

This document subject to change  
Check the FTR Manager website  
[www.ftr.co.nz](http://www.ftr.co.nz)  
for the latest version



---

## FTR Policy: FTR Grid and Auction Data

**December 2023**

**Vers. 1.21**

## Disclaimer

1. EMS, as FTR Manager, will only accept a person as an FTR participant, and will only offer and issue FTRs to that person, if the person meets all of the following requirements:
  - (a) Meets the prudential requirements in relation to FTRs set out in Part 14 of the Electricity Industry Participation Code 2010 (**Code**), as determined by the Clearing Manager under the Code.
  - (b) Is a natural person resident in New Zealand, a body corporate that is incorporated in New Zealand, or a person with a branch office or other substantial physical presence in New Zealand through which it conducts its FTR participation.
  - (c) Has provided EMS as FTR Manager with either:
    - (i) a current and valid eligible investor certificate under clause 41 of Schedule 1 of the Financial Markets Conduct Act 2013 (FMCA) in respect of the issue or sale of FTRs; or
    - (ii) a current and valid wholesale investor certificate under clause 44 of Schedule 1 of the FMCA.
  - (d) Is registered by the Electricity Authority as an Industry Participant under section 9 of the Electricity Industry Act 2010 as a trader in electricity.
  - (e) Agrees to the standard FTR participation agreement, **(authorised persons)**.
2. Information about FTRs made available by EMS through any medium (**FTR information**) is not:
  - (a) advice on, or a recommendation of, FTRs or any other investment, financial product or risk management arrangement;
  - (b) an offer or solicitation by EMS to issue or deal in FTRs or any other investment, financial product or risk management arrangement; or
  - (c) directed to any person who is not an authorised person.
3. Clause 2(c) applies to all FTR information including FTR information that is or may be accessible to persons who are not authorised persons, for example on the Internet or by being distributed outside New Zealand by persons to whom EMS initially made the FTR information available. No recipient of FTR information is authorised to distribute it outside New Zealand.
4. Prior to any person acquiring, entering into or dealing in any investment, financial product or risk management arrangement they should obtain their own tax, legal and financial advice.
5. The FTR auction, reconfiguration auction and assignment facilities provided by EMS as FTR Manager are not licensed financial product markets under the FMCA or otherwise. However, those facilities and the FTR Manager are regulated under the Electricity Industry Act 2010, Electricity Industry (Enforcement) Regulations 2010 and Electricity Industry Participation Code 2010.

# Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>8</b>
1.1	Content of this Policy .....	8
1.2	Supporting analysis .....	9
1.3	Development of the Policy.....	9
1.4	Review of the Policy .....	9
1.5	Application of discretion by the FTR Manager.....	10
1.6	FTR Grid is a snapshot in time.....	11
1.7	Glossary.....	11
<b>2</b>	<b>Structure of this policy .....</b>	<b>12</b>
<b>3</b>	<b>FTR Grid – Grid Owner inputs .....</b>	<b>14</b>
3.1	Network model .....	14
3.2	Asset naming and mapping.....	18
3.3	Outages .....	19
<b>4</b>	<b>FTR Grid – FTR Manager Inputs.....</b>	<b>22</b>
4.1	Contingencies.....	22
4.2	Constraints (nomograms) .....	22
4.3	Capacity scaling factor .....	25
4.4	Hubs .....	26
<b>5</b>	<b>FTR Grid – Downloads .....</b>	<b>29</b>
<b>6</b>	<b>Indicative Inter-Hub Capacity .....</b>	<b>30</b>
<b>7</b>	<b>Bid portfolios .....</b>	<b>31</b>
<b>8</b>	<b>Auction results.....</b>	<b>32</b>
<b>9</b>	<b>FTR rentals amount calculation – Inputs .....</b>	<b>33</b>
9.1	Grid Owner inputs.....	33
9.2	FTR Manager inputs.....	35
<b>Appendix A</b>	<b>Grid Owner file formats .....</b>	<b>39</b>
A1	Network Model format .....	39
A2	Asset Mapping File format.....	40
A3	Outage File format .....	40
<b>Appendix B</b>	<b>Market User Interface CSV Reference .....</b>	<b>41</b>
B1	Introduction .....	41
B2	Public Data – General Data Tab .....	42

B3	Public Data - Market Data Tab .....	47
B4	Public Data – Market Result Data Tab .....	49
B5	Private Data – Market Result Data Tab.....	50
<b>Appendix C</b>	<b>Market User Interface XML Reference .....</b>	<b>53</b>
C1	Introduction .....	53
C2	Public Data – General Data Tab .....	54
C3	Public Data - Network Data Tab .....	56
C4	Public Data - Market Data Tab .....	68
C5	Public Data – Market Result Data Tab .....	73
C6	Private Data – Market Result Data Tab.....	76
<b>Appendix D</b>	<b>Bid Portfolio format .....</b>	<b>80</b>
<b>Appendix E</b>	<b>FTR Register File.....</b>	<b>85</b>
<b>Appendix F</b>	<b>Assignment File Formats .....</b>	<b>88</b>

FTR REGISTER

## Figures

Figure 1 – FTR Grid and Auction Data Overview.....	12
Figure 2 – Components of the FTR Grid used to represent effect of each issue .....	13
Figure 3 – Three winding transformer representation.....	16
Figure 4 – FTR Grid asset naming conventions.....	18
Figure 5 – Permanent security constraints (example).....	24
Figure 6 – SPD to FTR Grid asset substitutions (example) .....	24
Figure 7 – FTR Periods (from December 2014 inclusive) .....	25
Figure 8 – Capacity Scaling Factors .....	26
Figure 9 – Hub-Node relationships .....	27
Figure 10 – Node definitions .....	28
Figure 11 – FTR Grid Inputs and Downloads .....	29
Figure 12 – Auction results downloads .....	32
Figure 13 – Grid Owner inputs to FTR Rentals Amount calculation (summary) .....	35
Figure 14 – FTR Manager inputs to FTR Rentals Amount calculation .....	36
Figure 15 – HVDC Capacity Limits for the Normal Grid Configuration .....	36
Figure 16 – Paired target flows for eight-hub market (2018), with example BEIP.....	37
Figure 17 – Network Model – PSS/E data requirements .....	39
Figure 18 – Asset Mapping File (example) .....	40
Figure 19 – Outage File (example) .....	40
Figure 20 – Example of Sloped Bid Portfolio format in Excel® .....	80
Figure 21 – Example Bid curves (BUY) .....	83
Figure 22 – Example Bid curves (SELL) .....	83
Figure 23 – Example of iHEDGE MUI for entering bid portfolios.....	84
Figure 24 – FTR Register on screen view .....	85

## Document History

Version	Date	Status	Edited By	Revision Description
1.0	15 April 2013	Released	EMS	
1.1	17 May 2013	Released	EMS	Inclusion of Appendix F: Assignment File Formats. Updates provided to XML schema definitions (headers). Updates to date format in output XML. Updates to Sections A2 and A3 to reflect Grid Owner change from using hyphens to full stops in Bus names. Updates to Fig 4 and Fig 7 (HVDC Constraints). Wording change to section 4.2.1. Update to Appendix E FTR Register Data format for Price
1.2	26 Jun 2013	Released	EMS	Adjustments to treatment of HVDC bipole outages following consultation: HVDC flag in 0, and Table 7
1.3	26 Sep 2013	Released	EMS	Clarity of treatment of HVDC status in normal grid configuration, and HVDC transfer post HAY statcom
1.4	May 2014	Released	EMS	Inclusion of changes derived from the Allocation Plan 2014. Includes Asset Map and Bid_and_FTR download enhancements.
1.5	July 2014	Released	EMS	Inclusion of Permanent Outages. Slight amendments to XML download formats, particularly the Bid_and_FTR download file.
1.6	August 2014	Released	EMS	Update to Asset Mapping filename format. Applies immediately.
1.7	September 2014	Released	EMS	Update to column ordering of Bid Portfolio
1.8	October 2014	Released	EMS	Update to filename for Bids Offers and FTRs private download file
1.9	November 2014	Released	EMS	Change to optionality of the 'Direction' property in the Binding Constraints Download file.
1.10	November 2014	Released	EMS	Updated Disclaimer to reflect FMCA changes
1.11	November 2014	Draft	EMS	Updated to outcome of the FTR market review September 2014, and clarifications on Outage Files
1.12	December 2014	Released	EMS	Update to Section 9 to include BEIP for FTR Rentals

1.13	January 2015	Released	EMS	Temporary amendment allowing change to bipole outage capacity to alleviate oversold scenario.
1.14	November 2015	Draft	EMS	Inclusion of limit adjustments as a result of solving auctions using the limit expansion feature of iHEDGE. Please refer to section 4.2
1.15	December 2016	Released	EMS	URL updates, change to capacity release factor following market review, AP 16 references and Grid Owner naming convention updates. Corrections to Bid Offers and FTRs file download naming.
1.16	June 2018	Released	EMS	Update of Figure 16 to include new Balanced Extreme Injection Patterns as a result of AP18
1.17	May 2019	Released	EMS	Update of Figure 16 to include updated Balance Extreme Injection Patterns Removed reference to ignoring South Island Constraints from nomogram section 4.2 due to addition of KIK, INV, ISL hubs.
1.18	May 2020	Released	EMS	Small typos and incorrect references to old allocation plans. Update 3.3 to cover the new policy defining how the FTR manager handles tentative outages, resulting from the tentative outage publication project underway by Transpower for POCP.
1.19	October 2020	Released	EMS	Update to references to include SIPS (as part of AP14). Updates to how the FTRM models permanent outages, including removing 2 decommissioned circuits from permanent outages from section 3.3.
1.20	November 2020	Released	EMS	Change to capacity release factor following market review 2020
1.21	December 2023	Released	EMS	Update of capacity scaling factor following market review 2023, Figure 8.

# 1 Introduction

The FTR Allocation Plan provides in section 1.6 that the FTR Manager will develop, publish apply and regularly review FTR Policies detailing how it will implement the FTR Allocation Plan, including an FTR policy on Determining the FTR Grid (the Policy).

This Policy is critical because the choice of FTR Grid determines the volume of FTRs that can be awarded in the FTR Auction, which in turn determines both the total net capacity available to FTR Participants for hedging, and the likelihood of revenue adequacy or revenue inadequacy.

This policy assumes the FTR Allocation Plan 2018, available from the FTR library.

## 1.1 Content of this Policy

The FTR Allocation Plan provides in section 1.6 that the FTR Manager will develop, publish, apply and regularly review FTR policies detailing how it will implement the FTR Allocation Plan, including an FTR policy on the FTR Grid.

The FTR Grid for each FTR Auction and FTR Period is reliant on:

- information provided by the Grid Owner including, a Network Model, Outage File and Asset Mapping File
- inputs by the FTR Manager including contingencies, constraints (nomograms), hubs, periods and the Capacity Scaling Factor and Capacity Release Factor

This policy explains how the Grid Owner and FTR manager create these other components of the FTR Grid.

FTR Grids are made available to participants to download through the FTR Information System (FIS). This Policy therefore provides sufficient detail that participants can interpret and use the FTR Grid files that they download in PSS/E, CSV, XML or XLS format, the formats of which are provided in the appendices.

As the iHEDGE system groups its downloads, it is convenient to describe all of them in this one policy document. We have therefore extended the scope of this document to cover not just the FTR Grid, but also the Bid Portfolio, Assignment Auction Results download formats. The actual mechanisms for uploading Bid Portfolios/Assignments and downloading data are described in the FTR Policy on the Use of the FIS.

Within the FTR Market, the FTR Manager calculates monthly the FTR Rentals Amount in accordance with Schedule 14.3 of the Code. This is then passed to the Clearing Manager for use in FTR settlement. While it is functionally quite separate from the FTR Grid and FTR Auction process, it is convenient to describe the Grid Owner and FTR Manger inputs to this process here, as they are closely related to the Grid Owner and FTR Manger inputs to the FTR Grid.

The purpose of this policy is thus to describe:

- Requirements from the Grid Owner in terms of its Network Model and Outage File and other information
- How the FTR Manager will prepare the other components in the FTR Grid for:
  - Running and clearing the Auction
- How FTR Participants can interpret the FTR Grid files



- The format of Bid Portfolios and Assignments
- The download formats of Auction Results and Auction Inputs
- The Grid Owner and FTR Manager inputs to the FTR Rentals Amount calculation.

## 1.2 Supporting analysis

A companion policy “FTR Grid and Auction Data - Supporting Analysis” provides the justification for many of the parameters included in this policy, including for:

- Outages
- Losses
- Capacity scaling factor
- Contingencies
- Permanent security constraints
- HVDC representation and constraints

The contingencies, permanent security constraints and HVDC representation are required also by the Rentals Amount Calculation, also described in the Policy.

The reasons that the Supporting Analysis is presented separately to the Policy, rather than say as appendices to it, are:

- To focus the Policy on the ‘what’ rather than the ‘why’
- To keep detailed technical analysis out of the Policy
- To simplify version control, as some reviews of the supporting analysis may not result in a change to the Policy, and some reviews of the Policy may not affect those areas covered by the supporting analysis.

The Supporting Analysis is available on the FTR Library.

## 1.3 Development of the Policy

The FTR Allocation Plan provides in section 1.6 that the FTR Manager will develop the FTR policies transparently with the industry through:

- Publication of current and proposed policies and their rationale
- Discussion with and considering feedback from an FTR users’ group
- Considering, and incorporating where appropriate, feedback from interested parties
- Keeping the market up to date
- Advising the Authority on developments as they arise.

The FTR Manager will operate a public website that will provide access to consultations on the FTR Allocation Plan and FTR policies, including the change process and submissions received.

## 1.4 Review of the Policy

The Policy will be reviewed:

- Annually
- Whenever there is a change to the FTR Allocation Plan, which itself is subject to annual review and potentially urgent variations

- If Revenue Inadequacy occurs in a third month of any rolling 12 month period or if Revenue Inadequacy is less than 80% in any single month (as required by section 4.9 of the FTR Allocation Plan 2012/2014/2016)
- Whenever the FTR Manager considers, taking into account any feedback received, that new information might materially change the content of this policy.

## 1.5 Application of discretion by the FTR Manager

The FTR Allocation Plan provides in Section 4.8 that, so that FTR Participants are fully informed, and that the FTR Manager need exercise no discretion in its application, the FTR Manager will develop that policy to be prescriptive including full:

- Definition of what planned outages are relevant
- Numerical values, balancing factors and weightings
- Security and reserve constraints
- Formats of files

The Plan provides in Section 1.6 that the FTR policies will be designed so that the FTR Manager needs to exercise discretion in their application only in exceptional circumstances, such as (as noted in section 4.9 of the Plan) to ensure optimal clearance in the Auction.

If an exceptional circumstance occurs, the FTR Manager will therefore issue a revised FTR Policy on the FTR Grid. There are only two exceptional circumstances foreseen that might require the FTR Manager to exercise discretion:

### ***A short-notice and material change to the transmission network***

A short-notice and material change to the transmission network (e.g. perhaps a major asset commissioning) that was not allowed for in developing the Policy and might require the FTR Manager to apply additional constraints or limitations to the FTR Grid in meeting its Revenue Adequacy Objective.

In such an event, the FTR Manager proposes to issues a temporary amendment to the Policy (e.g., to continue the example, during commissioning of a major transmission asset we might adopt a one-month-only special rule, such as to remove the asset being commissioned).

In this way, the industry will be informed and able to provide feedback on the amended Policy, albeit at short notice. The FTR Manager would exercise no discretion in application of the amended Policy.

### ***Problems with finding an FTRO solution***

It is possible that iHEDGE may not be able to solve for a particular FTR Grid enforcing all constraints in an auction. This has happened rarely in the United States with their very large grid and number of nodes and hubs with ill-formed problems, for example due to conflicting constraints. In the New Zealand market with its relatively small grid, and gradual inclusion of additional hubs, this is considered very unlikely, but remains formally a possibility.

## 1.6 FTR Grid is a snapshot in time

It is important to note that each component of the FTR Grid is a snapshot taken at a particular time, and as there is a sequence to the development of the different components of the FTR Grid, each component can be a snapshot at a different time. For example, the Outage File will be developed by the Grid Owner at a particular time in line with its business processes as well as the requirement to meet the timings of the FTR Calendar. The FTR Manager will not update FTR Grid components with any new information made available between the time of their creation and the FTR auction.

Please refer to the FTR Calendar for key timings.

## 1.7 Glossary

Please refer to the FTR Glossary for an explanation of terms used in this policy<sup>1</sup>.

