



---

# Generation Connection Guide

Including commissioning, registering,  
dispatch and payment

Version 11

Published – 4 November 2022

© TRANSPOWER NEW ZEALAND LIMITED ALL RIGHTS RESERVED 2022

This document is produced for external release. Its conclusions are based on the information currently available to Transpower and may change as further information becomes available either internally or externally

---

## Table of Contents

<b>Glossary.....</b>	<b>4</b>
<b>Generation connection guide.....</b>	<b>5</b>
INTRODUCTION .....	5
GENERATION CONNECTION PROCESS.....	6
Phasing by workstream.....	8
WORKSTREAM A - TRANSMISSION CONNECTION .....	9
Phase A1.    Concept .....	9
Phase A2.    Application.....	11
Phase A3.    Investigation .....	12
Phase A4.    Approval .....	13
Phase A5.    Design .....	14
Phase A6.    Construction & commissioning.....	15
WORKSTREAM B : GENERATION COMMISSIONING.....	16
Phase B1.    Concept .....	16
Phase B2.    Planning .....	17
Phase B3.    Pre-commissioning.....	21
Phase B4.    Commissioning.....	26
Phase B5.    Post-commissioning .....	27
C – MARKET REGISTRATION.....	28
D – DISPATCH .....	30
E – TRANSMISSION CHARGES .....	34

## Glossary

ACS	Asset Capability Statement
AOPO	Asset Owner Performance Obligation
Code	Electricity Industry Participation Code 2010 <sup>1</sup>
FTR	Financial Transmission Rights
GIP	Grid Injection Point
Grid	The system of transmission lines, substations and other works, including the HVDC link used to connect grid injection points and grid exit points
Grid Owner	Transpower acting in its role as Grid Owner, where Transpower develops, owns and maintains grid assets.
GXP	Grid Exit Point
ICCP	Inter-Control Centre Communications Protocol
LCE	Loss and Constraint Excess
NZX	NZX Energy (currently the Clearing Manager, Pricing Manager, WITS Manager and Reconciliation Manager)
PPO	Principal Performance Obligation
RCPD	Regional Coincident Peak Demand
SCADA	Supervisory Control And Data Acquisition system
SSR	Solution Study Report
SOW	Statement Of Work
System Operator	Transpower acting in its role as System Operator
TPM	Transmission Pricing Methodology
TSA	Transpower Services Agreement
TWA	Transpower Works Agreement
WITS	Wholesale and Information Trading System

<sup>1</sup> See [www.ea.govt.nz/code-and-compliance/the-code/](http://www.ea.govt.nz/code-and-compliance/the-code/)

---

## Generation connection guide

### Introduction

The document provides a guide to connecting, commissioning, registration, offering and dispatching of new generation plant onto New Zealand's electricity system, plus a summary of transmission charges.

Transpower's purpose is 'empowering the energy future for New Zealand', through its two roles as Grid Owner and System Operator:

- As Grid Owner, maintaining a reliable transmission network while undertaking efficient investment to achieve a less constrained and more resilient grid.
- As System Operator, providing an integrated operations service facilitating a reliable efficient and competitive wholesale electricity market.

Transpower's commitment is to deliver this safely and efficiently to meet customer requirements and shareholder<sup>2</sup> expectations. This is accomplished while complying with the regulatory obligations and fulfilling its responsibilities to future generations of New Zealanders.

Generation connection, commissioning and dispatch are complex processes, requiring the coordination of activities between several parties. This document provides a guide on the processes required for new generation to be successfully connected, commissioned, registered, offered and dispatched, plus a summary of transmission charges.

The latest version of this document, plus associated documentation and information, is available on Transpower's Connect to the Grid – [What do you need?](#) page:

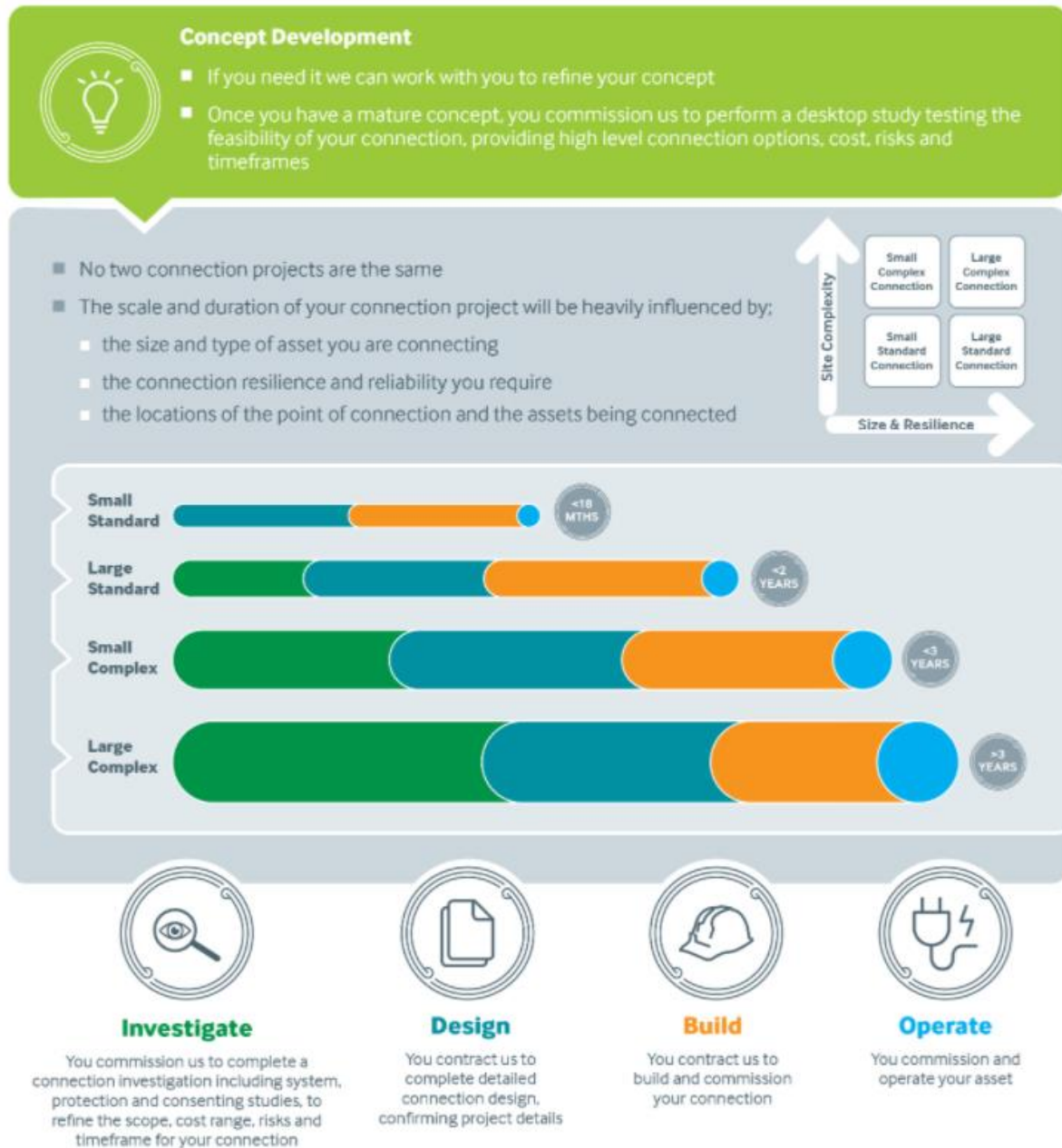
Transpower also provides information on its future plans and on market conditions through its website <https://www.transpower.co.nz>, including its Transmission Planning Report and System Security Forecast.

