as part of their prudential security requirements. This would be consistent with Clause 14.19A of the Code, which requires FTRs to be assessed as an “... estimate of the value ... of the FTR at the time that the estimate is made **and the potential for that value to change prior to settlement**”. Possible options to evaluate an Initial Margin include:

- by setting a percentage value that limits the Clearing Manager’s risk of under exposure to an FTR to a specified value, acceptable to the Authority and participants.
- assessing the most likely worst case movement in the value of an FTR over a specified period of time. This period of time could either be the maximum time required to satisfy a call from the Clearing Manager or the time required for the Clearing Manager to off-load a participant’s FTRs<sup>13</sup>.

Some indication of the relative size of an Initial Margin for FTRs can be made with reference to ASX New Zealand Electricity Futures Initial Margin requirements.<sup>14</sup> The Initial Margin is assessed by the ASX clearing house based on the largest most likely movement in the price of these futures contracts during a day. Assuming that a similar approach were taken for FTRs, then it would be reasonable to assume that the Initial Margin would be higher given that:

- ASX electricity futures are quarterly products. The volatility of electricity prices over a month, the duration of FTRs, is likely to be more volatile and hence have a higher risk,
- For FTRs the Clearing Manager has a longer period to consider when assessing the most likely worst case movement. Therefore the risk of significant movement in value will increase.

Unlike other options and futures markets the risk of default lies with FTR Holders rather than the Clearing Manager. For this reason, the Clearing Manager does not require Initial Margin to cover its own exposure. FTR Participants may be comfortable having no Initial Margin or having an Initial Margin that covers only a portion of the risk typically covered in other futures and options markets. When considering the need for, or level of, Initial Margin, FTR Participants will need to weigh the benefits of a lower prudential security burden versus the cost of socialising default risk.

The draft FTR prudential security assessment methodology is presented without a requirement for Initial Margin. The Clearing Manager would support inclusion of Initial Margin if supported by industry. The input from industry on this point is a key component of the consultation.

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<sup>13</sup> Where, with reference to Code Clause 14.58(1)(e), the Clearing Manager would take possession of a participants FTRs and sell them through the secondary FTR market.

<sup>14</sup> See [http://www.asx.com.au/data/clearing/nz\\_marginrates.pdf](http://www.asx.com.au/data/clearing/nz_marginrates.pdf)



## J. Discussion of the merits of the various approaches

In this section we provide more detail on the range of options and review the pro's and con's of each.

Type	Name	Description	Discussion	Pros	Cons	Code compliant/ required
Administrative assessment	Maximum cost to carry	This method assigns the maximum probable loss for the instrument as security requirement at the start of the period and retains that value for the security requirement for the duration of the life of the FTR.	The maximum possible loss for an instrument can be easily determined for options (it is the auction clearing amount or any subsequent bi-lateral trade disclosure amount). For obligation FTRs, the maximum possible loss is the auction clearing amount (or super ceding bi-lateral disclosed trade amount) plus the assessed maximum FTR payment obligation within a defined confidence interval.	<ul style="list-style-type: none"> <li>• Certainty of static assessment</li> <li>• Simplicity (for options)</li> <li>• Low cost of operation</li> <li>• Low discretion</li> </ul>	<ul style="list-style-type: none"> <li>• Prudential security requirements will exceed, by definition, the actual exposure in most cases</li> <li>• Upside will not be realised until settlement and will not be available to offset spot market impairments</li> <li>• Analysis required to set the value for obligation FTRs may be involved</li> </ul>	<b>May not be compliant.</b> Code requires prudential security requirements are based on value, not maximum value.
	Default product value	This method assigns a default value for the instrument as security requirement at auction and retains that value where it is not superseded by another method.	This method may be used where the values remain within known ranges and where the cost of applying an alternate method of valuation outweighs the benefit the reduction in security requirements.	<ul style="list-style-type: none"> <li>• Can serve as a valuation of last resort and an alternative to the use of discretion</li> <li>• Provides a 'benchmark'</li> </ul>	<ul style="list-style-type: none"> <li>• Method required to set the default value</li> </ul>	May not be compliant.
	Discretion	The Clearing Manager overrides other means of assessment and applies an alternate value.	Discretion is used in other markets for the purpose of setting a Daily Settlement Price where, in the view of the market operator or the clearing house, there are insufficient inputs to utilise another method effectively. Useful in low-liquidity markets. Could be used in combination with other methods, such as where the other methods are insufficient because of data limitations.	<ul style="list-style-type: none"> <li>• Ability to manually adjust for unanticipated situations</li> <li>• Provides an effective means to provide prudential security assessments in the early stages of a market.</li> </ul>	<ul style="list-style-type: none"> <li>• Increases likelihood of challenging assessments</li> <li>• Risk of misuse</li> </ul>	yes
Market assessm	Market price – Auction price	Competitive auctions establish values	This method hinges on the concept that a rational investor would not pay a higher price for an instrument than the value received. Criteria to establish that an	<ul style="list-style-type: none"> <li>• Initial auction has good chance of developing liquidity and Price Setting Trades</li> </ul>	<ul style="list-style-type: none"> <li>• If not sufficiently liquid, auction price may not reflect asset value</li> <li>• There may be extended</li> </ul>	yes

