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AN INTRODUCTION TO THE NEW ZEALAND FTR MARKET

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1 An FTR Market for New Zealand

1.1 PURPOSE OF THIS DOCUMENT

This document has been prepared as a general introduction to FTRs and the New Zealand FTR market. It is intended to accompany and reflect a number of formal documents and policies that are available on the FTR website.

The New Zealand Electricity Market is based on full nodal pricing i.e. wholesale electricity prices are discovered at 250 different price points around the electricity system every individual half hour. The relativity between these prices reflects the value of transmission. When flows reach their limits, constraints occur that manifest themselves in a widening differential in the price between the affected points. FTRs offer a way to manage this risk.

This document is targeted at any party interested in gaining a broad understanding of the design and workings of the FTR Market in New Zealand.

1.2 FINANCIAL TRANSMISSION RIGHTS (FTRs)

The purpose of Financial Transmission Rights (FTRs) is to manage the risk of congestion. Congestion occurs where electricity flows are constrained, and prices on the two sides of the constraint decouple. FTRs provide the ability to trade and benefit from changes in the differential between relative energy prices. The outcome from the FTR market can either be treated as standalone trading profits or to offset the cost of (hedge against) constraints when they occur.

The Electricity Authority's (EA) (the Authority's) objective in introducing an FTR Market is to promote competition in the electricity industry for the long-term benefit of consumers. FTRs are a solution to a key concern in that competition in the retail electricity market is inhibited by locational price risk in the wholesale market.

A market in FTRs has always been seen by electricity market designers as an important accompaniment to energy markets that have adopted a locational pricing model. FTRs provide all participants a tool for managing exposure to the price impact of constraints.

FTRs are financial instruments that complement other forms of financial trading instruments available in electricity markets. FTRs specify the relative price between two points on a grid for an amount of MWs for a defined period. Settlement is based on the difference between the price of the FTR and the actual differential between prices at the two nodes the FTR is based on.

The Code provides for the appointment of an FTR Manager to establish and operate the FTR market. The Code also specifies that the FTR Manager will create and allocate FTRs by auction, and the approach to the auction will be made clear in an FTR Allocation Plan. This document explains the provision of the FTR Allocation Plan and the auction design.

1.3 A HIERARCHY OF FTR DOCUMENTS

Several documents collectively define the market, the role of the FTR Manager, the limits of what the FTR Manager can do during implementation of the FTR market, obligations on market participants and the roles of other service providers. These are as follows:

| Document(s) | Owner | Description |
|--|--|---|
| The Electricity Industry Act 2010 | Government | Under the Act the Government established the Authority in 2010 to oversee the governance and operation of New Zealand's electricity market. |
| Electricity Industry Participation Code (the Code) | Authority | Sets the legislative requirement for FTRs. |
| FTR Allocation Plan | Prepared by FTR Manager, approved by Authority | The FTR Allocation Plan is a Code requirement. |
| Standard FTR Participation Agreement | FTR Manager | Required because under the Code the FTR Allocation Plan is only binding on the FTR Manager. An additional document is required to bind the FTR Market participants to the terms of the FTR market. |
| FTR Policies | FTR Manager | The FTR Allocation Plan refers to a number of FTR Policies to explain how the FTR Allocation Plan will be implemented. These policies are at a level of detail below that requiring Authority approval, and/or might need change for operational reasons outside the FTR Allocation Plan. |
| FTR Manager Service Provider Agreement | FTR Manager and Authority | Confirms commercial relationship between the Authority and the FTR Manager. |
| Explanatory documents | FTR Manager | Documents such as this explain the FTR market but do not have a formal role in defining the market. |

The FTR Manager documents are available from the FTR library at www.ftr.co.nz.

The Act and Authority documents are available from the Authority's website www.ea.govt.nz.

1.4 THE FTR MANAGER AND THE FTR ALLOCATION PLAN

Energy Market Services (EMS, a division of Transpower New Zealand Limited) has been appointed as the FTR Manager service provider by the Authority.

Part 13 of the Electricity Industry Participation Code (the Code) provides for the creation and allocation of FTRs by the FTR Manager, covering:

- the design of FTRs
- the FTR auction design
- the FTR grid design

Clause 13.238 of the Code specifically requires the FTR Manager to prepare an FTR Allocation Plan, consult on it with market participants and have the final form of it approved by the Authority. This process happened in 2018. For the latest version of the FTR Allocation Plan see www.ftr.co.nz.

1.5 IMPLEMENTING THE FTR ALLOCATION PLAN

EMS worked closely with the Authority to prepare the FTR Allocation Plan. The original Request for Proposals (RFP) for the FTR Manager role developed a number of the Code's provisions, reflecting the Authority's views on a number of implementation issues. This in turn reflected the thinking of the Authority's Locational Price Risk Technical Group (LPRTG). EMS's appointment was based on a proposal to deliver both the requirements of the Code and the provisions of the RFP. The FTR Allocation Plan therefore clarifies EMS's understanding of what is required and explains how was to deliver a fully working and compliant FTR Market.

The core engine chosen to deliver the market is Nexant Inc/Grid Management's i-HEDGE® Financial Transmission Rights System. This is a fully integrated system control and administers the FTR market, allowing accredited users to participate in the FTR auctions and the secondary Assignment market. Since 1996, Nexant has been forefront in the fields of market-based congestion arrangements and transmission rights, working with all of the established Independent System Operators (ISOs) in the United States.

The Authority and EMS are keen for the FTR market to develop beyond its initial implementation, with the Nexant i-HEDGE system capable of accommodating development in many ways. Discussion about future development has been deferred until the next FTR Allocation Plan 2021 which is currently under way.

In addition to the FTR Allocation Plan, the FTR Manager developed FTR policies to clarify details around how provisions of the FTR Allocation Plan will be delivered. Development of the policies, and any future changes to policies, is made transparently by the FTR Manager, with industry feedback sought.

Policies have been published in relation to:

- Registration
- The FTR calendar
- Prudential requirements
- Use of the FTR Information System
- Determining the FTR grid and auction data, including supplementary information

The FTR Information System (FIS) will be accessed through the website www.ftr.co.nz, which is maintained by the FTR Manager. This website will provide public access to formal documents such as the current FTR Allocation Plan, FTR Policies and regular market reports. Other information including models prepared for instructional purposes, general information on the New Zealand FTR market and reference material will be also available. The website will provide access to the FTR register for interested parties who agree to the terms and conditions. Registered FTR participants will also access the market user interface (MUI) through the website.

Separate from the FIS, the market operator's information system WITS will report FTR market information such as FTR prices and revenue adequacy. A summary is also included as part of the monthly report provided to the EA by FTR Manager.

1.6 FUTURE FTR ALLOCATION PLANS

The FTR Allocation Plan is expected to undergo an annual review, with any resulting changes being subject to consultation. This will provide the basis for an open and transparent dialogue between the FTR Manager, the Authority and market participants.

Examples of developments that are being considered:

- Resale of FTRs into Variation Auctions i.e. reconfiguration auctions
- Additional FTR hubs
- Reflecting losses in the FTR grid
- Reflecting reserve constraints in the FTR grid
- Varying firmness of FTRs
- FTRs longer or shorter than 1 month
- An ability to buy a series (strip) of FTRs conditional on getting all or none
- Long dated FTRs i.e. greater than 1 year
- Listing FTRs months beyond 24 months
- Day/night FTR products
- Business /non-business day FTR products

There is likely to be continual development and evolution of the FTR market once commenced, so future FTR Allocation Plan will not necessarily be the final market form but one of many stages.

The FTR Manager will follow the steps below to determine what developments are introduced:

- canvas the FTR users' group to see if any other development issues come to the fore
- investigate cost, Code change requirements (where applicable), impact on initial systems development and FMA implications (where applicable)
- prioritise possible developments if there are several and a limitation on how many can be developed
- advise the Authority and take account of feedback
- provide an estimate of cost to the Authority for their approval
- confirm design details with FTR users' group
- proceed with developments that pass all these tests

2 Roles and responsibilities

2.1 SERVICE PROVIDERS

FTR Manager

Subpart 6 of Part 13 of the Code sets out the roles and processes in the FTR Market as follows:

- the FTR Manager prepares and publishes the FTR allocation plan
- the Authority approves the FTR allocation plan
- the FTR Manager creates and allocates FTRs
- the FTR Manager operates the FTR register and collects information from the Grid Owner and Clearing Manager
- FTRs may be assigned
- the FTR Manager calculates the FTR Rental and notifies the Clearing Manager of the amount to be assigned to the FTR account for settlement of FTRs
- the Authority may direct the FTR Manager to suspend the allocation of FTRs

The FTR Manager is also the FTR market champion in the sense that they will proactively lead development of products and promote the use of the market.

NZX/Clearing Manager

NZX makes final wholesale electricity price information available. The FTR Manager will use this information to determine the FTR rentals amount for the FTR period. The Clearing Manager will use final energy prices (and the calculated FTR rentals amount) for settling the FTRs.

The Clearing Manager is required to assess and call for a minimum level of security (prudential requirements). The Clearing Manager also issues invoices and settles FTRs. For this the Clearing Manager establishes the primary FTR participant accounts.

The Clearing Manager is responsible for the methodology used to determine the level of prudential requirements.

While the Clearing Manager is responsible for determining the level of prudential requirements, the FTR Manager is responsible for determining whether the prudential requirements are adequate for individual FTR Participant's portfolio bids for any auction and requests for assignment of FTRs held. The Clearing Manager and the FTR Manager have worked closely together to ensure that this interface runs smoothly.

The Clearing Manager also is responsible for on-going clearing of FTRs, ensuring that participants hold sufficient collateral for their FTR holdings as the value of the FTRs change over time.

Grid Owners

The Grid Owners (GO) are responsible, under the Code, for providing to the FTR Manager:

- a forecast of the configuration and capacity of the Grid Owner's grid for the FTR period (as advised to each Grid Owner by the FTR Manager) for use in determining the FTRs to be offered in each FTR auction
- relevant planned outages
- a normal grid configuration for use in the FTR Manager's determination of FTR rentals amounts. This determination is made for an FTR period after it has ended

Currently, these requirements relate only to Transpower as the sole Grid Owner.

