

Investigation of alleged breaches of the Electricity Industry Participation Code 2010 by Transpower New Zealand Limited as the system operator

On 21 May 2018, the Authority alleged that Transpower New Zealand Limited as the system operator breached a number of provisions of the Electricity Industry Participation Code 2010 (Code) on 2 March 2017.

Under regulation 12 of the Electricity Industry (Enforcement) Regulations 2010, on 28 June 2018, the Authority appointed Alex Ehlert as investigator to investigate the alleged breaches.

Under regulation 16, the investigator must promptly notify the industry participant alleged to have breached the Code, of the allegations that are being investigated. On 29 June 2018, the investigator gave the system operator such notice.

Under regulation 17, at the same time as the investigator sends any notice under regulation 16, the investigator must publicise the matter under investigation, including the content of the notice given under that regulation. The investigator is hereby publicising the matter under investigation, and a copy of the notice given under regulation 16 is attached.

Any participant who considers that it is affected by the matter being investigated, and who wishes to become a party to this investigation, should notify the investigator within 10 working days after publication of this notice.

The investigator's contact details are:

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NOTICE UNDER REGULATION 16 OF THE ELECTRICITY INDUSTRY (ENFORCEMENT) REGULATIONS 2010

Date:	29 June 2018
Addressee:	Transpower New Zealand Limited as the system operator
Subject:	The system operator's management of a power system event on 2 March 2017
Investigator:	Alex Ehlert, Senior Investigator, alex.ehlert@ea.govt.nz (appointed investigator under regulation 12 of the Electricity Industry (Enforcement) Regulations 2010 (Regulations)).
Clauses allegedly breached:	<p>Clause 7.1A requires the system operator to carry out its obligations under the Code with skill, diligence, prudence, foresight, good economic management, and in accordance with recognised international good practice (generally referred to as operating as a reasonable and prudent system operator).</p> <p>Clause 7.2A(1) requires the system operator to dispatch generators in a manner that avoids cascade failure of assets resulting in a loss of electricity to consumers arising from a frequency or voltage excursion, or a supply and demand imbalance.</p> <p>Clause 7.2A(2) requires the system operator to maintain frequency in the normal band.</p> <p>Clause 7.2B requires the system operator, when there is a frequency fluctuation, to ensure that frequency is restored to the normal band as soon as reasonably practicable having regard to all surrounding circumstances.</p> <p>Clause 8.5(1)(a) requires the system operator to re-establish normal operation as soon as possible after an event that disrupted its ability to comply with the principal performance obligations, given the capability of generation, ancillary services and extended reserves.</p> <p>Clause 8.5(1)(b) requires the system operator to re-establish normal operation as soon as possible after an event that disrupted its ability to comply with the principal performance obligations, given the configuration and capacity of the grid.</p> <p>Clause 8.5(2) requires the system operator, when re-establishing normal operation of the power system, to have regard to specific priorities.</p> <p>Clause 3 of Technical Code B of Schedule 8.3 requires the system operator to act quickly and safely during a grid emergency so that the actual and potential impacts of any grid emergency are minimised.</p> <p>Clause 4(a) of Technical Code B of Schedule 8.3 requires the system operator to use reasonable endeavours to ensure that, if necessary, each participant is advised of any independent action required if there is a grid emergency.</p> <p>Clause 6(2)(a) and (e) of Technical Code B of Schedule 8.3 specifies actions the system operator may take in a grid emergency.</p> <p>Clause 3(1) of Technical Code C of Schedule 8.3 specifies the general</p>

requirements for voice communications between the system operator and asset owners.

Clause 84 of the Policy Statement specifies the methodology the system operator must follow to re-establish normal operations.

Circumstances of alleged breaches:

On 2 March 2017, the grid owner removed the Livingstone–Naseby circuit from service for planned maintenance work, leaving the Clyde–Cromwell–Twizel circuits 1 and 2 as the only connections in this part of the grid.

On the same morning, the grid owner was carrying out routine testing of 220 kV bus protection systems at the Clyde substation. The grid owner's protection work required the 220 kV bus zone and circuit breaker fail protection systems at Clyde to be removed from service.

At 11:20, the testing tripped the line circuit breakers at the Twizel substation on the two Clyde circuits causing the lower part of the South Island to be electrically islanded. The automatic control system mitigated the imbalance and the two South Island grid islands each initially returned to near 50 Hz, indicating reasonable balances between reduced levels of supply and demand in each of the two parts of the grid.

An unexpected generation reduction at Meridian Energy Limited's (Meridian's) Aviemore station caused the frequency in the upper part of the split to fall again. Meridian moved Aviemore to manual control, restoring generation output at 11:28.