			<p>auction clearing price is a valid Price Setting Trade is applied. Auctions prices provide our best look at market prices.</p>	<ul style="list-style-type: none"> <li>• Reconfiguration auctions (if/when available) provide potential for excellent price discovery and liquidity</li> <li>• Variation auctions provide additional opportunities to establish market prices</li> </ul>	<p>time between auctions</p> <ul style="list-style-type: none"> <li>• Clearing Manager does not have right to non-traded FTR pair pricing information ( including bids that were not cleared)</li> <li>• Bidding 'error' is possible, setting higher 'value' than can be sustained</li> <li>• Potential for manipulation needs to be understood</li> </ul>	
	Market price – bi-lateral secondary trading	Bi-lateral trading prices referenced	<p>Assumes rational actors meet in the market to set market price. Trades which involve parties exhibiting market power are normally not considered as Price Setting Trades. Additionally, a sufficient quantity is required so that the traders have skin in the game...and are not completing a small trade to achieve a desired prudential security outcome.</p>	<ul style="list-style-type: none"> <li>• Can provide information in between auctions</li> <li>• Likely to be useful indicator of value if the secondary market is liquid</li> </ul>	<ul style="list-style-type: none"> <li>• Eligibility of a bi-lateral trade as an indicator of market value needs to be looked at carefully...to avoid manipulation and considering trades which may be simply 'prudential' transfers</li> <li>• Clearing Manager does not have universal right to this information</li> <li>• Prices obtained may not reflect side deals, etc.</li> </ul>	yes
	Bid/offer reference	Eligible bids and offers, even if they do not clear or match, can indicate FTR market value.	<p>Bids and offers can bracket market value even where there is no trade.</p>	<ul style="list-style-type: none"> <li>• Can use bids/offers posted on bulletin boards or other trading venues</li> <li>• Broadly accepted methodology</li> </ul>	<ul style="list-style-type: none"> <li>• Requires access to FTR bids and offers</li> <li>• Careful eligibility tests required to avoid manipulation</li> <li>• Clearing Manager does not have rights to this information</li> <li>• Organised secondary trading is not planned for initial FTR implementation</li> </ul>	yes