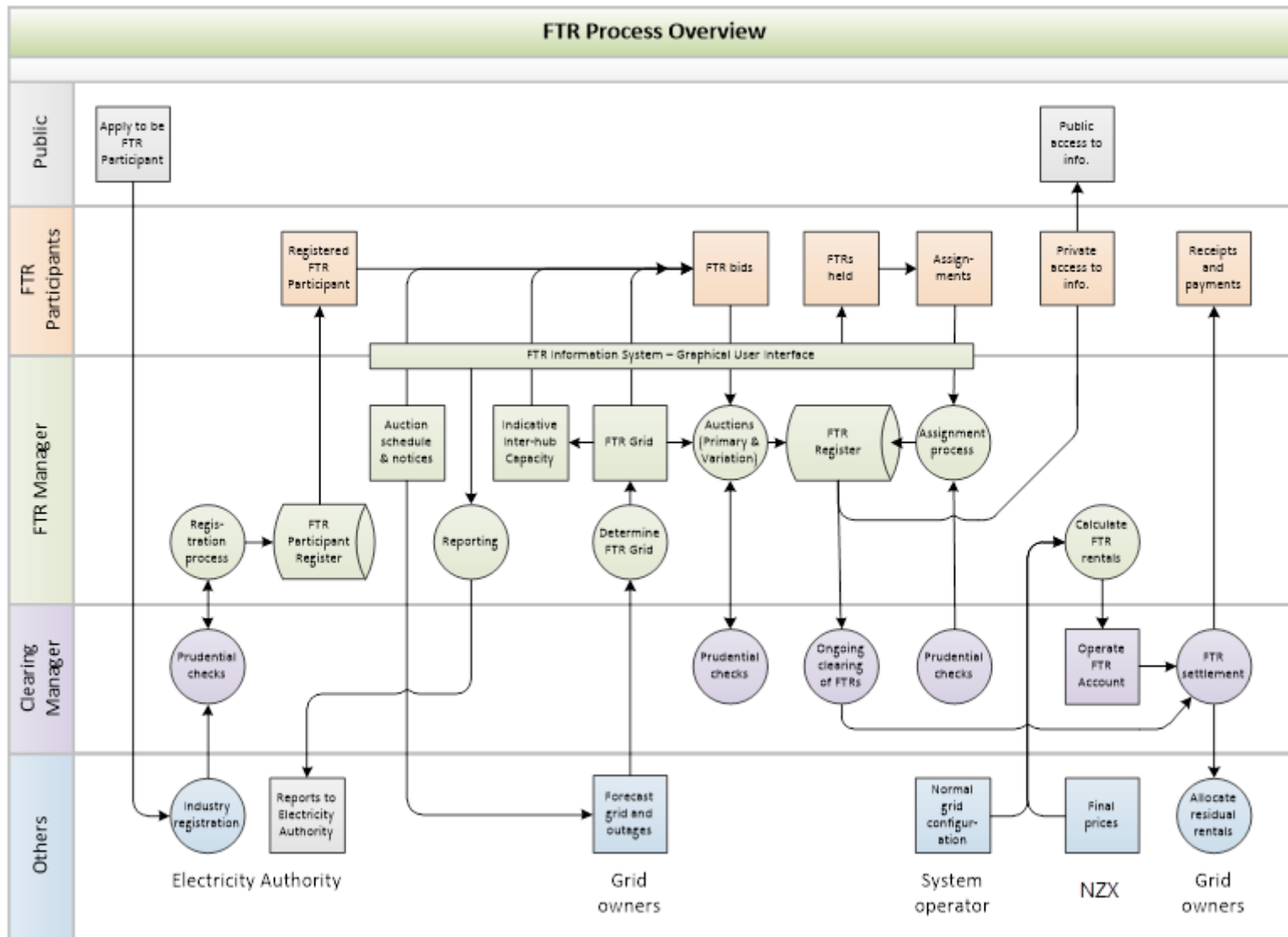
Electricity Authority

The Authority approves the initial and all future FTR Allocation Plans. They evolve the Code as is necessary and justifiable, and if necessary, suspends FTR auctions. The Authority provides the 'industry participant' stage of the FTR Participant registration process. The Authority receives a monthly report from the FTR Manager.

2.2 FTR PROCESS OVERVIEW

The figure shown below sets out the high-level processes that underpin the FTR market and identifies the respective roles of the FTR Manager, the Clearing Manager, other agencies and the market. For further detail see the FTR Allocation Plan and the FTR Policies.

Figure 1 – FTR process overview



3 FTR market design

3.1 INITIAL FTR PRODUCTS

The initial FTR products are the minimum requirements contained in schedule 13.5 of the Code. These are:

- FTRs must be created and allocated by auction.
- At a minimum, the FTRs allocated under the FTR allocation plan must be FTRs between a hub in the South Island and a hub in the North Island, and that would provide a reasonable match with the trading points for New Zealand electricity futures or the equivalent electricity forwards products, and which would enable the volumes of FTRs available to reflect inter-island grid capacity.
- The FTR Manager must offer option FTRs and obligation FTRs.
- The FTRs offered must include FTRs for which the FTR period is 1 month.

The Authority has, in appointing the FTR Manager, included a number of requirements as the 'FTR Manager Functional Specification' in schedule 3 to the FTR Manager Service Provider Agreement.

Accordingly, two types of FTR products are offered by the FTR Manager through FTR Auctions:

- An obligation FTR which is a right to be paid, or an obligation to pay, the sum of differences in final prices (\$/MW of FTR volume per hour) over the period of a calendar month between specified Hubs in accordance with the **obligation FTR preliminary and final payment formulae**.
- An option FTR which is a right to be paid the sum of positive differences in half hourly final prices (\$/MW of FTR volume per hour) over the period of a calendar month between specified Hubs in accordance with the **option FTR preliminary and final payment formulae**.

The obligation and option FTR **preliminary and final payment formulae** are detailed in the FTR Allocation Plan.

As a hedge mechanism, FTRs have the same characteristics as the financial instruments used in many commodities or financial markets. They offer a way for traders to protect against relative price volatility. In the case of FTRs the market is based on the volatility of price differences between selected hubs.

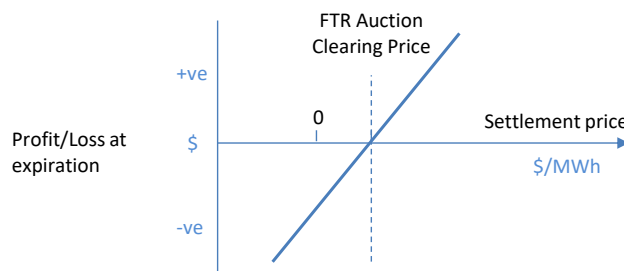
The auction of FTRs is analogous to raising equity through share offerings or issuing debt such as Government bonds. In the case of FTRs, determination of what is to be issued requires an understanding of the transmission grid and the resulting pool of loss and constraint rentals. That is a process similar to determining how much capital or debt is required with input from power systems experts.

These FTR instruments will be a significant addition to participants' ability to manage locational price risk, but they also carry a significant cash value. They effectively provide an allocation methodology for assigned loss and constraint rentals. As a result, the FTR market is expected to generate a lot of interest from market participants with a great deal of interest in future development at both at high and detailed levels.

3.2 FTR PAYOFF PROFILES

Obligation FTRs behave like other financial instruments such as CFDs, swaps or futures contracts where the receipts/payments at settlement are based on the actual price less the strike price or, in the case of the FTR market, the FTR Auction Clearing Price (clearing price). The payoff profile for FTR obligations is shown in the figure below.

Figure 2 – FTR Obligation payoff profile



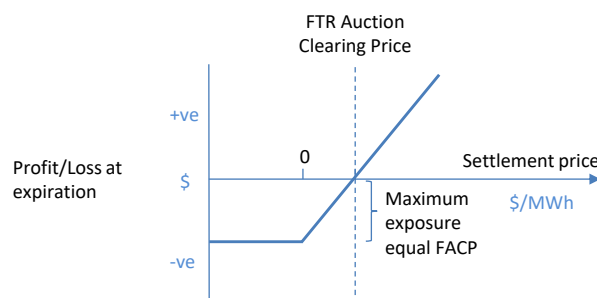
Option FTRs differ from the workings of an option in the financial markets. With a financial option the buyer pays an option premium for the right to buy or sell a specific financial instrument at a specific price (called the strike price), during a pre-set period of time. An option to buy the underlying instrument is known as a *call* and an option to sell is called a *put*. The one-off premium for the option is usually a fraction of the cost of buying the underlying instrument i.e. the strike price and the premium are different prices.

The buyer of an FTR option is liable for the whole amount of the FTR clearing price (i.e. the strike price and the premium) multiplied by the volume of FTRs held. For every trading period where the FTR value is positive the holder receives/pays the FTR settlement price (the Average of Relevant price differences as per the Financial Flow Model shown in Figure 16) less the FTR clearing price with the FTR settlement price limited to zero, so the maximum exposure for any half hour is limited to the FTR clearing price times the FTR volume.

FTR options therefore also differ from financial options in that they are intimately linked with the physical market through their reliance on loss and constraint rentals for funding.

The payoff profile for FTR options is shown in the figure below.

Figure 3 – FTR Option payoff profile



3.3 REQUIREMENTS FOR FTR AUCTION DESIGN

The initial market design is based on the provisions of the Code as described above. The requirements for FTR auction design are stated in clause 3 of Schedule 13.5 as follows:

1. *The number and nature of the FTRs allocated under the FTR allocation plan and available for auction must be:*
 - a. *supported by a reasonable estimate of the capacity of the grid for the relevant period; and*
 - b. *set so as to achieve a reasonable balance between the following:*
 - i. *ensuring that there is revenue available that is sufficient to settle the FTRs;*
 - ii. *ensuring that sufficient FTRs are available so that participants who wish to purchase FTRs are able to obtain them.*
2. *The FTR auction must be designed to:*
 - a. *maximise the value of trade in the auction as determined by the bids made in the auction;*
 - b. *maximise competition in the auction; and*
 - c. *minimise costs of participation in the auction.*
3. *The FTR allocation plan must include FTR auction rules.*
4. *The initial FTR allocation plan must specify a plan that seeks to:*
 - a. *ensure that, no later than 1 year after the first FTR auction, FTRs are available in each FTR auction relating to an initial month and to at least each of the 11 months following the initial month; and*
 - b. *ensure that the availability of FTRs is progressively increased so that, no later than 3 years after the first FTR auction, FTRs are available in each FTR auction relating to an initial month and to at least the 23 months following the initial month.*

The Authority's statutory objective¹ is:

To promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.

The initial market design and auction structure reflects the requirements of the Code and the Authority's statutory objective. In particular the methodology for determining the FTR capacity to be made available and the optimiser are both critical components of the market design. The approach to grid determination will form one of the FTR Policies: Determining the FTR Grid. The way the market is optimised is shown in the following section.

An integral part of auction design is the approach taken month by month with respect to revenue adequacy. Revenue adequacy refers to a situation where the pool of funds available for distribution is greater than the payments required at settlement. The converse is revenue inadequacy. The market design has to address what happens when there is a residual (revenue adequacy) or a shortfall (revenue inadequacy).

Payments for FTRs from FTR Market participants, and payments to FTR holders at settlement come and go from an FTR account administered by the Clearing Manager.

The amount in the FTR account for each FTR period is made up of:

¹ Section 15 Electricity Industry Act 2010.

- the FTR rentals amount;
- the FTR acquisition costs, summed across all FTRs for the FTR period; and
- any net side payments to and by the Clearing Manager resulting from FTR assignments.

The FTR account is then used to fund payments to FTR holders. If there is not enough in the FTR account to do this, then there is revenue inadequacy, and payments to FTR holders are scaled back as required.

The figure below illustrates the cash flows to and from the FTR account.

Figure 4 – Loss and constraint (L&C) rental flows and FTR market flows²

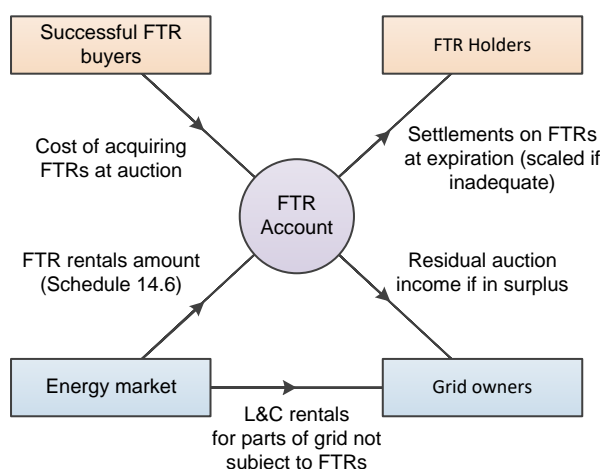


Figure 4 illustrates the treatment of loss and constraint rentals when FTRs began trading and the impact of revenue adequacy or inadequacy on FTR settlements:

- a proportion of loss and constraint rentals are taken from the pool for the purpose of the FTR market. This FTR rentals amount is calculated by the FTR Manager as described in Schedule 14.3, based on the loss and constraint rental associated with the path between the active FTR hubs;
- the pool for distribution includes the allocated loss and constraint rentals and auction income along with the FTR Acquisition Costs and side payments relating to assignments;
- if the pool of monies available for distribution to FTR holders is greater than the sum allocated for settlement the remainder goes back into the loss and constraint pool for distribution to Grid Owners as provided for in the Code for the same month they were collected; and
- if the pool of funds available for distribution is too small for the required settlement amounts the pay-outs are scaled and paid out by the Clearing Manager as discussed above.