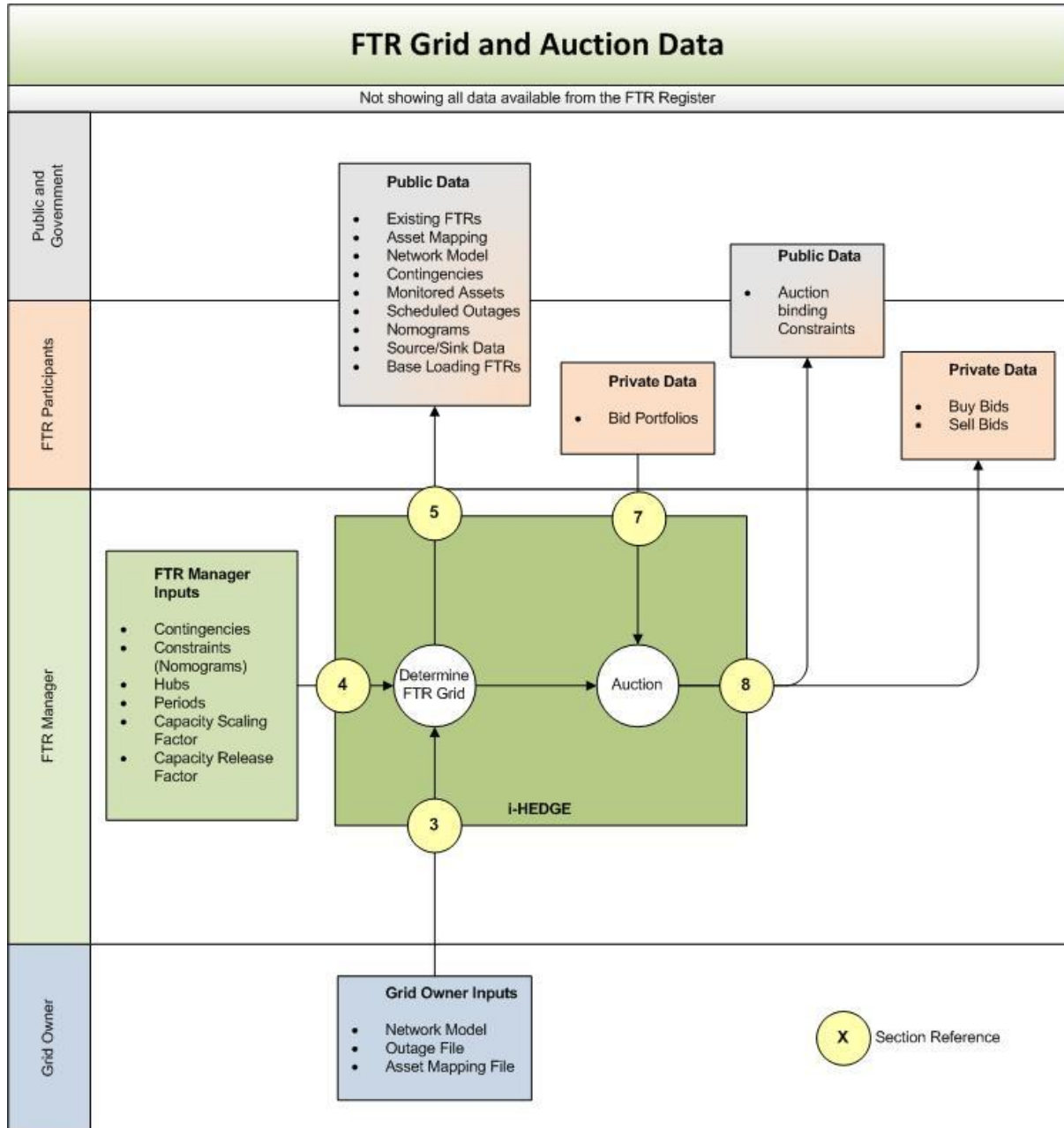
---

<sup>1</sup> Available at [www.ftr.co.nz](http://www.ftr.co.nz)

## 2 Structure of this policy

The relationships between these components of the FTR Grid and Auction Data are illustrated in Figure 1, which indicates also the structure of the sections of this policy:

Figure 1 – FTR Grid and Auction Data Overview



The inputs to the FTR Rentals Amount calculation are included as section 9.

The iHEDGE product allows for six key components that make up the FTR Grid:

- Network Model
- Outage File
- Contingencies

- Constraints (nomograms)
- Capacity Scaling Factor
- Hubs

The following table illustrates the relationship between the issues that might affect the FTR Grid, and which component of the FTR Grid reflects it.

**Figure 2 – Components of the FTR Grid used to represent effect of each issue**

Issue that might affect FTR capacity	Component of FTR Grid					
	Network Model	Outages	Contingencies	Constraints (Nomograms)	Capacity scaling	Hubs
In-month base transmission network change	○					
Planned outages		HVAC		HVDC	○	
Unplanned outages					○	
Loss effects					○	
Security constraints (N-1)			○			
Security constraints (voltage, stability etc.)				○		
Reserves constraints				○		
Variable line ratings	○					
Ensuring no artificial constraints						○
<b>Section</b>	<b>3.1</b>	<b>3.3</b>	<b>4.1</b>	<b>4.2 4.3</b>	<b>4.4</b>	<b>4.5</b>

The bottom row of this table marked ‘section’ indicates the section of this policy that deals with this component of the FTR Grid.

There are also a number of ‘administrative’ inputs, being the

- Asset Mapping File
- Period information
- Capacity Release Factor

The period information and Capacity Release Factor are taken from the FTR Calendar and are not detailed in this policy. The Asset Mapping File is discussed in section 3.2.

## 3 FTR Grid – Grid Owner inputs

The three Grid Owner inputs described below are the Network Model, Asset Mapping File and Outage File. The FTR Manager will import these files unaltered into the iHEDGE system. The FTR Manager will not check file content beyond format validation.

The FTR Manager and Grid Owner have agreed that the timing for the provision of these files is as defined in the FTR Calendar.

The Grid Owner will base its inputs for a future FTR Period on assets that are planned to be in service and released to the market as a formal offer by the Grid Owner. This excludes assets that are not planned to be commissioned, including those planned to be in a commissioning process, and those that are planned to have been decommissioned. The Grid Owner will either exclude such assets from the Network Model, or include them in both the Network Model and the Outage File.

### 3.1 Network model

The Network Model is used by iHEDGE to represent the basic network for the FTR Period. There is a single Network Model per FTR Period per Auction.

#### REQUIREMENTS

The FTR Allocation Plan requirement is as follows:

#### Section 4.2 – Network Model

A single Network Model will form the basis of the FTR Grid for each FTR Period offered in each FTR Auction. The FTR Manager will use as the Network Model the Grid Owner's forecast of the configuration and capacity of its grid for the FTR Period, allowing for:

- Any planned asset commissioning, asset decommissioning, asset re-rating or grid reconfiguration
- The expected impact of any variable and/or dynamic line ratings.

The FTR Manager will assume that the Network Model does not allow for any planned or unplanned outages.

#### SCOPE OF NETWORK MODEL

The Grid Owner will, for each FTR Period requested, provide its forecast of the transmission network as a single Network Model including the following information:

- Must include the BEN-220 buses, connections between them and the HVDC assets, all HVDC assets, and the North Island power system (NIPS), and the South Island power system (SIPS)
  - Must reflect a single interconnected transmission network encompassing the BEN2201 and OTA2201 buses (i.e. no islanding between these buses)
- Must model the HVDC assets as a single HVAC circuit equivalent in accordance with this section
- Must include all circuits, busbars and transformers and their interconnections

- Must not include any switches<sup>2</sup>.
- Must not account for any planned (or unplanned) outages (relevant planned outages are included separately – see section 3.3)
  - Must include asset ratings. These are to be the Grid Owner’s assessment of the expected rating that will be applied during the FTR Period, taking into account any variable or dynamic line ratings

The FTR Manager understands that the Grid Owner’s policy is to use continuous rating for the season that the FTR Period falls in – winter, shoulder or summer. Where transition from one season to the other occurs during the FTR period select the lower rating. This policy will be updated if and when variable or dynamic line ratings are introduced.

- Need not include load or fixed shunt data
  - Must include at least one generator to provide a voltage set-point. This does not have to be an actual generator.

Further details of the Network Model format are provided in Appendix A.

#### **HVDC REPRESENTATION**

iHEDGE represents all assets as if they were HVAC assets.

The Grid Owner will, for each FTR Period requested, represent the HVDC in the Network Model as follows<sup>3</sup>:

- The inter-island HVDC link or links will be modeled as a single AC circuit between Benmore (BEN) and Haywards (HAY).
- BEN and HAY will each be modeled as a single bus.
- This single AC line will have:
  - a capacity in MW equal to or greater than the sum of the capacities of HVDC circuits in service
  - a voltage of 220kV

The Grid Owner will include this representation in its Network Model, so the PSS/E file will have only AC assets.

---

<sup>2</sup> i-HEDGE cannot handle zero impedance branches, so any system splits will be modelled through complete outage (or ‘inage’) of the relevant circuit.

<sup>3</sup> The rationale for this is explained in section 8.1 of the Supporting Analysis

## HVDC CONFIGURATION

A flag will be placed in the Network Model indicating the HVDC configuration. The circuit ID of the BEN.HAY branch (AC equivalent of HVDC link) will show the HVDC configuration as follows:

- 1 – both pole 2 and pole 3 (no bipole outage)
- 2 – pole 2 only (pole 3 outage, no bipole outage)
- 3 – pole 3 only (pole 2 outage, no bipole outage)
- 4 – no poles (whole month bipole outage)
- 5 – bipole outage, counterfactual is both pole 2 and pole 3
- 6 – bipole outage, counterfactual is pole 2 only (pole 3 outage)
- 7 – bipole outage, counterfactual is pole 3 only (pole 2 outage)

Here, outage means planned and meeting the outage duration threshold (section 3.3), and counterfactual means the grid configuration during parts of the FTR Period without such a bipole outage.

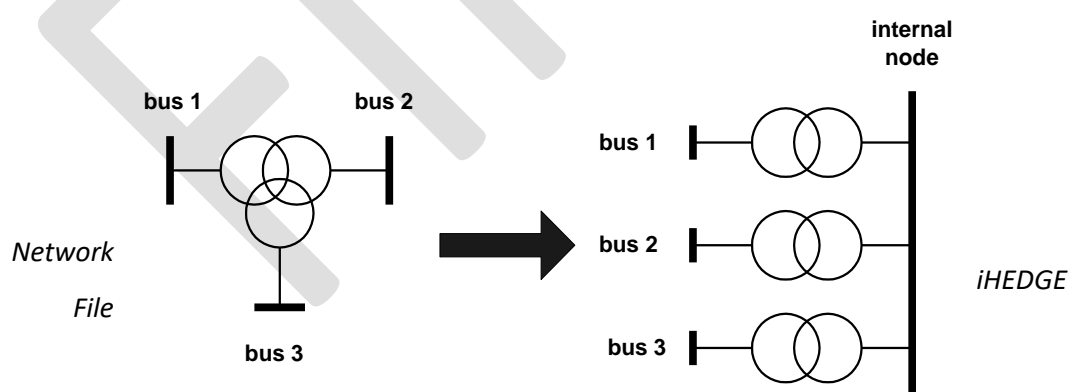
If both HVDC Poles are out of service, the HVDC will still be represented as a single AC circuit between BEN and HAY, with a configuration flag of 4. This flag will trigger zero capacity constraints in the nomogram file (see section 4.2).

## TRANSFORMERS

Two-winding transformers have common representation in DigSILENT Power Factory (the Grid Owner’s power systems analysis software) and hence PSS/E, and iHEDGE.

For three-winding transformers, there will be a difference between the representation in the Network File and in iHEDGE, with iHEDGE adding an internal node as illustrated in Figure 3:

**Figure 3 – Three winding transformer representation**





iHEDGE requires that they are represented as three with a data record containing the three nodes to which the transformer is connected, i.e. including the 'middle' node as a bus. The conversion will be included in the Asset Mapping File with the respective transformer name used as the 'internal node'<sup>4</sup>.

#### SINGLE NETWORK MODEL

If the Grid Owner forecasts that there will be multiple grids in the FTR Period (such as through a mid-month commissioning), then the Grid Owner is to provide the transmission network that:

- Is forecast to apply for at least the duration of relevant outages in the FTR Period
- Is, of those grids that apply for at least the duration of relevant outages in the FTR Period, the transmission network that the Grid Owner forecasts has the least transfer capacity between the Hubs.
- The 'duration of relevant outages' refers to the rule for whether a planned outage is relevant, given in see section 3.3 below.

That is, the same rule will be applied for choosing whether or not to include major non-outage transmission network changes (e.g. commissionings, decommissioning's or reconfigurations) as for outages.

---

<sup>4</sup> The PSS/E .raw file does not include the conversion that iHEDGE requires: while most power system analysis software including PSS/E and DigSILENT Powerfactory use the conversion that iHEDGE requires, it is done internally at runtime, so the transformer details in the converted state are not available to the user.

## 3.2 Asset naming and mapping

All FTR Grid files will use the following asset naming conventions, except that the Network Model will not use this convention for circuit names<sup>5</sup>:

**Figure 4 – FTR Grid asset naming conventions**

Asset type	Asset naming convention	Explanation
<b>Circuit</b> <b>Branch</b> <b>Line</b>	ABC.DEF.n	The n'th circuit between bus ABC and bus DEF. The two buses are listed in alphabetical order.
<b>Bus</b>	ABC/ABCxxx	ABC – name of station ABCxxx – name of the bus xxx – being the nominal voltage of bus ABC
<b>Busbar</b>	ABCxxx ABC-xxx-n	xxx being the nominal voltage of bus ABC The -n suffix is used when there are multiple buses in the same station at the same voltage
<b>Transformer</b>	ABC.TF.Tn ABC.TF.Tn_X	For normal (two-winding) transformers: the n'th transformer at bus ABC For three-winding transformers: with X = P, S or T for primary, secondary or tertiary (see section 3.1)
<i>There must be no spaces or special characters (other than those used above) in or after asset names</i>		

The Grid Owner will provide an Asset Mapping File to link the bus names in the Network Model with the Branch/Circuit/Line names in the other input files, including the Outage File.

The Asset Mapping File will be relatively static, but will need to change from time to time as for example new grid assets are planned and commissioned.

The Grid Owner will provide the FTR Manager with an Asset Mapping File per FTR Period that is, for all FTR Periods in the coming Auction Month. The Asset Mapping File can be expected to expand as new assets are commissioned, but not contract as old assets are de-commissioned.

<sup>5</sup> This is because PSS/E network data format does not include branch names – it uses bus number IDs to which each branch is connected.

An example of an Asset Mapping File is provided in Appendix A, and the format of the Asset Mapping download files are provided in Appendix B and Appendix C for Excel and XML formats respectively.

### 3.3 Outages

The FTR Allocation Plan requirement is as follows:

#### Section 4.3 – Planned outages

The FTR Manager will use the relevant planned outages provided by the Grid Owner to develop the FTR Grid for each FTR Period offered in each FTR Auction. The source for these will be the public information posted on the POCP site [pocp.redspider.co.nz](http://pocp.redspider.co.nz).

The FTR Manager shall define in its policy on the FTR Grid what planned outages are relevant, as a function of their asset type, outage duration and distribution of multiple outages across parallel circuits.

The FTR Manager shall remove the relevant planned outages from the Network Model when determining the Indicative Inter-hub Capacity and clearing an Auction.

The Grid Owner will provide an Outage File listing all relevant outages planned for the FTR Period. The Outage File is used by iHEDGE to remove specific assets from the basic network for the FTR Period. The assets in this file are removed for the entire FTR Period.

The reasons for having the FTR Manager remove the outages via a separate file, rather than having the Grid Owner remove the outages directly from the Network Model itself, are for transparency, and because the Network Model may remain the same between FTR Periods, while outages may differ.

The rule for whether a planned outage is considered ‘relevant’ is<sup>6</sup>:

#### For CONFIRMED

Outages are considered relevant if they both:

- Satisfy the outage duration threshold as:
  - being out or open **16 half-hours** (not necessarily consecutive) or more during the FTR Period
  - with separate outages on circuits between the same buses (e.g. ABC.DEF.1 and ABC.DEF.2) being considered as a single-circuit outage for this purpose
- Are flagged as **Confirmed** in POCP

#### For Everything Else<sup>7</sup>

Outages are considered relevant if they both:

- Satisfy the outage duration threshold as:

<sup>6</sup> The rationale for this is explained in section 3.1 of the Supporting Analysis

<sup>7</sup> This covers possible combinations of confirmed and tentative statuses

- being out or open **32 half-hours** (not necessarily consecutive) or more during the FTR Period
- with separate outages on circuits between the same buses (e.g. ABC.DEF.1 and ABC.DEF.2) being considered as a single-circuit outage for this purpose
- Are flagged as either **Tentative or Confirmed** in POCP

Other outages, of shorter duration, not so flagged in POCP, or from other sources inconsistent with POCP, will not be considered relevant.

Relevant HVAC outages are included in the Outage File, except that<sup>8</sup>:

HVAC outages assessed as relevant may be excluded from the Outage File if the Grid Owner or FTR Manager (on advice from the Grid Owner or System Operator) believes that the effects of that outage on capacity are less than that of another relevant outage that does not overlap it in duration, or are negated by inter-trip arrangements.

The Grid Owner or FTR Manager as the case may be will publish any such decision with its reason.

Relevant HVDC outages are flagged in the Network Model as a change in the HVDC grid configuration (section 3.1).

The relevant outages definition above applies also to the Grid Owner choosing whether or not to include major non-outage transmission network changes (e.g. commissionings, decommissionings or reconfigurations) as for outages (see section 3.3).

The Grid Owner will ensure that all assets in the Outage File are present in the accompanying Network Model for that FTR period, and use the asset naming conventions defined in section 3.2.

Examples of the Outage File are provided in Appendix A, and the format of the Scheduled Outages download files are provided in Appendix B and Appendix C for CSV and XML formats respectively.