Modelled value	Compar - able price conversion	Deriving an FTR value from the established value of another FTR.	<p>This approach leverages mathematical or empirical relationships between two FTRs to enable the Clearing Manager to adjust a number of FTRs where updated, high quality information is available for a reference FTR pair. Example 1: Using a combination of ASX futures prices for Q4, empirically derived insurance premiums, and established FTR prices for October and November to derive the FTR price for December.</p> <p>Example 2: Using a price ratio between two FTR pairs (determined from auction data) and using that ratio to impute a value increase to an FTR pair based upon movement in the value of the comparable FTR. (such as WIL-BPE vs. HAY-SFD)</p> <p>Probably most valuable once the market moves beyond 2 nodes.</p>	<ul style="list-style-type: none"> <li>• Leverages high quality price information for broader application</li> <li>• Information could be made public, providing participants up-to-date value indications</li> </ul>	<ul style="list-style-type: none"> <li>• The nature of the relationship used to extrapolate prices can change over time (i.e. localised constraints or changes in market allocation of 'insurance' premiums)</li> <li>• Potentially extensive effort will be required to load and monitor the associated relationships to enable automated updates</li> </ul>	yes
	Carrying cost/ Mark to Model	General: Deriving an FTR value from predicted settlement values, discount rate (time value of funds), and 'insurance' value	<p>The technique involves modelling the price difference between two nodes, considering evolving transmission, demand, and generation conditions, in the short to medium term. Conditions such as hydrology, outages, offer behaviour are not predictable and are often included in varied input set for numerous runs. The spectrum of payouts is valued, not only for the average expected value, but also for option valuation.</p> <p>In addition, where there is a reasonable prospect for scaling of FTR Payments, revenue adequacy may need to be considered.</p>	<ul style="list-style-type: none"> <li>• Independent valuation (may be important where market power/manipulation may be an issue)</li> <li>• Outcomes are constantly adjusted as the inputs are refined and path dependency is played out</li> </ul>	<ul style="list-style-type: none"> <li>• Modelling of prices are difficult, modelling of price differences can be even more difficult</li> <li>• Maintaining an operating models requires the maintenance and adjustment of numerous input streams—and this requires resources</li> <li>• Added complexity accompanies revenue adequacy assessment if adopted</li> </ul>	yes
		Sub-model: Statistical analysis of historical prices	To be determined. One approach could be the autoregressive moving average time series model as used by PJM.	<ul style="list-style-type: none"> <li>• Source data available (as opposed to a variable wait for a Price Setting Trade)</li> <li>• Recognisable trends ease communication of findings with industry</li> </ul>	<ul style="list-style-type: none"> <li>• Historical prices resulted from the interactions of a different demand, generation, and transmission environment</li> <li>• Relevant price data</li> </ul>	Yes

				<ul style="list-style-type: none"> <li>• Will provide some feed through of seasonality, offer behaviour, and load response</li> </ul>	<ul style="list-style-type: none"> <li>• availability</li> <li>• Known transmission and generation upgrades are not reflected in historical prices</li> </ul>	
		Sub-model: Persistence forecast	This is simply the forecast employed by the Clearing Manager for spot exposure.	<ul style="list-style-type: none"> <li>• A simple persistence forecast is used for near term spot market projections</li> </ul>	<ul style="list-style-type: none"> <li>• Needs to be combined with other methods to go beyond a few weeks</li> </ul>	Yes
		Sub-model: Use of location factors		<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>	Yes
		Sub-model: Stochastic modelling to develop a set of prices under a number of different scenarios	<p>The Clearing Manager would operate, license, or contract for the operation of a stochastic model for prices (such as with Energy Link's EMarket or PSR's SPPD models). Inputs to the model will alter as the FTR month approaches.</p> <p><a href="http://www.psr-inc.com.br/portal/psr/servicos/modelos_de_apoio_a_decisao/studio_opera/sddp/">http://www.psr-inc.com.br/portal/psr/servicos/modelos_de_apoio_a_decisao/studio_opera/sddp/</a>.</p> <p><a href="http://www.energylink.co.nz/analysis-planning/market-models">http://www.energylink.co.nz/analysis-planning/market-models</a></p>	<ul style="list-style-type: none"> <li>• Future grid, generation, and demand configurations can be incorporated.</li> <li>• Significant events, such as a major HVDC outage, can be rapidly incorporated into assessments</li> <li>• Industry standard models, while they are simply models, have gained industry acceptance for what they do.</li> <li>• There is flexibility around control of the models employed: Clearing Manager operated, Electricity Authority Operated, consultancy operated, etc.</li> <li>• Model results may be provided to industry to aid in transparency, planning, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Intensity of effort and cost</li> <li>• Care must be taken around dispatch blocks—some models operate in fairly aggregated blocks which may obscure HVDC transfer switching and limit utility for valuing options.</li> <li>• Reliability depends on underlying accuracy of model</li> </ul>	Yes
		Sub-model: reference ASX futures prices for the relevant quarter	The Clearing Manager would subscribe to ASX data and track movements in the differential between OTA and BEN futures. ASX future prices can be utilised in two ways.	<ul style="list-style-type: none"> <li>• An industry recognised, and improving, forward price curve (some debate this)</li> <li>• Potential for alignment of</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly term limits direct utility for FTRs – requires significant analysis to break price signal into constituent parts.</li> </ul>	