---

<sup>2</sup> Transpower is 100% owned by the New Zealand Government and operates under the State Owned Enterprises Act

## Generation connection process

The complexity and duration of each phase will vary from project to project but typically follows a standard sequence from concept development through to operation.



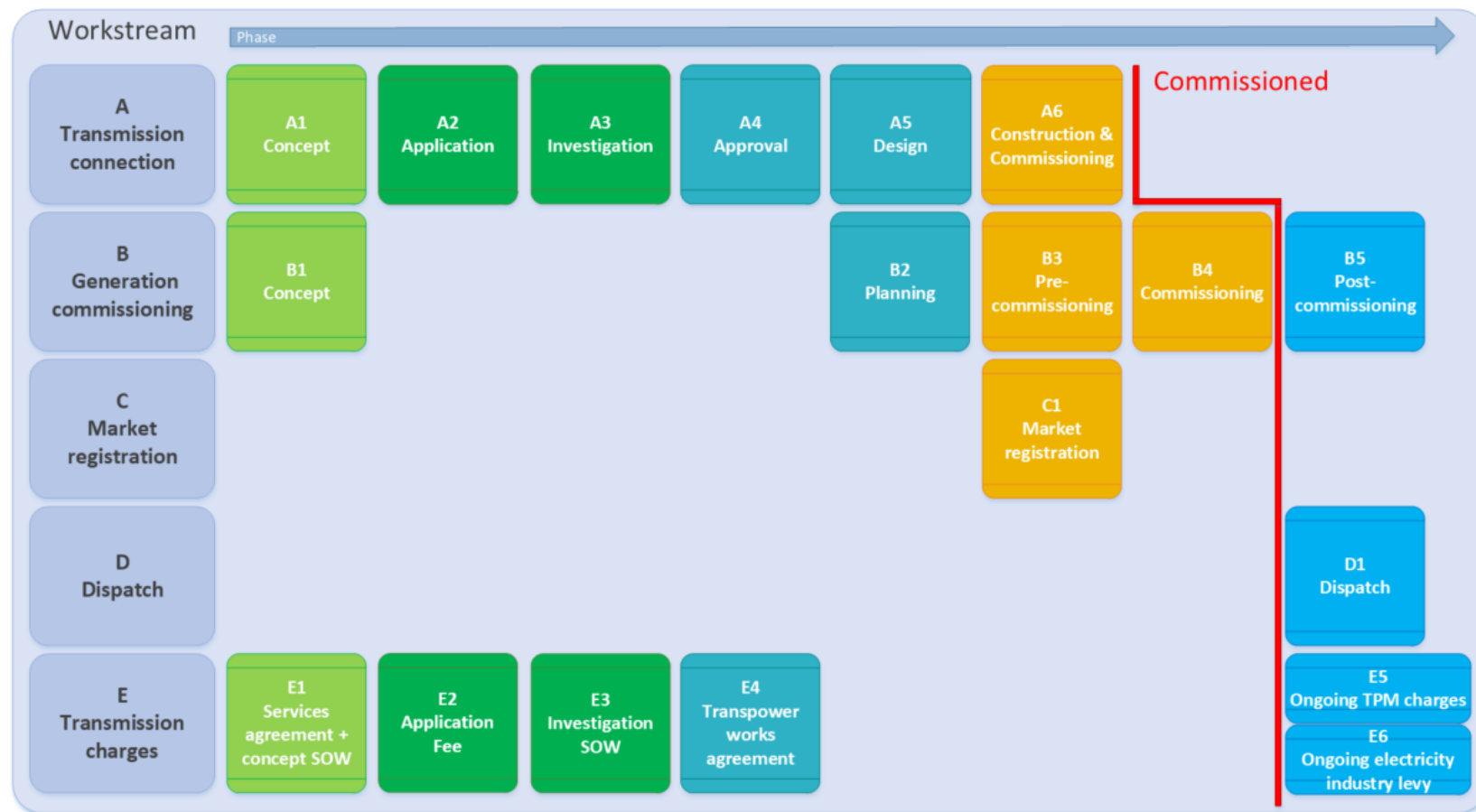
The generation connection process is further broken down into discrete phases that occur across five concurrent workstreams.

A description of each of the workstreams is provided below.

<p><b>A</b> <b>Transmission connection</b></p>	<p>Concept, application, investigation, design, construction and commissioning of the Grid Injection Point (GIP) where new generation plant will connect to Transpower's assets</p> <p>This is conducted by <b>Transpower</b> in its capacity as <b>Grid Owner</b></p>	<p>Applies to all generation plant connecting directly to Transpower's assets</p> <p>May or may not apply to generation equipment that connects within a distribution network</p>
<p><b>B</b> <b>Generation commissioning</b></p>	<p>Commissioning and testing required to ensure that the new generation is compliant with the Electricity Industry Participation Code's requirements</p> <p>This is conducted by <b>Transpower</b> in its capacity as <b>System Operator</b></p>	<p>Applies to all generation plant with a capacity &gt;1MW, but smaller plant can be excluded from some of the requirements in some situations</p>
<p><b>C</b> <b>Market registration</b></p>	<p>Registration for market services allows the trading of and payment for electricity produced by generation plant</p> <p>This is conducted by <b>NZX Energy</b> in its role as Clearing Manager, which oversees the trading and reconciliation for the New Zealand electricity market</p>	<p>Applies to all generation with a connection to a network</p>
<p><b>D</b> <b>Dispatch</b></p>	<p>Generators are required by the <b>Electricity Authority</b> to comply with the <b>Code</b></p> <p>This provides a brief summary of these requirements as they relate to dispatch</p>	<p>Applies to all dispatched generation plant. (optional for plant less than 10MW if not required by the System operator to maintain system security)</p>
<p><b>E</b> <b>Transmission charges</b></p>	<p>This workstream covers the financial aspects of connection to the grid</p> <p><b>Transpower</b> charges for concept assessment, investigation, detailed design and construction work in Workstream A and, once connected, through the Transmission Pricing Methodology (TPM) and Transpower Works Agreement (TWA)</p>	<p>Applies to all generation plant connected directly to Transpower's assets</p>

## Phasing by workstream

The diagram below shows the typical sequencing of the connection, commissioning and registration.