#### IDENTIFICATION OF PLANNED OUTAGE PERIODS:

The following approach will be taken to identifying planned outage periods, needed for applying the Capacity Scaling Factor (section 4.3):

- The Grid Owner provides an Outage File whenever there are relevant outages
- The Grid Owner provides a null (empty) Outage File when there are no relevant HVAC outages, but confirmed or tentative outage information is available (e.g. there are planned outages for that period, but they are all short duration ones)
- The Grid Owner does not provide an Outage File when there is no confirmed or tentative outage information available, i.e. outside the outage planning horizon

As the Grid Owner has increased its rolling outage planning horizon to two years, which is the maximum FTR Horizon, it is expected that there will always be an Outage File provided, either including outages or null.

---

<sup>8</sup> The rationale for this is explained in section 3.2 of the Supporting Analysis

## PERMANENT OUTAGES

For the forecast grid (applied to FTR Auctions), system splits are modeled in the grid PSS/E file as out of service.

For the Normal Grid Configuration (used to calculate the FTR Rentals Amount), system splits are modelled in the same way.

The current list of permanent outages is as follows:

DEVICE_TYPE	DEVICE_NAME	STATUS in PSS/E file	DESCRIPTION
LINE	ARI.ARI.1 <sup>9</sup>		ARI Bus Split
LINE	FHL.WPW.1	0	Permanent System Split
LINE	FHL.WPW.2	0	Permanent System Split
XFMR	EDG.TF.T4 <sup>10</sup>	2	Permanent System Split
XFMR	EDG.TF.T5 <sup>11</sup>	2	Permanent System Split
LINE	STU.TIM.1	0	Every year from May-Sep (SI Outage)

<sup>9</sup> The ARI.ARI.1 bus split cannot be modelled in the FTR Grid Model.

<sup>10</sup> The EDG.TF.T4 three winding transformer will have a status of “2”. This indicates the secondary winding is open and the split is in place.

<sup>11</sup> As above for EDG.TF.T5

## 4 FTR Grid – FTR Manager Inputs

The FTR manager inputs will use the asset naming conventions defined in section 3.2.

### 4.1 Contingencies

The FTR Allocation Plan requirement is as follows:

#### Section 4.4 – Security constraints

The FTR Manager will apply contingent security constraints to the network model, net of the relevant planned outages, when clearing an Auction. These constraints will be consistent with the System Operator’s Policy Statement, which is included by reference in the Code (clause 8.10).

[...]

The following contingencies will be allowed for to ensure that the solution is robust to them<sup>12</sup>:

- All circuits of 110kV and over
- Except the proxy HVDC circuits (any circuit between BEN and HAY)

These contingencies will be applied to the FTR Grid, as well as to the FTR Rentals Amount calculation.

The solution time of iHEDGE increases with the number of monitored assets. For this reason, the huge US FTR grids have relatively few, carefully selected, monitored assets rather than a blanket rule such as the above. This rule will therefore be subject to run-time testing.

The FTR Manager is aware that the System Operator is tasked with managing pre-contingent flows on those interconnector transformers that are assessed as posing a cascade failure risk, but the process has not yet been finalised. The FTR Manager will monitor this situation and reflect it as necessary once finalised.

### 4.2 Constraints (nomograms)

The FTR Allocation Plan requirement is as follows:

#### Section 4.4 – Security constraints

[...]

The FTR Manager may include additional security constraints in the FTR Grid to reflect constraints that the System Operator applies or might in future apply to manage, for example, voltage or transient stability.

#### Section 4.6 – Instantaneous reserves

<sup>12</sup> The rationale for this is explained in section 6 of the Supporting Analysis

The FTR Manager will include in the FTR Grid constraints that limit flow across the inter-island HVDC link to represent the expected, average impact of instantaneous reserve constraints in the energy and reserves market.

These constraints will be a function of which HVDC assets are in the Network Model net the relevant planned outages.

iHEDGE uses the term nomograms for constraints. The nomogram file is used to constrain the HVDC and model it as a HVAC circuit. The nomograms (i.e. each constraint) will be monitored in iHEDGE for the base case and all contingency cases.

#### PERMANENT SECURITY CONSTRAINTS

Permanent security constraints will be taken from the System Operator's manual constraints list, as published at <https://www.transpower.co.nz/system-operator/operational-information/security-constraints>. The constraints will be applied to all FTR Periods. That is, the FTR Manager will maintain a latest set of permanent security constraints, which will be updated when the System Operator updates its list.

Allowance for permanent security constraints<sup>13</sup>:

- Permanent security constraints will be applied to all FTR Grids and FTR Periods, as well as to the normal grid configuration for the FTR Rentals Amount calculation
- The source of permanent security constraints will be the System Operator's latest published manual constraints list
- Other constraints in that list (e.g. outage constraints) are not to be included

---

<sup>13</sup> The rationale for this is explained in section 7 of the Supporting Analysis

An example extract of relevant constraints from the System Operator’s constraints list is shown in Figure 5:

**Figure 5 – Permanent security constraints (example)**

Constraint name	Equation	≤ RHS	Purpose
<b>HLY_SFD_Stability_P_z</b>	$-1 * \text{HLY\_SFD.1} + 1 * \text{SFD\_TMN1.1}$	550	To limit pre-contingency flows from SFD to HLY and SFD to TMN to set maximum stability limit for a single contingency during high Taranaki generation and high north flow.
<b>UPPER_NORTH_ISLAND_STABILITY_P_1D</b>	$-1 * \text{HLY\_OHW1.1} + -1 * \text{HLY\_OHW2.1} + -1 * \text{HLY\_SFD.1} + -1 * \text{HLY\_TWH1.1} + 1 * \text{OHW\_OTA1.1} + 1 * \text{OHW\_OTA2.1} + -1 * \text{OTA\_WKM1.1} + -1 * \text{OTA\_WKM2.1} + -1 * \text{PAK\_WKM1.2} + -1 * \text{PAK\_WKM2.2} + -1 * \text{BOB\_HAM1.1} + -1 * \text{BOB\_HAM2.1} + 1 * \text{ARI\_BOB1.1}$	2500	The effect of this constraint is to manage flows through all transmission lines into the upper north island region for a contingency of the largest connected generator, to maintain post contingent voltage stability.

The FTR Manager will re-express these constraints using the asset naming conventions defined in section 3.2, and include them in the nomogram file. Sometimes, the System Operator’s SPD configuration differs from the FTR Grid, for example in the handling of ‘tee’ connections. In such cases, the FTR Manager will maintain a mapping to the most comparable FTR Grid asset. An example of this substitution file is proved as Figure 6:

**Figure 6 – SPD to FTR Grid asset substitutions (example)**

SPD asset	FTR asset
HLY.OTA.2	HLY.TAT.2
CYD.TWZ.2	CML.CYD.2
BPE_PRM_HAY1.1	BPE.PRT.1

The asset substitution file is not available for download. However, active substitutions can be inferred through comparing the nomogram file with the System Operator’s manual constraints list.

#### **HVDC CONSTRAINTS**

The FTR Allocation Plan requirement is as follows:

##### **Section 4.6 – Instantaneous reserves**

The FTR Manager will include in the FTR Grid constraints that limit flow across the inter-island HVDC link to represent the expected, average impact of instantaneous reserve constraints in the energy and reserves market.



These constraints will be a function of which HVDC assets are in the Network Model net the relevant planned outages.

The HVDC constraints in the forms of maximum flows will depend on the HVDC configuration (that itself allows for outages) and direction as shown in Figure 7:

**Figure 7 – FTR Periods (from December 2014 inclusive)**

	HVDC configuration						
	No bipole outages			Bipole outages, with configuration otherwise:			
	P2 and P3	P2 only	P3 only	No poles	P2 and P3	P2 only	P3 only
<b>HVDC flag</b>	1	2	3	4	5	6	7
<b>Northwards</b>	907 MW	440 MW	440 MW	0	499 MW	242 MW	242 MW
<b>Southwards</b>	630 MW	180 MW	180 MW	0	347 MW	99 MW	99 MW

Both HVDC and HVAC capacities will be multiplied by the relevant Capacity Scaling Factor (section 4.3) and Capacity Release Factor (from FTR Calendar).

If downwards revision of FTR Grid capacity, due to a revision in the data provided by the Grid Owner (including network model, outage file and HVDC configuration) causes existing FTR holdings to exceed FTR Grid capacity, then the FTR Manager will automatically adjust the limit (the ‘right hand side’) of any constraints violated by existing FTR holdings, including thermal, contingency and nomogram constraints. This may result in the actual grid capacity on certain paths or assets exceeding the limits of the FTR Grid as published prior to the auction.

#### CONSTRAINT FILES

In the iHEDGE download, the security and reserve constraints are grouped together as Nomograms. The format of the Nomogram download files are provided in Appendix B and Appendix C for CSV and XML formats respectively.

### 4.3 Capacity scaling factor

The FTR Allocation Plan requirement is as follows:

#### Section 4.5 – Other outages and losses

Unplanned outages can increase the likelihood of Revenue Inadequacy if the FTR Grid does not allow for them.

The FTR Manager will apply a capacity scaling factor in the FTR Grid to allow for the expected, average impact of:

- Unplanned outages
- Planned outages that are not “relevant” (e.g. of shorter duration)
- Electrical losses.

The capacity scaling factor used will be a function of:

- The horizon of the FTR Period and its relationship to the Grid Owners’ outage planning cycle
- Which major assets are in the network model, net of the relevant planned outages

The capacity scaling factor will be a percentage applied to the capacity of all assets, or of HVDC or HVAC assets separately.

A Capacity Scaling Factor will be applied in accordance with the look-up table in Figure 8:

**Figure 8 – Capacity Scaling Factors<sup>14</sup>**

FTR Periods for which there is an Outage File	FTR Periods for which there is no Outage File
91%	77%

The capacity scaling factor will be applied to all assets, HVDC and HVAC.

The existence or not of the Outage File is used as a marker of planned outage periods, as described in section 3.3. However, as the Grid Owner has increased its rolling outage planning horizon to two years it is expected that there will always be an Outage File, and that the Capacity Scaling Factor in the left hand column of Figure 8 above will apply.

## 4.4 Hubs

The FTR Allocation Plan 2018 requirement is as follows:

### Section 2.2 – FTR Hubs

There are eight FTR hubs. Each FTR Hub will have a Settlement Node and will be offered in all Auctions from a particular Auction Month (inclusive).

Hub	Settlement Node	Offered in Auctions from:
Benmore (BEN)	BEN2201	June 2013
Otahuhu (OTA)	OTA2201	June 2013
Haywards (HAY)	HAY2201	November 2014
Islington (ISL)	ISL2201	November 2014
Invercargill (INV)	INV2201	November 2014

<sup>14</sup> The rationale for this is explained in section 5 of the Supporting Analysis

Whakamaru (WKM)	WKM2201	May 2018
Kikawa (KIK)	KIK2201	May 2018
Redclyffe (RDF)	RDF2201	May 2018

All FTRs will be between pairs of these Hubs, with one of these Hubs as the Source, and another different Hub as the Sink.

#### Section 4.7 – Auction hub weightings

For each Hub, the FTR Manager shall use its Settlement Node for the FTR Auction unless that node restricts the FTR capacity to below the full capacity of the other inter-Hub circuits. In that case, the FTR Manager will include a weighting of neighbouring nodes in the relevant Hub to relieve that restriction.

The Hub 220kV buses will be used as the FTR Hubs and for settlement, as illustrated in Figure 9.

**Figure 9 – Hub-Node relationships**

Hub	FTR Grid		Settlement	
	Network Model node	Weighting	Market Node	Weighting
<b>BEN</b>	BEN/BEN_220	100%	BEN2201	100%
<b>OTA</b>	OTA/OTA220B1	100%	OTA2201	100%
<b>HAY</b>	HAY2/HAY220A	100%	HAY2201	100%
<b>ISL</b>	ISL2/ISL220A	100%	ISL2201	100%
<b>INV</b>	INV/INV220A1	100%	INV2201	100%
<b>WKM</b>	WKM/WKM220A1	100%	WKM2201	100%
<b>KIK</b>	KIK/KIK_220	100%	KIK2201	100%
<b>RDF</b>	RDF/RDF220A1	100%	RDF2201	100%

The 100% weightings of the settlement nodes are prescribed in the FTR Allocation Plan. The 100% weightings of the FTR Grid Network Model nodes are to reflect this, in the expectation that those two buses are sufficient to enable a full transfer of capacity between them. This is expected to be the case for the foreseeable future. If this is found not to be, then the FTR Manager will amend this policy according, for example to add some weight to a neighbouring node e.g. OTA Hub as 80% OTA/OTA220 and 20% PEN/PEN220.

In interpreting the network and market data downloads, iHEDGE uses three general types of nodes as illustrated in Figure 10:

**Figure 10 – Node definitions**

Term	Definition	Relationship	Example
Bus	Electrical bus in the Network Model	One PNode is mapped to one and only one Bus.	BEN/BEN_220
PNode	Elemental Pricing Node		P-BEN
APNode	Aggregate Pricing Node (i.e. a Hub)	One APNode is mapped to one or more PNodes with defined participation factors.	BEN

Note that the definition of PNode here is not the same as in scheduling, dispatch and pricing (SPD).

## 5 FTR Grid – Downloads

iHEDGE download provides for the FTR Grid files to be downloaded as public data. Please refer to the FTR Policy on Use of the FIS for details on this. The format of the download files are provided in Appendix B and Appendix C for CSV and XML formats respectively, other than for the PSS/E Network file, which is in .raw format as described in Appendix A.

Figure 11 describes the layout of FTR Grid downloads (the last two items being Auction results).

**Figure 11 – FTR Grid Inputs and Downloads**

Input	Tab	Comments
Public Data	General Data	Existing FTRs
	Network Data	PSS/E Network Model
		Contingencies
		Monitored Lines And Transformers
		Scheduled Outages
		Nomograms
		Asset Map
	Market Data	Source/Sink Data
		Base Loading FTR
Market Result Data	Auction Binding Constraints	
Private Data	Market Result Data	Auction Results – Bids (Bids and FTRs)

## 6 Indicative Inter-Hub Capacity

The FTR Manager will no longer publish indicative capacity for the Multi-Hub Market (>2 HUBS). As such there will be no Notice #2 or Notice #3 published by the FTR Manager prior to an Auction.

FINAL

## 7 Bid portfolios

The FTR Allocation Plan requires that:

### Section 3.9 Submitting bids

Any FTR Participant can submit bids in Bid Portfolios for any FTR Period offered in any Auction.

The FTR Manager will enable FTR Participants to upload, download, revise and cancel Bid Portfolios during the Bid Window.

Bid Portfolios will be specific to an FTR Participant, FTR Auction, and FTR Period, and each Bid Portfolio may include one or more bids, each for:

- A specific FTR Product
- One or more price and quantity tranches with:
  - Bid quantity (MW) in 0.1 MW increments: bid quantities must be a positive value
  - Bid price (\$/MW/h) in \$0.01 (one cent) increments: bid prices may be positive, negative or zero.

Each bid must be submitted as a buy bid or a sell bid ('offer'). Participants may submit sell bids only for FTRs and FTR volumes that they hold for that FTR Period. A sell bid may be for the full volume of a held FTR, or for a part of that volume.

The FTR Manager will accept only those bids that conform to the Auction Rules and are submitted through the FTR Information System by an FTR Participant.

For the process for uploading, downloading, revising and cancelling Bid Portfolios, please refer to the FTR Policy on the use of the FIS.

For the format of Bid Portfolio files, please refer to Appendix C.

## 8 Auction results

iHEDGE download provides for the auction results to be downloaded as public data (Public users, once registered, can access Auctions results via the FTR Register). Please refer to the FTR Policy on Use of the FIS for details on this. The format of the download files are provided in Appendix B and Appendix C for CSV and XML formats respectively.

**Figure 12 – Auction results downloads**

Input	Tab	Comments
Public Data	Market Result Data	Auction Binding Constraints
Private Data	Market Result Data	Auction Results – Bid and FTRs



## 9 FTR rentals amount calculation – Inputs

Within the FTR Market, the FTR Manager calculates monthly the FTR Rentals Amount in accordance with Schedule 14.3 of the Code. This is then passed to the Clearing Manager for use in FTR settlement. FTR Rentals input files are not made available to participants via the FIS Portal.

While it is functionally quite separate from the FTR Grid and FTR Auction process, it is convenient to describe the Grid Owner and FTR Manger inputs to this process here, as they are closely related to the Grid Owner and FTR Manger inputs to the FTR Grid.

The FTR Allocation Plan requirement is as follows:

### Section 2.8 – FTR Rentals Amount

After each FTR Period, the FTR Manager will determine an FTR Rentals Amount according to Schedule 14.3 of the Code (which is based in part on inputs from the Grid Owner and the Pricing Manager) and inform the Clearing Manager by 1600 hours on the 7<sup>th</sup> Business Day after that FTR Period.

If the FTR Rentals Amount advised by the FTR Manager exceeds the amount of the loss and constraint excess for the FTR Period, the Clearing Manager will reduce the FTR Rentals Amount advised by the FTR Manager to that amount.

### 9.1 Grid Owner inputs

Clause 4 of Schedule 14.3 of the Code requires that:

- The Grid Owner must determine a Normal Grid Configuration and provide its model to the FTR Manager
- This Normal Grid Configuration must have all existing branches and switches closed except where the Grid Owner has implemented operational system splits and the Grid Owner considers that the normal state of those operational system splits is for the relevant branch or switch to be open.