			<ol style="list-style-type: none"> <li>1. Movements in ASX future prices could be projected onto movements of FTR prices. For example, if OCT 2014 BEN-HAY obligation FTR auctions for \$7000 (MWxmonth), at a time when HAY less BEN for ASX Q4 14 is \$8, then if in two weeks time, HAY less BEN for ASX Q4 14 moves to \$7, the Clearing Manager may assess the new value at \$6125 and the holder of the FTR would be called for \$875/MW.</li> <li>2. ASX future price differences may be applied directly to quarters, ignoring expected price differential between months. For example, if OCT 2014 BEN-HAY would be valued at \$5952/mw, at a time when HAY less BEN for ASX Q4 14 is \$8. [\$8mwh x 24 hr x 31 days]. Alternately, a price profile can be applied to ASX prices to break out monthly differentials.</li> </ol>	<p>FTR prudential security obligations and ASX prudential security obligations, which would enable some participants to manage exposure across markets (manually)</p> <ul style="list-style-type: none"> <li>• Option for Clearing Manager or FTR manager to bundle three FTR months (e.g. OCT, NOV, DEC 2014) into 'strips' which mirror ASX quarters and then allow direct use of ASX prices for prudential security calculations .</li> </ul>	<ul style="list-style-type: none"> <li>• Trading limited to BEN-OTA which limits direct application to other FTR pairs.</li> <li>• If market liquidity is marginal, may require 'Price Setting Trade' testing</li> <li>• Participants to trades not transparent so Clearing Manager blind to market power/manipulation implications</li> <li>• FTRs are settled against each trading period individually rather than the average difference for the month.</li> </ul>	
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## K. Draft methodology for on-going assessment of FTRs

This following outlines how the Clearing Manager intends to assess participants' FTR holdings on an on-going basis.

The methodology considers each FTR Participant's FTR holdings as identified in the registry and multiplies the associated MWh FTR quantity by an assessed FTR Daily Settlement Price to arrive at the participant's total Hedge Value. The Clearing Manager then considers the Acquisition Cost owed to arrive at the net FTR exposure. The Clearing Manager determination of the Daily Settlement Price is the defining aspect of the methodology.

A key feature of our draft methodology is the employment of one of a handful of distinct valuation sub-routines depending on the information available and proximity to settlement. While the methodology's business rules which are applied to determine which sub-method to use may be somewhat involved, the overall methodology should appear simple to the casual observer. The Daily Settlement Price provides a single metric of Hedge Value.

The methodology can be applied to either options or obligations and can be applied to any variety of FTR nodes.

The draft methodology will operate from 24 months ahead of the FTR month until settlement. During this time, different assessments apply for each of six periods. These six periods include:

- the period after the FTR month but ahead of settlement,
- the FTR month,
- the month prior to the FTR month, and
- three other periods extending to 24 months ahead.

During each of these periods, distinct sets of business rules are applied to derive a preferred valuation method. The distinct periods were created in recognition of the fact that the most appropriate methodologies for determining value are time dependant. For example, the Clearing Manager has Final Prices after the FTR month, so interim or final pricing can be relied upon exclusively.

For each of the periods, the Clearing Manager utilises one of a combination of five sub-methods. The pre-determined choice of sub method reflects information availability and suitability. The best source of information is sought first. Where that quality of information is not available or current, the next best source is sought. The sub methods are:

- Actual underlying price (spot price),
- Projected underlying price (from Clearing Manager spot market prudential security assessment methodology)<sup>15</sup>,