## Workstream A - Transmission connection

This section provides an overview of the process for generators who require connection to Transpower's assets. **This workstream does not apply to generators who are connecting to a local network, but other workstreams do. (Note; for significant new distributor connected generation requiring new Transpower assets, the distribution company you are connecting to may need to undertake some activities with Transpower under this workstream)**

Transmission connection comprises six phases:

- Concept
- Application
- Investigation
- Approval
- Design
- Construction and Commissioning

Each phase consists of a number of actions that generally need to be completed before moving to the next phase.

### Phase A1. Concept

In this phase, generators who are considering a new generation project provide Transpower with high level details of their plans. Transpower will then provide guidance on the connection process, and assess the generator's concept covering feasibility, connection options, grid constraints, any operational considerations and likely timeframes.

A1.1 Develop concept	
Description	The Generator determines their need for a new connection to Transpower assets. Considerations include: the type and size of the proposed generation, location in relation to Transpower's assets, operating scenarios, desired connection resilience and any consenting and property issues.
Responsible party	Generator
Timeframe	Dependent on Generator
A1.2 Express interest	
Description	The owner of the proposed new generation plant will contact Transpower's Customer Solutions Team. A meeting will be arranged with the prospective Generator to discuss their proposal. Transpower provides guidance and information on the process required for generation connection. Transpower will appoint a point of contact person for the connection process.
Responsible party	Generator, Transpower's Customer Solutions Team
Timeframe	Dependent on Generator
Resources	<a href="mailto:Customer.solutions@transpower.co.nz">Customer.solutions@transpower.co.nz</a> or +64 4 495 7000.

A1.3	<b>Provide preliminary information</b>
Description	Following the initial meeting, the Generator submits a formal request for a Concept Assessment workshop or a Concept Assessment completed by desk top study.
Responsible party	Generator
Timeframe	Dependent on Generator
Resources	Concept assessment questionnaires are available on request from Transpower's Customer Solutions at <a href="mailto:customer.solutions@transpower.co.nz">customer.solutions@transpower.co.nz</a> or +64 495 7000

Costs are incurred to the Generator from this stage on.

A1.4a	<b>Concept workshop</b>
Description	<p>Using the information provided by the Generator, Transpower arranges a concept assessment workshop to discuss considerations for connection options, site selection, estimated costs, environmental and property requirements, operational considerations and system constraints.</p> <p>This can be in person or via video conference and is normally requested where the generator has multiple options for their project they wish to evaluate and narrow down. Transpower will normally charge a fee for the Workshop to cover costs.</p>
Responsible party	Transpower
Timeframe	About 2 weeks

A1.4b	<b>Concept Assessment</b>
Description	<p>Using the information provided by the Generator, Transpower prepares a Concept Assessment report covering the following aspects: connection options and feasibility, estimated timeline for connection, estimated costs and risks, environmental and property requirements, operational considerations, system constraints and next steps.</p> <p>This is a desktop study. Transpower will normally charge a fee for the Concept Assessment to cover costs.</p>
Responsible party	Transpower
Timeframe	About 6-9 weeks

## Phase A2. Application

The Generator reviews the Concept Assessment and decides whether to proceed. This process may involve several further discussions with Transpower before the Generator is ready to commit to a connection application.

A2.1 Application	
Description	<p>Following on from the results of Transpower's Concept Assessment, the Generator will decide whether to proceed with a detailed investigation.</p> <p>Applicants must submit a completed application form along with supporting information, to demonstrate that the applicant has completed sufficient due diligence to understand all aspects of the connection process and that the project is viable.</p> <p>If proceeding, the generator completes an application to secure a place in Transpowers generation connection pipeline. The application form, fee structure, and application instructions are available on Transpower's website</p>
Responsible party	Generator
Timeframe	Dependent on Generator
A2.2 Application review	
Description	<p>Transpower reviews connection applications and advises the applicant if their application has been accepted or rejected. If rejected this will include information on why the application was rejected.</p> <p>If desired a modified application can be submitted for the same project at a later date.</p> <p>For accepted applications the Generator will be invoiced the initial portion of the associated application fee (E2) which must be paid to secure a place in Transpowers generation connection pipeline.</p>
Responsible party	Transpower
Timeframe	Up to six weeks
A2.3 Generation pipeline publication	
Description	<p>Transpower publishes basic information on all accepted generation connection applications as part of Transpowers generation pipeline. This allows generation developers to see where there project is in the pipeline against other competing generation developments.</p>
Responsible party	Transpower
Timeframe	Monthly

**Phase A3. Investigation**

Once Transpower resource is available the investigation commences.

A3.1	<b>Investigation initiation</b>
Description	Once Transpower investigation resources are available Transpower and the Generator agree and sign a seed funding statement of work under a Transpower Services Agreement (TSA) to fund a project team to initiate the investigation. This team works with the developer to agree the investigation scope, indicative cost and indicative timeframe for a second statement of work. The remainder of the application fee (E2) is payable at this stage.
Responsible party	Transpower / Generator
Timeframe	1 – 2 months
A3.2	<b>Detailed Solutions Development (DSD)</b>
Description	Transpower and the Generator agree and sign a Detailed Solution Development (DSD) statement of work under a Transpower Services Agreement (TSA) . The DSD documents the scope and cost of work to produce a Solution Study Report (SSR).  Depending on the complexity of the project and the Generator's internal decision points, this may be staged with a series of agreed scopes of work.
Responsible party	Generator / Transpower
Timeframe	About 2 weeks
A3.3	<b>Agreement on land acquisition and environmental approvals</b>
Description	Transpower and the Generator agree on the process and responsibilities associated with environmental and property processes and approvals for the new Transpower connection point. Transpower's preference is to obtain a designation for its short and long term flexibility. Designations can only be applied for by Transpower. In some instances, Transpower may be able to rely on regional consents or other environmental approvals obtained by the Generator (subject to Transpower's requirements being met). There is some flexibility regarding whether property rights are obtained by the Generator or by Transpower (on condition that Transpower's property requirements are met). The resultant agreements are included as appendices to the Transpower Works Agreement (TWA) in Phase A4.2.
Responsible party	Generator / Transpower
Timeframe	Two weeks

A3.4	Solution Study Report (SSR)
Description	Transpower engages a design consultant to prepare a Solution Study Report (SSR). The SSR will typically cover the conceptual connection design, system impact, wide area protection impact, and detailed cost and timeline estimates. A final report is provided to the Generator following review by Transpower.
Responsible party	Transpower
Timeframe	About 4 - 12 months (depending on complexity)

A3.5	Environmental and property investigation
Description	Transpower engages a planning consultant to undertake an environmental assessment. The assessment would typically identify the approvals required under the Resource Management Act and Heritage New Zealand Pouhere Taonga Act as well as issues, risks and potential timeframes for obtaining the approvals. Information regarding the approvals required, risks and timing is provided to the Generator by Transpower.
Responsible party	Transpower
Timeframe	About 6 months (may run in parallel with A3.4)

#### Phase A4. Approval

When the Generator is ready to proceed, the Generator enters into a contract with Transpower to cover the cost of constructing the new Transpower connection facility.