Thus, the surplus proceeds from the purchase of FTRs are shown as flowing back to the Grid Owners replacing the equivalent loss and constraint rental income.

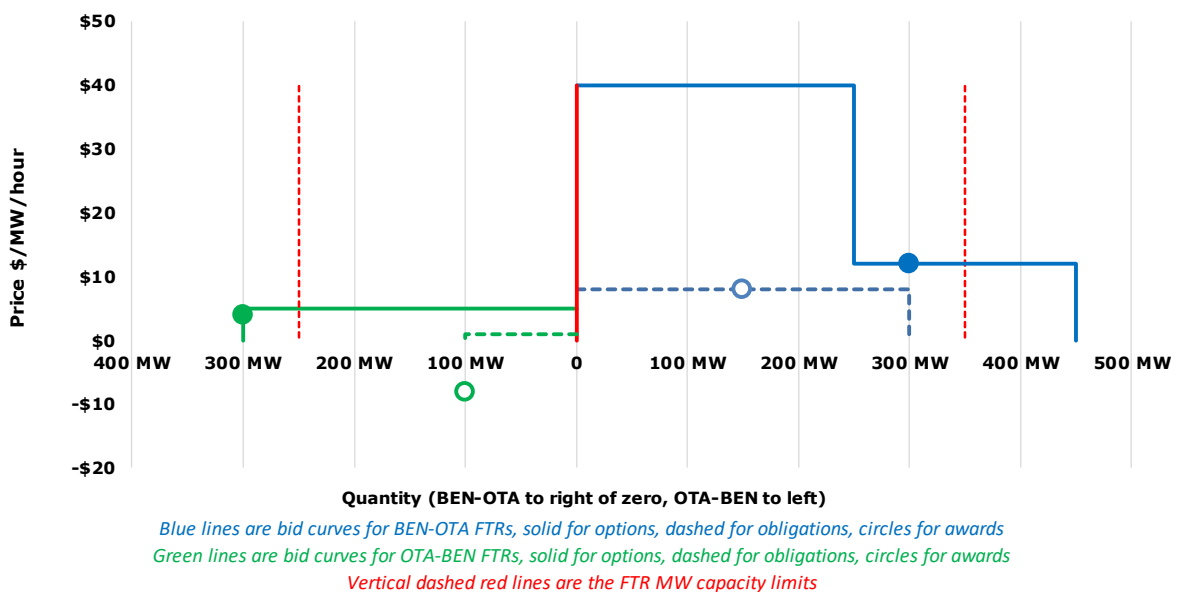
² Note: this does not reflect flows associated with assignment.

3.4 OPTIMISING THE ALLOCATION OF FTRs FOR A TWO HUB TWO PRODUCT AUCTION

The diagram below is an illustration of an optimised solution from a two-hub FTR auction. It shows the bid curves for the four FTR products, the volumes of awards and the price of each FTR type. The direction of available FTRs is shown as opposing or complementary quantities along the x axis. Optimisation of the total quantities on offer takes into account the demand for obligations and options on opposing directions and the overriding revenue adequacy objective as discussed above.

The figure below is an illustration of the possible awarded volumes and auction clearing prices combinations for the four initial FTR products that have to be optimised for awarding in auctions each FTR month.

Figure 5 – Illustration of optimised solution for four initial FTR products



FTR auction optimisers, such as that in i-HEDGE, have an underlying full nodal representation of the grid, in the same manner as New Zealand’s SPD scheduling, pricing and dispatch software. This model approximates that through a simple FTR product representation for a two-node case.

In this representation, there are four products, representing options (OP) and obligations (OB) Ben – OTA “northwards” (AB) and OTA – BEN “southwards” (BA): OPAB, OPBA, OBAB and OBBA. Awards for these products must obey the following two constraints relating to the available capacity (C) northwards and southwards:

$$\begin{array}{ll}
 \text{OPAB} + (\text{OBAB} - \text{OBBA}) \leq \text{CAB} & \text{BEN - OTA constraint "northwards"} \\
 \text{OPBA} + (\text{OBBA} - \text{OBAB}) \leq \text{CBA} & \text{OTA - BEN constraint "southwards"}
 \end{array}$$

The vertical dashed red lines represent the FTR grid capacity limits southwards (CBA) and northwards (CAB), and the stepped lines represent bid curves for the four FTR products.

Awarded quantities must be positive, and the auction optimiser finds the combination of awards that will simultaneously maximise the value of all awards, with value measured relative to the price bid, in the same manner as SPD does for the energy market. In the example, the MW awards and prices for each FTR Product are shown by the circles, with the optimal solution being:

- BEN - OTA options OPAB: Award 300 (below bid limit and the 350MW CAB)

- BEN - OTA obligations OBAB: Award 150 (below bid limit and 350MW CAB)
- OTA – BEN options OPBA: Award 300 (bid limit, above the 250MW CBA)
- OTA – BEN obligations OBBA: Award 100 (bid limit, below the 250MW CBA)

Considering first the obligations, the award of 100MW OBBA allows an additional combined volume of 100MW OPAB and OBAB to be cleared to reach the net 350MW CAB limit (satisfying $OPAB + (OBAB - OBBA) \leq CAB$), and the award of 150MW OBAB, offset by the opposite flow of 100MW OBBA, in turn allows additional an volume of 50MW OPBA to be cleared (satisfying $OPBA + (OBBA - OBAB) \leq CBA$).

While the bid prices are highest for OPAB, awards of OPAB are ‘pulled back’ 50MW from the available northwards capacity of $CAB = 350MW$ to allow an additional 50MW of OBAB (beyond that which balances off OBBA), which in turn allows an extra 50MW of OPBA to be awarded. This increases value, as the sum of the OBAB and OPBA bid prices exceeds the OPAB bid price. That is, each 1MW OBAB represents a bid value of \$12, and the alternative of clearing 1MW each of OPAB and OBBA represents a total bid value of \$13, so the optimiser reaches its optimal point by pulling back OBAB to allow additional clearance of the other two products.

The auction optimiser does not calculate sequentially in this manner, which is just a way of explaining the results. Rather, the auction does a ‘single hit’ optimisation. Conceptually, the auction evaluates every possible combination of awards, and selects that with the highest value as bid of awarded FTRs.

Auction clearing prices (P) are then calculated which observe their own rules:

$$P_{OBAB} = P_{OPAB} - P_{OPBA}$$

$$P_{OBBA} = P_{OPBA} - P_{OPAB}$$

$$P_{OBAB} = - P_{OBBA}$$

In this case: $P_{OBAB} = \$8$, $P_{OPAB} = \$12$, $P_{OPBA} = \$4$, $P_{OBBA} = -\$8$. It is these relationships between the auction clearing prices of the products that determine the \$4 price of the southwards options (OPBA), indicated by the green circle in the figure. The other prices are determined directly by the cleared bid price.

Note: This is a two-node approximation of the underlying calculations used by i-HEDGE’s full nodal auction optimiser.

3.5 AUCTION APPROACH

The FTR auctions will be single-stage, sealed bid uniform price auctions. All bidders are to submit their bids for simultaneous assessment allowing optimisation of the allocation of FTRs amongst all the products currently on offer. All bidders for each separate product will pay the FTR Auction Clearing Price (based on the lowest cleared bid) required to fill the allocation of FTRs across all four FTR Products for that FTR Period.

Accepting that there are many forms of auction, economic literature suggests the sealed bid auction provides a superior outcome in terms of productive efficiency and consumer welfare compared to

an ascending auction³ for example. It is also the form of auction that market participants are already familiar with, as the energy market is in effect run on the basis of a sealed bid uniform price auction for dispatch rights, and is the norm for operational FTR markets worldwide. Furthermore, in year two of the market FTR Participants (and the FTR Manager) will be managing a cycle of nine FTR periods per month, so the workload of single rather than multi-stage auctions is likely to be preferred.

The FTR Allocation Plan provides for two sealed bid auctions per month. One is a “Primary” Auction where previously unlisted FTR periods (and some recently listed FTR periods) are auctioned and the other is a “Variation” Auction where additional FTRs for any of the previously listed FTR periods might be added. Variation Auctions are also Reconfiguration Auctions, where Participants can place SELL bids by offering Capacity (expressed against held FTRs for the same FTR Period as the Auction) at a reserve price. The reserve price is expressed as a tranching bid curve.

The distribution of capacity through the life of the FTRs is based on the release of one-ninth of the nominal FTR grid capacity across each of nine auctions as follows:

- FTRs will be offered in auctions in a way that aligns with the relevant NZ Electricity futures contract quarter⁴. Traders will, therefore, be able to bid for FTRs to match NZ electricity futures positions or alternatively match NZ electricity futures positions to FTR acquisitions
- a ‘block’ of 3 individual months to match the relevant futures quarter will be made available in the primary auction 24 months prior to the start of the first month in the ‘block’.
- further capacity will be made available in variation auctions to be held 12 and 6 months prior to the start of the first month in the ‘block’
- further capacity for each individual month will be made available 3, 2 and 1 month prior to the start of the month.
- note: FTR capacity will be awarded and optimised on a month by month basis not a ‘block’ basis
- The volumes will vary based on the refreshed estimation of final FTR capacity and the capacity release factor applying in the auction month

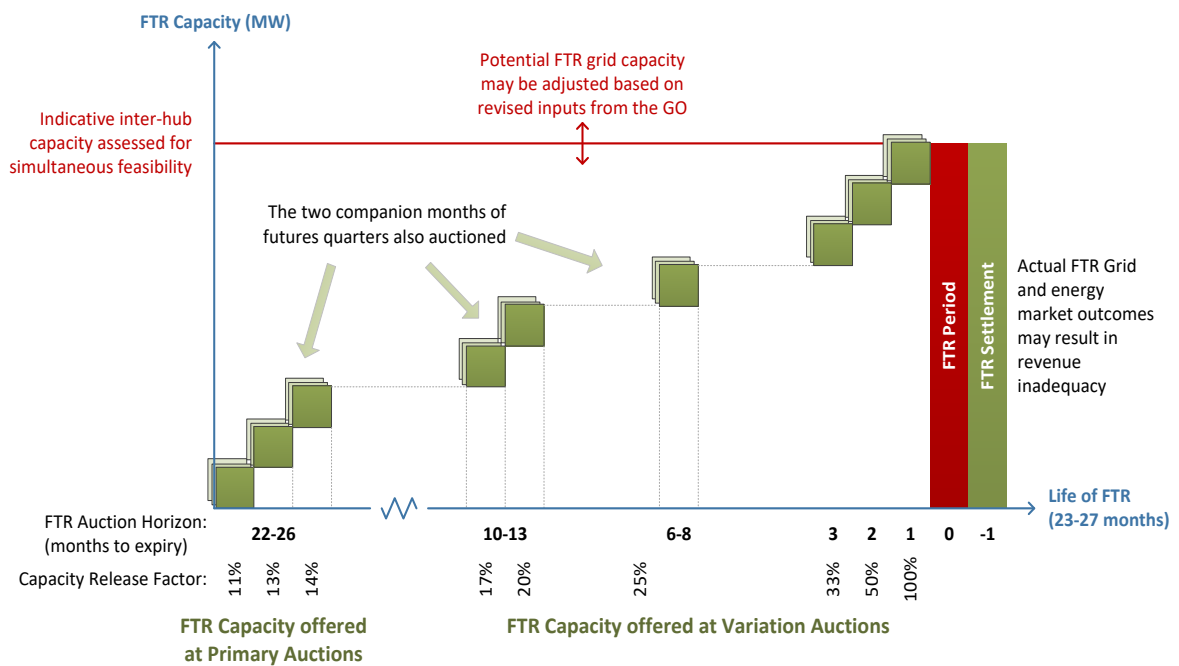
The Capacity Release Factors are shown on Figure 6 below, which illustrates how the FTR capacity would be fed into the market, across the 3 months of each ‘block’. The use of Capacity Release Factors accounts for the possibility that the FTR Grid capacity for an FTR period may change between the first auction and the last. The Capacity Release Factors are expressed as a proportion of the remaining FTR capacity – as judged at the time of each auction – that will be released at the imminent auction. In the later auctions this could prove to be as low as zero capacity if conditions change and it is determined that there is sufficient capacity already auctioned.