The Grid Owner and FTR Manager have agreed (under Clause 4(5)) that a single Normal Grid Configuration will be provided for each calendar month.

The FTR Manager has developed the FTR Rentals Calculation engine as a customisation of iHEDGE. The FTR manager has agreed with the Grid Owner that the Normal Grid Configuration will be in the same PSS/E v0.32 format as the FTR Grid Network Model, reducing complexity and risk of human error to both parties.

The Normal Grid Configuration has specific Code requirements for its representation of the HVDC link. This is because the Schedule 14.3 algorithm uses the HVAC representations explicitly, but used the HVDC simply to provide electrical connectivity between Benmore and Haywards. For this reason, Clause 6 of Schedule 14.3 requires that:

- The set of inter-island HVDC links must be replaced by a single AC line with a nominal susceptance value between the Benmore and Haywards HVDC terminal nodes

- This nominal susceptance value determined under paragraph may be any suitable value that will avoid numerical difficulties
- Any switches between the Benmore HVDC terminal node and other Benmore nodes operating at the same nominal voltage that are normally closed must be treated as closed
- Any switches between the Haywards HVDC terminal node and other Haywards nodes operating at the same nominal voltage that are normally closed must be treated as closed

The Network Model will, as described in section 3.1, model the HVDC as a single AC circuit between Benmore and Haywards, each of which will be modelled as a single bus.

This approach will satisfy the requirements of Schedule 14.3 except when no HVDC poles were in service. In that case, a notional HVDC pole needs to be included, which could be modelled on Pole 2, Pole 3, both poles or a notional pole.

The requirements for the Normal Grid Configuration are therefore:

- Scope is the same as for the Network Model described in section 3.1 and Appendix A
- HVDC representation is the same as for the Network Model described in section 3.1,
- A flag will be placed in the Normal Grid Configuration indicating the HVDC configuration. The circuit ID of the BEN-HAY branch (AC equivalent of HVDC link) will show the HVDC configuration as follows:
  - **1** – both pole 2 and pole 3 (expected case for foreseeable future)
  - **2** – pole 2 only (should pole 3 have been decommissioned)
  - **3** – pole 3 only (should pole 2 have been decommissioned)
  - **4** – no poles (should both poles have been decommissioned)
- Here, decommissioned means take permanently out of service. It does not include HVDC outages.
- If both HVDC Poles have been decommissioned for the entire month, the HVDC will still be represented as a single AC circuit between BEN and HAY, with a configuration flag of 4. This flag will trigger zero capacity constraints in the nomogram file (see section 9.2).
- Transformer representation is the same as for the Network Model described in section 3.1
- Asset naming is the same as for the Network Model described in section 3.1, provided by the Grid Owner at the same time as the Normal Grid Configuration.
- Consistent with the latest Asset Mapping File provided to the FTR Manager
- A single Normal Grid Configuration will be provided for each calendar month
- The Normal Grid Configuration will include permanent outages using a status flag
- No Outage File is required

Figure 13 maps, in summary, the Grid Owner’s inputs to the FTR Grid with its inputs to the FTR Rentals Amount calculation:

**Figure 13 – Grid Owner inputs to FTR Rentals Amount calculation (summary)**

	Grid Owner inputs to:	
	FTR Grid	FTR Rentals Amount calculation
<b>Grid</b>	Network Model in PSS/E format Full grid with HVDC link represented as a single AC circuit, with HVDC configuration flag	Normal Grid Configuration in same format as Network Model
<b>Outage File</b>	Applied	Not applied
<b>Asset Mapping File</b>	Applied	Supplied by Grid Owner at same time as Normal Grid Configuration
<b>Permanent outages</b>	Included in Outage File	Included in Normal Grid Configuration

## 9.2 FTR Manager inputs

The first stage of the FTR Rentals Amount calculation is the determination of FTR injection patterns.

Clause 5 of Schedule 14.3 of the Code requires that the FTR injection patterns must be determined from the normal grid configuration assuming:

- the absence of all other grid flows
- all AC line and HVDC link capacity limits applied
- all risk and reserve constraints disabled
- all branch fixed and variable losses set to 0

The term risk and reserve constraints is not defined in the Code but is taken to have the same meaning as in the SPD model formulation<sup>15</sup>, which includes reserves, DCCE and DCECE constraints. It is thus assumed not to include HVAC N-1 contingency, or HVDC or HVAC stability constraints.

<sup>15</sup> Available at <http://www.ea.govt.nz/dmsdocument/12270> See section 3.4.

Figure 14 maps, in summary, the FTR Manager’s inputs to the FTR Grid with its inputs to the FTR Rentals Amount calculation:

**Figure 14 – FTR Manager inputs to FTR Rentals Amount calculation**

	FTR Manager’s inputs to:	
	FTR Grid	FTR Rentals Amount calculation
<b>Contingencies</b>	Business rule for monitoring all 110kV+ circuits in the Network Model except the proxy HVDC lines	Same business rule applied (see section 4.1)
<b>Constraints (nomograms)</b>	Permanent stability constraints	Applied
	HVDC reserve and contingency constraints	Not applied
	HVDC capacity limits	Applied as per Figure 15 – HVDC Capacity Limits for the Normal Grid Configuration below.
<b>Capacity Scaling Factor</b>	A proportion (e.g. 0.85) depending on the circumstances	Not applied
<b>Capacity Release Factor</b>	As defined in the FTR Calendar	Not applied
<b>Hubs</b>	Weighted as necessary to provide maximum capacity	Same as for FTR Grid (see section 4.4)

**Figure 15 – HVDC Capacity Limits for the Normal Grid Configuration<sup>16</sup>**

	HVDC configuration			
	P2 and P3	P2 only	P3 only	No poles
<b>HVDC Flag</b>	1	2	3	4
<b>Northwards</b>	1200 MW	500 MW	700 MW	0
<b>Southwards</b>	850 MW	489 MW	700 MW	0

To ensure that the calculated FTR Rentals Amount is as close as practicable to the maximum amount allowable under Schedule 14.3, without the algorithm having convergence problems, the FTR

<sup>16</sup> The rationale for this is explained in section 8.7 of the Supporting Analysis

Manager will use the paired target flows tabulated in the left four columns of Figure 16 – Paired target flows for eight-hub market (2018), with example BEIP to determine balanced extreme FTR injection patterns (BEIPs).

**Figure 16 – Paired target flows for eight-hub market (2018), with example BEIP**

Pattern	Target flow			Example BEIP*	Pattern	Target flow			Example BEIP*
	Source	Sink	MW			Source	Sink	MW	
1	BEN	ISL	3000	998.9	35	HAY	WKM	3000	661.1
	ISL	INV	3000	562.7		OTA	WKM	3000	1572.9
2	BEN	INV	3000	1196.1	36	OTA	HAY	3000	869.5
	INV	ISL	3000	1330.0		OTA	WKM	3000	771.0
3	INV	ISL	3000	562.7	37	HAY	OTA	3000	869.5
	ISL	BEN	3000	998.9		WKM	OTA	3000	771.0
4	BEN	ISL	3000	1263.0	38	HAY	OTA	3000	509.2
	INV	BEN	3000	528.7		HAY	RDF	3000	368.3
5	INV	BEN	3000	1246.2	39	OTA	HAY	3000	509.2
	ISL	INV	3000	1556.9		RDF	HAY	3000	368.3
6	BEN	INV	3000	528.7	40	RDF	HAY	3000	291.3
	ISL	BEN	3000	1263.0		RDF	OTA	3000	291.3
7	ISL	KIK	3000	623.3	41	HAY	RDF	3000	291.3
8	KIK	ISL	3000	623.3		OTA	RDF	3000	291.3
9	BEN	INV	1500	401.1	42	OTA	HAY	3000	931.3
	BEN	ISL	1500	643.6		OTA	RDF	3000	582.6
10	INV	BEN	1500	401.1	43	HAY	OTA	3000	931.3
	ISL	BEN	1500	643.6		RDF	OTA	3000	582.6
11	INV	BEN	1500	286.5	44	HAY	RDF	3000	476.0
	INV	ISL	1500	262.2		HAY	WKM	3000	357.4
12	BEN	INV	1500	286.5	45	RDF	HAY	3000	476.0
	ISL	INV	1500	262.2		WKM	HAY	3000	357.4
13	ISL	BEN	1500	1032.4	46	RDF	HAY	3000	291.3
	ISL	INV	1500	401.8		RDF	WKM	3000	291.3
14	BEN	ISL	1500	851.0	47	HAY	RDF	3000	291.3
	INV	ISL	1500	479.0		WKM	RDF	3000	291.3
15	HAY	OTA	3000	69.7	48	WKM	HAY	3000	785.9
	HAY	RDF	3000	565.2		WKM	RDF	3000	582.6
	OTA	WKM	3000	1643.4	49	HAY	WKM	3000	785.9
	RDF	WKM	3000	1147.8		RDF	WKM	3000	582.6
16	HAY	RDF	3000	539.5	50	HAY	OTA	2000	375.1
	HAY	WKM	3000	420.5		HAY	RDF	2000	283.2
	RDF	OTA	3000	762.8		HAY	WKM	2000	202.5
	WKM	OTA	3000	881.8	51	RDF	HAY	2000	194.2
17	OTA	HAY	3000	567.7		RDF	OTA	2000	194.2
	RDF	OTA	3000	162.2	52	RDF	WKM	2000	194.2
	RDF	WKM	3000	420.5		WKM	HAY	2000	634.9
	WKM	HAY	3000	309.4		WKM	OTA	2000	1573.7
						WKM	RDF	2000	582.6

Pattern	Target flow			Example BEIP*
	Source	Sink	MW	
18	HAY	WKM	3000	1160.9
	OTA	WKM	3000	1630.3
	RDF	HAY	3000	526.0
	RDF	OTA	3000	56.6
19	HAY	OTA	3000	864.3
	RDF	HAY	3000	242.0
	RDF	WKM	3000	340.7
	WKM	OTA	3000	765.6
20	OTA	HAY	3000	69.7
	RDF	HAY	3000	565.2
	WKM	OTA	3000	1643.4
	WKM	RDF	3000	1147.8
21	HAY	RDF	3000	526.0
	OTA	RDF	3000	56.6
	WKM	HAY	3000	1160.9
	WKM	OTA	3000	1630.3
22	HAY	OTA	3000	773.8
	RDF	OTA	3000	799.9
	WKM	HAY	3000	1408.7
	WKM	RDF	3000	1382.6
23	OTA	RDF	3000	762.8
	OTA	WKM	3000	881.8
	RDF	HAY	3000	539.5
	WKM	HAY	3000	420.5
24	HAY	RDF	3000	242.0
	OTA	HAY	3000	864.3
	OTA	WKM	3000	765.6
	WKM	RDF	3000	340.7
25	HAY	WKM	3000	1408.7
	OTA	HAY	3000	773.8
	OTA	RDF	3000	799.9
	RDF	WKM	3000	1382.6
26	RDF	OTA	3000	291.3
	RDF	WKM	3000	291.3
27	OTA	RDF	3000	291.3
	WKM	RDF	3000	291.3
28	WKM	OTA	3000	1601.8
	WKM	RDF	3000	582.6
29	OTA	WKM	3000	1601.8
	RDF	WKM	3000	582.6
30	OTA	RDF	3000	582.6
	OTA	WKM	3000	1019.8
	RDF	OTA	3000	582.6
31	WKM	OTA	3000	1019.8
	HAY	OTA	3000	562.5
32	HAY	WKM	3000	303.6

Pattern	Target flow			Example BEIP*
	Source	Sink	MW	
53	OTA	HAY	2000	586.0
	OTA	RDF	2000	521.6
	OTA	WKM	2000	520.7
54	OTA	HAY	2000	375.1
	RDF	HAY	2000	283.2
	WKM	HAY	2000	202.5
55	HAY	RDF	2000	194.2
	OTA	RDF	2000	194.2
56	WKM	RDF	2000	194.2
	HAY	WKM	2000	634.9
	OTA	WKM	2000	1573.7
57	RDF	WKM	2000	582.6
	HAY	OTA	2000	586.0
	RDF	OTA	2000	521.6
58	WKM	OTA	2000	520.7
	HAY	OTA	1500	486.7
	HAY	WKM	1500	379.1
	RDF	OTA	1500	345.1
59	RDF	WKM	1500	237.5
	HAY	OTA	1500	763.9
	HAY	RDF	1500	232.3
	WKM	OTA	1500	881.9
60	WKM	RDF	1500	350.3
	HAY	RDF	1500	70.1
	HAY	WKM	1500	617.2
	OTA	RDF	1500	512.5
61	OTA	WKM	1500	1059.6
	RDF	HAY	1500	70.1
	RDF	OTA	1500	512.5
	WKM	HAY	1500	617.2
62	WKM	OTA	1500	1059.6
	OTA	HAY	1500	760.9
	OTA	WKM	1500	884.6
	RDF	HAY	1500	229.5
63	RDF	WKM	1500	353.2
	OTA	HAY	1500	486.7
	OTA	RDF	1500	345.1
	WKM	HAY	1500	379.1
64	WKM	RDF	1500	237.5
	HAY	OTA	3000	567.7
	HAY	WKM	3000	309.4
	OTA	RDF	3000	162.2
	WKM	RDF	3000	420.5

*\* Determined using a recent Normal Grid Configuration, expressed to one decimal place*

## Appendix A GRID OWNER FILE FORMATS

Please refer to section 3.

### A1 Network Model format

The Grid Owner will use the naming conventions and units specified in section 3.2.

The Grid Owner will provide the Network Model as a PSS/E version 32.0 raw data file. The parts of that file that must be populated are indicated as 'Required' in Figure 17:

**Figure 17 – Network Model – PSS/E data requirements<sup>17</sup>**

Table	Status
Header	Required
Bus Data	Required
Load Data	Ignored
Fixed Shunt Data	Ignored
Generator Data	Required*
Non-Transformer Branch Data	Required
Transformer Data	Required
Area Interchange Data	Ignored
Two-Terminal DC Line Data	Ignored
Transformer Impedance Correction Tables	Ignored
Multi-terminal DC Line Data	Ignored
Multi-section Line Grouping Data	Ignored
Zone Data	Ignored
Inter-area Transfer Data	Ignored
Owner Data	Ignored
FACTS Control Device	Ignored
* Generator data is only required so that there is at least one generator to provide a voltage set-point and a swing bus if required. This could be either an actual generation scenario, or an imaginary generator.	

A flag will be placed in the Network Model indicating whether Pole 2, Pole 3 or both poles are in service, as explained in section 4.2.

PSS/E is a widely used, industry standard power systems analysis package. The PSS/E documentation, including details of the .raw formats, is copyright to Siemens Energy Inc.

Parties that license PSS/E will already have access to the raw file format documentation as part of their User Manual.

<sup>17</sup> Source: Section 5.1 of Nexant's NZ iHEDGE Data Interface Subsystem, Version 1.1

Parties that do not, but require the documentation, need to submit their own request to Siemens, whose policy is (the FTR Manager understands) to approve each request after the requesting party has agreed to the terms and conditions. There is a fee for the documentation. Under the terms and conditions, the raw file format may not be distributed. The request can be made at <http://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/Pages/PSSERawDataFormat.aspx>.

## A2 Asset Mapping File format

An example of this Asset Mapping File is illustrated by Figure 18:

**Figure 18 – Asset Mapping File (example)**

FROM BUS	TO BUS	CCT	ASSET TYPE	BRANCH NAME	Notes
BPE220A1a	TKU-220-1	1	LINE	BPE.TKU.1	HVAC circuit
BEN/BEN_220	HAY2/HAY220A	1	LINE	BEN.HAY.1	HVDC circuit(s) represented as a single AC circuit
WIL2/WIL220A	WIL33/WIL33K	1	XFMR	WIL.TF.T5	Transformer
OTA/OTA220B1	OTA.TF.T4	1	XFMR	OTA.TF.T4_P	Three winding transformer: P – primary S – secondary T – tertiary
OTA110B1a	OTA.TF.T4	1	XFMR	OTA.TF.T4_S	
N_OTA-TF-T4	OTA.TF.T4	1	XFMR	OTA.TF.T4_T	

In this file the From Bus, To Bus and circuit (CCT) must include all the data in the Branch Data part of the Network Model, with the bus numbers substituted by the bus names. There must be no duplicate records in the Asset Mapping File.

## A3 Outage File format

An example of an Outage File (for a specific FTR Auction and FTR Period) is provided in Figure 19:

**Figure 19 – Outage File (example)**

	A	B	C	D	E	F
1	OUTAGE_SCHEDULER_ID	DEVICE_TYPE	DEVICE_NAME	STATUS	START_DATE	STOP_DATE
2	1049884	LINE	ABY.TIM.1	A	01/12/2017	31/12/2017
3	1050096	LINE	ABY.TKA.1	A	01/12/2017	31/12/2017
4	1047451	LINE	BLN.STK.2	A	01/12/2017	31/12/2017
5	1047452	XFMR	BLN.TF.T3	A	01/12/2017	31/12/2017

*DEVICE\_TYPE can be LINE or XFMR for transformer. Status must be A for active, or that outage is ignored. The start date and stop date range must encompass the entire FTR period.*



## Appendix B MARKET USER INTERFACE CSV REFERENCE

### B1 Introduction

#### B1.1 Overview

Through the Market User Interface of the FTR Information System, Market Participants have access to a wealth of information about FTR data. The information can be classified under two broad categories: (a) Public data and (b) Private data. This data is available to Market Participants in two formats - Comma Separated Variables (CSV) and Extensible Markup Language (XML). This Appendix serves as a reference to the csv formatted files within the FTR system.