A4.1	Proceed with construction
Description	Following on from the results of the SSR, the Generator decides whether to proceed, and advises Transpower accordingly.
Responsible party	Generator
Timeframe	About 2 to 3 months for Transpower approval

A4.2	Transpower Works Agreement (TWA)
Description	Transpower and the generator agree and sign a Transpower Works Agreement (TWA). The TWA is Transpower's standard contract covering the terms and conditions for Transpower's provision of new infrastructure to enable customer projects, and the recovery of costs.
Responsible party	Generator / Transpower
Timeframe	About 2 months

**Phase A5. Design**

Transpower undertakes the design of the new connection on behalf of the Generator.

<b>A5.1 Detailed design</b>	
Description	<p>Transpower prepares the detailed design for the construction and commissioning of the new connection.</p> <p>The design work will typically be undertaken concurrently with the consenting process (Phase A5.2).</p>
Responsible party	Transpower
Timeframe	Varies depending on the complexity of the project
<b>A5.2 Obtain environmental approvals</b>	
Description	<p>The party or parties designated in Phase A3.2 secures the necessary environmental approvals to enable the construction, operation, maintenance and upgrade of the new connection.</p> <p>Gaining approvals will likely be staged. Some may be obtained based on SSR level engineering detail. Others will require detailed design and civil design aspects (Phase A5.1).</p>
Responsible party	Generator or Transpower (dependant on Phase A3.2).
Timeframe	Varies depending on the complexity of the project
<b>A5.3 Metering</b>	
Description	<p>The Generator must arrange a metering installation that complies with the Code. Grid connected Generators must provide Transpower with a copy of their metering installation design for review and comment. Generators should note that the Code contains other obligations on collecting and providing data to the market, noted below. (Noted also in section B2.8).</p>
Responsible party	Generator / Transpower
Timeframe	6 months pre commissioning
Compliance	<p>Part 10 (Metering arrangements) of the Code includes metering installation requirements</p> <p>Part 13 (Trading arrangements) of the Code includes requirements for embedded generators subject to dispatch or intermittent generation connected to the Grid.</p> <p>Part 15 (Reconciliation) of the Code includes requirements for collection and provision of metered data to the market</p>

**Phase A6. Construction & commissioning**

Transpower undertakes the construction and commissioning of the new grid connection on behalf of the Generator.

A6.1	<b>Construction &amp; commissioning of new connections to Transpower Assets</b>
Description	Transpower undertakes the construction and commissioning of the new connection to its assets. Monthly project progress reports are provided to the Generator. Progress meetings can be arranged if and when required.
Responsible party	Transpower
Timeframe	Varies depending on the complexity of the project

A6.2	<b>Transmission Agreement</b>
Description	All parties connected to Transpower assets are required to have a transmission agreement, which stipulates terms and conditions of the connection. The form of the standard transmission agreement, known as the Benchmark Agreement, is set out by the Electricity Authority in the Code. A copy of the Benchmark Agreement is available on Transpower's <a href="#">website</a> Generators with an existing transmission agreement do not require an additional agreement. Rather, new schedules are added to the existing agreement.
Responsible party	Generator / Transpower
Timeframe	4 – 8 weeks
Resources	Reference to the Benchmark Agreement can be found in Part 12 of the Code.

## Workstream B : Generation commissioning

This section outlines the process for Generators who want to commission new generation plant onto the grid or a local or embedded network. **It applies to all generators.** However, not all of the phases may be applicable to smaller Generators. Transpower in its role as System Operator will advise what is required.

Generation commissioning comprises five phases:

- Concept
- Planning
- Pre-commissioning
- Commissioning
- Post-commissioning

Each phase consists of a number of actions that need to be completed before moving to the next phase. Each of the actions has an associated commissioning lead-time, which is the minimum period of time between completing the action and beginning the commissioning and testing in order to avoid delays to the planned commissioning date. The actions within each phase can be carried out in any order, so long as they are all completed by their 'lead-time'.

### Phase B1. Concept

Irrespective of whether a generator connects to Transpower assets (during stages A1 and A2 of this guide) or Distribution assets, the generator should engage directly with the System Operator to discuss potential operational considerations for the project. These may impact the generators' planning, design, procurement and business case. This is especially important for investments in new generating technologies and should occur early in the project to avoid unforeseen complications during commissioning and operation.

B1.1	Education during concept phase
Description	Read operational guidance available on Transpower's website and assess operational obligations under the Code. If not conversant with the Code or the NZ Power System Asset Owners should seek advice from a Consultant.
Responsible party	Generator
Timeframe	During concept phase
Compliance	No
Show-stopper	No



B1.2	Education pre Investigation
Description	Understand the operational implications of various technology and design options being investigated. If not conversant with the Code or the NZ Power System Asset Owners should seek advice from a Consultant.
Responsible party	Generator
Timeframe	Pre investigation phase
Compliance	No
Show-stopper	No

## Phase B2. Planning

The System Operator meets with the Generator to discuss and agree key aspects of the commissioning, and highlight the information requirements, studies and approvals that need to occur to ensure there are no delays. The Planning phase commences soon after the Generator has approval to construct the new generation plant whether connected to Transpower (Workstream A: Phase A3) or Distribution assets.