The figure illustrates the pattern of FTRs released at Primary Auction and subsequent additions until the full assessed FTR capacity is reached.

³ For example, Klemperer (*Applying Auction Theory to Economics* 1999) considered modern auction design taking into account symmetry of information, the application of the internet and examples such as auctions for radio spectrum. He concludes the sealed bid auction is more productively efficient providing greater incentive for aggressive bidding; ascending auctions are more susceptible to collusion; and competition-policy practitioners usually prefer sealed-bid auctions because sealed-bid auctions typically yield lower consumer prices and most competition regimes concentrate on consumer welfare.

⁴ New Zealand Electricity futures contracts listed on the ASX See; http://www.asx.com.au/products/nz-electricity-contract-specifications.htm#otahuhu_electricity_futures

Figure 6 – Illustration of the progressive release of FTR capacity for an individual FTR month through to expiration and settlement



The configuration of Primary Auction, Variation Auction and the approach to Capacity Release Factors are intended to provide efficient price discovery and the greatest level of transparency for prices through the life of each contract.

3.6 FTR CALENDAR

The NZ FTR market went live on 1 June 2013 auctioning 300.2 MW for the July 2013 FTR period.

The pattern of release is designed to assist liquidity, price discovery and determination of prudential.

As discussed earlier it is also aligned with the NZ Electricity Futures contracts traded on ASX. To illustrate this in the table the timing of release of the March 2023 FTR is highlighted, as are the accompanying months that are also covered in the relevant futures contract.

Figure 7 –FTR auction horizons

| | Auction Month | | Primary Auction Periods | | | | | | Variation Auction Periods | | | | | |
|--------------|---------------|--------|-------------------------|--------|--------|--------|--------|--------|---------------------------|--------|--------|--------|--------|--------|
| | | | | | | | | | | | | | | |
| Steady State | 88 | Sep-20 | Jul-22 | Aug-22 | Sep-22 | Dec-21 | Nov-21 | Oct-21 | Jun-21 | May-21 | Apr-21 | Dec-20 | Nov-20 | Oct-20 |
| | 89 | Oct-20 | Oct-22 | Nov-22 | Dec-22 | Jan-22 | Dec-21 | Nov-21 | Jul-21 | Jun-21 | May-21 | Jan-21 | Dec-20 | Nov-20 |
| | 90 | Nov-20 | Oct-22 | Nov-22 | Dec-22 | Feb-22 | Jan-22 | Dec-21 | Aug-21 | Jul-21 | Jun-21 | Feb-21 | Jan-21 | Dec-20 |
| | 91 | Dec-20 | Oct-22 | Nov-22 | Dec-22 | Mar-22 | Feb-22 | Jan-22 | Sep-21 | Aug-21 | Jul-21 | Mar-21 | Feb-21 | Jan-21 |
| | 92 | Jan-21 | Jan-23 | Feb-23 | Mar-23 | Apr-22 | Mar-22 | Feb-22 | Oct-21 | Sep-21 | Aug-21 | Apr-21 | Mar-21 | Feb-21 |
| | 93 | Feb-21 | Jan-23 | Feb-23 | Mar-23 | May-22 | Apr-22 | Mar-22 | Nov-21 | Oct-21 | Sep-21 | May-21 | Apr-21 | Mar-21 |
| | 94 | Mar-21 | Jan-23 | Feb-23 | Mar-23 | Jun-22 | May-22 | Apr-22 | Dec-21 | Nov-21 | Oct-21 | Jun-21 | May-21 | Apr-21 |
| | 95 | Apr-21 | Apr-23 | May-23 | Jun-23 | Jul-22 | Jun-22 | May-22 | Jan-22 | Dec-21 | Nov-21 | Jul-21 | Jun-21 | May-21 |
| | 96 | May-21 | Apr-23 | May-23 | Jun-23 | Aug-22 | Jul-22 | Jun-22 | Feb-22 | Jan-22 | Dec-21 | Aug-21 | Jul-21 | Jun-21 |
| | 97 | Jun-21 | Apr-23 | May-23 | Jun-23 | Sep-22 | Aug-22 | Jul-22 | Mar-22 | Feb-22 | Jan-22 | Sep-21 | Aug-21 | Jul-21 |
| | 98 | Jul-21 | Jul-23 | Aug-23 | Sep-23 | Oct-22 | Sep-22 | Aug-22 | Apr-22 | Mar-22 | Feb-22 | Oct-21 | Sep-21 | Aug-21 |
| | 99 | Aug-21 | Jul-23 | Aug-23 | Sep-23 | Nov-22 | Oct-22 | Sep-22 | May-22 | Apr-22 | Mar-22 | Nov-21 | Oct-21 | Sep-21 |
| | 100 | Sep-21 | Jul-23 | Aug-23 | Sep-23 | Dec-22 | Nov-22 | Oct-22 | Jun-22 | May-22 | Apr-22 | Dec-21 | Nov-21 | Oct-21 |
| | 101 | Oct-21 | Oct-23 | Nov-23 | Dec-23 | Jan-23 | Dec-22 | Nov-22 | Jul-22 | Jun-22 | May-22 | Jan-22 | Dec-21 | Nov-21 |
| | 102 | Nov-21 | Oct-23 | Nov-23 | Dec-23 | Feb-23 | Jan-23 | Dec-22 | Aug-22 | Jul-22 | Jun-22 | Feb-22 | Jan-22 | Dec-21 |
| | 103 | Dec-21 | Oct-23 | Nov-23 | Dec-23 | Mar-23 | Feb-23 | Jan-23 | Sep-22 | Aug-22 | Jul-22 | Mar-22 | Feb-22 | Jan-22 |
| | 104 | Jan-22 | Jan-24 | Feb-24 | Mar-24 | Apr-23 | Mar-23 | Feb-23 | Oct-22 | Sep-22 | Aug-22 | Apr-22 | Mar-22 | Feb-22 |
| | 105 | Feb-22 | Jan-24 | Feb-24 | Mar-24 | May-23 | Apr-23 | Mar-23 | Nov-22 | Oct-22 | Sep-22 | May-22 | Apr-22 | Mar-22 |
| | 106 | Mar-22 | Jan-24 | Feb-24 | Mar-24 | Jun-23 | May-23 | Apr-23 | Dec-22 | Nov-22 | Oct-22 | Jun-22 | May-22 | Apr-22 |
| 107 | Apr-22 | Apr-24 | May-24 | Jun-24 | Jul-23 | Jun-23 | May-23 | Jan-23 | Dec-22 | Nov-22 | Jul-22 | Jun-22 | May-22 | |
| 108 | May-22 | Apr-24 | May-24 | Jun-24 | Aug-23 | Jul-23 | Jun-23 | Feb-23 | Jan-23 | Dec-22 | Aug-22 | Jul-22 | Jun-22 | |
| 109 | Jun-22 | Apr-24 | May-24 | Jun-24 | Sep-23 | Aug-23 | Jul-23 | Mar-23 | Feb-23 | Jan-23 | Sep-22 | Aug-22 | Jul-22 | |
| 110 | Jul-22 | Jul-24 | Aug-24 | Sep-24 | Oct-23 | Sep-23 | Aug-23 | Apr-23 | Mar-23 | Feb-23 | Oct-22 | Sep-22 | Aug-22 | |
| 111 | Aug-22 | Jul-24 | Aug-24 | Sep-24 | Nov-23 | Oct-23 | Sep-23 | May-23 | Apr-23 | Mar-23 | Nov-22 | Oct-22 | Sep-22 | |
| 112 | Sep-22 | Jul-24 | Aug-24 | Sep-24 | Dec-23 | Nov-23 | Oct-23 | Jun-23 | May-23 | Apr-23 | Dec-22 | Nov-22 | Oct-22 | |
| 113 | Oct-22 | Oct-24 | Nov-24 | Dec-24 | Jan-24 | Dec-23 | Nov-23 | Jul-23 | Jun-23 | May-23 | Jan-23 | Dec-22 | Nov-22 | |
| 114 | Nov-22 | Oct-24 | Nov-24 | Dec-24 | Feb-24 | Jan-24 | Dec-23 | Aug-23 | Jul-23 | Jun-23 | Feb-23 | Jan-23 | Dec-22 | |
| 115 | Dec-22 | Oct-24 | Nov-24 | Dec-24 | Mar-24 | Feb-24 | Jan-24 | Sep-23 | Aug-23 | Jul-23 | Mar-23 | Feb-23 | Jan-23 | |
| 116 | Jan-23 | Jan-25 | Feb-25 | Mar-25 | Apr-24 | Mar-24 | Feb-24 | Oct-23 | Sep-23 | Aug-23 | Apr-23 | Mar-23 | Feb-23 | |
| 117 | Feb-23 | Jan-25 | Feb-25 | Mar-25 | May-24 | Apr-24 | Mar-24 | Nov-23 | Oct-23 | Sep-23 | May-23 | Apr-23 | Mar-23 | |
| 118 | Mar-23 | Jan-25 | Feb-25 | Mar-25 | Jun-24 | May-24 | Apr-24 | Dec-23 | Nov-23 | Oct-23 | Jun-23 | May-23 | Apr-23 | |
| 119 | Apr-23 | Apr-25 | May-25 | Jun-25 | Jul-24 | Jun-24 | May-24 | Jan-24 | Dec-23 | Nov-23 | Jul-23 | Jun-23 | May-23 | |

3.7 ASSIGNMENT AND A SECONDARY MARKET

The Assignment of FTRs is a trade between FTR market participants on a bilateral basis. No formal or structured secondary market is provided for at the commencement of the FTR market, but FTR market participants are free to identify themselves in any way they wish and to enter into secondary market trades.

A secondary market is one where previously issued FTRs are traded by market participants. In that sense, the provisions in the Code for assignment allow bilateral secondary trading to take place from day one as long as the parties to an assignment (trade) are registered FTR market participants, and met the prudential requirements at the time. Arrangements for prudential security and transfer of ownership are provided for from inception.

In FTR markets, a further option for secondary trading is a so-called reconfiguration auction, in which not only can parties bid for FTRs, but FTR holders can offer their FTRs for sale at auction. Reconfiguration auctions allow not only for FTR products to change hands, but even for new FTR products to be created, e.g. an obligation sold to create more options. (In multi-hub FTR markets, an FTR for one hub pair can be sold to create more FTRs between a different hub pair)

The FTR Manager is pursuing reconfiguration auctions in the Allocation Plan 2014.