#### B1.2 Public Data

In the Market User Interface, data that is common to all Market Participants is grouped under the umbrella of Public Data. Under the current scheme of logging into the New Zealand FTR portal, all participants are able to download exactly the same information through the Public Data downloads. This data is classified into the following four broad categories – General data, Network data, Market data and Market Result data.

This document will describe the CSV formats for all data items with the sole exception of the Network Model. The network model will be available in PSS/E™ 32 format, thus recognizable and usable by many analysis tools.

#### B1.3 Private Data

Sensitive data that is confidential to a particular Market Participant (e.g. the Bids and FTRs file) will be available under the Private Data tab in the FTR System. This data is classified into one category – Market Result data.

#### B1.4 Document Structure

Each of the following sections describes the various files available in CSV format. The details of the files are elaborated using three sub-sections:

- File Description - The contents of the file.
- File Name – The format of the file name.
- File Description - The details of the CSV fields used in this file.

Section B2 describes the Public data – General data downloads.

Section B2 describes the Public data – Network data downloads.

Section B3 describes the Public data – Market data downloads.

Section B4 describes the Public data – Market Result data downloads.

Section B5 describes the Private data – Market Result data downloads

## B2 Public Data – General Data Tab

### B2.1 Introduction

This section describes the general public data that is available to Market Participants. Specifically, the following information will be available to market participants:

- Existing FTRs

#### B2.1.1 EXISTING FTRs

#### B2.1.2 File Description

This file reports the current list of FTRs in the system for all market participants. It contains FTRs that are currently valid or whose effective Dates are in the future.

#### B2.1.3 File Name

The download file name for existing FTRs will be EXISTING\_FTR.csv

#### B2.1.4 File Description

Field Name	Field Description	Data Type
FTR_ID	Unique identifier of the FTR	Long, NUMBER(10,0)
SegmentID	Unique number of the segment ID of the FTR – applicable when FTRs are reconfigured on the time axis.	Integer, NUMBER(2,0)
MarketParticipant	Unique identifier of the Market Participant overseeing the asset owner associated with the FTR	String, VARCHAR2(4 CHAR)
Category	Type of the FTR (PTP)*	String, VARCHAR2(3 CHAR)
Source	Source name for Point-to-Point (PTP) FTR	String, VARCHAR2(40 CHAR)
Sink	Sink name for the PTP FTR	String, VARCHAR2(40 CHAR)
StartDate	Start Date for the FTR	Date, in format dd/mm/yyyy
EndDate	End Date for the FTR	Date, in format dd/mm/yyyy
HedgeType	FTR Option (OPT) / Obligation (OBL) designation	String, VARCHAR2(3 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
MW	FTR MW value	Float with one decimal place, >= 0.1

\* Note that this is the standard iHEDGE data format and has not yet been reformatted to include the NZ market customisations, including the additional public information requirements of section 5.2 of the FTR Allocation Plan 2012.Public Data - Network Data Tab

## B2.2 Introduction

This section describes the FTR Grid data that will be used in an upcoming FTR auction market (Primary or Variation). Market Participants will be able to construct the FTR Grid using the PSS/E file and the following data objects:

- Contingencies
- Monitored lines and transformers
- Scheduled outages
- Nomograms

Each of these objects is described in the following sections.

## B2.3 PSS/E Network Model

As mentioned earlier, the network model will be available as a PSS/E version 32 format for each FTR period and will not be converted to XML format or csv format.

For a description of what parts of the PSS/E network file are relevant to or ignored by iHEDGE, and a description of how the HVDC is represented, please refer to section 3.1 and Appendix A.

The file name of network model will be will be XXX\_YYY\_24-HOURS\_NETWORK\_MODEL.RAW where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_24-HOURS\_NETWORK\_MODEL.RAW

## B2.4 Contingencies

Contingencies are determined within iHEDGE from a rule on contingent event types (e.g. all circuits of a certain voltage or higher). This rule is applied automatically. For the rules on contingent event types, please refer to the section 4.1.

### B2.4.1 File Description

This file contains the list of automatically generated contingencies that will apply to the FTR market calculation.

### B2.4.2 File Name

The file name for contingency download file will be XXX\_YYY\_CONTINGENCY.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_CONTINGENCY.csv

### B2.4.3 File Description

Field Name	Field Description	Data Type
Contingency	Unique identifier of the contingency	String, VARCHAR2(20 CHAR)
DeviceName	Contingency action device name	String, VARCHAR2(40 CHAR)
DeviceType	Contingency action device type (Line, Transformer)	String, VARCHAR2(11 CHAR)

Field Name	Field Description	Data Type
Action	Contingency action type – ‘inage’ (IN) or outage (OUT)	String, VARCHAR2(3 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market		

## B2.5 Monitored Lines and Transformers

Monitored branches are determined within iHEDGE from a rule on monitored transmission lines/transformers (e.g. all circuits of a certain voltage or higher). This rule is applied automatically. For the rules on monitored lines and transformers, please refer to section 4.1.

### B2.5.1 File Description

This file contains the list of automatically generated monitored transmission lines (circuits) and transformers that will apply to the FTR market calculation.

### B2.5.2 File Name

The file name for contingency download file will be XXX\_YYY\_MONITORED\_LINE\_TRANSFORMER.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_MONITORED\_LINE\_TRANSFORMER.csv

### B2.5.3 File Description

Field Name	Field Description	Data Type
DeviceName	Unique identifier of the device being monitored	String, VARCHAR2(40 CHAR)
DeviceType	Type of device being monitored (Line, Transformer)	String, VARCHAR2(11 CHAR)
BaseCaseRating	Device rating in MW for the base case	Float with one decimal place
EmergencyRating	Device rating in MW for contingency cases	Float with one decimal place
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market		

## B2.6 Scheduled Outages

### B2.6.1 File Description

This file contains the scheduled outages that affect the FTR market calculation.

### B2.6.2 File Name

The file name of scheduled outage download file will be XXX\_YYY\_SCHEDULED\_OUTAGE.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201509\_SCHEDULED\_OUTAGE.csv

### B2.6.3 File Description

Field Name	Field Description	Data Type
Name	Unique identifier of the outage	String, VARCHAR2(20 CHAR)
DeviceName	Unique name of the device	String, VARCHAR2(40 CHAR)
DeviceType	Device type (Line, Transformer)	String, VARCHAR2(11 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market		

## B2.7 Nomograms

### B2.7.1 File Description

This file contains the details of nomograms to be used in the upcoming FTR market.

### B2.7.2 File Name

The file name of nomogram download file will be XXX\_YYY\_NOMOGRAM.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_NOMOGRAM.csv

### B2.7.3 File Description

Field Name	Field Description	Data Type
Name	Unique identifier of the nomogram	String, VARCHAR2(64 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
Constraint	Name of the constraint in the nomogram	String, VARCHAR2(64 CHAR)
Limit	Constraint limit value	Float with one decimal place
DeviceName	Name of the device whose flow is being measured in the constraint	String, VARCHAR2(40 CHAR)
DeviceType	Type of device participating in the constraint (Line and Transformer)	String, , VARCHAR2(11 CHAR)
Direction	Direction of flow monitored on device (From-To and To-From)	String, VARCHAR2(7 CHAR)
Factor	Participation factor of the flow on the monitored device in the given constraint	Float
* Not currently relevant to NZ Market		

## B2.8 Asset Mapping

### B2.8.1 File Description

This file reports the current mapping of asset names of transmission lines (circuits) and transformers to the records in the Network Model file (PSS/E).

### B2.8.2 File Name

The file name for asset mapping download file will be XXX\_YYY\_ASSET\_MAPPING.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_ASSET\_MAPPING.csv

### B2.8.3 File Description

Field Name	Field Description	Data Type
FromBusName	“From” bus name of the asset in the Network Model (PSS/E file)	String, VARCHAR2(40 CHAR)
ToBusName	“To” bus name of the asset in the Network Model (PSS/E file)	String, VARCHAR2(40 CHAR)
CircuitID	Circuit ID of the asset in the Network Model (PSS/E) file	String, VARCHAR2(2 CHAR)
AssetType	Asset Type (Line, Transformer)	String, VARCHAR2(11 CHAR)
AssetName	Name of the Asset	String, VARCHAR2(40 CHAR)

## B3 Public Data - Market Data Tab

### B3.1 Introduction

This section describes the market data that will be used in the upcoming FTR market. Specifically, it contains the following FTR market related data objects:

- Sources/Sinks
- Base Loading FTRs

Each of these objects is described in the following sections.

### B3.2 Source/Sink Data

#### B3.2.1 File Description

This file contains the details of the biddable sources/sinks that will be used in the upcoming FTR market. Market Participants nominate the MW amount for FTR bids in auctions based on this list of sources/sinks.

#### B3.2.2 File Name

The file name of source/sink download file will be XXX\_YYY\_SOURCE\_SINK.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_SOURCE\_SINK.csv

#### B3.2.3 File Description

Field Name	Field Description	Data Type
Name	Unique identifier of the source/sink	String, VARCHAR2(40 CHAR)
Type	Source sink type [HUB]*	String, VARCHAR2(3 CHAR)

Field Name	Field Description	Data Type
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
PriceNode	Price node associated with the source/sink	String, VARCHAR2(40 CHAR)
BusName	Bus name associated with the source/sink	String, VARCHAR2(40 CHAR)
participationFactor	Participation factor of Price Node to the source/sink	Float, multiple decimal place, >=0
* Not currently relevant to NZ Market		

### B3.3 Base Loading FTR

#### B3.3.1 File Description

This file contains the details of the existing FTRs owned by Market Participants, which will be used in the upcoming FTR monthly auction market. All FTRs awarded in prior auctions (Primary, Variation) for a particular period will be included as base loading for this period in the auction.

#### B3.3.2 File Name

The file name of base loading FTR download file will be XXX\_YYY\_BASE\_LOADING\_FTR.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_BASE\_LOADING\_FTR.csv

#### B3.3.3 File Description

Field Name	Field Description	Data Type
FTR_ID	ID of the FTR associated with the Asset Owner.	Long, NUMBER(10,0)
MarketParticipant	Unique identifier of the Market Participant overseeing the Asset Owner	String, VARCHAR2(64 CHAR)
Source	Source name for the PTP FTR	String, VARCHAR2(40 CHAR)
Sink	Sink name for the PTP FTR	String, VARCHAR2(40 CHAR)
MW	FTR MW value	Float with one decimal place, >= 0.1



Field Name	Field Description	Data Type
HedgeType	FTR Option (OPT) / Obligation (OBL) designation	String, VARCHAR2(3 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market		

## B4 Public Data – Market Result Data Tab

### B4.1 Introduction

This section describes the public data that is available to Market Participants after a market has executed. The following sets of information will be available:

- Binding constraints

Each of these objects is described in the following sections.

### B4.2 Auction Binding Constraints

#### B4.2.1 File Description

This file contains the details of the binding constraints in the FTR auction. The essential details of this binding constraint - the device, limit enforced, contingency name (if applicable) and the marginal cost of enforcement of the constraint are listed in this download.

#### B4.2.2 File Name

The file name of binding constraint download file will be XXX\_YYY\_BINDING\_CONSTRAINT.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_BINDING\_CONSTRAINT.csv

#### B4.2.3 File Description

Field Name	Field Description	Data Type
DeviceName	Unique identifier of the device associated with the binding constraint	String, VARCHAR2(64 CHAR)
DeviceType	Device type (Line, Transformer, Nomogram)	String, VARCHAR2(11 CHAR)
Direction	Direction of the binding flow (From-To, To-From)	String, VARCHAR2(7 CHAR)
Limit	MW limit on the device	Float with one decimal place
Flow	MW flow on the device	Float with one decimal place

Field Name	Field Description	Data Type
Violation%	Violation of the limit as a percentage of the device limit (in case, the limit is not enforced).	Float
Contingency	Name of the contingency where the binding constraint is applicable (Null if binding constraint refers to the base case)	String, VARCHAR2(20 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
MarginalCost	Marginal cost of the binding constraint, \$/MWh	Float with two decimal places
* Not currently relevant to NZ Market		

## B5 Private Data – Market Result Data Tab

### B5.1 Introduction

This section describes the private data that will be visible to the market participant. It consists of information that is confidential to a particular Market Participant and thus not accessible by others. Specifically, this section outlines the following data object:

- Auction results (Bids and FTRs)

### B5.2 Auction Results –Bids and FTRs

#### B5.2.1 File Description

This file contains the private auction results for buy or sell bids, specific to a market participant. It lists non-zero MW FTRs awarded in the last FTR auction as well as bids that were not awarded any MWs in the auction. For reference, it also lists the input price bid curve entered by the market participant for that FTR bid.

#### B5.2.2 File Name

The file name of auction result download file will be XXX\_YYY\_BID\_OFFERS\_AND\_FTR.csv where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_BID\_OFFERS\_AND\_FTR.csv

#### B5.2.3 File Description

Field Name	Field Description	Data Type
BID_ID	Unique identifier of the bid	Long, NUMBER(10,0)

Field Name	Field Description	Data Type
FTR_ID	Unique identifier of the FTR awarded. FTRID is not available when awarded MW = 0 and type = BUY	Long, NUMBER(10,0)
Bid Description	Bid description	String, VARCHAR2(50 CHAR)
Category	Type of the FTR (PTP)*	String, VARCHAR2(3 CHAR)
Portfolio	Unique identifier of the portfolio	String, VARCHAR2(50 CHAR)
AssetOwner	Unique identifier of the Asset Owner	String, VARCHAR2(64 CHAR)
Source	Unique identifier of the PTP FTR source	String, VARCHAR2(40 CHAR)
Sink	Unique identifier of the PTP FTR sink	String, VARCHAR2(40 CHAR)
StartDate	Start Date for the FTR	Date, in format dd/mm/yyyy
EndDate	End Date for the FTR	Date, in format dd/mm/yyyy
HedgeType	Flag denoting FTR class (OPT: Option & OBL: Obligation)	String, VARCHAR2(3 CHAR)
Type	Flag denoting FTR type (BUY or SELL)*	String, VARCHAR2(4 CHAR)
Class	Time-of-use period (24-HOURS)*	String, VARCHAR2(40 CHAR)
AwardedMW	FTR amount granted in auction. As per previous Policy for context of a BUY bid, but will also show the reconfigured capacity (the amount of MW sold) in a SELL bid	Float with one decimal place , >= 0
ClearingPrice	Clearing price of awarded FTR.	Float with two decimal places , can be negative, zero or positive
Bid MW 1	Bid MW. Each of the 11 possible bid points (10 tranches) is represented in a unique column.	Float with one decimal place, >= 0
Bid Price 1	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 2	Bid MW.	Float with one decimal place, >= 0
Bid Price 2	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 3	Bid MW.	Float with one decimal place, >= 0

Field Name	Field Description	Data Type
Bid Price 3	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 4	Bid MW.	Float with one decimal place, >= 0
Bid Price 4	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 5	Bid MW.	Float with one decimal place, >= 0
Bid Price 5	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 6	Bid MW.	Float with one decimal place, >= 0
Bid Price 6	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 7	Bid MW.	Float with one decimal place, >= 0
Bid Price 7	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 8	Bid MW.	Float with one decimal place, >= 0
Bid Price 8	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 9	Bid MW.	Float with one decimal place, >= 0
Bid Price 9	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 10	Bid MW.	Float with one decimal place, >= 0
Bid Price 10	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
Bid MW 11	Bid MW.	Float with one decimal place, >= 0
Bid Price 11	Bid Price in \$/MWh	Float with two decimal places, can be negative, zero or positive
* Not currently relevant to NZ Market		

## Appendix C MARKET USER INTERFACE XML REFERENCE

### C1 Introduction

#### C1.1 Overview

Through the Market User Interface of the FTR System, the Market Participant has access to a wealth of information about the data in the FTR System. The information can be classified under two broad categories: (a) Public data and (b) Private data. This data is available to Market Participants in two formats - Comma Separated Variables (CSV) and Extensible Markup Language (XML). This document serves as a reference to the XML formatted files within the FTR system.

#### C1.2 Public Data

In the Market User Interface, data that is common to all Market Participants is grouped under the umbrella of Public Data. Under the current scheme of logging into the New Zealand FTR portal, all participants are able to download exactly the same information through the Public Data downloads. This data is classified into the following four broad categories – General data, Network data, Market data and Market Result data.

This document will describe the XML formats for all data items with the sole exception of the Network Model. The network model will be available in PSS/E™ 32 format, thus recognizable and usable by many analysis tools.

#### C1.3 Private Data

Sensitive data that is confidential to a particular Market Participant will be available under the Private Data tab in the FTR System. This data is classified into one category –Market Result data.

#### C1.4 Document Structure

Each of the following sections describes the various files available in XML format. The details of the files are elaborated using four sub-sections:

- File Description - The contents of the file.
- File Name – The format of the file name.
- Schema Description - The details of the XML fields used in this file.
- Schema Definition - The precise XML schema used to define the data.

Section C2 describes the Public data – General data downloads.

Section C3 describes the Public data – Network data downloads.

Section C4 describes the Public data – Market data downloads.

Section C5 describes the Public data – Market Result data downloads.