B2.1	Advice of Commissioning
Description	<p>Consultation with the System Operator that a commissioning is planned will help parties identify and discuss key activities which may include:</p> <ul style="list-style-type: none"> <li>• Allocation of 3 letter operational code for dispatch purposes</li> <li>• Identifying if activities may result in a secondary risk to the power system</li> <li>• Agreement of relevant Asset Owner Performance Obligations and early notification of any residual non-compliances</li> <li>• Agreement of points of contact within affected organisations</li> <li>• Discussion of connection to the grid or a local network as appropriate to convey energy to the market.</li> <li>• Provision of generating unit/inverter planning models</li> <li>• Requirements for connection studies</li> </ul>
Responsible party	Generator
Lead-time	12 months pre commissioning
Compliance	No
Show-stopper	No

B2.2 Identify protection coordination requirements	
Description	Coordination of protection requirements can be a long lead-item and impact multiple asset owners at the grid interface
Responsible party	Generator / Distribution Company (for embedded generation projects) / Transpower as grid owner
Lead-time	12 months pre commissioning
Compliance	Clause 4(4a) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
Show-stopper	No

B2.3 Identify any ancillary services capability	
Description	<p>The Generator should have an awareness of ancillary services that may be offered to the electricity market, that could be required to be demonstrated during commissioning. Examples may include, but not be limited to:</p> <ul style="list-style-type: none"><li>• Fast and/or sustained instantaneous reserves</li><li>• Over-frequency reserves</li><li>• Single frequency keeping</li><li>• Multiple frequency keeping</li><li>• Black start</li></ul>
Responsible party	Generator
Lead-time	6 months pre commissioning
Compliance	No
Show-stopper	No

B2.4	<b>Submit Planning Asset Capability Statement (ACS)</b>
Description	Generators are required under the Code to submit an Asset Capability Statement (ACS) to the System Operator. The ACS contains the technical details of the new generation plant to be connected. This is the first stage of an iterative process, with more detail added to the ACS as the project progresses toward commissioning. Transpower will provide access to their on-line Asset Capability Database upon request.
Responsible party	Generator
Lead-time	6 months pre commissioning
Compliance	Clause 8.25(4) of Part 8 (Common Quality) of the Code Clause 2(5) of Schedule 8.3 (Tech Code A) of Part 8 (Common Quality) of the Code
Show-stopper	No
Resources	Information on Asset Capability Statements is available via Transpower's Generation Connection & Dispatch page <sup>3</sup> . For further information contact the System Operator
B2.5	<b>Agree applicable Asset Owner Performance Obligations (AOPOs) and Technical Codes</b>
Description	Based upon the submitted ACS the generator the System Operator should agree which Asset Owner Performance Obligations (AOPOs) and Technical Codes apply to the unit being commissioned and any changes to obligations of the station it is a part of.  Any residual non-compliances should be noted and managed appropriately as they are identified.
Responsible party	Generator / System Operator
Lead-time	6 months pre commissioning
Compliance	Part 8 (Common Quality) sub-part 2 of the Code
Show-stopper	No

<sup>3</sup> <https://www.transpower.co.nz/system-operator/information-industry/asset-owner-requirements/connecting-generation>

B2.6	<b>Consider establishing a Memorandum of Understanding (MoU)</b>
Description	<p>An optional Memorandum of Understanding (MoU) can be agreed between Transpower and the Generator. The MoU clearly defines an issue escalation process, and contains an agreement that failure to meet Transpower's 'show-stoppers' will result in delays to commissioning.</p> <p>The MoU includes a risk register with compliance issues, an actions register with pending tasks, and a decisions register detailing decisions that have been made to date.</p>
Responsible party	Generator / System Operator
Lead-time	6 months pre commissioning
Compliance	No
Show-stopper	No
Resources	A draft MoU is available on Transpower's Generation Connection & Dispatch page <sup>4</sup> .

B2.7	<b>Market considerations</b>
Description	<p>Where generators are uncertain of all the Code obligations Transpower may be able to give guidance in specific areas to assist, which could include establishing the need for dispatch facilities. If a new dispatch connection is required this could take several months to arrange depending on the type of facility.</p>
Responsible party	Generator
Lead-time	6 months pre commissioning
Compliance	Yes
Show-stopper	No

<sup>4</sup> <https://www.transpower.co.nz/system-operator/information-industry/asset-owner-requirements/connecting-generation>

B2.8	Metering Installation Design
Description	The Generator must arrange a metering installation that complies with the Code. Grid connected Generators must provide Transpower with a copy of their metering installation design for review and comment. Generators should note that the Code contains other obligations on collecting and providing data to the market, noted below. (Noted also in section A2.6).
Responsible party	Generator / Transpower
Lead-time	6 months pre commissioning
Compliance	Part 10 (Metering arrangements) of the Code includes metering installation requirements Part 13 (Trading arrangements) of the Code includes requirements for embedded generators subject to dispatch or intermittent generation connected to the Grid Part 15 (Reconciliation) of the Code includes requirements for collection and provision of metered data to the market
Show-stopper	Yes

### Phase B3. Pre-commissioning

The System Operator reviews the information that is provided by the Generator to ensure that the new generation plant is compliant with the Code. All 'showstoppers' must be satisfied before commissioning and testing of the generation plant commences.

B3.1	Submit Pre-commissioning ACS
Description	As more data comes to hand, the Generator provides further technical details of their new plant via an updated ACS.
Responsible party	Generator
Lead-time	4 months pre commissioning
Compliance	Clause 8.25(4) of Part 8 (Common Quality) of the Code Clause 2(5) of Schedule 8.3 (Technical Code A) of Part 8 (Common Quality) of the Code
Show-stopper	No

B3.2	<b>Submission of draft plans for review</b>
Description	Commissioning and an Engineering Methodology plans should be prepared by the generator and submitted for for agreement by the System Operator. It can be advantageous to develop plans in conjunction with the System Operator.
Responsible party	Generator
Lead-time	4 months pre commissioning
Compliance	No
Show-stopper	No
B3.3	<b>Submission of Connection Study</b>
Description	Assists asset owners to check compliance of their final design and any limitations in performance relating to the topology of the connection to the power system.  A Connection Study Guide document is available on the Transpower website
Responsible party	Generator
Lead-time	4 months pre commissioning
Compliance	Clause 2(2) of Schedule 8.3 (Technical Code A) of Part 8 (Common Quality) of the Code
Show-stopper	No
B3.4	<b>Submit outage requests for grid equipment</b>
Description	All outage requests must be lodged in the Transpower outage planning system for primary grid equipment and protection systems.
Responsible party	Generator
Lead-time	4 months pre commissioning
Compliance	No
Show-stopper	Yes
B3.5	<b>Submission of final plans for review and agreement</b>
Description	Final drafts must be submitted the System Operator for review and agreement with sufficient time for a review to be carried out and changes, if identified, made to the documents.
Responsible party	Generator
Lead-time	3 months pre commissioning
Compliance	Clause 2 of Technical Code A of Part 8 (Common Quality) of the Code.
Show-stopper	Yes

B3.6	<b>Indications and measurements</b>
Description	The Generator provides Transpower with indications and measurements as specified in the Code. These are supplied through Inter-Control Centre Communications Protocol (ICCP) data links. Indications and ACS data are utilised to ready Transpower's Market model for dispatch where appropriate and organise configuration of SCADA databases.
Responsible party	Generator
Lead-time	4 months pre commissioning
Compliance	Appendix A (Indications and Measurements) of Technical Code C (Operational communications) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code.
Show-stopper	Yes
B3.7	<b>Agree commissioning and test plans</b>
Description	The System Operator reviews and agrees the commissioning and test plans.
Responsible party	System Operator
Lead-time	6 weeks pre commissioning
Compliance	Clause 2(7) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality)
Show-stopper	Yes
B3.8	<b>Agree Protection coordination studies</b>
Description	The Generator liaises with Transpower to ensure that the protection settings and design at the Grid interface meet Code requirements. Transpower will provide the Generator, or the Distribution Company for embedded generation projects, with the Transpower document 'Generation Protection at the Interface'.
Responsible party	Generator / Distribution Company (for embedded generation projects) / Transpower
Lead-time	3 months pre commissioning for the final draft
Compliance	Clause 4(4a) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
Show-stopper	Yes

B3.9	<b>Notices of intention to Connect and Offer</b>
Description	If the generating units are greater than 1MW, the Generator submits a 'Notice of Intention to Connect' and a "Notice of Initial Offer" as appropriate to the System Operator.
Responsible party	Generator
Lead-time	4 weeks pre commissioning
Compliance	Clause 8.21(2) of Technical Code A (Assets) of of Part 8 (Common quality) of the Code
Show-stopper	Yes
Resources	These forms are available via Transpower's Generation Connection & Dispatch page <sup>5</sup> .
B3.10	<b>Finalising protection and SCADA details</b>
Description	Commissioning requires: <ul style="list-style-type: none"> <li>▪ protection coordination sign-off from Transpower as Grid Owner, and</li> <li>▪ indications and measurements available in Transpower SCADA.</li> </ul> A special meeting to discuss delaying commissioning is held if protection has not been agreed, or real-time data is not available.
Responsible party	Transpower
Lead-time	2 weeks pre commissioning
Compliance	Technical Code C (Operational communications) of Part 8 (Common quality) of the Code Clause 4(4) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
Show-stopper	Yes
B3.11	<b>Week ahead schedule</b>
Description	The System Operator needs to receive a commissioning/testing schedule one week prior to commissioning.
Responsible party	Generator
Lead-time	1 week pre commissioning
Compliance	No
Show-stopper	Yes

<sup>5</sup> <https://www.transpower.co.nz/system-operator/information-industry/asset-owner-requirements/connecting-generation>



B3.12	<b>Market confirmation</b>
Description	This requires setting a minimum confirmation period to the market for system ride through and other significant system tests when required.
Responsible party	Generator
Lead-time	2 days
Compliance	No
Show-stopper	Yes
B3.13	<b>Day ahead schedule</b>
Description	The System Operator needs to receive a commissioning/testing schedule one day prior to commissioning activities for the next day.
Responsible party	Generator
Lead-time	1 day
Compliance	No
Show-stopper	No
Resources	The difference between B3.11 and B3.13 is in Transpower's Companion Guide for Commissioning Generation on Transpower's Generation Connection & Dispatch page <sup>6</sup> .
B3.14	<b>Offer and Dispatch during commissioning</b>
Description	<p>The Generator must comply with all the relevant Electricity Market Trading Arrangements including:</p> <ul style="list-style-type: none"> <li>• Complying with offer and dispatch provisions unless agreed otherwise in an approved Operational Test Plan</li> <li>• Managing the offer of the commissioning assets in order to ensure they are dispatched to the loads necessary for commissioning. At the discretion of the Generator this may include bidding into the must run dispatch auction<sup>7</sup> or offering the unit at \$0.01/MWh.</li> </ul>
Responsible party	Generator
Show-stopper	No
Resources	See D3 for more information on offering and dispatch

<sup>6</sup> <https://www.transpower.co.nz/system-operator/information-industry/asset-owner-requirements/connecting-generation>

<sup>7</sup> The must run dispatch auction enables generators to offer generation at \$0/MWh, giving the generator the greatest likelihood of dispatch but it does not confer a guarantee of actually being dispatched. See D6.

## Phase B4. Commissioning

The Generator commissions and performs the required tests - adhering to the timeline in the agreed commissioning and test plan.

B4.1	<b>Perform tests</b>
Description	The Generator commissions the new plant, then performs the tests according to the timetable in the Commissioning Plan unless agreed otherwise with the System Operator.
Responsible party	Generator
Compliance	Clauses 3(7-9) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
B4.2	<b>Witness testing to demonstrate compliance with the Code</b>
Description	The System Operator may request to witness AOPO tests as required.
Responsible party	System Operator
Compliance	Clause 8(4) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
B4.3	<b>Provide test results</b>
Description	The Generator provides test results and data to the System Operator to demonstrate compliance with AOPOs and Technical Codes.
Responsible party	Generator
Compliance	Clause 8 of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code

**Phase B5. Post-commissioning**

Following commissioning and testing, the Generator provides updated test data to Transpower, who reviews and provides a final assessment of compliance. The Generator is required to adhere to all of the ongoing obligations as set out in the Code.

<b>B5.1</b>	<b>Post-commissioning ACS</b>
Description	The Generator provides a final updated ACS following the commissioning and testing.
Responsible party	Generator
Compliance	Clauses 8.25(4) of Part 8 (Common quality) of the Code Clause 2(5) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
<b>B5.2</b>	<b>Submit test reports</b>
Description	The Generator submits test reports and data from commissioning (including unencrypted verified models) to Transpower for analysis.
Responsible party	Generator
Compliance	Clause 2(5b) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code
<b>B5.4</b>	<b>AOPO and Technical Code non-compliances</b>
Description	If any potential non-compliances are identified during either: commissioning, testing; or production of the test reports they must be identified to the System Operator.
Responsible party	Generator
Compliance	Clause 8.29 of Part 8 (Common quality) of the Code.
<b>B5.3</b>	<b>Assessment of compliance</b>
Description	The System Operator completes a report on final assessment of compliance, on request of the generator, based upon the information provided throughout the ommissioning process.
Responsible party	System Operator
Compliance	Clause 2(3) of Technical Code A (Assets) of Schedule 8.3 (Technical codes) of Part 8 (Common quality) of the Code.

## C – Market Registration

This section provides an overview of the process for Generators who will be offering electricity to the market after the new generation has been commissioned. Registration comprises six actions that must be completed prior to starting commissioning, so is typically conducted in parallel with the early phases of the commissioning workstream.

The Generator registers with the Electricity Authority and NZX Energy as the appointed Clearing Manager. The generator will also require a contract with NZX Energy as the appointed Clearing Manager in order to take or inject electricity from or to the Grid.