4 Monthly auction operation

4.1 INFORMATION FOR FTR MARKET PARTICIPANTS

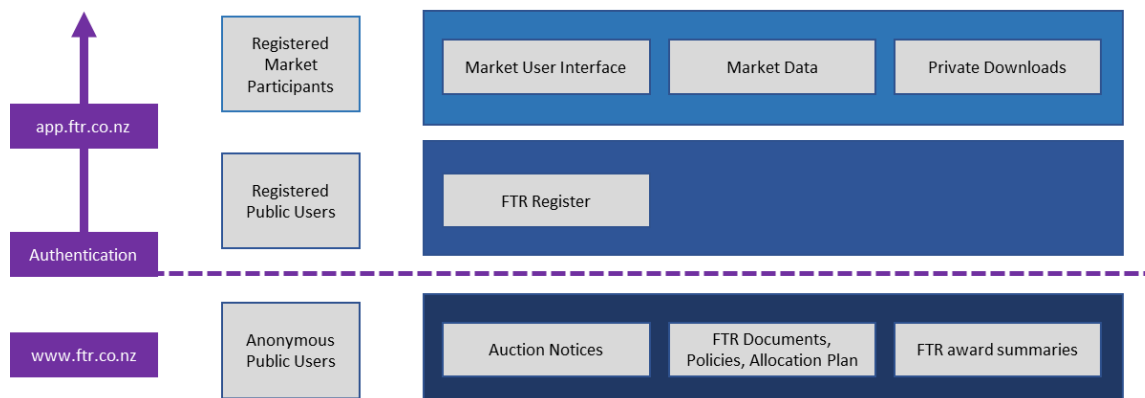
The FTR Manager provides a transparent FTR market that fully meets Code requirements for public disclosure of the FTR registry information, as well as reporting to the Authority.

Information will be made available to FTR market participants, the Clearing Manager, the Authority and the wider public as provided for in the final FTR Allocation Plan, and as agreed with the Authority.

The FTR Information System (FIS) will be accessed through the website www.ftr.co.nz which will be maintained by the FTR Manager. There will be three levels of access:

1. General public (Anonymous Public Users): formal documents such as the current FTR Allocation Plan, FTR Policies and regular market reports. Other information including models prepared for instructional purposes, general information on the New Zealand FTR market and reference material will be available.
2. Public user site (Registered Public User): this level will provide access to the FTR register for interested parties who agree to the terms and conditions.
3. Registered FTR participant user: fully registered FTR participants will have secure access the market user interface (MUI) through the website.

Figure 8 – Schematic of the FTR Information System



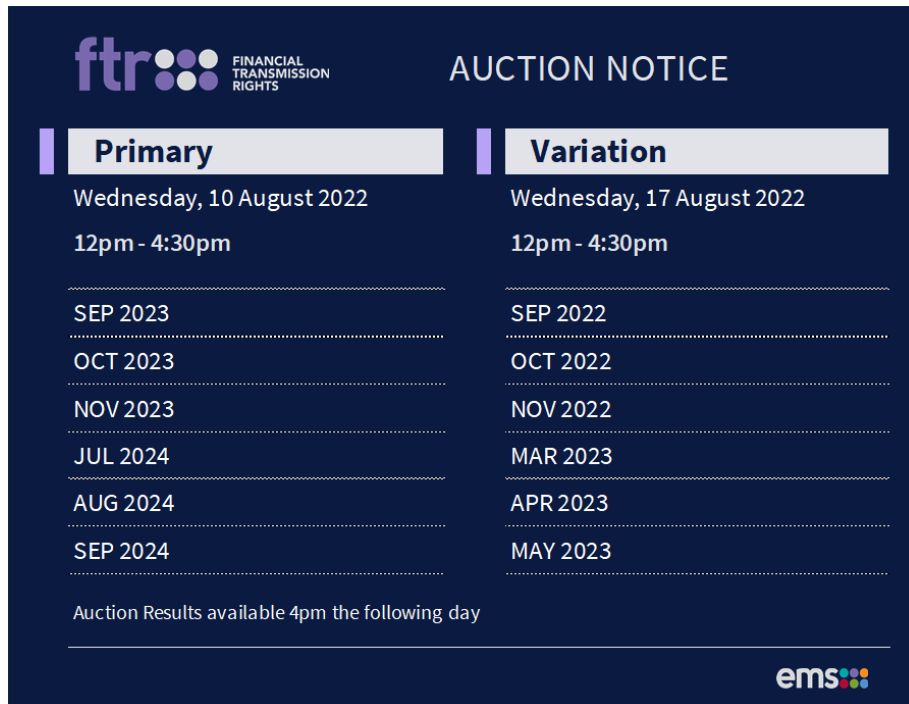
Separate from the FIS the market operator’s information system WITS will report FTR market information such as FTR prices and revenue adequacy.

4.2 AUCTION NOTICES AND FTR GRID INFORMATION

Each month the FTR Manager will make information available to market participants on the FTR grid related to each auction as follows:

- The auction notice, [below] issued 12 business days before the Primary Auction will include all the information on the upcoming Primary and Variation Auctions in advance of receiving the grid information from the Grid Owner, including:
 - Auction identifier
 - the FTR Periods for which FTRs will be offered
 - the time and date when the FTR Grid will be available for FTR Participants to view in the FIS
 - the Bid Window when bids will be accepted
 - the time when the auction results are expected to be published


In addition to advising FTR Participants of the details of the forthcoming auctions, this first auction notice serves as notification to the Clearing Manager of the FTR Periods that will require assessment for prudential calculations.



ftr FINANCIAL TRANSMISSION RIGHTS

AUCTION NOTICE

| Primary | Variation |
|---|---------------------------|
| Wednesday, 10 August 2022 | Wednesday, 17 August 2022 |
| 12pm - 4:30pm | 12pm - 4:30pm |
| SEP 2023 | SEP 2022 |
| OCT 2023 | OCT 2022 |
| NOV 2023 | NOV 2022 |
| JUL 2024 | MAR 2023 |
| AUG 2024 | APR 2023 |
| SEP 2024 | MAY 2023 |
| Auction Results available 4pm the following day | |



Auction Notice

- The actual information on the FTR grid(s) for all FTR months to be auctioned will be made available ten business days before the Primary Auction.

In addition, the grid owner will provide the network model & associated files 12 business days prior to the Primary Auction.

These Notice releases provide all the information that FTR Participants need to prepare their bids, with the exception of their prudential limits and the FTR liabilities to be applied. The prudential and FTR liability information releases are dealt with in the section below on monthly patterns of information.

4.3 THE CYCLE OF NOTIFICATIONS, FTR AUCTIONS AND PRUDENTIAL CHECKS

Based on the approaches discussed above, the monthly pattern of auctions, auction information and outputs is as shown below.

Figure 9 – Monthly schedule of notifications, FTR auctions and prudential checks

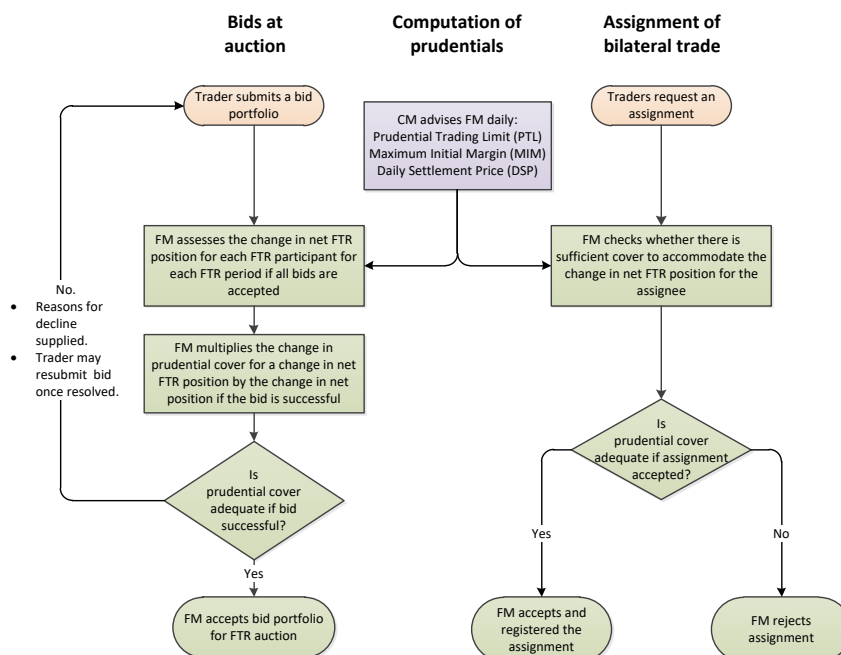
| Business days (BD) | FTR Auction information | Assignment & Prudentials |
|---|---|---|
| 12 BD before PA | Auction notice number 1: auction details, and Grid owner provides network model & associated files. | Able to assign FTRs continuously except during the auction CM advises prudential limits for each participant and prudential liability per FTR daily at 11:00 |
| 10 BD before PA | FTR Grid information available on FIS. <i>Monthly report to the Authority.</i> | |
| | <i>FTR rentals amount for previous month to CM.</i> | |
| PA on Wednesday >6 BD into the calendar month | PRIMARY AUCTION (PA) Bid window 12:00 – 16:30. PA results 16:00 on day following auction. | |
| VA held the Wednesday following PA | VARIATION AUCTION (VA) Bid window 12:00 – 16:30. VA results 16:00 on day following auction. | |
| | <i>CM settles previous month on 20th of calendar month.</i> | |
| 12 BD before PA | Auction notice number 1: auction details, and Grid owner provides network model & associated files. | |
| 10 BD before PA | FTR Grid information available on FIS. <i>Monthly report to the Authority.</i> | |
| | | |
| | | |

4.4 MEETING PRUDENTIAL REQUIREMENTS

An integral part of the FTR market is the process of checking prudential requirements before trades occur. In the case of the purchase of newly issued FTRs through auction, the FTR Manager has to confirm that bids (with regard to their potential liabilities of FTR auction prices and the liabilities inherent in awarded FTRs) are within each FTR market participant’s prudential limits before the bids can be accepted. Assignment of bilateral trades can only be accepted if the FTR Manager obtains confirmation from the Clearing Manager that the assignee meets the prudential requirements that result following a successful assignment. The Code only mentions the assignee in respect to assignment, but it follows that the Clearing Manager will take into account the impact of the assignor’s position after the assignment in the normal course of events.

The flow charts below show the two processes for assessing whether an FTR trader has sufficient prudential cover for either bids or assignment.

Figure 10 – Flow Chart of Assessing Prudential Cover at Auction and For Assignment



There is a clear demarcation between the responsibility for assessing prudential requirements for a given net FTR position and determining the net position that would result from a successful bid or the acceptance of a request to reassign the holder of the FTRs:

- The Clearing Manager is responsible to determine the adequacy of each FTR market participant’s prudential cover and the prudential cover required for each FTR.
- The FTR Manager is responsible for determining the net FTR volume exposure for bids or assignment and for applying the prudential parameters provided by the Clearing Manager to determine whether a bid or assignment should be accepted.

The process of synchronising the Clearing Manager and FTR Manager’s responsibilities is dealt with in the section below on monthly patterns of information.

SELL bids (in a reconfiguration auction) do not undergo a prudential check in the same way.