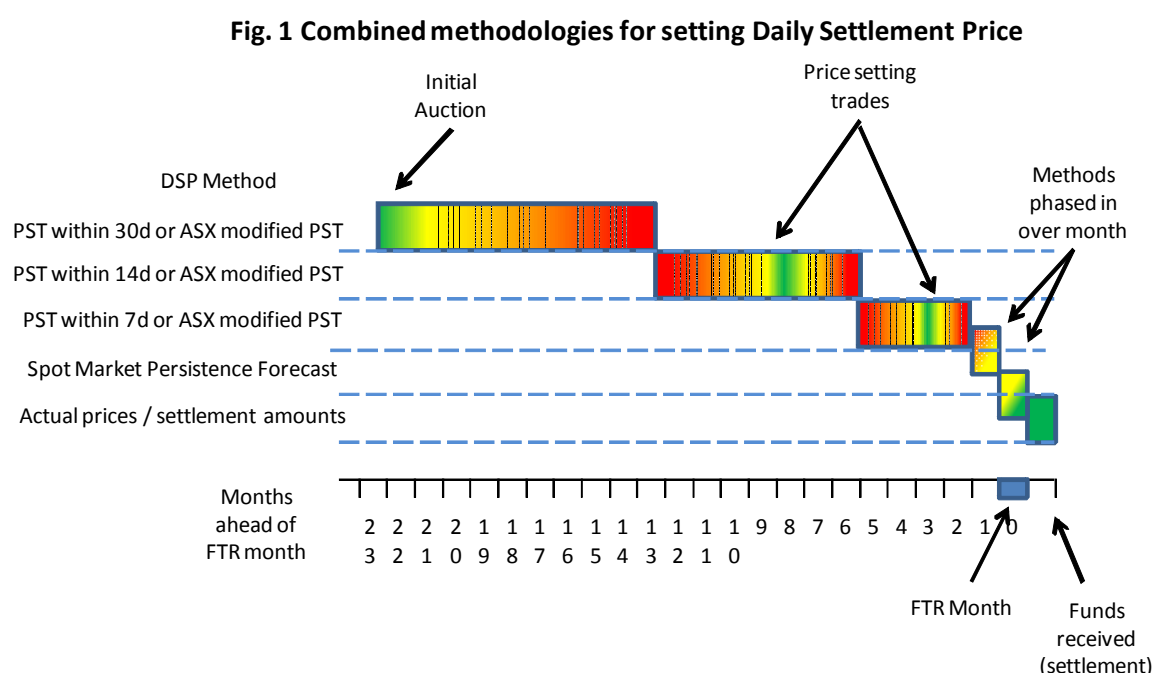
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<sup>15</sup> While it certainly can be argued that the Clearing Manager's price projection methodology is far from best-in-class—it is a simple persistence model based on a profiled, trailing three week average—it was chosen as the preferred near settlement forecast as it is used to support spot market

- Market value of the FTR as determined by a Price Setting Trade,
- Adjusted Daily Settlement Price based upon bids and offers,
- Adjusted (or drifted) market value determined with reference to:
  - A price or price difference forecast model, and/or
  - ASX futures prices

Figure 5 shows how different valuation rules are applied in each of the six periods. The application of sub-methods is changed over time to take advantage of the best available information.

Figure 5. Progression of methodologies for setting the Daily Settlement Price



In the illustration, colours represent the relative quality of assessment. They roughly equate to the three tiers in the standard hierarchy used to establish fair value for securities and derivative assets. The first tier (green above) relate to values derived from observable prices in highly liquid over-the-counter markets or exchanges. The green areas toward the right also relate to values derived directly for high-confidence underlyings—Final Prices. Green represents the highest quality assessment of FTR value.

The second tier (not shown above) would include indicative quotes or data gathered from disparate markets or brokers. If bid and offer details for secondary trading become available, the clearing manner would include these values in the methodology. The Clearing Manager does not expect this information to be available in the near future.

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prudential security assessments. Participants who have FTR positions, a hedge lodged with the Clearing Manager, and an offsetting spot market exposure will benefit from netting and will not suffer any basis risk from divergent price forecasts.

The third tier involves principles-based valuation which is shown above in red. This colour represents the least reliable of the three tiers. Methods for these tiers are applied where one may reasonably expect that the impact of time or market events have degraded the quality of a valuation derived from a higher tier source.

As valuations from higher tiers are more reliable, accuracy can be improved by holding additional auctions, providing opportunities for increased secondary trading, enhanced disclosure of secondary trading, and efficient models.

