

Overview of the FTR market

Financial Transmission Rights (FTRs) are an electricity hedge

FTRs are hedges designed to assist wholesale electricity market participants to manage their locational price risk.

Locational price risk is the risk that wholesale electricity market participants face due to unexpected changes in the difference between prices at different locations across the transmission grid. Price differences between locations can rise and fall significantly and are not easily predicted. They are affected by factors such as generation offers, the reserves market, transmission constraints and electricity losses along the grid.

FTR's are sold in monthly blocks at designated locations (called FTR "hubs") by the FTR manager via a blind auction process. Because this is a public auction, any person or company can bid once they pass the entry criteria to be a FTR Participant. This has attracted companies without positions in the physical electricity markets, such as speculators and financial institutions.

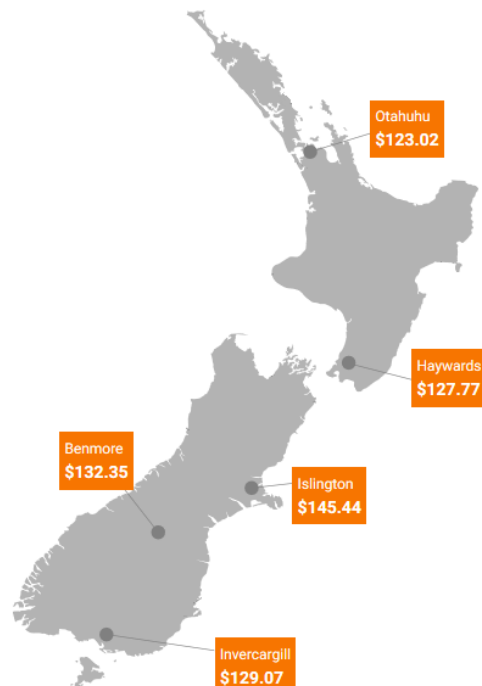
FTRs are a financial derivative; their value is derived from the electricity prices at two nodes. As such, the FTR market falls under the scope of the Financial Markets Conduct Act 2013 (FMCA), and under the regulation of the Financial Markets Authority (FMA). To avoid the complexity of complying with the FMCA retail market disclosure requirements, FTR participants are required to certify they are a "wholesale investor".¹

The FTR manager is a market operation service provider, contracted by the Authority to run the FTR auction process. The current contract expires in 2021 and costs about \$760,000 per annum.

FTRs reduce locational price risk for retailer generators selling electricity in one location and purchasing in another

FTRs help retailer generators manage the locational price risk associated with generating in one location, and retailing in another location.

For example, in the diagram on the right any generator generating at, or near Invercargill (such as Pioneer Generation or Meridian Energy) will be paid to generate electricity in Invercargill at \$129.07 per MWh.



¹

The FMCA describes a "wholesale investor" as someone who is an investment business, has net assets over \$5 million, or has investments in the area of over \$1 million.

If the generator was also retailing in Christchurch (Islington) they would be paying \$145.44 per MWh.

An Invercargill to Islington FTR will pay the difference between the two spot prices (\$145.44 - \$129.07 = \$16.37 per MWh).

If in a subsequent trading period, the spot price at Islington dropped to \$131.17, and the price in Invercargill remained the same then the FTR for that trading period would pay \$2.10 (\$131.17 - \$129.07).

FTRs are sold in monthly blocks. FTR holders cannot change the amount of FTRs they hold from trading period to trading period. The amount they have purchased for the month is the same for every trading period in that month.

This helps manage the locational price risk for the Invercargill generator, and gives them certainty that the price they are paid for generating electricity in Invercargill will be matched to what they pay for electricity in Christchurch by the FTR. The risk premium the retailer pays to manage the risk is the purchase price of the FTR.