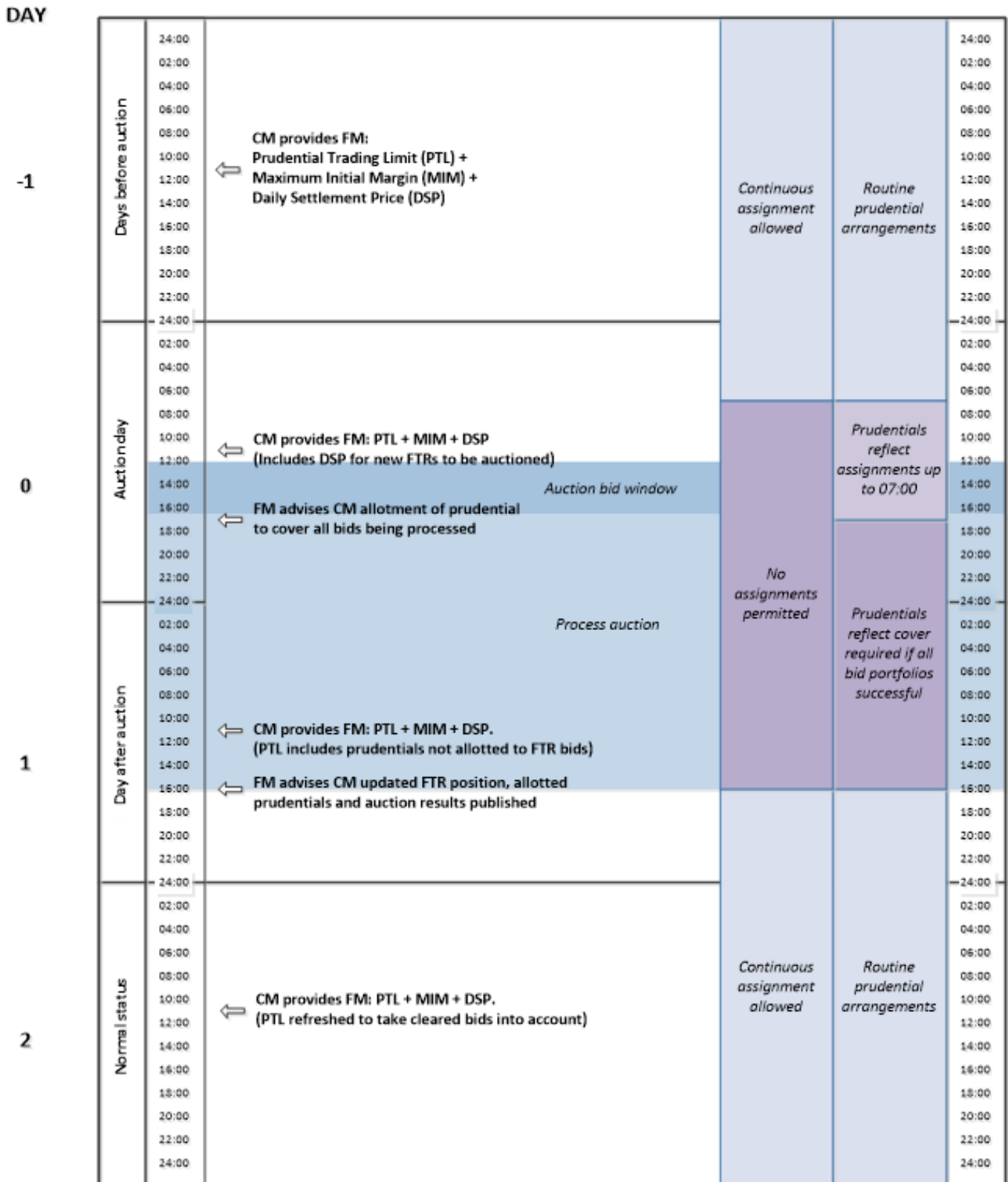
4.5 BIDDING AND CHECKING PRUDENTIAL REQUIREMENTS THROUGH THE FTR AUCTION

The diagram below shows in more detail what is proposed for the synchronisation between the FTR Manager and the Clearing Manager in respect to:

- advising FTR market participants of their prudential cover available for FTR trading;
- advising the FTR market of the assumed liability per FTR the FTR Manager will apply to assessment of FTR Market Participant’s intentions; and
- the time required for the FTR Manager to process the auction bids and ensure a balanced solution⁵.

⁵ The 23 hours allowed for the auction run time, review and analysis is a conservative estimate.

Figure 11 –Timing for auction bids, assignment and assessment of prudential requirements



5 Trading FTRs

5.1 MONTHLY FTR SETTLEMENT HISTORY

This section looks at the history of market prices at Otahuhu (OTA) and Benmore (BEN) nodes and shows what the “relevant price differences” (as per the FTR Financial Flows model in Figure 16) would have been. The relevant price differences are the average of the full difference (positive or negative) for obligation FTRs, and the average of positive-only differences for option FTRs.

Figure 12 – OTA and BEN monthly average time weighted spot prices

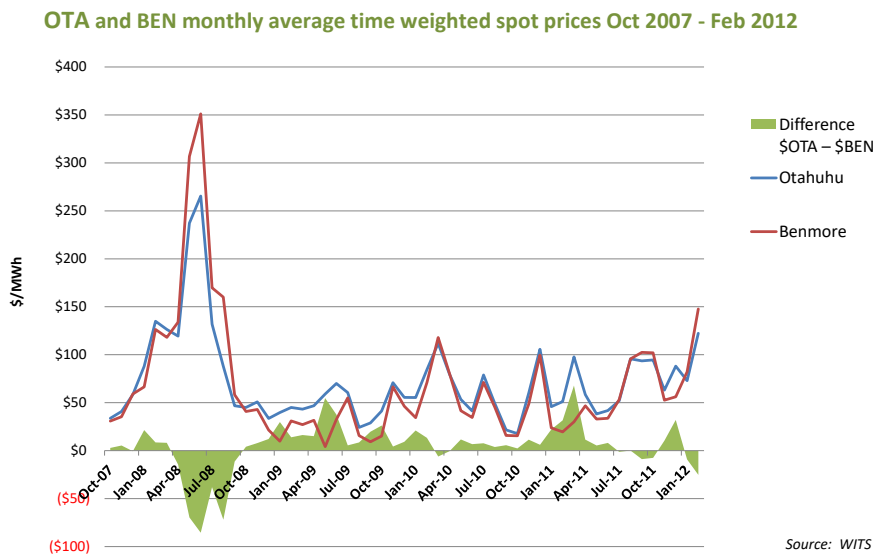
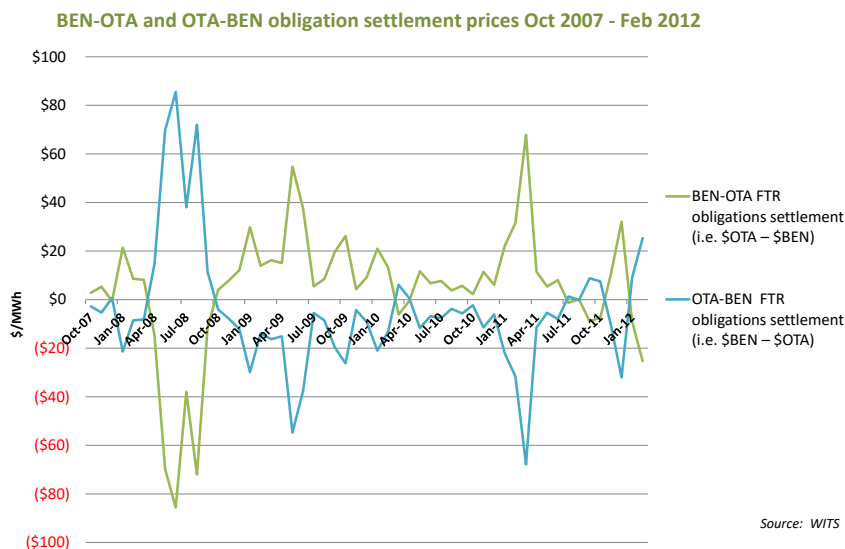


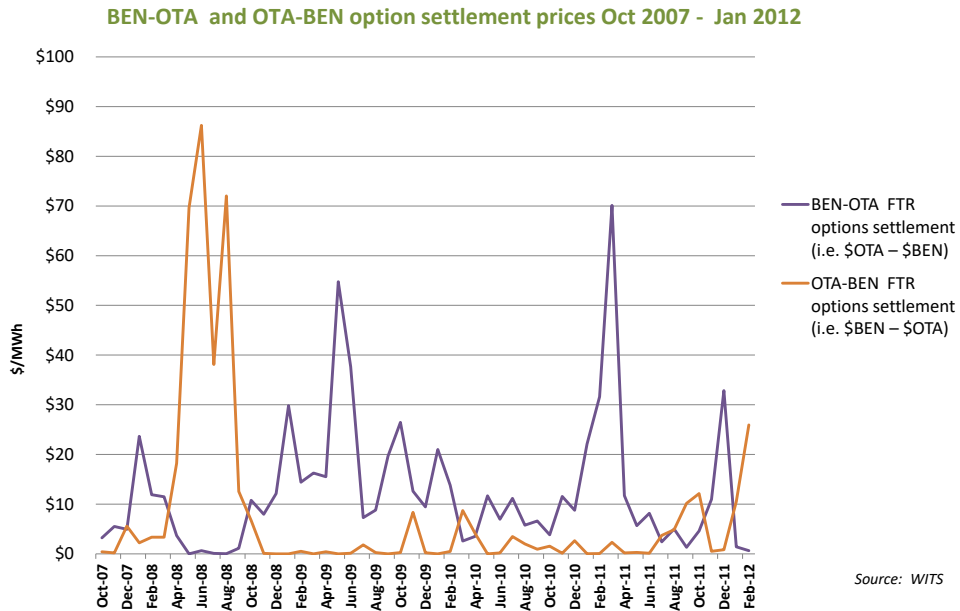
Figure 12 shows monthly averages of price differences between OTA and BEN for the period October 2007 through to February 2012. The introduction of FTRs provided for in this proposed FTR Allocation Plan has given traders an ability to manage their exposure between hubs defined at these points.

Figure 13 – BEN-OTA and OTA-BEN obligations: Average of price differences



Relevant price differences for FTR obligation for BEN-OTA are the mirror image of OTA-BEN FTR relevant price differences.

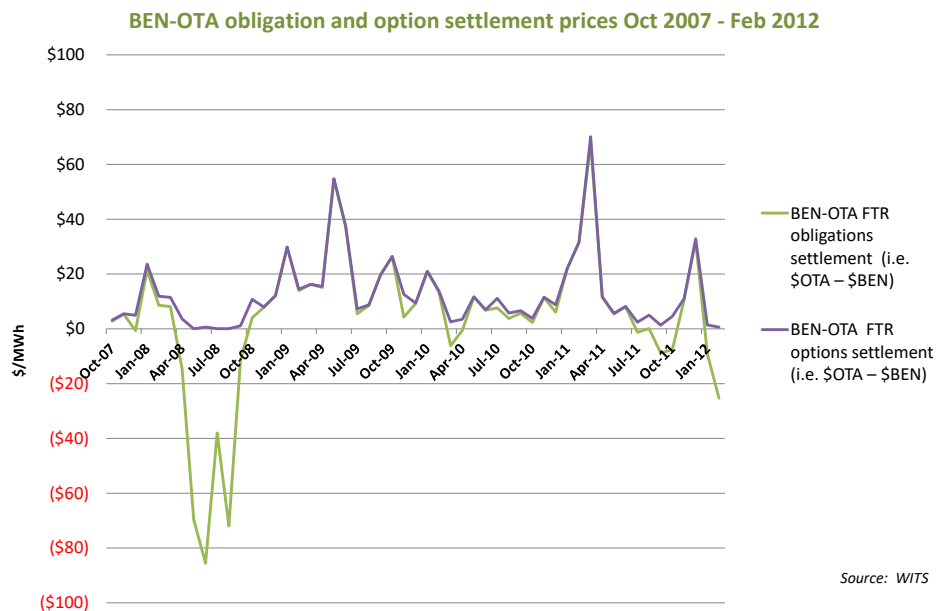
Figure 14 – BEN-OTA and OTA-BEN options: Average of relevant price differences



Source: WITS

Relevant price differences for FTR options can, of course, never be negative.