Section C6 describes the Private data – Market Result data downloads

## C1.5 Configurable Parameters

Download name space and URLs for download XML schema information are defined in configurable parameters. There will be a parameter for download name space URI, a parameter for download XSD root URI and one parameter for the XSD location of each download. The target namespace in the schema definitions listed in the following sections is configurable.

## C2 Public Data – General Data Tab

### C2.1 Introduction

This section describes the general public data that is available to Market Participants. Specifically, the following information will be available to market participants:

- Existing FTRs
- Asset Mapping

### C2.2 Existing FTRs

#### C2.2.1 File Description

This file reports the current list of FTRs in the system for all market participants. It contains FTRs that are currently valid or whose effective Dates are in the future.

#### C2.2.2 File Name

The download file name for existing FTRs will be EXISTING\_FTR.

#### C2.2.3 Schema Description

Element Name	Element Description	Optionality	Data Type
ExistingFTRs	Root element		
ExistingFTR	Container element for an FTR	Optional	
ftrID	Unique identifier of the FTR	Required	Long, NUMBER(10,0)
segmentID	Unique number of the segment ID of the FTR – applicable when FTRs are reconfigured on the time axis*	Required	Integer, NUMBER(2,0)
marketParticipant	Unique identifier of the Market Participant overseeing the asset owner associated with the FTR	Required	String, VARCHAR2(4 CHAR)
category	Type of the FTR (PTP)*	Required	String, VARCHAR2(3 CHAR)

Element Name	Element Description	Optionality	Data Type
source	Source name for Point-to-Point (PTP) FTR	Required	String, VARCHAR2(40 CHAR)
sink	Sink name for the PTP FTR	Required	String, VARCHAR2(40 CHAR)
startDate	Start Date for the FTR	Required	Date, in format yyyy-mm-dd
endDate	End Date for the FTR	Required	Date, in format yyyy-mm-dd
hedgeType	FTR Option (OPT) / Obligation (OBL) designation	Required	String, VARCHAR2(3 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
MW	FTR MW value	Required	Float with one decimal place, >= 0.1
* Not currently relevant to NZ Market			

Note that this is the standard iHEDGE data format and has not yet been reformatted to include the NZ market customisations, including the additional public information requirements of section 5.2 of the FTR Allocation Plan 2014.

## C2.2.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:element name="ExistingFTRs">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="ExistingFTR"
          maxOccurs="unbounded">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="ftrID"
                  type="xs:long" minOccurs="1"/>
                <xs:element
                  name="segmentID" type="xs:int" minOccurs="1"/>
                <xs:element
                  name="marketParticipant" type="xs:string" minOccurs="1"/>
                <xs:element name="category"
                  type="CategoryDefType" minOccurs="1"/>
                <xs:element name="source"
                  type="xs:string" minOccurs="1"/>
                <xs:element name="sink"
                  type="xs:string" minOccurs="1"/>
                <xs:element
                  name="startDate" type="xs:date" minOccurs="1"/>
                <xs:element name="endDate"
                  type="xs:date" minOccurs="1"/>
                <xs:element
                  name="hedgeType" type="HedgeDefType" minOccurs="1"/>
                <xs:element name="class"
                  type="ClassDefType" minOccurs="1"/>
                <xs:element name="MW"
                  type="Megawatt" minOccurs="1"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:schema>

  <xs:simpleType name="CategoryDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="PTP"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="HedgeDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="OBL"/>
      <xs:enumeration value="OPT"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="Megawatt">
    <xs:restriction base="xs:float">
      <xs:pattern value="[\\-+]?[\\d]+\\.?\\d?"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

## C3 Public Data - Network Data Tab



### C3.1 Introduction

This section describes the FTR Grid data that will be used in an upcoming FTR auction market (Primary or Variation). Market Participants will be able to construct the network model using the PSS/E file and the following data objects:

- Contingencies
- Monitored lines and transformers
- Scheduled outages
- Nomograms
- Asset Mappings

Each of these objects is described in the following sections.

### C3.2 PSS/E Network Model

As mentioned earlier, the network model will be available as a PSS/E version 32 format for each FTR period and will not be converted to XML format.

For a description of what parts of the PSS/E network file are relevant to or ignored by iHEDGE, and a description of how the HVDC is represented, please refer to section 3.1 and Appendix A.

The file name of network model will be XXX\_YYY\_24-HOURS\_NETWORK\_MODEL.raw.

### C3.3 Contingencies

Contingencies are determined within iHEDGE from a rule on contingent event types (e.g. all circuits of a certain voltage or higher). This rule is applied automatically. For the rules on contingent event types, please refer to section 4.1.

#### C3.3.1 File Description

This file contains the list of automatically generated contingencies that will apply to the FTR market calculation.

#### C3.3.2 File Name

The file name for contingency download file will be XXX\_YYY\_CONTINGENCY where XXX is the auction market name and YYY is the period name.

#### C3.3.3 Schema Description

Element Name	Element Description	Optionality	Data Type
contingencies	Root element		
contingency	Container element for a contingency	Optional	
name	Unique identifier of the contingency	Required	String, VARCHAR2(20 CHAR)

Element Name	Element Description	Optionality	Data Type
components	Container element for all the components	Required	
component	Container element for a component	Required, at least one	
deviceName	Contingency action device name	Required	String, VARCHAR2(40 CHAR)
deviceType	Contingency action device type (Line, Transformer)	Required	String, VARCHAR2(11 CHAR)
action	Contingency action type - inage (IN) or outage (OUT)	Required	String, VARCHAR2(3 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market			

### C3.3.4 Schema Definition

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="contingencies">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="contingency"
          maxOccurs="unbounded">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="name"
                  type="xs:string"/>
                <xs:element
                  name="components">
                    <xs:complexType>
                      <xs:sequence minOccurs="1" maxOccurs="unbounded">
                        <xs:element name="component" maxOccurs="unbounded">
                          <xs:complexType>
                            <xs:sequence>
                              <xs:element name="deviceName" type="xs:string" minOccurs="1"/>
                              <xs:element name="deviceType" type="DeviceDefType" minOccurs="1"/>
                              <xs:element name="action" type="xs:string" minOccurs="1"/>
                              <xs:element name="class" type="ClassDefType" minOccurs="1"/>
                            </xs:sequence>
                          </xs:complexType>
                        </xs:element>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:sequence>
</xs:schema>

```

## C3.4 Monitored Lines and Transformers

Monitored branches are determined within iHEDGE from a rule on monitored transmission lines/transformers (e.g. all circuits of a certain voltage or higher). This rule is applied automatically. For the rules on monitored lines and transformers, please refer to section 4.1..

### C3.4.1 File Description

This file contains the list of automatically generated monitored transmission lines (circuits) and transformers that will apply to the FTR market calculation.

### C3.4.2 File Name

The file name for contingency download file will be XXX\_YYY\_MONITORED\_LINE\_TRANSFORMER where XXX is the auction market name and YYY is the period name.

### C3.4.3 Schema Description

Element Name	Element Description	Optionality	Data Type
monitoredBranches	Root element		
branch	Container element for a branch	Optional	
deviceName	Unique identifier of the device being monitored	Required	String, VARCHAR2(40 CHAR)
deviceType	Type of device being monitored (Line, Transformer)	Required	String, VARCHAR2(11 CHAR)
baseCaseRating	Device rating in MW for the base case	Required	Float with one decimal place
emergencyRating	Device rating in MW for contingency cases	Required	Float with one decimal place
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market			

### C3.4.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="monitoredBranches">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="branch" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element
name="deviceName" type="xs:string" minOccurs="1"/>
              <xs:element
name="deviceType" type="DeviceDefType" minOccurs="1"/>
              <xs:element
name="baseCaseRating" type="Megawatt" minOccurs="1"/>
              <xs:element
name="emergencyRating" type="Megawatt" minOccurs="1"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:simpleType name="DeviceDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Line"/>
      <xs:enumeration value="Transformer"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="Megawatt">
    <xs:restriction base="xs:float">
      <xs:pattern value="[-+]?[\d]+\.\d{1,2}"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

## C3.5 Scheduled Outages

### C3.5.1 File Description

This file contains the scheduled outages that affect the FTR market calculation.

### C3.5.2 File Name

The file name of scheduled outage download file will be XXX\_YYY\_SCHEDULED\_OUTAGE where XXX is the auction market name and YYY is the period name.

### C3.5.3 Schema Description

Element Name	Element Description	Optionality	Data Type
scheduledOutages	Root element		
outage	Container element for an outage	Optional	
name	Unique identifier of the outage	Required	String, VARCHAR2(20 CHAR)
deviceName	Unique name of the device	Required	String, VARCHAR2(40 CHAR)
deviceType	Device type (Line, Transformer)	Required	String, VARCHAR2(11 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market			

### C3.5.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="scheduledOutages">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="outage" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="name"
type="xs:string" minOccurs="1"/>
              <xs:element
name="deviceName" type="xs:string" minOccurs="1"/>
              <xs:element
name="deviceType" type="DeviceDefType" minOccurs="1"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:simpleType name="DeviceDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Line"/>
      <xs:enumeration value="Transformer"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

## C3.6 Nomograms

### C3.6.1 File Description

This file contains the details of nomograms to be used in the upcoming FTR market.

### C3.6.2 File Name

The file name of nomogram download file will be XXX\_YYY\_NOMOGRAM where XXX is the auction market name and YYY is the period name.

### C3.6.3 Schema Description

Element Name	Element Description	Optionality	Data Type
nomograms	Root element		
nomogram	Container element for a nomogram	Optional	
name	Unique identifier of the nomogram	Required	String, VARCHAR2(64 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
constraints	Container element for all the constraints		
constraint	Container element for a constraint	Required, at least one	
constraintName	Name of the constraint in the nomogram	Required	String, VARCHAR2(64 CHAR)
limit	Constraint limit value	Required	Float with one decimal place
devices	Container element for all devices		
component	Container element for a device (component)	Required, at least one	
deviceName	Name of the device whose flow is being measured in the constraint	Required	String, VARCHAR2(40 CHAR)
deviceType	Type of device participating in the constraint (Line and Transformer)	Required	String, , VARCHAR2(11 CHAR)
flowDirection	Direction of flow monitored on device (From-To and To-From)	Required	String, VARCHAR2(7 CHAR)

Element Name	Element Description	Optionality	Data Type
factor	Participation factor of the flow on the monitored device in the given constraint	Required	Float
* Not currently relevant to NZ Market			

FINAL



### C3.6.4 Schema Definition

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="nomograms">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="nomogram" minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="name" type="xs:string" minOccurs="1"/>
              <xs:element name="class" type="ClassDefType" minOccurs="1"/>
              <xs:element name="constraints" minOccurs="1">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="constraint" minOccurs="1"
maxOccurs="unbounded">
                      <xs:complexType>
                        <xs:sequence>
                          <xs:element
name="constraintName" type="xs:string" minOccurs="1"/>
                          <xs:element
name="limit" type="Megawatt" minOccurs="1"/>
                          <xs:element
name="devices">
                            <xs:complexType>
                              <xs:sequence>
                                <xs:element name="component" minOccurs="1" maxOccurs="unbounded">
                                  <xs:complexType>
                                    <xs:sequence>
                                      <xs:element name="deviceName" type="xs:string" minOccurs="1"/>
                                      <xs:element name="deviceType" type="deviceDefType" minOccurs="1"/>
                                      <xs:element name="flowDirection" type="directionType" minOccurs="1"/>
                                      <xs:element name="factor" type="xs:double" minOccurs="1"/>
                                    </xs:sequence>
                                  </xs:complexType>
                                </xs:element>
                              </xs:sequence>
                            </xs:complexType>
                          </xs:element>
                        </xs:sequence>
                      </xs:complexType>
                    </xs:element>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>

```

## **C3.7 Asset Mapping**

### **C3.7.1 File Description**

This file reports the current mapping of asset names of transmission lines (circuits) and transformers to the records in the Network Model file (PSS/E).

### **C3.7.2 File Name**

The file name for asset mapping download file will be XXX\_YYY\_ASSET\_MAPPING where XXX is the auction market name and YYY is the period name., e.g.

PRI\_AUG\_2014)201609\_ASSET\_MAPPING.XML

FEMNAL

### c3.7.3 Schema Description

Element Name	Element Description	Optionality	Data Type
AssetMappings	Root element		
AssetMapping	Container element for the Asset Mapping	Optional	
fromBusName	“From” bus name of the asset in the Network Model (PSS/E file)	Required	String, VARCHAR2(40 CHAR)
toBusName	“To” bus name of the asset in the Network Model (PSS/E file)	Required	String, VARCHAR2(40 CHAR)
circuitID	Circuit ID of the asset in the Network Model (PSS/E) file	Required	String, VARCHAR2(2 CHAR)
assetType	Asset Type (Line, Transformer)	Required	String, VARCHAR2(11 CHAR)
assetName	Name of the Asset	Required	String, VARCHAR2(40 CHAR)

### C3.7.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:element name="AssetMappings">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="AssetMapping"
maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element
name="fromBusName" type="xs:string" minOccurs="1"/>
              <xs:element
name="toBusName" type="xs:string" minOccurs="1"/>
              <xs:element
name="circuitID" type="xs:string" minOccurs="1"/>
              <xs:element
name="assetType" type="DeviceType" minOccurs="1"/>
              <xs:element
name="assetName" type="xs:string" minOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:simpleType name="DeviceType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Line"/>
      <xs:enumeration value="Transformer"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

## C4 Public Data - Market Data Tab

### C4.1 Introduction

This section describes the market data that will be used in the upcoming FTR market. Specifically, it contains the following FTR market related data objects:

- Sources/Sinks
- Base Loading FTRs
- FTR Capacity

Each of these objects is described in the following sections.

### C4.2 Source/Sink Data

#### C4.2.1 File Description

This file contains the details of the biddable sources/sinks that will be used in the upcoming FTR market. Market Participants nominate the MW amount for FTR bids in auctions based on this list of sources/sinks.

### C4.2.2 File Name

The file name of source/sink download file will be XXX\_YYY\_SOURCE\_SINK where XXX is the auction market name and YYY is the period name.

### C4.2.3 Schema Description

Element Name	Element Description	Optionality	Data Type
sourceSinks	Root element		
sourceSink	Container element for a source sink definition	Optional	
name	Unique identifier of the source/sink	Required	String, VARCHAR2(40 CHAR)
type	Source sink type [HUB]*	Required	String, VARCHAR2(3 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
definitions	Container element for all the associated definitions		
definition	Container element for a definition	Required, at least one	
priceNode	Price node associated with the source/sink	Required	String, VARCHAR2(40 CHAR)
busName	Bus name associated with the source/sink	Required	String, VARCHAR2(40 CHAR)
participationFactor	Participation factor of Price Node to the source/sink	Required	Float, multiple decimal place, >=0
* Not currently relevant to NZ Market			

## C4.2.4 Schema Definition

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="sourceSinks">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="sourceSink"
maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="name"
type="xs:string" minOccurs="1"/>
              <xs:element name="type"
type="SSDefType" minOccurs="1"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
            <xs:element
name="definitions" minOccurs="1">
              <xs:complexType>
                <xs:sequence>
                  <xs:element name="definition" minOccurs="1" maxOccurs="unbounded">
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element name="priceNode" type="xs:string" minOccurs="1"/>
                        <xs:element name="busName" type="xs:string" minOccurs="1"/>
                        <xs:element name="participationFactor" type="xs:float" minOccurs="1"/>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:sequence>
    </xs:element>
  </xs:sequence>
  <xs:simpleType name="SSDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="HUB"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>

```

## C4.3 Base Loading FTR

### C4.3.1 File Description

This file contains the details of the existing FTRs owned by Market Participants, which will be used in the upcoming FTR monthly auction market. All FTRs awarded in prior auctions (Primary, Variation) for a particular period will be included as base loading for this period in the auction.

### C4.3.2 File Name

The file name of base loading FTR download file will be XXX\_YYY\_BASE\_LOADING\_FTR where XXX is the auction market name and YYY is the period name.

### C4.3.3 Schema Description

Element Name	Element Description	Optionality	Data Type
BaseLoadingFTRs	Root element		
BaseLoadingFTR	Container element for an FTR	Optional	
ftrID	ID of the FTR associated with the Asset Owner.	Required	Long, NUMBER(10,0)
marketParticipant	Unique identifier of the Market Participant overseeing the Asset Owner	Required	String, VARCHAR2(64 CHAR)
source	Source name for the PTP FTR	Required	String, VARCHAR2(40 CHAR)
sink	Sink name for the PTP FTR	Required	String, VARCHAR2(40 CHAR)
MW	FTR MW value	Required	Float with one decimal place, >= 0.1
hedgeType	FTR Option (OPT) / Obligation (OBL) designation	Required	String, VARCHAR2(3 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
* Not currently relevant to NZ Market			

### C4.3.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="BaseLoadingFTRs">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="BaseLoadingFTR"
maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="ftrID"
type="xs:long" minOccurs="1"/>
              <xs:element
name="marketParticipant" type="xs:string" minOccurs="1"/>
              <xs:element name="source"
type="xs:string" minOccurs="1"/>
              <xs:element name="sink"
type="xs:string" minOccurs="1"/>
              <xs:element name="MW"
type="Megawatt" minOccurs="1"/>
              <xs:element
name="hedgeType" type="HedgeDefType" minOccurs="1"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="CategoryDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="PTP"/>
    </xs:restriction>
  </xs:complexType>
  <xs:complexType name="HedgeDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="OBL"/>
      <xs:enumeration value="OPT"/>
    </xs:restriction>
  </xs:complexType>
  <xs:complexType name="Megawatt">
    <xs:restriction base="xs:float">
      <xs:pattern value="\[-+\]?[\d]+\.\d{1,2}/>
    </xs:restriction>
  </xs:complexType>
  <xs:complexType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:complexType>
</xs:schema>
```



## C5 Public Data – Market Result Data Tab

### C5.1 Introduction

This section describes the public data that is available to Market Participants after a market has executed. The following sets of information will be available:

- Binding constraints

Each of these objects is described in the following sections.