The table below elaborates on the methods illustrated in the figure above. A feature of the draft methodology is the presence of successively shorter timeframes for which the Clearing Manager references the previous trade price. This progression reflects the fact that closer to settlement, higher quality information is available and that information is updated on a regular basis.

Time	Primary method	If primary unavailable
Prior to settlement/after FTR month	Calculated settlement amount	Estimated settlement amount
During FTR month	Partial: Calc settlement amount Partial: Spot market prudential security spot market price estimates	
Month Prior to FTR month	Phased in: Spot market prudential security spot market price estimates Phased out: Price Setting Trade (or equivalent) within 7 days where no material events have transpired	Phased in: N/A  Phased out: Price referenced to FTR bids and offers. Where this information is not available then price will be adjusted with reference to ASX futures and a price forecast model.
> 1 month prior and < 5 Months prior	Price Setting Trade (or equivalent) within 7 days where no material events have transpired	Price referenced to FTR bids and offers. Where this information is not available then price will be adjusted with reference to ASX futures and a price forecast model.
> 4 months and < 13 months	Price Setting Trade within 14 days where no material events have transpired	Price referenced to FTR bids and offers. Where this information is not available then price will be adjusted with reference to ASX futures and a price forecast model.
From 13 to 24 months ahead	Price Setting Trade within 30 days where no material events have transpired	Price referenced to FTR bids and offers. Where this information is not available then price will be adjusted with reference to ASX futures and a price forecast model.

### ***Criteria for assessing if market based prices can be used to assess value***

The draft methodology also considers a number of considerations in evaluating whether or not to use a market based price to assess value.

- **Price Setting Trade:** A trade is not considered a Price Setting Trade unless at a minimum, it involves the lesser of 2 MW capacity or a trade value of \$1000<sup>16</sup>. Trades are considered to establish value where a reasonable investor puts value at risk. Low value trades do not support this assumption.
- **Related parties:** Trades between established related parties may be omitted from consideration.
- **Trades where participants exhibit market power:** Trades where the Authority advises one party holds significant market power may be exclude at the request of the Authority<sup>17</sup>.
- **Trades intended to manipulate prudential security levels:** Trades where the Authority advises it holds a reasonable belief that the trade is an intended to manipulate prudential security levels may be exclude at the request of the Authority.

### ***Predictive model***

The draft methodology includes the use of a price or price difference forecast model, based on one of the methods described in Section I, to assist with prudential security assessment.

A model will be used where no better information is available and as means of adjusting a Daily Settlement Price to reflect changed market pressures (applying drift). While details have not been confirmed, security assessments for such purposes could be based on a weighted average of prices determined from a model and prices determined with reference to ASX futures. The weighting could depend on the quality of ASX price information and the FTR to which the assessment was being applied to (e.g. a weighting in favour of the model would apply where there is no 'Price Setting Trade' or for an FTR pair where the HVDC is not very relevant). There would also be the intent to adjust the weighting as experience with the methodology develops.

The inclusion of a model, rather than strict reliance on ASX forward prices, provides a methodology to disaggregate quarterly price information into more discrete components. It also provides the opportunity to independently monitor security assessments as a check

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<sup>16</sup> The \$1000 threshold for value at risk is based on amounts applied in other markets in the Clearing Manager's experience. Occasionally, FTRs, especially out of the money options, may trade at modest prices. In this case, the Clearing Manager proposes that a trade of 2 MW could be consider price setting.

<sup>17</sup> The Clearing Manager considers this role fits naturally with the Authority's market monitoring function. Furthermore, the Authority will have a broader view of participants overall position, where as the Clearing Manager will only have a view of some parts of a participant's portfolio.

against FTR prices that do not adequately reflect market value. It also protects against the loss of access to ASX information.

## **L. Draft methodology for initial auction of FTRs**

The following outlines how the Clearing Manager intends to provide the FTR manager with a value for an FTR which has yet to be traded at auction. This methodology is a special case of the methodology to assess FTRs holdings on an on-going basis, as described above.

It may be argued that the initial FTR auction for each vintage will provide the most liquid trading to establish price. It may also be argued that the bidding participants have the least information available at that auction and that the bidders who err most in their valuation will win.