C1	Register as market participant
Description	All <sup>8</sup> new Generators must register as a market participant, if not currently registered with the Electricity Authority.
Responsible party	Generator
Lead-time	6 months
Compliance	Clauses 9, 10, 27-31 of Electricity Industry Act 2010
Resources	<a href="http://www.ea.govt.nz/operations/industry-participants/how-to-register-as-a-participant">www.ea.govt.nz/operations/industry-participants/how-to-register-as-a-participant</a>
C2	Advise dispatch requirements
Description	The Generator advises the System Operator of dispatch requirements
Responsible party	Generator
Lead-time	6 months
Compliance	Clause 13.76 of Part 13 (Trading arrangements) of the Code.
Resources	See section D of this guide for a summary of dispatch requirements
C3	Notice to submit offers
Description	The Generator submits a 'notice of intention to submit initial offers' to Transpower. This includes whether the offer will be by station or unit.
Responsible party	Generator
Lead-time	4 weeks
Compliance	Clause 13.6(4) of Part 13 (Trading arrangements) of the Code.
Resources	A template Notice of Initial Offer is available via Transpower's website <a href="https://www.transpower.co.nz/system-operator/information-industry/electricity-market-operation/connecting-market">https://www.transpower.co.nz/system-operator/information-industry/electricity-market-operation/connecting-market</a> .

<sup>8</sup> An exemption to registering as a participant for small generation (<100kw) has been drafted by the Authority but is yet to be enacted at the time of publication

C4	<b>Register for WITS</b>
Description	The Generator registers for WITS (the wholesale information and trading system) with the Clearing Manager (NZX Energy) if it has not already done so. <a href="mailto:cadmin@nzx.com">cadmin@nzx.com</a>
Responsible party	Generator
Lead-time	4 weeks
Compliance	No
Resources	<a href="http://www.ea.govt.nz/operations/wholesale/spot-pricing/wits">www.ea.govt.nz/operations/wholesale/spot-pricing/wits</a>
C5	<b>Advise clearing manager</b>
Description	The Generator advises the Clearing Manager (NZX Energy) of the upcoming generation connection in order that they are setup in the Clearing Manager's system in order to be cleared in the market each month. <a href="mailto:cmanager@nzx.com">cmanager@nzx.com</a>
Responsible party	Generator
Lead-time	4 weeks
Compliance	Part 14 (Clearing and settlement) of the Code
C6	<b>Advise reconciliation manager</b>
Description	The Generator advises the Reconciliation Manager (NZX) of the upcoming generation connection. Contracts for selling and/ or purchasing energy may be required. <a href="mailto:rm@nzx.com">rm@nzx.com</a>
Responsible party	Generator
Lead-time	4 weeks
Compliance	Clauses 15.38 and 15.39 of Part 15 (Reconciliation) of the Code

## D – Dispatch

This section provides a high-level description of the dispatch process. This guide is not intended to relieve asset owners from identifying and meeting their obligations set out in the Electricity Industry Participation Code 2010 (Code). Where there is conflict between this guide and the Code, the Code takes precedence.

### D1

#### Electricity market

The System Operator schedules and dispatches generation on the basis of the bids and offers made by purchasers and generators. Generators offer electricity into the electricity market. Purchasers bid for electricity.

### D2

#### Pricing

The New Zealand wholesale market design includes dispatch, based on bids and offers with locational marginal pricing (nodal pricing) to arrive at the overall lowest cost dispatch solution. The co-optimisation of the cost and quantity of reserve needed to cover the loss of generation or HVDC transfer, along with the cost of energy dispatch, is included in meeting the least cost objective.

The market settles on an ex-post basis with 30 minute trading periods and a price for each of the over 200 nodes in the market model. Generators are paid for the amount of output produced in a trading period, at the final price for the trading period, at the node to which they are connected. Dispatch occurs every five minutes through formal dispatch instructions sent electronically.

The Electricity Authority is currently developing enhancements to the spot market so settlement prices will be available in real time.

### D3

#### Generation offers

All generation offered under the trading rules in Part 13 of the Code is dispatched through the offer process in real time. There is no provision for dispatch rights based on any bilateral arrangement or hedge arrangements between generators and retailers.

All generation over 10 MW - if directly grid connected or embedded within a distribution network - must offer. Embedded generation below 10 MW can be required to provide intended output data if the Authority agrees this will assist the System Operator in meeting its principal performance objective (PPO).

Different dispatch rules exist for intermittent (wind and solar) generation and certain types of co-generation plant, reflecting the characteristics of these generators.

Participants can change their offer up to 'gate closure'<sup>9</sup>. A number of schedules are provided to participants up to a week in advance giving an indication of the likely dispatch quantities and prices.

There is currently no binding ahead or unit commitment market as in some overseas jurisdiction.

**D4****No right of capacity**

A connection to the Grid does not result in any capacity rights for that connected party. Generators connecting to the Grid should be aware that existing, or future congestion on the Grid may affect the ability of a generator to deliver its energy to the market.

**D5****No right of dispatch**

Connection to the grid and participation in the electricity market does not guarantee that a generator will be dispatched at all times by the System Operator. A generator may not be dispatched where:

- there is sufficient lower priced generation to meet demand;
- there are constraints on the power system that limit the amount of electricity that the generating unit can produce; or
- the generator is non-compliant with the AOPOs and Technical Codes.

**D6****Sufficient lower priced generation**

Dispatch is based on offer price. Generating plant may not be dispatched if there is sufficient lower priced generation offered to meet system demand.

At times, clearing prices may drop to close to zero if there is a surplus of generation that wants to run irrespective of the clearing price. This typically happens at times of low system demand; overnight in summer, and at other times when there is a very high proportion of hydro generation relative to total system demand due to full storage catchments and strong inflows.

Negative priced offers are not allowed; however, there is a Must Run Dispatch Auction (MRDA) where generators can bid for rights to offer at \$0.00 per MWh. The quantity of generation that can be cleared in this auction is limited to 80% of the minimum system demand. All other generation must offer at \$0.01 per MWh or above.

Rules for the dispatch of intermittent (wind and solar) generation and type B cogeneration plant effectively see them dispatched to their current output. However due to the offer price, system constraints or times of excess generation, intermittent generation may need to "spill" in the same way that can happen with hydro

<sup>9</sup> Gate closure is the point at which changes to offers can no longer be made for commercial reasons. For most generation this is currently 1 hour ahead of dispatch beginning for the applicable trading periods. Clause 13.17 of Part 13 of the Code.

generation at times.

Holding rights to offer at \$0.00 per MWh from the MRDA does not guarantee dispatch. Reserve co-optimisation or constraints, could result in dispatch being less than the quantity offered at times, particularly during periods of low demand. In some cases, this may put thermal generating units below minimum running limits, requiring the plant operators to disconnect the generating unit.

**D7****Constraints on the power system**

Transmission constraints on the Grid may also affect generation dispatch. The System Operator analyses generation schedule information to identify when and where a constraint may have to be applied to ensure the power system remains within capability. The market system will bring on higher cost generation within a constrained region once a constraint limit is reached.