### C5.2 Auction Binding Constraints

#### C5.2.1 File Description

This file contains the details of the binding constraints in the FTR auction. The essential details of this binding constraint - the device, limit enforced, contingency name (if applicable) and the marginal cost of enforcement of the constraint are listed in this download.

#### C5.2.2 File Name

The file name of binding constraint download file will be XXX\_YYY\_BINDING\_CONSTRAINT where XXX is the auction market name and YYY is the period name.

#### C5.2.3 Schema Description

Element Name	Element Description	Optionality	Data Type
bindingConstraints	Root element		
constraint	Container element for a constraint	Optional	
deviceName	Unique identifier of the device associated with the binding constraint	Required	String, VARCHAR2(64 CHAR)
deviceType	Device type (Line, Transformer, Nomogram)	Required	String, VARCHAR2(11 CHAR)
direction	Direction of the binding flow (From-To, To-From)	Optional	String, VARCHAR2(7 CHAR)
limit	MW limit on the device	Required	Float with one decimal place
flow	MW flow on the device	Required	Float with one decimal place
violationPct	Violation of the limit as a percentage of the device limit (in case, the limit is not enforced).	Required	Float

Element Name	Element Description	Optionality	Data Type
contingency	Name of the contingency where the binding constraint is applicable (Null if binding constraint refers to the base case)	Optional	String, VARCHAR2(20 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
marginalCost	Marginal cost of the binding constraint, \$/MWh	Required	Float with two decimal places
	* Not currently relevant to NZ Market		

DRAFT

## C5.2.4 Schema Definition

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="bindingConstraints">
    <xs:complexType>
      <xs:sequence minOccurs="0">
        <xs:element name="constraint"
maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element
name="deviceName" type="xs:string" minOccurs="1"/>
              <xs:element
name="deviceType" type="DeviceDefType" minOccurs="1"/>
              <xs:element
name="direction" type="DirectionType" minOccurs="1"/>
              <xs:element name="limit"
type="Megawatt" minOccurs="1"/>
              <xs:element name="flow"
type="Megawatt" minOccurs="1"/>
              <xs:element
name="violationPct" type="xs:double" minOccurs="1"/>
              <xs:element
name="contingency" type="xs:string" minOccurs="0"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
              <xs:element
name="marginalCost" type="PricePerMWh" minOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:simpleType name="DeviceDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Line"/>
      <xs:enumeration value="Transformer"/>
      <xs:enumeration value="Nomogram"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="DirectionType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="From-To"/>
      <xs:enumeration value="To-From"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="Megawatt">
    <xs:restriction base="xs:float">
      <xs:pattern value="[\-+]?[\d]+\.\d?"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ClassDefType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="24-HOURS"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="PricePerMWh">
    <xs:restriction base="xs:float">
      <xs:pattern value="[\-+]?[\d]+\.\d?\d?"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>

```

## C6 Private Data – Market Result Data Tab

### C6.1 Introduction

This section describes the private data that will be visible to the market participant. It consists of information that is confidential to a particular Market Participant and thus not accessible by others. Specifically, this section outlines the following data object:

- Auction results (Bids)

### C6.2 Auction Results – Bids and FTRs

#### C6.2.1 File Description

This file contains the private auction results for buy and sell bids, specific to a market participant. It lists non-zero MW FTRs awarded in the last FTR auction as well as bids that were not awarded any MWs in the auction. For reference, it also lists the input price bid curve entered by the market participant for that FTR bid.

#### C6.2.2 File Name

The file name of auction result download file will be XXX\_YYY\_BID\_OFFERS\_AND\_FTR where XXX is the auction market name and YYY is the period name. For example, PRI\_NOV\_2016\_201810\_BID\_OFFERS\_AND\_FTR.xml

#### C6.2.3 Schema Description

Element Name	Element Description	Optionality	Data Type
AuctionFTRs	Root element		
AuctionFTR	Container element for an FTR	Optional	
bidID	Unique identifier of the bid	Required	Long, NUMBER(10,0)
ftrID	Unique identifier of the FTR awarded. ftrID is not available when awarded MW = 0 and type = BUY	Optional	Long, NUMBER(10,0)
bidDescription	Bid description	Optional	String, VARCHAR2(50 CHAR)
category	Type of the FTR (PTP)*	Required	String, VARCHAR2(3 CHAR)
portfolio	Unique identifier of the portfolio	Required	String, VARCHAR2(50 CHAR)
assetOwner	Unique identifier of the Asset Owner	Required	String, VARCHAR2(64 CHAR)

source	Unique identifier of the PTP FTR source	Required	String, VARCHAR2(40 CHAR)
sink	Unique identifier of the PTP FTR sink	Required	String, VARCHAR2(40 CHAR)
startDate	Start Date for the FTR	Required	Date, in format yyyy-mm-dd
endDate	End Date for the FTR	Required	Date, in format yyyy-mm-dd
hedgeType	Flag denoting FTR class (OPT: Option & OBL: Obligation)	Required	String, VARCHAR2(3 CHAR)
class	Time-of-use period (24-HOURS)*	Required	String, VARCHAR2(40 CHAR)
type	Flag denoting FTR type (BUY or SELL)*	Required	String, VARCHAR2(4 CHAR)
awardedMW	FTR amount granted in auction. As per previous Policy for context of a BUY bid, but will also show the reconfigured capacity (the amount of MW sold) in a SELL bid	Required	Float with one decimal place, >= 0
clearingPrice	Clearing price of awarded FTR. Will show the Clearing Price of the current auction (i.e. the \$MWh of the offered capacity that was sold at in the auction (in context of SELL bid)).	Required	Float with two decimal places, can be negative, zero or positive
bidCurve	Container element for an FTR Bid Curve	Required	
bidPoint	Container element for a bid point in an FTR Bid Curve	Required, min = 2 and max = 11 (giving a maximum of 10 segments)	This is a repeating element with the XML download.
MW	Bid MW	Required	Float with one decimal place, MW of the first bid point must be 0 and MW of the second bid point must be >= 0.1

pricePerMWh+	Bid Price in \$/MWh	Required	Float with two decimal places, can be negative, zero or positive
<p>* Not currently relevant to NZ Market</p> <p>† There will be up to 10 MW and Price point pairs in the Download File</p>			

## C6.2.4 Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xs:element name="AuctionFTRs">
    <xs:complexType>
      <xs:sequence minOccurs="0"
maxOccurs="unbounded">
        <xs:element name="AuctionFTR"
          <xs:complexType>
            <xs:sequence>
              <xs:element name="bidID"
type="xs:long" minOccurs="1"/>
              <xs:element name="ftrID"
type="xs:long" minOccurs="0"/>
              <xs:element
name="bidDescription" type="xs:string" minOccurs="0"/>
              <xs:element name="category"
type="CategoryDefType" minOccurs="1"/>
              <xs:element
name="portfolio" type="xs:string" minOccurs="1"/>
              <xs:element
name="assetOwner" type="xs:string" minOccurs="1"/>
              <xs:element name="source"
type="xs:string" minOccurs="1"/>
              <xs:element name="sink"
type="xs:string" minOccurs="1"/>
              <xs:element
name="startDate" type="xs:date" minOccurs="1"/>
              <xs:element name="endDate"
type="xs:date" minOccurs="1"/>
              <xs:element
name="hedgeType" type="HedgeDefType" minOccurs="1"/>
              <xs:element name="class"
type="ClassDefType" minOccurs="1"/>
              <xs:element name="type"
type="BidDefType" minOccurs="1"/>
              <xs:element
name="awardedMW" type="Megawatt" minOccurs="1"/>
              <xs:element
name="clearingPrice" type="PricePerMWh" minOccurs="1"/>
              <xs:element
name="bidCurve">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="bidPoint" minOccurs="2" maxOccurs="11">
                      <xs:complexType>
                        <xs:sequence>
                          <xs:element name="MW" type="Megawatt" minOccurs="1"/>

```

```

<xs:element name="pricePerMWh" type="PricePerMWh" minOccurs="1"/>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:simpleType name="CategoryDefType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="PTP"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="HedgeDefType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="OBL"/>
    <xs:enumeration value="OPT"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="ClassDefType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="24-HOURS"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="BidDefType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="BUY"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="Megawatt">
  <xs:restriction base="xs:float">
    <xs:pattern value="[\-+]?[\d]+\.\d?"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="PricePerMWh">
  <xs:restriction base="xs:float">
    <xs:pattern value="[\-+]?[\d]+\.\d?\d?"/>
  </xs:restriction>
</xs:simpleType>
</xs:schema>

```

## Appendix D BID PORTFOLIO FORMAT

FTR Participants that are not in breach of their prudential requirements<sup>18</sup> can submit bid portfolios for an FTR auction. Please refer also to section 5, Bid Portfolios.

The following is an example of the format of the csv (comma separated values) BUY Bid Portfolio file that FTR Participants can upload into the FIS:

Figure 20 – Example of Sloped Bid Portfolio format in Excel®

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	Bid ID	FTR ID	Bid Description	Asset Owner	Source	Sink	Hedge Type	Class	Type	Period	BidMW 1	Bid Price 1	Bid MW 2	Bid Price 2	Bid MW 3	Bid Price 3	Bid MW 4	Bid Price 4	Bid MW 5	Bid Price 5	Bid MW 6	Bid Price 6	Bid MW 7	Bid Price 7	Bid MW 8	Bid Price 8	Bid MW 9	Bid Price 9	Bid MW 10	Bid Price 10	Bid MW 11	Bid Price 11
2	123	456							BUY		0	15	5	14	10	13	18	13	25	12	25	6	30	6	32	2	40	-2	45	-5	48	-8
3									SELL		0	4	2	6	3	10	3	14	5	16	6	16										

Element Name	Element Description	Optionality	Data Type
Bid ID	Unique identifier of the bid	Optional (Required for updating an existing bid)	NUMBER(10,0)
FTR ID	Unique identifier of the FTR for sale	Required for SELL bids, Not required for BUY Bids. Can be selected using the interface on the Bid Portfolio Editor Screen (MUI))	NUMBER(10,0)
Bid Description	Bid description	Optional	VARCHAR2(50 CHAR)

<sup>18</sup> Please refer to the FTR Policy on Prudential Requirements.



Element Name	Element Description	Optionality	Data Type
Asset Owner	Unique identifier of the Asset Owner	Required	VARCHAR2(64 CHAR)
Source	Unique identifier of the PTP FTR source	Required	VARCHAR2(40 CHAR)
Sink	Unique identifier of the PTP FTR sink	Required	VARHCAR2(40 CHAR)
Hedge Type	Flag denoting FTR class (OPT: Option & OBL: Obligation)	Required	VARCHAR2(3 CHAR)
Class	Time-of-use period (24-HOURS)*	Required	Must be '24-HOURS'
Type	Flag denoting FTR type (BUY or SELL)*	Required	String, VARCHAR2(4 CHAR)
Period	FTR Period	Required	VARCHAR2(20 CHAR)
Bid MW 1	Bid MW of the first bid point. Each of the 11 possible bid points (10 tranches) is represented in a unique column.	Required	FLOAT, Must be zero (0)
Bid Price 1	Bid Price of the first bid point in \$/MWh	Required	FLOAT, 2 decimal place limit, can be negative, zero or positive
Bid MW 2	Bid MW of the second bid point	Required	FLOAT, Must be >= 0.1 and 1 decimal place max
Bid Price 2*	Bid Price of the second bid point in \$/MWh	Required	FLOAT, Must be = Bid Price 1
Bid MW 3	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 3	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 4	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 4	Bid Price in \$/MWh	Optional	Float with two decimal places, can be

Element Name	Element Description	Optionality	Data Type
			negative, zero or positive
Bid MW 5	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 5	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 6	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 6	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 7	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 7	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 8	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 8	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 9	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 9	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive
Bid MW 10	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 10	Bid Price in \$/MWh	Optional	Float with two decimal places, can be

Element Name	Element Description	Optionality	Data Type
			negative, zero or positive
Bid MW 11	Bid MW.	Optional	Float with one decimal place, >= 0
Bid Price 11	Bid Price in \$/MWh	Optional	Float with two decimal places, can be negative, zero or positive

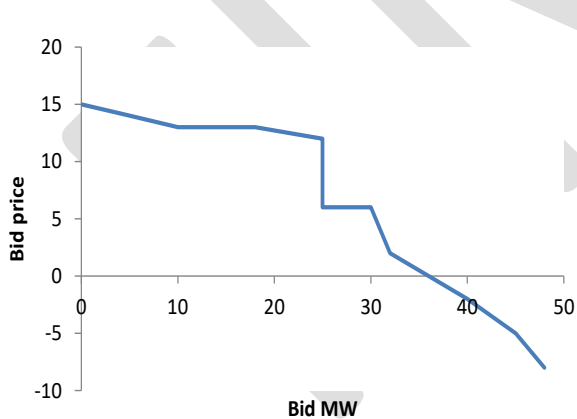
\* There are a maximum of ten Bid combinations (Price and MW) allowed in the sloped Bid Portfolio. Participants not wishing to use this feature can continue using two as per the Allocation plan 2012.

After the header line, the bid lines can be in any order within the Bid Portfolio csv file.

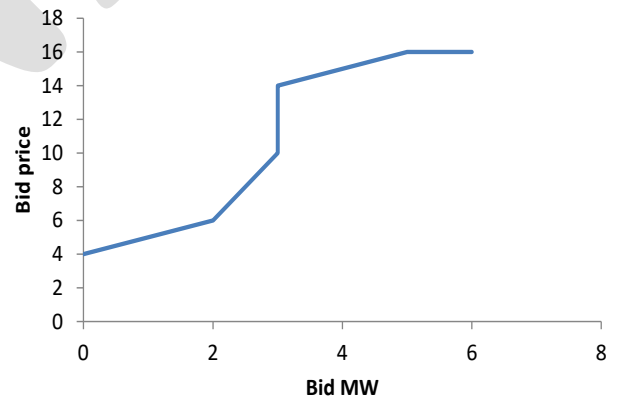
Multiple bids for the same FTR product (i.e. same From Hub, To Hub, Type of FTR and FTR Period) create in effect a tranced bid curve.

Figure 20 above creates bid curves as illustrated in Figures 21 and 22 below:

**Figure 21 – Example Bid curves (BUY)**



**Figure 22 – Example Bid curves (SELL)**



The following is an example of a screenshot of a market user interface (MUI) for entering bid portfolios into iHEDGE. It illustrates the interface for FTR Participants uploading (system checks for validation) submitting (to be approved based on a prudential checks), retracting or deleting bid portfolios. Where bid portfolios are not validated or approved, this is indicated and the reasons explained in a message.