Our draft methodology for determining initial auction prudential security requirements is as follows:

- the FTR value is the lesser of:
  - the auction clearing price or
  - the FTR Reserve Value
- the FTR Reserve Value is as determined by the draft methodology described above multiplied by a factor of 1.5, however
- For the first three auctions and for any auction for an instrument 12 or more months prior to settlement, the FTR Reserve Value shall be the lesser of:
  - the six year average settlement value (back casted) times a factor of two for obligation FTRs and half the auction clearing price for option FTRs, or
  - the value obtained by applying the principle of 'drift' to the most recently traded FTR in a proximate vintage, times a factor of two

The application of factors is intended to allow the market to set the new value of the units at auction while restricting large swings in value which are not supportable by available information.

The draft methodology for consultation is included in the box below. The Clearing Manager invites comments and suggestions on this methodology.

### ***Spot, lodged hedge, and FTR exposure assessment***

The Clearing Manager assesses prudential security requirements for participants or FTR Participants as being the net of:

- Spot market exposure as described in the Clearing Manager's functional specification,
- Exposure for hedges lodged with the Clearing Manager (assessed for the same period as the spot market exposure), and
- Exposure to FTRs

A participant's exposure to FTRs holdings is assessed as the net value of all FTRs held on the FTR registry. Lodged hedges and spot market exposures are assessed for a period of approximately 57 days inclusive of current and projected exposure.

Prudential assessments and balances are updated each business day by 11 am to reflect updated information and participant actions. Participants will be able to view balances by secure web portal.

### ***FTR exposure calculation***

#### Principles

The adopted methodology shall

- be applicable to multiple hubs as well as the initial Benmore-Haywards pair,
- respond to changing market inputs, and
- avoid introducing 'methodology-driven' volatility into the assessment process.

#### Definition

For the purpose of assessing exposure to each FTR held by the participant, exposure is defined as:

FTR Hedge Value – FTR Acquisition Cost.

### ***FTR value determination***

The FTR value for the purposes of prudential security is the Daily Settlement Price (DSP) calculated by the Clearing Manager multiplied by the FTR quantity.

The DSP is calculated for each FTR product on the registry. This value will be available from the Clearing Manager's website.

For the period prior to one month ahead of the FTR period, the DSP for each product is calculated as follows:

1. The DSP shall be equal to a **Price Setting Trade** price where that trade occurred within the following timelines:

- > 1 month prior and < 5 Months prior to the FTR period – within seven days of assessment
- > 5 month prior and < 13 Months prior to the FTR period – within 14 days of assessment
- > 13 month prior to the FTR period – within 30 days of assessment

2. Where a Price Setting Trade which meets the requirements of the above paragraph is not available, the FTR value is to be set according to the following formula:

DSP = previous DSP x %change in Reference Price between the date the previous DSP was first established and the assessment date.

This formula is subject to modification upon review subsequent to approval by the Authority.

A Price Setting Trade is a trade which is deemed, by the Clearing Manager, to reflect a market price. Initially, a Price Setting Trade will involve a transaction value greater than \$1000 or transaction quantity greater than 2MW.

The Clearing Manager calculates a Reference Price for each FTR product. The Clearing Manager develops and maintains Reference Price methodologies. Reference Prices are not published; however the resulting DSP values are published.

For obligation FTRs, the Reference Price is derived from a weighted average of a predictive price model and the ASX New Zealand Electricity futures price, adjusted to compensate for basis difference (period and location). The weighting of the components may vary (and may be set to zero. )

For option FTRs, the Reference Price is derived from applying an option valuation model to the results of an appropriate predictive price model.

For the month ahead of the FTR period, the above DSP methodology is phased out and a calculated FTR settlement based upon the Clearing Manager's spot market prudential security price projection methodology is phased in. This ensures alignment spot exposures, lodged hedges and near term FTRs are assessed on the same measure and will offset appropriately. The phase in is used to avoid step changes in security requirements.

For the FTR period, calculated FTR settlement value is used. Actual prices are used where available – otherwise the projected prices are used per the spot market methodology.

After the FTR period and prior to settlement, calculated FTR settlement value is used.

***Initial prudential security requirements to be met before bidding***

This initial prudential security methodology is a special case of the methodology to assess FTRs holdings on an on-going basis described above.

The initial FTR prudential security value is the lesser of:

- the auction clearing price
- or
- the FTR Reserve Value.

For the first three auctions and for any auction for an instrument 12 or more months prior to settlement, the Reserve Value shall be the lesser of:

- the six year average settlement value times a factor of 2 will be used for obligation FTRs and half the clearing price for option FTRs will be used or
- the value obtained by applying the principle of 'drift' to the most recently traded FTR in a proximate vintage, times a factor of 2.

For other auctions, the FTR Reserve Value is determined by the Daily Settlement Price methodology described above multiplied by a factor of 1.5.



The application of factors is intended to allow the market to set the new value of the units at auction while restricting large swings in value which are not supportable by available information.

## **M. Refinement of the draft methodology**

The Clearing Manager will continue to study aspects related to the draft methodology during the consultation period. Specifically, the Clearing Manager has set up a modelling environment to enable modelling and back casting of specific sub-methodologies. The modelling and back casting is intended to validate the function of the sub-methodologies and establish the range of FTR valuations. Findings, as available, will be presented at the industry workshop in May.

One main decision for the draft methodology is the selection of an appropriate forecast model. The Clearing Manager is seeking advice from the industry on the draft methodology during the consultation period before intensively investigating models. The Clearing Manager proposes to select an appropriate model in consultation with the Electricity Authority and the WAG. The Clearing Manager plans to communicate model selection and provide analysis of subsequent back casting to the industry when available.

Further detailed design work to be completed after the close of the consultation period includes:

- setting of weightings (e.g. % ASX derived price movement vs. % model-based price movement),
- refinement of parameter details for sub-methodologies,
- refinement of boundaries between sub-methodologies,
- the method for converting ASX price drift to FTR price drift, and
- the inclusion of any feedback or calibrating mechanisms.

Once the methodology parameters are set (except as adjusted by feedback mechanisms), the methodologies will be fixed and disclosed to ensure transparency.

### ***FTR trade frequency***

All else being equal, increased frequency of secondary FTR trading, or distributing initial sales across a number of auctions will increase high-quality price discovery and reduce the Clearing Manager's dependence on estimates. As such, the Clearing Manager recommends the Authority and the FTR manager consider frequent auctions.

While high liquidity is predicted with the OTA-BEN FTR pair, liquidity for subsequent FTR pairs may be substantially less. The provision of re-configuration auctions, where participants can offer FTRs back into the capacity pool, will assist in ensuring that secondary market FTR trades are Price Setting Trades. The Clearing Manager recommends that the Authority and the FTR manager consider implementation of reconfiguration auctions upon commencement of trading of additional FTR pairs.

With sufficient FTR trading/disclosure, the Clearing Manager may assess the merits of de-commissioning some aspects of the draft methodology. In other words, as the quality of

market information improves, trade information may be sufficient to eliminate the need for modelling or reliance on ASX information. Any changes will be consulted upon with industry.

## **N. Consultation questions**

The Clearing Manager would like participants to provide feedback on the following questions:

- a. Does the draft methodology provide a means to appropriately value FTRs for prudential security purposes?
- b. Do you support a requirement for Initial Margins? If so, do you support assessment of Initial Margin to the extent applied in other futures markets or do you support a lesser requirement?
- c. If you do not support Initial Margins but were required to post Initial Margins to participate in the FTR market, what characteristics would you like to see incorporated in a methodology to determine Initial Margins?
- d. Do you support the use the spot market prudential security methodology for projecting price in valuing FTRs where indicated in the methodology or is the application of a more sophisticated approach preferred?
- e. The Clearing Manager is evaluating models for developing a price forecast which has sufficient resolution to evaluate nodal price differentials with intra-day flow reversals. Do you have preferred models or modelling approaches?
- f. What information can assist your organisation to assess FTR trading opportunities and risks?
- g. What if any of the prudential security requirements or assessment methods applied by other markets should be applied in New Zealand, regardless of compatibility with the Code?
- h. Do you support removing reference to a model and utilising a simpler assessment method if it requires assessment of an Initial Margin for obligation FTRs and posting of the entire Acquisition Cost for option FTRs?
- i. Is the proposed flow of information sufficient to support participation in the market?