The system operator continued issuing dispatch instructions to South Island generators that were still calculated as though the tripped circuits were still connected.

The incorrect dispatch resulted in an over-frequency condition in the electrical island south of the split and an under-frequency condition on the grid north of the split.

The system operator and the grid owner decided to restore the South Island power system by joining the two grid islands and to use the grid owner's auto-sync function to start the process.

However, the grid owner did not enable the auto-sync function as instructed by the system operator, and instead closed the circuit breaker without the two parts of the grid being synchronised.

This reconnection attempt failed, because the grid frequency in the electrical island south of the split was 0.6 Hz higher than the grid frequency in the electrical island north of it, with a phase angle difference of 120 degrees. A minute after the first reconnection attempt failed, the grid owner initiated a second reconnection attempt that resulted in reconnection, despite a frequency mismatch of 0.6 Hz and phase angle difference of 60 degrees. This created a risk of asset damage to connected South Island generators.

The system operator is alleged to have breached:

- Clause 7.1A because the system operator did not meet the reasonable and prudent system operator standard when it failed to:
 - Address the fundamental misalignment between the separate grid islands using re-dispatch before reconnection.
 - Recognise international best practice to synchronise electrical islands before reconnection.

- Clause 7.2A(1) when it failed to dispatch the South Island generators in a manner that would have avoided cascade failure arising from a frequency excursion or a supply and demand imbalance.

The system operator's incorrect dispatch created a supply and demand imbalance in each of the electrical islands. The dispatch was the opposite of what was required.

- Clause 7.2A(2) when it failed to maintain frequency in the normal band. After the recovery from the Aviemore event, system frequency settled in the normal frequency band. The system operator's subsequent return to incorrect economic dispatch pushed the frequency outside of the normal band.
- Clause 7.2B when it failed to ensure that frequency was restored to the normal band as soon as reasonably practicable having regard to all circumstances surrounding the frequency fluctuation.
- Clause 8.5(1)(a) when it failed to re-establish normal operation as soon as possible given the capability of generation, ancillary services, and extended reserve. The system operator could have restored normal operation faster had it used Meridian as a frequency keeper to manage frequency in both electrical islands.
- Clause 8.5(1)(b) when it failed to re-establish normal operation as soon as possible given the configuration and capacity of the grid. The system operator's dispatch ignored the actual configuration and capacity of the grid.
- Clause 8.5(2) when it had insufficient regard to the second priority, which is to avoid damage to assets. The incorrect dispatch instructions created a situation where the frequencies were so far outside the normal band that they introduced the potential risk of asset damage in case of a reconnection attempt. In addition, the system operator had insufficient regard to the fourth priority, which is the conformance with the principal performance obligation to maintain frequency in the normal band.
- Clause 3 of Technical Code B of Schedule 8.3 when it failed to act quickly and safely during a grid emergency so that the actual and potential impact was minimised. The system operator's incorrect dispatch during the grid emergency increased the risk of damaging connected generators.
- Clause 4 of Technical Code B of Schedule 8.3 when it failed to use reasonable endeavours to ensure that it advised Meridian and Contact of any independent action required during the grid emergency.
- Clause 6(2)(a) and (e) of Technical Code B of Schedule 8.3 when it failed to

request generators to vary their offers and to dispatch the generators accordingly, to ensure there was sufficient generation and frequency keeping. It also failed to take any other reasonable action to alleviate the grid emergency.

- Clause 3(1) of Technical Code C of Schedule 8.3 when it failed to meet the general sequence requirement for operational communications when communicating with the generators and the grid owner (voice instruction, repeat back, confirm). Miscommunication was the main reason for the issues occurring during the restoration process.
- Clause 84 of the Policy Statement when it failed to address any aspects avoiding asset damage (clause 84.2) and to stabilise the frequency of the grid through a combination of manual dispatch instructions and ancillary service action (clause 84.3).

Date and time of alleged breaches:

- Approximately between 11:20 am and 11.45 am on 2 March 2017.

Please note, under regulation 16 of the Regulations, you must respond to this allegation, in writing, to the investigator within 10 working days of receipt of this notice (unless the investigator allows, in writing, a longer period).

Please provide your response by return e-mail to the Investigator.

Your response should include:

Whether you believe you have breached the Code;

Whether there is another provision you consider more accurately describes the nature of the event;

A full explanation of the circumstances surrounding the alleged breaches;

Identification of any information provided in your response that you consider confidential and should not be included in the investigator's report under regulation 19 (regulation 15(2)).