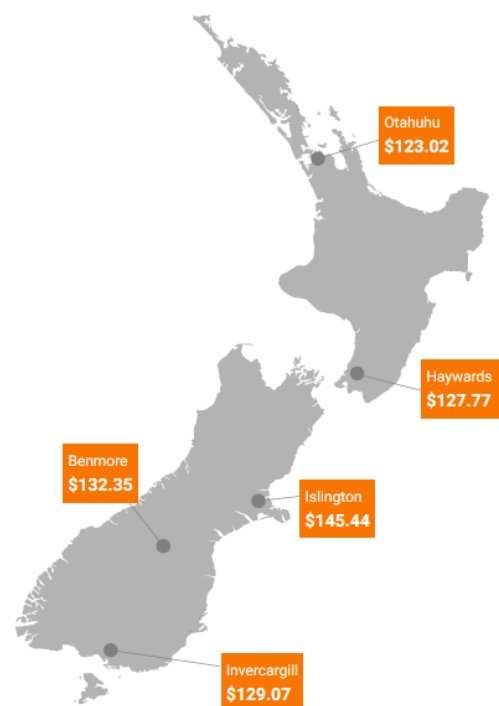
FTRs reduce locational price risk for retailers holding 'traditional' hedge products

FTRs help retailers manage the locational price risk associated with holding a traditional hedge product, such as ASX hedges or a contract for differences in one location and retailing electricity in other locations.

For example, a retailer purchasing an electricity hedge at Auckland (Otahuhu) can manage the locational price risk from selling electricity in Wellington (Haywards), Christchurch (Islington) and Invercargill by purchasing three FTRs between the relevant locations.

Much like the above scenario, as spot prices vary from trading period to trading period, the amount of money the FTR pays will vary from trading period to trading period.

In each case the FTR will match the price difference between Auckland and the relevant FTR hub, giving the retailer certainty that the price they pay for electricity will be based on the hedge they hold in Auckland.²



²

An FTR hub is made up of one (or more) spot market pricing nodes. In the current FTR system all FTR hubs are associated with only one pricing node on the 220kV grid.

FTRs are funded by the auction income and the loss and constraint excess LCE from the spot market

The money to fund FTR payouts come from two sources:

- the 'auction income' (what FTR participants pay to hold the FTR)
- the 'loss and constraint excess' (LCE)

LCE is the surplus created in the wholesale electricity market once purchasers have been invoiced and generators have been paid.

LCE occurs because the market system includes the losses incurred transporting electricity from each injection point to each load point. This means the price paid by retailers at each load point is higher than the price paid to generators at injection points.

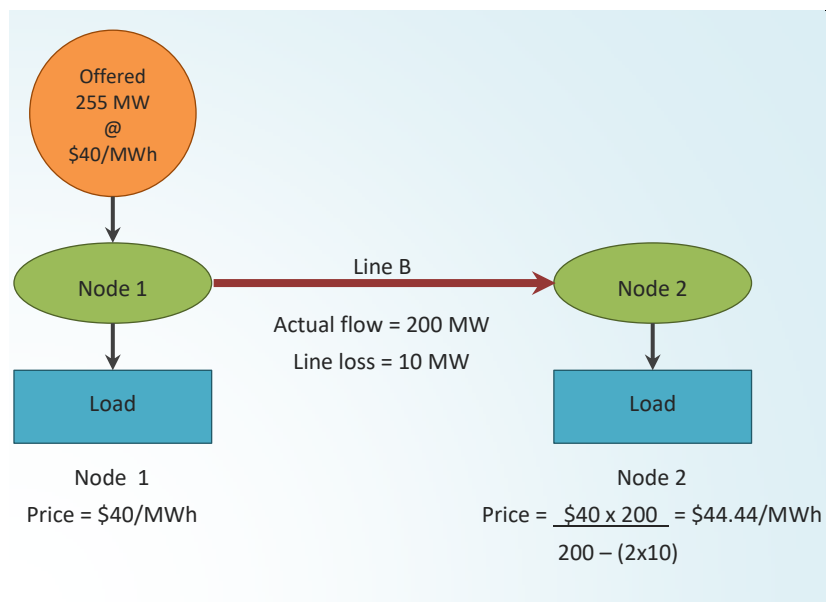
Loss excess is created by the nature of physical and marginal losses

Due to the physical nature of electricity and the transmission network, the electrically further away you are from a generator the greater the power the generator needs to generate to supply the same amount of electricity.