**Figure 23 – Example of iHEDGE MUI for entering bid portfolios**

FTR System | i-HEDGE Version 3.0.0 Build - [17549] | Role(s) : [ROLE\_MP, ROLE\_MP\_RW] | Available Prudential : \$77,091,690.00

i-HEDGE FTR Bids/Offers Assignment Market Download - Message -

Home / Auction Portfolio List

Market: VAR\_DEC\_2016 Period: 201701

Effective Dates		Bidding Window	
Start Date	End Date	Open Date	Close Date
01/01/2017	31/01/2017	12/12/2016 12:00:00 GMT-05:00	13/12/2016 17:00:00 GMT-05:00

10 records per page

Portfolio Name	Date Modified	Download	Status	Submit	Retract	Delete	Msg	Allocated Prudential
EXAMPLE_BID_4	12/12/2016 16:02:12 GMT-05:00	CSV	Approved		Retract			\$21,724.80
EXAMPLE_BID_2	12/12/2016 16:00:07 GMT-05:00	CSV	Approved		Retract			\$12,142.08
EXAMPLE_BID_3	09/12/2016 11:35:09 GMT-05:00	CSV	New			Delete		
EXAMPLE_BID_1	09/12/2016 11:33:37 GMT-05:00	CSV	New			Delete		

Showing 1 to 4 of 4 entries

First Previous 1 Next Last



## Appendix E FTR REGISTER FILE

FTR Participants are able to download the FTR Register file from FIS. The FTR Register can be filtered on-screen as per Figure 21 below. The name of the file will be 'FTR\_Register.xls' (or .csv)

Figure 24 – FTR Register on screen view

FTR ID	Auction Name	StartDate	EndDate	CurrentOwner	PreviousOwner	FirstOwner	HedgeType	Source	Sink	MW	price	DateA
2363547	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	HAY	OTA	24.3	4.67	17/11
2363461	VAR_NOV_2016	01/12/2017	31/12/2017	MRPL		MRPL	OPT	HAY	BEN	5.0	0.22	17/11
2363497	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	BEN	ISL	15.6	3.14	17/11
2363475	VAR_NOV_2016	01/12/2017	31/12/2017	MERI		MERI	OPT	BEN	HAY	32.8	3.13	17/11
2363479	VAR_NOV_2016	01/12/2017	31/12/2017	MERI		MERI	OPT	HAY	BEN	4.2	0.22	17/11
2363553	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	HAY	OTA	0.6	4.67	17/11
2363543	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	BEN	ISL	20.2	3.14	17/11
2363541	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	INV	ISL	9.1	3.64	17/11
2363405	VAR_NOV_2016	01/12/2017	31/12/2017	TRUS		TRUS	OPT	ISL	BEN	10.9	0.01	17/11
2363533	VAR_NOV_2016	01/12/2017	31/12/2017	CTCT		CTCT	OPT	HAY	OTA	17.7	4.67	17/11
2363548	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	OTA	HAY	31.4	0.15	17/11
2363478	VAR_NOV_2016	01/12/2017	31/12/2017	MERI		MERI	OPT	OTA	HAY	14.9	0.15	17/11
2363525	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	OTA	HAY	2.3	0.15	17/11
2363481	VAR_NOV_2016	01/12/2017	31/12/2017	MERI		MERI	OPT	INV	ISL	14.3	3.64	17/11
2363476	VAR_NOV_2016	01/12/2017	31/12/2017	MERI		MERI	OPT	BEN	ISL	17.5	3.14	17/11
2363537	VAR_NOV_2016	01/12/2017	31/12/2017	CTCT		CTCT	OPT	BEN	ISL	16.9	3.14	17/11
2363546	VAR_NOV_2016	01/12/2017	31/12/2017	OMFM		OMFM	OPT	HAY	BEN	33.5	0.22	17/11
2363531	VAR_NOV_2016	01/12/2017	31/12/2017	CTCT		CTCT	OPT	BEN	HAY	15.0	3.13	17/11

The following is an example of the format of the xls/csv formatted FTR Register file that FTR Participants can download from the FIS:

Element Name	Element Description	Optionality	Data Type
FTR_ID	ID of the FTR associated to the Current Owner.	Required	Long, NUMBER(10,0)
AuctionName	This is the Auction Name	Optional. Will be present for all Awarded FTR from an Auction, but not present for Assigned FTRs	String, VARCHAR2(21 CHAR) in the format: XXX_MMM_YYYY_ For example, PRI_MAR_2014
StartDate	Start Date for the FTR	Required	Date, in format dd/mm/yyyy
EndDate	End Date for the FTR	Required	Date, in format dd/mm/yyyy
CurrentOwner	Unique identifier of the Current Owner	Required	String, VARCHAR2(64 CHAR)
PreviousOwner	Unique identifier of the Previous Owner (If there	Optional	String, VARCHAR2(64 CHAR)

Element Name	Element Description	Optionality	Data Type
	is no previous owner, the record will have a blank Previous Owner.)		
FirstOwner	Unique identifier of the First Owner.	Required	String, VARCHAR2(64 CHAR)
HedgeType	FTR Option (OPT) / Obligation (OBL) designation	Required	String, VARCHAR2(3 CHAR)
Source	Unique identifier of the PTP FTR source	Required	String, VARCHAR2(40 CHAR)
Sink	Unique identifier of the PTP FTR sink	Required	String, VARCHAR2(40 CHAR)
MW	FTR MW value. Is adjusted for Assignments and Reconfigurations	Required	Float with one decimal place, $\geq 0$
Price	The Clearing Price of the FTR Auction. Remains as per original Price when FTR awarded or assigned (if disclosed) i.e. does not change if whole or portion of the FTR is offered into Reconfiguration Auction.	Optional	Float with two decimal places, can be negative, zero, positive or null
DateAcquired	Date the FTR was acquired by the CURRENT Owner	Required	Date, in format dd/mm/yyyy
AcquisitionCost	The total cost of FTR acquisition for the Auction. Is updated to reflect Assignments and Reconfiguration Auctions.	Optional	Float with two decimal places, can be negative, zero, positive or null
OriginalAcquisition Cost	Acquisition cost when the FTR was first awarded or assigned.	Optional	Float with two decimal places, can be negative, zero, positive or null

Element Name	Element Description	Optionality	Data Type
Status	The status of the FTR, e.g. AWARDED or ASSIGNED	Required	String, VARCHAR2(40 CHAR)
AllocationPlan	Unique identifier of the Allocation Plan	Required	String, VARCHAR2(8 CHAR)

FINAL

## Appendix F ASSIGNMENT FILE FORMATS

Upload Assignments (Offers) – The Upload format for both Buy and Sell Offers

Element Name	Element Description	Optionality	Data Type
Request ID	The Specific ID of the Request.	The Request ID column shall be left blank and the system will assign the Request ID of each valid record upon upload if all records in the upload file pass the data validations.	NUMBER(10,0)
Public/Private Type	EMS currently allows only 'PRIVATE'.	Required	String, VARCHAR2(7 CHAR)
Buy/Sell Type	BUY for buy offer or SELL for sell offer	Required	String, VARCHAR2(4 CHAR)
FTR ID	The specific ID of the FTR. This is applicable only in the "Sell Offer".	Required for Sell Offer	Long, NUMBER(10,0)
Responding AO	The name of the Asset Owner who will respond to the private offer	Required	String, VARCHAR2(4 CHAR)
Source	The name of the source of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Sink	The name of the sink of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Start Date	The effective starting date of the FTR being traded	Required	Date, in format dd/mm/yyyy



Element Name	Element Description	Optionality	Data Type
End Date	The effective expiration date of the FTR being traded	Required	Date, in format dd/mm/yyyy
TOU	The class is automatically filled as '24-HOURS'.	Required	String, VARCHAR2(40 CHAR)
Hedge Type	OBL for Obligation or OPT for Option	Required	String, VARCHAR2(3 CHAR)
MW	The MW amount of the FTR being traded	Required	Float with one decimal place, >= 0.1
Price	The assignment price.	Optional	Float with two decimal places, can be negative, zero or positive
Contact Name	The name of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Contact Address	The address of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Contact Email	The phone number of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Contact Phone	The email address of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Request ID	Public/Private	Buy/Sell	FTR ID	Responding AO	Source	Sink	Start Date	End Date	TOU	Hedge Type	MW	Price	Contact Name	Contact Address	Contact Email	Contact Phone
2		PRIVATE	SELL	2007	EMS2	OTA	BEN	1/6/2013	30/06/2013	24-HOURS	OBL	2	3.45				
3		PRIVATE	BUY		EMS2	BEN	OTA	1/6/2013	30/06/2013	24-HOURS	OBL	2	2.07				
4																	

### Upload Assignments (Responses) – The Upload format for Responses to Buy and Sell Offers

Element Name	Element Description	Optionality	Data Type
Request ID	The Specific ID of the Request.	The Request ID column shall be left blank and the system will assign the Request ID of each valid record upon upload if all records in the upload file pass the data validations.	NUMBER(10,0)
Buy/Sell Type	BUY for buy offer or SELL for sell offer	Required	String, VARCHAR2(4 CHAR)
FTR ID	The specific ID of the FTR. This is applicable only for the "Respond to Buy Offer".	Required for Respond to Buy Offer	Long, NUMBER(10,0)
Initiating AO	The name of the Asset Owner who initiated the private offer. It must match the offer's asset owner.	Required	String, VARCHAR2(4 CHAR)
Source	The name of the source of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Sink	The name of the sink of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Start Date	The effective starting date of the FTR being traded	Required	Date, in format dd/mm/yyyy
End Date	The effective expiration date of the FTR being traded	Required	Date, in format dd/mm/yyyy
TOU	The class is automatically filled as '24-HOURS'.	Required	String, VARCHAR2(40 CHAR)

Element Name	Element Description	Optionality	Data Type
Hedge Type	OBL for Obligation or OPT for Option	Required	String, VARCHAR2(3 CHAR)
MW	The MW amount of the FTR being traded	Required	Float with one decimal place, >= 0.1
Price	The assignment price entered by the initiating asset owner. The price in the response is not validated and does not overwrite the Assignment price entered by the initiating Asset Owner.	Optional	Float with two decimal places, can be negative, zero or positive

Responses to both buy and sell offers can be in the same upload file.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Request ID	Buy/Sell Offer	FTR ID	Initiating AO	Source	Sink	Start Date	End Date	TOU	Hedge Type	MW	Price
2	20001	BUY	2011	EMS2	OTA	BEN	1/7/2013	31/07/201	24-HOURS	OBL	100	20
3	20002	SELL		EMS2	OTA	BEN	1/7/2013	31/07/201	24-HOURS	OPT	20	20

Download Assignments (Offers) – The Download format for Buy and Sell Offers

Element Name	Element Description	Optionality	Data Type
Request ID	The Specific ID of the Request.	The Request ID column shall be left blank and the system will assign the Request ID of each valid record upon upload if all records in the upload file pass the data validations.	NUMBER(10,0)
Public/Private Type	EMS currently allows only 'PRIVATE'.	Required	String, VARCHAR2(40 CHAR)

Element Name	Element Description	Optionality	Data Type
Buy/Sell Type	BUY for buy offer or SELL for sell offer	Required	String, VARCHAR2(40 CHAR)
FTR ID	The specific ID of the FTR. This is applicable only in the "Sell Offer".	Required for Sell Offer	Long, NUMBER(10,0)
Responding AO	The name of the Asset Owner who will respond to the private offer	Required	String, VARCHAR2(4 CHAR)
Source	The name of the source of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Sink	The name of the sink of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Start Date	The effective starting date of the FTR being traded	Required	Date, in format dd/mm/yyyy
End Date	The effective expiration date of the FTR being traded	Required	Date, in format dd/mm/yyyy
TOU	The class is automatically filled as '24-HOURS'.	Required	String, VARCHAR2(40 CHAR)
Hedge Type	OBL for Obligation or OPT for Option	Required	String, VARCHAR2(3 CHAR)
MW	The MW amount of the FTR being traded	Required	Float with one decimal place, >= 0.1
Price	The assignment price entered by the initiating asset owner	Optional	Float with two decimal places, can be negative, zero or positive
Contact	The name of the designated person regarding this	Optional	String, VARCHAR2(256 CHAR)

Element Name	Element Description	Optionality	Data Type
	transaction for the PTP FTR.		
Contact Address	The address of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Contact Email	The phone number of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Contact Phone	The email address of the designated person regarding this transaction for the PTP FTR.	Optional	String, VARCHAR2(256 CHAR)
Status	The Status of the Assignment Transaction. Can be 'Posted', 'Pending AO Response', 'Approved' or 'Error'.	Required	String, VARCHAR2(40 CHAR)

### Sample Download File for Buy/Sell Offers

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Request ID	Public/Private	Buy/Sell	FTR ID	Responding AO	Source	Sink	Start Date	End Date	TOU	Hedge Type	MW	Price	Contact N	Contact A	Contact Er	Contact Pl	Status
2	28011	PRIVATE	BUY	EMS2	BEN	OTA	1/7/2013	31/07/2013	24-HOURS	OBL	9	0					Approved
3	27004	PRIVATE	BUY	EMS2	BEN	OTA	1/7/2013	31/07/2013	24-HOURS	OBL	3	0					Approved
4	27003	PRIVATE	BUY	EMS2	BEN	OTA	1/7/2013	31/07/2013	24-HOURS	OBL	2	0					Approved
5	27002	PRIVATE	BUY	EMS2	BEN	OTA	1/7/2013	31/07/2013	24-HOURS	OBL	1	1.23					Approved
6	29001	PRIVATE	SELL	2007	EMS2	OTA	BEN	1/6/2013	30/06/2013	24-HOURS	OBL	2	3.45				Pending AO Response
7	22001	PRIVATE	SELL	2008	EMS2	BEN	OTA	1/6/2013	30/06/2013	24-HOURS	OBL	250	500				Approved
8	2003	PRIVATE	SELL	2004	EMS2	OTA	BEN	1/5/2013	31/05/2013	24-HOURS	OBL	2	0				Approved
9	2001	PRIVATE	SELL	2004	EMS2	OTA	BEN	1/5/2013	31/05/2013	24-HOURS	OBL	1	9.99				Approved
10	1001	PRIVATE	SELL	2001	EMS2	BEN	OTA	1/5/2013	31/05/2013	24-HOURS	OBL	100	200000				Approved
11	3	PRIVATE	SELL	2007	EMS2	OTA	BEN	1/6/2013	30/06/2013	24-HOURS	OBL	2	3.45				Approved

### Download Assignments (Responses) – The Download format for Responses to Buy and Sell Offers

#### Method 1: Download Pending AO Responses

Element Name	Element Description	Optionality	Data Type
Request ID	The Specific ID of the Request.	Required.	NUMBER(10,0)

Element Name	Element Description	Optionality	Data Type
Buy/Sell Type	BUY for buy offer or SELL for sell offer	Required	String, VARCHAR2(4 CHAR)
FTR ID	The specific ID of the FTR. This is applicable only in the "Response to Buy Offer".	Required for Response to Buy Offer	Long, NUMBER(10,0)
Initiating AO	The name of the Asset Owner who initiated the private offer. It must match the offer's asset owner.	Required	String, VARCHAR2(4 CHAR)
Source	The name of the source of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Sink	The name of the sink of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Start Date	The effective starting date of the FTR being traded	Required	Date, in format dd/mm/yyyy
End Date	The effective expiration date of the FTR being traded	Required	Date, in format dd/mm/yyyy
TOU	The class is automatically filled as '24-HOURS'.	Required	String, VARCHAR2(40 CHAR)
Hedge Type	OBL for Obligation or OPT for Option	Required	String, VARCHAR2(3 CHAR)
MW	The MW amount of the FTR being traded	Required	Float with one decimal place, >= 0.1
Price	The assignment price entered by the initiating asset owner.	Optional	Float with two decimal places, can be negative, zero or positive

Sample Download using Method 1: Download Pending AO Responses

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Request ID	Buy/Sell Offer	FTR ID	Initiating	Source	Sink	Start Date	End Date	TOU	Hedge Type	MW	Price	
2	20001	BUY		EMS2	OTA	BEN	1/7/2013	31/07/2013	24-HOURS	OBL	100	20	
3													

## Method 2: Download All Responses

Element Name	Element Description	Optionality	Data Type
Response ID	The specific ID of the Response	Optional	NUMBER(10,0)
Request ID	The Specific ID of the Request.	Required	NUMBER(10,0)
Buy/Sell Type	BUY for buy offer or SELL for sell offer	Required	String, VARCHAR2(40 CHAR)
FTR ID	The specific ID of the FTR. This is applicable only in the "Response to Buy Offer".	Required for Response to Buy Offer	Long, NUMBER(10,0)
Initiating AO	The name of the Asset Owner who initiated the private offer. It must match the offer's asset owner.	Required	String, VARCHAR2(4 CHAR)
Source	The name of the source of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Sink	The name of the sink of the FTR being traded	Required	String, VARCHAR2(40 CHAR)
Start Date	The effective starting date of the FTR being traded	Required	Date, in format dd/mm/yyyy
End Date	The effective expiration date of the FTR being traded	Required	Date, in format dd/mm/yyyy

Element Name	Element Description	Optionality	Data Type
TOU	The class is automatically filled as '24-HOURS'.	Required	String, VARCHAR2(40 CHAR)
Hedge Type	OBL for Obligation or OPT for Option	Required	String, VARCHAR2(3 CHAR)
MW	The MW amount of the FTR being traded	Required	Float with one decimal place, >= 0.1
Price	The assignment price entered by the initiating asset owner	Optional	Float with two decimal places, can be negative, zero or positive
Status	The Status of the Assignment Transaction. Can be 'Posted', 'Pending AO Response', 'Approved' or 'Error'.	Required	String, VARCHAR2(40 CHAR)

Sample Download using Method 2: Download All Responses

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Response ID	Request ID	Buy/Sell Offer	FTR ID	Initiating	Source	Sink	Start Date	End Date	TOU	Hedge Type	MW	Price	Status
2	28012	28011 BUY		28014 EMS1	BEN	OTA		1/7/2013	31/07/2013	24-HOURS	OBL	9	0	Approved
3	28010	27002 BUY		28014 EMS1	BEN	OTA		1/7/2013	31/07/2013	24-HOURS	OBL	1	1.23	Approved
4	28009	27003 BUY		28014 EMS1	BEN	OTA		1/7/2013	31/07/2013	24-HOURS	OBL	2	0	Approved
5	28004	27004 BUY		28014 EMS1	BEN	OTA		1/7/2013	31/07/2013	24-HOURS	OBL	3	0	Approved
6		29001 SELL		EMS1	OTA	BEN		1/6/2013	30/06/2013	24-HOURS	OBL	2	3.45	Pending AO Response
7	24007	22001 SELL		EMS1	BEN	OTA		1/6/2013	30/06/2013	24-HOURS	OBL	250	500	Approved
8	2004	2003 SELL		EMS1	OTA	BEN		1/5/2013	31/05/2013	24-HOURS	OBL	2	0	Approved
9	2002	2001 SELL		EMS1	OTA	BEN		1/5/2013	31/05/2013	24-HOURS	OBL	1	9.99	Approved
10	1002	1001 SELL		EMS1	BEN	OTA		1/5/2013	31/05/2013	24-HOURS	OBL	100	200000	Approved
11	4	3 SELL		EMS1	OTA	BEN		1/6/2013	30/06/2013	24-HOURS	OBL	2	3.45	Approved