SETTLEMENT AGREEMENT

Regulation 24(1) Electricity Industry (Enforcement) Regulations 2010

DATED: 31 May 2019

BETWEEN:

(1) Transpower New Zealand Limited as the grid owner of 22 Boulcott Street, Wellington (grid owner);

(2) MainPower New Zealand Limited of 172 Fernside Road, Rangiora (MainPower);

(3) Transpower New Zealand Limited as the system operator of 22 Boulcott Street, Wellington (system operator)

(Collectively the **parties**).

BACKGROUND:

(A) On 31 May 2018 and on 2 July 2018 the grid owner self-reported to the Electricity Authority that on three separate occasions it had breached clause 4(4)(a)(ii) of Technical Code A of Schedule 8.3 of the Electricity Industry Participation Code 2010. The breaches occurred at the Bombay, Southbrook, and Invercargill GXPs.

(B) On 6 August 2018 the Authority appointed an investigator under regulation 12 of the Electricity Industry (Enforcement) Regulations 2010 (Regulations), to investigate the Alleged Breaches by the grid owner.

(C) MainPower and the system operator joined the investigation as interested parties.

(D) The parties have agreed to settle the Alleged Breaches on the terms contained in this Agreement.

IT IS AGREED:

1. Interpretation

1.1 In this Agreement, unless the context requires otherwise:

(a) **Agreement** means this Settlement Agreement;

(b) **Alleged Breaches** means the alleged breaches of the Code arising from the Circumstances and described in clause 2;

(c) **Approval Date** means the date the parties to this Agreement are notified that the Electricity Authority has approved this Agreement under regulation 24(4) of the Regulations;

(d) **Circumstances** means the circumstances set out in clause 3;

(e) **Code** means the Electricity Industry Participation Code 2010;

(f) **Regulations** means the Electricity Industry (Enforcement) Regulations 2010.

2. Alleged Breaches

2.1 Clause 4(4)(a)(ii) of Technical Code A of Schedule 8.3. This clause requires an asset owner to design, commission, maintain and apply settings to its protection systems to be selective when operating so that the minimum amount of assets are electrically disconnected.

3. Circumstances of the Breaches

1. Event: Invercargill transformer T3 tripping

3.1 At 2:43 am on 8 November 2017, the two in-service upper South Island (USI) 220 kV circuits simultaneously tripped (USI event). Shortly afterwards the 66 kV/110 kV West Coast network tripped as it could not support the total USI load.

3.2 At 2:44 am on 8 November 2017, Invercargill transformer T3 also tripped. Invercargill transformer T5, operating in parallel with T3, remained in service and maintained supply to the load previously supplied by T3.

3.3 The grid owner's on-site investigation of T3 failed to find any visible fault. The grid owner investigated further and found that the transformer high voltage winding restricted earth fault protection element had incorrectly operated, causing T3 to trip. The grid owner found that it had configured the protection element setting incorrectly and the protection element was more sensitive than it should have been.

3.4 The grid owner had expected the restricted earth fault protection element to only operate for a fault in the protected zone associated with T3. The grid owner's investigation concluded the restrictive earth fault tripping of T3 was due to the over-sensitive setting that was triggered by the significant tripping of the 220 kV circuits in the USI.

3.5 The grid owner issued a protection setting change to be applied to the restricted earth fault protection element for T3. The grid owner's service provider then applied the setting change and at 4:13 pm on 8 November 2018 the grid owner returned T3 to service.

2. Event: Bombay transformer T2 tripping

3.6 On 26 January 2018, the grid owner replaced Bombay 33 kV circuit breaker 72 with a similar circuit breaker that the grid owner had previously used at another of its substations.

3.7 The current transformers in the replacement circuit breaker had different ratios to the original Bombay current transformers. This required the grid owner to change a protection setting during commissioning.

3.8 At 0:12 am on 4 February 2018, a fault occurred on feeder circuit breaker 102 supplying Counties Power Limited's (Counties Power) distribution network. The fault was intermittent and circuit breaker 102 successfully auto-reclosed.