For example a generator in Hamilton may need to generate 200 MW to supply 190 MW to Auckland.

However prices are set by the marginal loss (the change in losses for the next unit of load). Because the loss is based on the square of the current flow³, mathematically this results in the losses having a 'doubling' effect on the price, creating the loss excess.

In this example the generator will be paid \$40 per MWh (\$8,000) for the 200 MW generated.



The retailers will need to pay \$44.44 per MWh (\$8,443.60) for the 190 MW delivered.

This creates a loss excess of \$443.60. This is calculated as $\$8,443.60 - \$8,000 = \$443.60$

Constraint excess is created by pricing effects due to transmission capacity limits

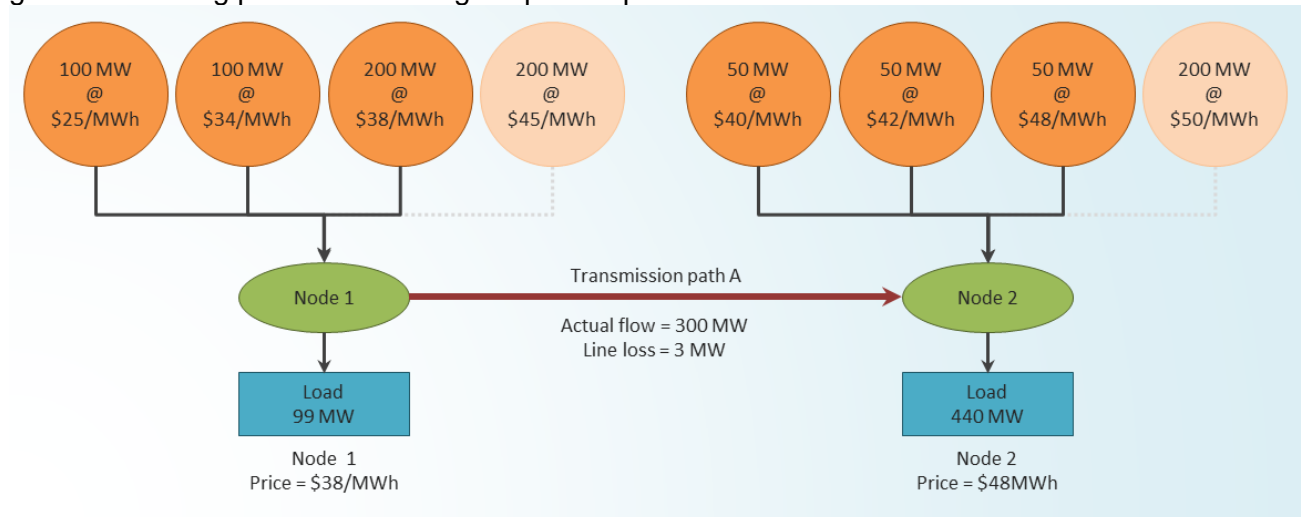
When the national grid is 'constrained' (no more power can flow down a line) price separation occurs.

The prices on the "downstream" side of the constraint will be set by the marginal generators "downstream" of the constraint, even though some of the electricity will be provided by

³

The formula for resistive power loss is: power lost (P) = current flow squared (I^2) x conductor resistance (R). The actual formula for calculating the price at node 2: $\text{Price}_{\text{node2}} = \text{Price}_{\text{node1}} / (1 - 2\text{MW}_{\text{loss}}/\text{MW}_{\text{flow}})$

generators being paid a lower marginal price “upstream” of the constraint.



For example at Node 1 the price of \$38 per MWh is set by the marginal generator in the (unconstrained) area of Node 1.

However the maximum 300 MW of power from Node 1 is being sent to Node 2.

No more power can be transferred between Node 1 and Node 2, so the remaining electricity must be supplied by the more expensive generators in Node 2.

The Node 2 generators set the marginal price at \$48.

This creates a ‘constraint excess’, where 300 MW of electricity is being generated at \$38 per MWh for Node 2, but retailers are paying \$48 per MWh for the 297 MW consumed at Node 2.

This creates a constraint excess of \$2,856. This is calculated as:

$$(297 \text{ MW} \times \$48 - 300 \text{ MW} \times \$38) = (\$14,256 - \$11,400) = \$2,856$$

Not all of the LCE is used for FTRs

Not all of the LCE is used to fund FTRs. This is because FTRs do not cover all of the grid electricity flows. The amount of LCE used for FTRs is known as the FTR “rental”. The rental is calculated each month⁴, and is based on the energy flows between FTR hubs.

The FTR rental amount is transferred to a separate account, called the “FTR Account”. The auction revenue is also paid into this account. FTR settlement amounts are paid from the FTR account and any surplus is transferred, along with the unallocated LCE to Transpower (as the grid owner) to be allocated to transmission customers.

There is a possibility that there will not be enough money in the FTR account to fully settle all FTRs for a month. This situation is called “revenue inadequacy”. When a month is revenue inadequate, all FTR payments are scaled back to match the amount of money available in the FTR account.

Revenue inadequacy is part of the design of the FTR market, and is expected to occur up to once in a 12 month period.

FTR products

An FTR is the right to the difference in price between two hubs. The hub from which the energy originates is called the “source”, and the hub where the energy exits is called the “sink”.

⁴ FTR rentals are calculated in accordance with Schedule 14.3 of the Code

Because energy can flow in either direction, for each pair of hubs there are two potential FTRs, one where the first hub is the source and the other where the second hub is the source.

Each FTR is further split into two products – “options” and “obligations”. Just like regular futures markets, an option only settles if the FTR payout is positive and the owner receives a payment, but an obligation always settles, even if the FTR payout is negative (i.e. the sink price is lower than the source) and the owner has to make a payment.

For each pair of hubs there are four FTR products sold. As each hub is paired with every other hub, the number of products increases exponentially when each new hub is added. For example, with two hubs there were four products, the current five hubs has 40 products, and if expanded to six hubs or seven hubs there will be 60 or 84 products respectively.

FTRs are sold in quantities of 0.1MW. The majority of FTRs sold are options.

Auction processes

Each month there are two FTR auctions, one at the beginning of the month (called the “initial” auction) and one in the middle of the month (called the “variation” auction). Each auction sells FTRs for six target months. The initial auction sells target months that are 13 to 26 months in the future. The variation auction sells target months that are 1 to 9 months in the future. The actual auction schedule is called the “FTR calendar” and is complex as it does not roll forward each month, but is scheduled in quarterly blocks to allow participants to align FTR purchases with their ASX electricity futures market purchases.

Each target month is auctioned 12 times over a 26 month period. The total amount of FTRs for a target month is calculated before the auction of the target month using the line capacity and scheduled grid and HVDC outages. This is called the “capacity”. This total is then allocated over the 12 auctions. Before each auction, the capacity is recalculated using the most up to date information on grid outages

In some instances, the volume of FTRs sold in previous auctions may exceed the recalculated capacity. In these cases the capacity is artificially increased to equal the amount sold plus 0.1MW. This is called “limit expansion”.

Reselling FTRs

When a target month is being auctioned, a FTR participant may offer for sale any FTRs they already hold for that month. These FTRs are added to the pool of FTRs available at that auction. This is called “reconfiguration”

A FTR participant can also enter a bilateral arrangement with another FTR participant to sell some of its FTRs. These can be for any month and can be completed at any time. The sale needs to be lodged with the FTR manager so the holder of the FTRs can be updated. These are called “assignment trades”.

The FTR manager (EMS) and clearing manager (NZX) are responsible for running the FTR market



Energy Market Services (EMS) is the FTR manager. The FTR manager is responsible for the allocation of FTRs.

This includes:

- providing FTR participants access to FTR systems

- setting the auction rules
- providing a list of FTRs held by participant and period (called the FTR register)
- running the FTR auction process
- calculating the amount of LCE available for FTRs (rentals)

The auction rules are contained in a document known as the *FTR allocation plan*. The FTR manager is responsible for making changes to the FTR allocation plan and is required under the Code, to consult with industry and obtain Authority Board approval before any changes are made to the FTR allocation plan.⁵

Electricity Clearing

NZX is the clearing manager. The clearing manager is responsible for the clearing and settlement of FTRs.

This includes:

- setting the rules for calculating FTR prudential requirements
- determining the daily prudential requirements for each FTR
- settling FTRs

The FTR prudential rules are contained in a document known as the *FTR prudential security assessment methodology*. The clearing manager is responsible for making changes to the FTR prudential security assessment methodology and is required under the Code to consult with industry and obtain Authority Board approval before any changes are made to the FTR prudential security assessment methodology.

The FTR market is evolving over time

The FTR market has evolved from a two hub model in 2013, to the current five hub model in 2014.

The FTR market was established to meet the requirement of section 42 of the Electricity Industry Act (2010).⁶

The first FTR auction was held in June 2013. At that time there were two FTR hubs, at Otahuhu and Benmore.

The two hub model enabled FTR participants to manage inter-island locational price risk.

In November 2014, in response to an Authority led initiative, three additional FTR hubs were added at Invercargill, Islington and Haywards.

The five hub model enables FTR participants to manage both inter-island and intra-island locational price risk.



⁵ Clause 13.241 of the Code

⁶ Section 42(c) of the Electricity Industry Act (2010) required the Authority to amend the Code to include *mechanisms to help wholesale market participants manage price risks caused by constraints on the national grid*:

As part of the implementation of the five hub model, the FTR manager was asked to develop objective criteria for adding and removing FTR points.

FTR manager has developed an objective criteria for adding new FTR points and is considering adding up to three new FTR hubs

In 2016 the Authority Board approved an amendment to the FTR allocation plan that included an objective criteria for adding new FTR hubs.

This objective criteria included a hub nomination and voting process to identify which potential FTR hubs should be subject to a cost-benefit analysis.

The FTR manager performs a cost-benefit analysis on each of the proposed FTR hubs to determine if there will be a net benefit to New Zealand consumers by adding the proposed FTR hubs.

Any FTR hubs that have a positive cost-benefit are included in an amended FTR allocation plan and consulted on with industry before being presented to the Authority Board for approval.

In December 2016 the FTR manager began the FTR hub nomination and voting process. The FTR manager is currently assessing the costs and benefits of adding new FTR hubs at Whakamaru (central North Island), Redclyffe (Hawkes Bay) and Kikiwa (top of the West Coast).⁷



We expect an amended FTR allocation plan to be consulted on from September 2017 and presented to the Board in December 2017.

Authority market design team is considering other enhancements to the FTR market

On 28 March 2017 the Authority released an issues and options paper for FTR market development.⁸ As these ideas are developed further, any viable options will be presented to the Board for approval as proposals for consultation.

The issues and options paper included Authority led FTR market options to:

- enable overseas based participants to trade FTRs
- allow participants to create and sell FTRs
- develop an exchange traded FTR derivative product
- develop a bulletin board to facilitate 'over the counter' trading of FTRs.

⁷ In August 2016 Mercury Energy, with letters of support from 13 industry participants requested Whakamaru be urgently added as an FTR hub, bypassing the hub nomination and cost-benefit analysis process being developed at the time.

A copy of the letters and submissions can be found at: <http://www.ea.govt.nz/development/work-programme/risk-management/hedge-market-development/correspondence/mercury-nz-ltd-request-for-a-central-north-island-ftr-hub>
⁸ <http://www.ea.govt.nz/development/work-programme/risk-management/hedge-market-development/consultations/#c16389>