Details of the permanent transmission constraints applied by the System Operator are available on this [page](#) of our website.

**D8****Ancillary services cost allocation**

Transpower, as the System Operator, procures ancillary services (instantaneous reserve, over frequency reserves, frequency keeping, voltage support, and a black start facility) to meet its PPO. The costs of procurement of these services are allocated to participants as set out in Clauses 8.55 to 8.70 of Part 8 (Common quality) of the Code.

Some ancillary services costs are allocated to generators:

- The availability costs of instantaneous reserves for a trading period are allocated to generators when their generating units output is above 60 MW.
- An event charge is payable by generators if their assets cause an under frequency event.
- Non-compliant generators with dispensations are allocated a share of reserve costs related to their non-compliance.

Generation plant with certain capability may also be able to be offered or tendered to provide ancillary services. Please see <https://www.transpower.co.nz/system-operator/information-industry/electricity-market-operation/ancillary-services/about> and section B2.3 of this guide for further information.

**D9****Co-optimisation of energy and reserve**

The New Zealand power system currently has single generating units of up to 380 MW output dispatched. Single generating units or multiple generators on a single connection can be constrained back at times due to the co-optimisation of reserve in the market model.

In determining the least cost solution for each 30 minute trading period, the market system co-optimises the cost and quantity of instantaneous reserve (reserve) needed to cover the loss of the largest generating unit connected, group of generators on a single connection or HVDC at risk transfer at that time. Where the



cost of the reserve to cover the loss of the largest generating unit, group of generators on a single connection or at risk HVDC transfer is more than dispatching energy from other generators, the market system will dispatch the largest generating unit, group of generators on a single connection (or adjust the HVDC transfer by re-dispatching generation in one island to the other) below where it might otherwise clear based on its offer price alone.

Reserve is offered through the market in a similar way to energy offers. Reserve is offered as generator response or interruptible load. There can be times where reserve prices are as high as, or higher than, energy offers. There are also times when there is insufficient reserve to cover the full output of the largest generating unit or at risk HVDC transfer. In such situations, large generating units, at risk HVDC transfer or a group of generators on a single connection, may be constrained back.

Common situations where generation unit dispatch can be constrained by reserves include:

- when reserve prices may be high relative to energy prices; and
- times where prices are low and close to zero.

In some situations (i.e. low load), reserve co-optimisation has resulted in large generators being dispatched below minimum running levels and having to disconnect.

## E – Transmission charges

A generation plant connecting to the Grid will be required to pay charges as follows.

E1	<b>Transpower Services Agreement(TSA) and Concept Assessment statement of work (SOW)</b>
----	--

In phase A1.3 Transpower and the Generator sign a Transpower Services Agreement (TSA) as a master agreement for the provision of Transpower Services, and for the recovery of costs by Transpower from the Generator.

Transpower and the Generator will also sign a Statement of Work(SOW) under the master TSA. This defines the scope and cost of the Concept Assessment.

E2	<b>Application fee</b>
----	------------------------

In phase A2.1 the Generator submits an application where they agree to pay the associated application fee. If the application is accepted the fee will become payable. There are limited situations under which the fee is refundable but, 100% of the fee can be allocated to a subsequent Transpower Works Agreement (TWA)

E3	<b>Investigations Statement of Work (SOW) under master Services Agreement</b>
----	---

In phase A3.3, Transpower and the Generator agree and sign a Detailed Solution Development statement of work (SOW). This defines the scope and cost of investigation to produce the Solution Study Report (SSR).

Depending on the complexity of the project, the investigation may be staged, with a series of SOWs.

E4	<b>Transpower Works Agreement(TWA)</b>
----	--

A Transpower Works Agreement (TWA) is a bilateral contract between a connected customer and Transpower to cover the costs of any new Transpower assets required to enable the Grid. This is an unregulated revenue stream for Transpower. Normally any maintenance or operating costs associated through these assets will be recovered through the TPM.

E5	<b>Transmission Pricing Methodology (TPM)</b>
----	---

Transpower's business is subject to price and quality regulation under Part 5 of the Commerce Act 1986. This regulation determines the amount of revenue Transpower can recover, while the methodology by which Transpower allocates the annual revenue requirement is regulated by the Electricity Authority under Schedule 12.4 of Part 12 (Transport) of the Code: this is known as the Transmission Pricing Methodology (TPM)

There are three charge components to the TPM, plus LCE rebates.

### Connection charges

A connection asset is any Grid asset that connects a customer to Transpower's interconnected transmission network. Connection charges recover the capital, maintenance, operating and injection overhead component associated with

connection assets.

### **Interconnection charges**

A demand based charge that recovers the remainder of Transpower's HVAC revenue requirement. The charge is based on each customer's contribution to the regional coincident peak demand (RCPD) in their region.

### **HVDC charges**

An injection based charge levied on South Island generators, used to recover Transpower's revenue allowance associated with the operating the HVDC interisland link. This charge was based on each customer's historic anytime maximum injection (HAMI), however from September 2015 Transpower began transitioning in the South Island Mean Injection (SIMI) charge to replace HAMI. The SIMI charge will first be charged in April 2017 and be used to allocate 25% of Transpower's HVDC revenue allowance, reaching 100% of Transpower's revenue allowance by April 2020. There will be no HAMI charges for generators connected after 31 August 2015.

### **LCE credit**

Under Part 14 (Clearing and settlement) of the Code, Transpower receives the loss and constraint excess (LCE), a surplus generated in the wholesale electricity market, net of that used for the Financial Transmission Rights (FTR) market. There is currently no regulation around how Transpower should allocate the funds, however the current methodology is to allocate the LCE back to the assets that have created the LCE. For example, where an LCE amount has generated from the HVDC link, this amount is apportioned back to those of Transpower's customers that contribute toward our HVDC revenue. In most cases, this can result in a credit toward the cost of our customer's transmission bill.

### **Information**

For more information on the historical TPM rates levied on transmission customers, see Transpower's revenue and pricing page, which includes information on our forecast transmission revenue for future years.

### **TPM review**

At the time of writing, the TPM is under review by the Electricity Authority<sup>10</sup>. A new Transmission Pricing Methodology is under implementation, more information can be found on this [page](#) of our website.

A short guide to the new TPM can be found [here](#).

E6

## **Electricity industry levy**

All registered market participants are required pay an electricity industry levy to cover the cost of the Electricity Authority's activities. The levy is payable in monthly instalments to NZX Energy as the Clearing Manager .

<sup>10</sup> See [www.ea.govt.nz/development/work-programme/pricing-cost-allocation/transmission-pricing-review](http://www.ea.govt.nz/development/work-programme/pricing-cost-allocation/transmission-pricing-review)