3.9 At the same time as the fault occurred on circuit breaker 102, the recently replaced circuit breaker 72 also tripped, removing T2 from service. This should not have happened for a feeder fault on circuit breaker 102.

3.10 The grid owner's investigation revealed that the restricted earth fault element of the differential protection for T2 had operated incorrectly during the fault on circuit breaker 102. The relay associated with this protection had become unstable during the fault, due to the difference in current transformer ratios between circuit breaker 72 and the transformer neutral current transformer.

3.11 The grid owner had recognised this potential issue when preparing the new settings and made allowance for the different ratios. The manufacturer's documentation indicated that the relay had the ability to compensate for different current transformer ratios.

3.12 However, the grid owner's investigation found the relays it installed at Bombay had an earlier version of firmware installed that did not make sufficient allowance for operating with different current transformer ratios.

3.13 At 8:40 pm on 4 February 2018, the grid owner returned T2 to service after re-instating the relay's original pickup current setting.

3.14 On 14 April 2018, the grid owner installed and commissioned a new relay with the latest firmware.

3.15 There was no loss of supply to the distributor when T2 tripped, as the parallel transformer T3 continued to supply load on the three 33 kV feeders to Counties Power.

3. Event: Southbrook Transformers T1 and T2 tripping

3.16 At 2 24 pm on 9 March 2018, the grid owner's Southbrook grid exit point transformers T1 and T2 tripped when a fault occurred in MainPower's 11 kV network. MainPower's protection correctly operated and cleared the fault. However, the grid owner's protection also operated and tripped both T1's and T2's high voltage and low voltage circuit breakers.

3.17 The transformers' tripping resulted in a loss of 14 MW of 33 kV supply to MainPower.

3.18 MainPower isolated the faulted equipment on its network and at 2:52 pm the grid owner restored supply.

3.19 The grid owner investigated the tripping of T1 and T2 and found it had incorrectly designed the 'directional' setting for the back-feed protection element on the T1 and T2 protection relays.

3.20 The grid owner describes the Southbrook 33 kV supply as unusual because it does not include a 33 kV busbar (which is an unusual connection arrangement). The Southbrook 33 kV supply from transformers T1 and T2 is directly cabled to MainPower's substation on an adjacent property.

3.21 The grid owner considers the unusual connection arrangement contributed to the star point of the current transformers used for the back-feed protection element of the protection being connected to look in the opposite direction to a standard 33 kV installation (non-standard star point connection).

3.22 The grid owner believes it overlooked the non-standard star point connection when designing the protection system, and this oversight resulted in the incorrect operation of the protection system when the fault occurred in MainPower's network on 9 March 2018.

3.23 On 22 March and 19 April 2018, the grid owner changed the current transformer star points on transformers T1 and T2 respectively to the standard connection arrangement.

4. Impact of the Alleged Breaches

4.1 The parties agreed that the market impact as assessed by the Investigator should be recorded as significant for the Southbrook event and no impact for the Bombay and Invercargill events. However, in different circumstances incorrect protection settings can have a severe impact.

5. Steps taken to prevent recurrence

5.1 The grid owner is reviewing the wider design, settings, and testing aspects of its protection systems.

5.2 The grid owner has discussed the incorrect design of protection with its protection designer. The grid owner's approved protection designers provide:

- the protection design
- the peer review of that design
- the final approval of that design.

5.3 The grid owner has discussed with the relevant service providers the grid owner's expectation that the protection functionality should be fully tested at the time of commissioning. This testing should identify any error in the protection operation.

5.4 The grid owner has followed up its discussions with service providers with formal documentation.

6. Guiding Principle

6.1 The parties agree the following guiding principle in relation to this Agreement:

> Managing processes and procedures for the design, commissioning, maintenance, and application of protection systems are important requirements to assure the reliable supply and efficient operation of the electricity industry.