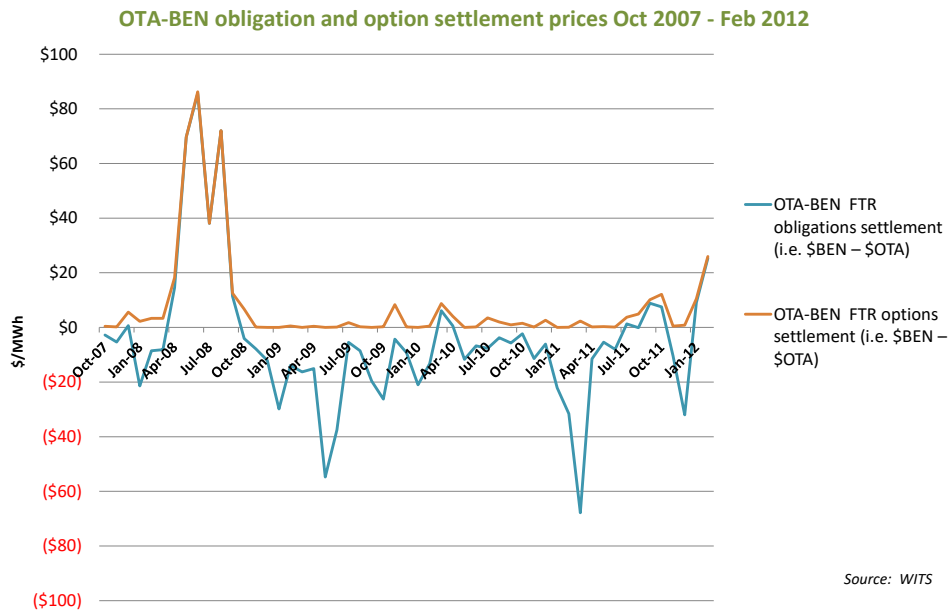
Figure 15 – BEN-OTA obligations and options: Averages of relevant price differences



Source: WITS

A plot of relevant average of price differentials for FTR option and FTR obligations for BEN-OTA FTRs shows the impact of altering half hours with a negative differential to zero.

Figure 16 – OTA-BEN obligations and options: Averages of relevant price differences



A plot of relevant average of price differentials for FTR option and FTR obligations for OTA-BEN shows the same effect as BEN-OTA flows.

5.2 TRADER PERSPECTIVE

The FTR market includes two types of FTRs - Option FTRs and Obligation FTRs. The injection hub of an FTR is referred to as the source and the off-take hub of an FTR is referred to as the sink. Registered FTR Participants will be able to bid for FTRs between any pairs of the 8 Hubs (as defined in the allocation Plan 2018)

1. Option FTR with Source Hub Benmore and Sink Hub Otahuhu (BEN – OTA)
2. Option FTR with Source Hub Otahuhu and Sink Hub Benmore (OTA – BEN)
3. Obligation FTR with Source Hub Benmore and Sink Hub Otahuhu (BEN – OTA)
4. Obligation FTR with Source Hub Otahuhu and Sink Hub Benmore (OTA – BEN).

The table below summarises the intuitive position traders might take in the FTR market. Traders will form their own strategy and may base decisions on a variety of factors not discussed here.

| Action: | Trader 1 | Trader 2 |
|-------------|--|--|
| IF | SI seller (generator) exposed to lower prices and/or NI buyer (retailer) exposed to higher prices: | SI buyer (retailer) exposed to higher prices and/or NI seller (generator) exposed to lower prices: |
| | Exposed to a wider source - sink price differential | Exposed to a narrower, even negative, differential |
| OR | FTR trader expects differential to widen | FTR trader expects differential to narrow, possibly go negative |
| THEN | Action in FTR market | Action in FTR market |
| | Buy south to north (northwards flow) FTRs | Buy –Southwards flow FTRs |
| | i.e. Buy Option or Obligation FTR with Source Hub Benmore and Sink Hub Otahuhu | i.e. Buy Option or Obligation FTR with Source Hub Otahuhu and Sink Hub Benmore. |

5.3 FTR FINANCIAL FLOWS

EMS has made available on the FTR site www.ftr.co.nz three spread sheets written in Microsoft Excel®. These tools demonstrate the mechanics of the market and have been developed for FTR traders to develop their understanding of the workings of the market. These do not replace the need for traders to develop their own models and, in particular, none of them attempt to value FTRs. The three models are:

1. FTR optimiser shows how FTR capacity is allocated to the four products given the bids received in an auction. This is shown above at section 3.5 Auction approach.
2. FTR Financial Flows demonstrates the settlement process given 6 different scenarios of holding FTRs and the FTR market outcomes
3. The third model is the FTR Trading Outcome model The FTR Trading Outcomes spread sheet gives traders the opportunity to compare expectations in the energy market and expectations in the FTR market with actual outcomes. This illustrates how the FTR market works and how it provides a hedge for energy traders. An example from it is shown below

The FTR Trading Outcomes model is prepared from the perspective that in “normal” months electrical flows are expected to run south to north. Thus OTA (NI) prices would be expected to be higher than BEN (SI) prices and BEN - OTA FTRs would have a positive hedge value.

Figure 17 – Energy Market Expectations

| 1. ENERGY MARKET EXPECTATIONS | Energy prices | Expected differential | |
|--|---------------|-----------------------|--|
| Forecast SI prices | \$100 | | Assumes South to North flows is the normal course of events. |
| Forecast NI prices | \$110 | | |
| Expected NI - SI difference (Expected FTR settlement value) | | | |

Calculates the net effect on traders for electricity market and FTR market price assumptions and outcomes. To be synchronised with the FTR Optimiser and the Financial Flows spreadsheets

Inputs that can be changed

The first panel of the FTR Trading Outcomes spread sheet shown above in Figure 17, allows forecast prices at Benmore and Otahuhu to be inserted. The result is an expected differential which is essentially an expectation of what the FTR would be worth all things being equal. The actual price of the FTRs is determined at auction.

A standalone trader would think in terms of just the expected FTR value. For generators and retailers, the risk that the differential of the two separate forecast prices diverge against their interests is what they are hedging against by using FTRs. The FTR outcomes and combined FTR and energy position outcomes are considered in later sections of the spread sheet.

Figure 18 – FTR Market

| 2. FTR MARKET | BEN - OTA FTR prices (\$OTA - \$BEN) | OTA - BEN FTR prices (\$BEN - \$OTA) |
|---|--|--|
| Weighted average price of options held: | \$12 | \$4 |
| Weighted average price of obligations held: | \$8 | -\$8 |

TRADER 1: exposed to (or expecting) wider North South differential buys BEN - OTA FTRs

TRADER 2: exposed to (or expecting) weaker South to North flows or Southward flows buys OTA - BEN FTRs

This section of the FTR Trading Outcomes spread sheet allows for the prices of the four products to be inserted. In reality these would be the prices discovered at auction. (For the purpose of the model these can be linked to the FTR Financial Flows model.)

The prices shown in the example illustrate the relativity that one would expect between the four FTR prices. The obligation prices are an inverse of each other. The options prices are both positive. The stronger option price is likely to be associated with the positive obligation price.

Figure 19 – Energy Market Outcomes by Scenario

| 3. ENERGY MARKET OUTCOME BY SCENARIO | | Energy prices | Actual differential (\$B - \$A) | | Actual differential (\$A - \$B) | |
|--------------------------------------|---------------|---------------|---------------------------------|--|---------------------------------|---|
| Scenario 1: | BEN price (A) | \$100 | \$25 | Energy price differential wider than expected. | -\$25 | Difference between BEN and OTA more "negative" as a result of northward flows |
| | OTA price (B) | \$125 | | | | |
| Scenario 2: | BEN price (A) | \$100 | \$4 | Difference between OTA and BEN slightly narrower than expected | -\$4 | Difference between BEN and OTA slightly narrower than expected |
| | OTA price (B) | \$104 | | | | |
| Scenario 3: | BEN price (A) | \$100 | -\$30 | Difference between OTA and BEN "negative" as a result of southward flows | \$30 | North to South differential "positive" (reflecting North to South flows) in trader's favour |
| | OTA price (B) | \$70 | | | | |

The third section of the FTR Trading Outcomes spread sheet allows for energy settlement prices to be entered. If the “normal” electrical flows are South to North, the “normal expected” outcome is a positive value for BEN – OTA (i.e. \$OTA - \$BEN) and a corresponding negative outcome for OTA – BEN FTRs. Three scenarios are developed:

1. Stronger south to north flows i.e. a higher positive value for BEN – OTA at settlement
2. Less positive flows but still a positive outcome
3. North to south flows i.e. a negative value for BEN – OTA settlement

When viewed from the perspective of an OTA – BEN trader the outcomes are reversed.

Figure 20 – Combined FTR and Energy Market outcomes

| 4. COMBINED FTR AND ENERGY MARKET OUTCOMES - TRADER 1 PERSPECTIVE | | FTR settlement | Net FTR only outcome (no scaling*) | Energy outcome | Energy trading outcome c.f. expectations | |
|---|-----------------|----------------|------------------------------------|----------------|--|-----------|
| | | | | | Without FTRS | With FTRS |
| | | | | | | |
| Scenario 1: | FTR Options | \$28 | \$16 | \$25 | -\$15 | \$1 |
| | FTR Obligations | \$25 | \$17 | | -\$15 | \$2 |
| Scenario 2: | FTR Options | \$6 | -\$6 | \$4 | \$6 | \$0 |
| | FTR Obligations | \$4 | -\$4 | | \$6 | \$2 |
| Scenario 3: | FTR Options | \$1 | -\$11 | -\$30 | \$40 | \$29 |
| | FTR Obligations | -\$30 | -\$38 | | \$40 | \$2 |

| 5. COMBINED FTR AND ENERGY MARKET OUTCOMES - TRADER 2 PERSPECTIVE | | FTR settlement | Net FTR only outcome (no scaling*) | Energy outcome | Energy trading outcome c.f. expectations | |
|---|-----------------|----------------|------------------------------------|----------------|--|-----------|
| | | | | | Without FTRS | With FTRS |
| | | | | | | |
| Scenario 1: | FTR Options | \$3 | -\$1 | -\$25 | \$15 | \$14 |
| | FTR Obligations | -\$25 | -\$17 | | \$15 | -\$2 |
| Scenario 2: | FTR Options | \$2 | -\$2 | -\$4 | -\$6 | -\$8 |
| | FTR Obligations | -\$4 | \$4 | | -\$6 | -\$2 |
| Scenario 3: | FTR Options | \$31 | \$27 | \$30 | -\$40 | -\$13 |
| | FTR Obligations | \$30 | \$38 | | -\$40 | -\$2 |

Sections 4 and 5 combine the price forecast, FTR prices, energy settlement prices and FTR settlement prices for each of the 3 scenarios shown in section 3. Section 4 sets out the outcomes from the perspective of a South Island generator/North Island retailer hedging against a widened of the gap between the price at OTA and the BEN price. This trader makes money from FTRs when the price narrows and that offsets their high costs. Section 5 shows the outcome from the opposite perspective a North Island generator/SI retailer exposed to a narrowing gap or southward flows. In this case the trader benefits from the FTRs and the revenue from that offsets their physical exposure.

In both cases, where the differential in prices moves in their favour losses on FTRs offset the gains made against original expectations. The table also illustrates the benefit of buying options rather than obligations.

In sections 4 and 5 above the **FTR settlement** price is shown. These are calculated based on actual half hourly energy prices. The next column is **Net FTR only outcomes** which is the settlement price of the FTR less the initial price (cost). The next column to the right shows the **Energy outcome**, which is the difference between the energy prices at the relevant hubs. The settlement price for obligations will be the same as these prices.

The **Energy trading outcomes** column compares the market outcomes with the original forecast of energy prices. Shown are the outcomes for an energy trader who doesn't hold FTRs and a trader holding FTRs as a hedge for each of the three scenarios considered. Section 4 shows these results from the perspective of someone exposed to northward flows and section 5 shows the perspective of a trader hedging against southward flows.

Figure 21 displays the combined profit payoffs as shown in Figure 2 and Figure 3 calculated on the basis of FTR prices and energy price expectations contained in the spread sheet. For the given FTR prices and the forecast energy prices the outcomes at each differential between energy prices at the two hubs is shown on a continuous scale (as opposed to the 3 points covering the scenarios shown in the section 3 of the table)

On the model available on the web site these charts are updated for each different FTR price and forecast price combination entered into the spread sheet.

Figure 21 – SI generator/NI retailer perspective

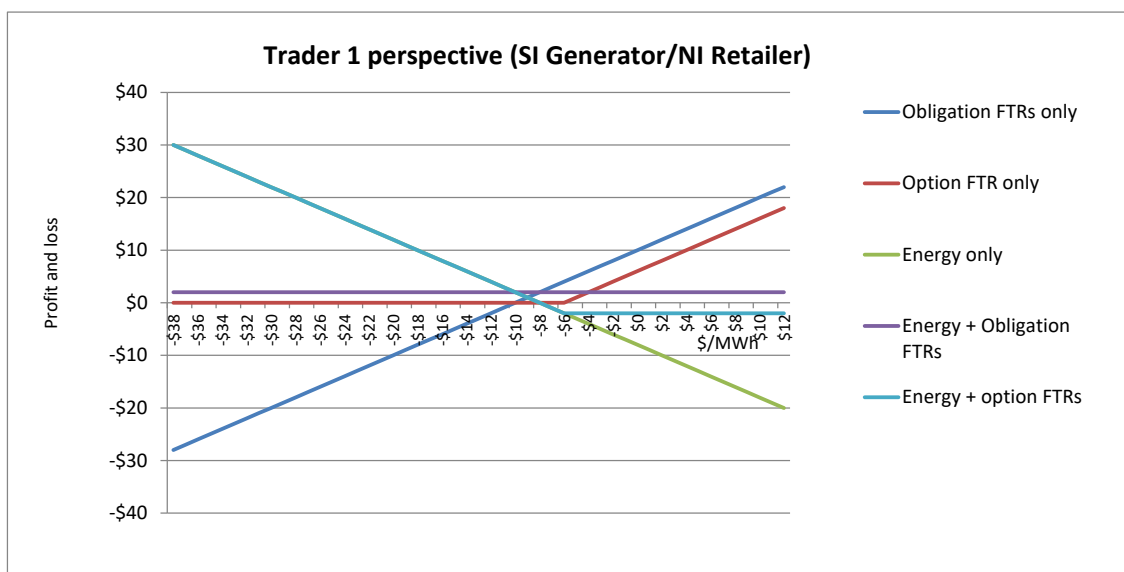
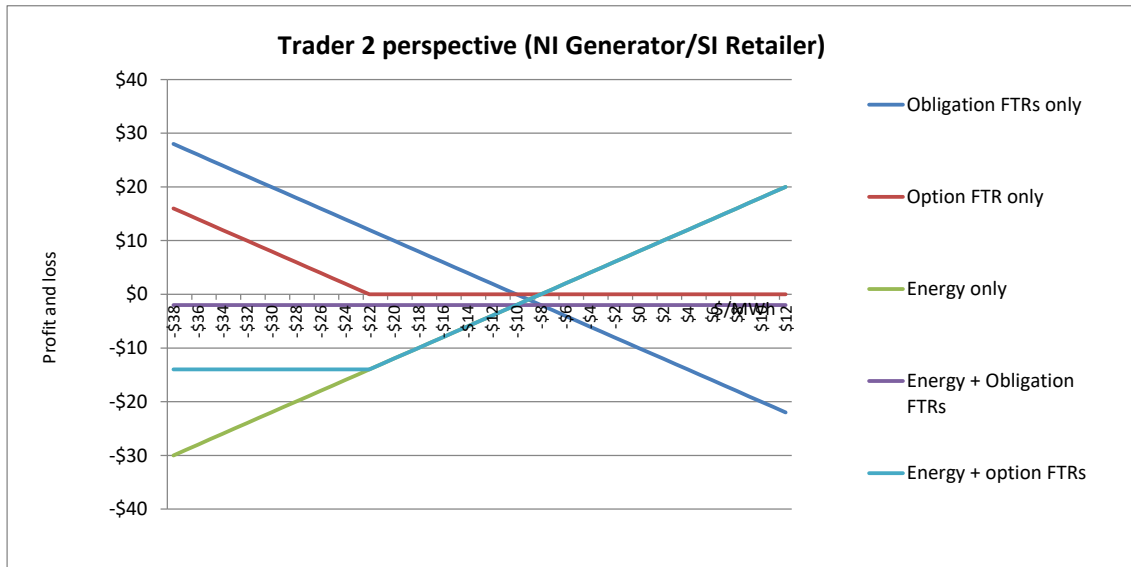


Figure 21 displays the outcome for a trader exposed to widening prices between BEN and OTA (I.e. \$OTA - \$BEN) or trading standalone FTRs in the expectation that BEN – OTA FTR prices will widen. The obligation outcome is the inverse of the energy only outcome at all price levels. (They will not cross at 0 is the FTR price and energy forecast price are different.) Where the obligation and physical positions are combined the outcome is constant at all price points. Options are worth 0 below the strike price but make a profit above the strike price. (No allowance is made here for the cost of the option.) When the options are combined with energy prices a constant outcome is locked in above the strike price.

Figure 22 similarly shows the outcomes for traders based on the spread sheet for all possible energy market outcomes for traders hedging against southward flows.

Figure 22 – NI generator/SI retailer perspective



The NI generator/SI retailer perspective is the reverse of the SI generator/NI retailer perspective i.e. revenue from FTR trading is either an outright profit or offsets the generators exposure.

6 Product Summary

The following table is a description of the products to be offered in the initial FTR Market, including summary of FTR terms, auction rules and settlement provisions. Detailed and comprehensive terms are included in the FTR Allocation Plan.

Product specifications (includes summary of FTR terms, auction rules and settlement provisions)

| Provision | Definition |
|-----------------------|--|
| Auction hours | The bid window for auctions will be 12.00 p.m. (noon) to 4.30 p.m. |
| Assignment | Traders may assign FTRs where the receiving party is a registered FTR market participant and meets the prudential requirements for the received FTRs. |
| Bids | Bids must be submitted in price and volume pairs. Bid prices for options must be positive. Bid prices for obligations may be positive or negative. Bid volumes must be positive and expressed as multiples of 0.1 MW. |
| Clearing price | The FTR clearing price will be the price of the lowest bid accepted in order to clear the volume of FTRs offered for each product, based on the optimisation of awarded bids for all FTR products. |
| FTR calendar | <p>There will be two auctions per calendar month:</p> <ul style="list-style-type: none"> • a Primary Auction will be held for the auction of newly listed and recently listed FTR period(s); and • a Variation Auction will be for additions of FTR capacity to months previously listed. <p>The Primary Auction will be held on the 5th to 7th business day each month and the Variation Auction one week later. The precise dates and details of each auction will be published in advance in an FTR calendar and confirmed each month.</p> |
| FTR hubs | <p>FTRs will be available between the following hubs:</p> <ul style="list-style-type: none"> - Benmore (BEN) - Otahuhu (OTA) - Haywards (HAY) - Islington (ISL) - Invercargill hub (INV) - Whakamaru (WKM) - Redclyffe (RDF) - Kikiwa (KIK) |
| FTR payment | The FTR provisional payment is the FTR hedge value minus the FTR acquisition cost (based on the clearing price, or assigned price where applicable), for each FTR. The final FTR payment may have been scaled due to revenue inadequacy. |
| FTR register | The FTR Manager will maintain a register of FTRs sold at auction and the current holders. |
| FTR types | <p>Two types of FTR products are offered by the FTR Manager through FTR Auctions:</p> <ol style="list-style-type: none"> 1. An obligation FTR is a right to be paid, or an obligation to pay, the sum of differences in final prices over the period of a calendar month between specified Hubs per MW of FTR volume in accordance with the obligation FTR preliminary and final payment formulae. 2. An option FTR is a right to be paid the average of positive differences (including \$0 where the differential is negative) in half hourly final prices over the period of a calendar month between specified Hubs per MW of FTR volume in accordance with the option FTR preliminary and final payment formulae. |

| Provision | Definition |
|-------------------------------------|---|
| Information on FTR auctions | <p>The FTR Manager will provide the following information each month:</p> <ul style="list-style-type: none"> • a notice of auction details will be available to FTR market participants 12 business days before the Primary Auction; • the FTR grid including outages and constraint information for the upcoming month's auctions will be posted on the FTR Information System 10 days prior to the Primary Auction; and • notice of the FTR capacity offered at the auction will be available to FTR market participants at least 5 business days prior to each FTR auction. |
| Listed FTRs | <p>FTRs will be listed for at least 24 separate consecutive calendar months as published in the FTR calendar. (Initially FTR contracts will be added each month until at least 24 months are listed.)</p> |
| Participation in the auction | <p>To participate in an FTR Auction a trader must:</p> <ul style="list-style-type: none"> • be a registered industry participant and a registered FTR participant; and • have adequate prudential cover for FTR bids to be accepted. Where a bid is received, and prudential cover found to be inadequate bids will be returned to the bidder. Revised bids may be submitted within the trading window. |
| Publication of results | <p>Clearing prices and volumes for each FTR product and each FTR month will be published at the end of the day following each auction.</p> |
| Residual amounts | <p>If the combined loss and constraint rentals allocated to the FTR market and auction income exceed FTR payments the residual will be distributed on the same basis as loss and constraint rentals by the Clearing Manager in accordance with 14.73 of the Code.</p> |
| Scaling | <p>Positive payments due to FTR holders will be scaled in a month where revenue inadequacy occurs i.e. where auction income plus loss and constraint rentals apportioned to the FTR market are less than prospective FTR payments. (Initially scaling will be applied to previous holders of FTRs who have assigned FTRs and disclosed the assignment price. The application of scaling and rules relating to disclosure of prices are under review.)</p> |
| Settlement | <p>The 20th of the month following the FTR period.</p> |
| Settlement procedures | <p>The Clearing Manager will settle the final FTR payment with the FTR holder based on the FTR acquisition cost and relevant nodal price differences which will be based, in turn, on final prices at relevant nodes in the energy market.</p> <p>At settlement the holder of the FTR and FTR Participants eligible for payments from the Clearing Manager associated with assignment (i.e. assignments where prices are disclosed) bear the scaling risk.</p> |
| Suspension | <p>Auctions may be suspended by the Electricity Authority. Where the FTR market is suspended the FTR Manager will announce the time and date for the rescheduled auction.</p> |
| Units | <p>Bids, auction clearing prices and relevant differences in energy prices used for settlement purposes are expressed in dollars and cents per MW of FTR volume per hour of the FTR period.</p> <p>FTR costs and payments are expressed as dollars and cents per FTR for the full FTR volume and FTR period.</p> |