7. Settlement

7.1 The grid owner agrees to:

(a) Review its current process documentation and identify any improvements. The relevant documents are:

- Relay setting process TP.AP 01.02 issue # 4 January 2015
- Commissioning of secondary equipment: general requirement TP.CP 01.05 # 4 July 2002

(b) Review compliance with the process documentation and identify any action to rectify any non-compliance

(c) Provide a report to the Authority and to the parties to the investigation, on the reviews (7.1 (a) and (b)) and any actions arising from those reviews, within three months of the Approval Date

(d) Provide ongoing monitoring of the processes to provide assurance that the processes are being followed.

(e) Provide a report to the Authority and to the parties to this investigation, on the ongoing monitoring and compliance with the processes, 12 months after the Approval Date.

(f) Investigate or carry out an audit when it is identified that a design consultant has failed to meet the design requirements for a protection project.

8. Confidentiality

8.1 If the Authority decides under regulation 25(2) of the Regulations not to publicise any part of this Agreement, each party will treat that part of the Agreement as confidential information and will not disclose it other than:

(a) to the party's employees or contractors who need to know the confidential information to implement or monitor the implementation of this Agreement;

(b) to the party's professional advisers, auditors and bankers;

(c) as required by law or for the purposes of judicial proceedings;

(d) as required by any securities exchange or regulatory or governmental body to which the party is subject or submits; or

(e) as authorised in writing by the other parties.

8.2 A party must not disclose confidential information under clause 8.1(a) or (b) unless the party obtains a confidentiality undertaking from the person to whom the confidential information is to be disclosed on terms no less onerous than those set out in this clause 8 before disclosing the confidential information. Any confidential information to be disclosed in the circumstances set out in clause 8.1(c) or (d) may only be disclosed after written notice to the other parties (unless the disclosing party is prevented from notifying the other parties by law).

9. Agreement Subject to Approval

9.1 Subject to clause 9.2, this Agreement will come into effect on the Approval Date.

9.2 Clause 8 is binding on the parties as from the date of this Agreement. Pending the Authority's approval of this Agreement under regulation 24(4) of the Regulations, clause 8 will apply as if the Authority has decided under regulation 25(2) of the Regulations not to publicise any part of this Agreement or the existence of this Agreement.

10. Settled Breaches

10.1 This Agreement is in full and final settlement of all claims, actions and demands against any party (under the Regulations, the Code or otherwise) in relation to:

(a) the Alleged Breaches; and

(b) any other breaches of the Regulations or Code involved in or arising from the Circumstances that the claiming party ought reasonably to have known about at the date of this Agreement,

(the Alleged Breaches and such other breaches together the **Settled Breaches**).

10.2 Subject to regulation 26 of the Regulations, this Agreement is also binding on the Authority and all participants who are not a party to this Agreement to the effect that:

(a) the Authority may not on its own initiative instigate a further breach investigation, or take any enforcement action in respect of, the Settled Breaches; and

(b) a participant who is not a party to this Agreement may, in accordance with regulation 26 of the Regulations, make a further notification under regulation 7 or 8 of the Regulations in relation to a Settled Breach, and the Authority

may then take all or any of the steps provided for in the Regulations despite this Agreement.

11. General

11.1 Each party will execute all documents and do, or refrain from doing, all other reasonable things necessary or desirable to give full effect to the provisions of this Agreement, including to secure the Authority's approval of this Agreement under regulation 24(4)(a) of the Regulations.

11.2 This Agreement is the whole and only agreement between the parties relating to the settlement of claims, actions and demands arising from the Circumstances. Each party acknowledges that it has not been induced to enter into this Agreement by any representation made by or on behalf of the other party that is not repeated in this Agreement.

11.3 This Agreement may be signed in any number of counterparts.

SIGNED:

For Transpower New Zealand Limited as the grid owner

Name:

Position:

SIGNED:

For Mainpower New Zealand Limited

Name:

Position:

SIGNED:

For Transpower New Zealand Limited as the system operator

Name:

Position: