The Authority's draft determinations of causer

13 and 14 December 2018 under-frequency events

Consultation paper

Submissions close: 5 pm Tuesday 13 August 2019

16 July 2019

Market Performance

Executive summary

Under-frequency events occurred on 13 and 14 December 2018

Two separate under-frequency events (UFE) occurred in December 2018.

The normal frequency band in New Zealand is between 49.8 and 50.2 Hz. An under-frequency event occurs when the frequency falls below 49.25 Hz because of a loss of more than 60 MW injected into the grid. The Electricity Industry Participation Code 2010 (Code) requires us to determine the causer (as defined in the Code) of a UFE, and sets the process for making the determination (clause 8.61).

The purpose of this paper is to:

(a) set out our draft determination of causer for the 13 December 2018 UFE

(b) set out our draft determination of causer for the 14 December 2018 UFE

(c) consult with interested parties on the draft determinations.

Our draft determination for the 13 December 2018 UFE

Our draft determination under clause 8.61 of the Code is that Genesis Energy Limited (Genesis), as a generator, was the causer of the UFE on 13 December 2018.

The reasons for the 13 December 2018 draft determination are:

(a) the interruption/reduction of energy occurred at Unit 5 at the Huntly power station, which belongs to Genesis

(b) no other asset was identified as having caused or potentially caused the UFE

(c) in the system operator's view, Genesis is the causer of the UFE

(d) in reply to a system operator letter, Genesis has accepted that it was the causer of the 13 December 2018 UFE.

Our draft determination for the 14 December 2018 UFE

Our draft determination under clause 8.61 of the Code is that Transpower New Zealand Limited (Transpower), as the grid owner, was the causer of the UFE on 14 December 2018.

The reasons for the 14 December 2018 draft determination are:

(a) the interruption or reduction of electricity occurred when lightning struck, faulting the Huntly-Stratford One circuit (Stratford circuit) in north Taranaki triggering protection equipment to disconnect Unit 4 at the Huntly power station and causing a UFE

(b) Transpower is the grid owner that owns the Stratford circuit.

Submissions are invited from interested parties

We must consult with interested parties before making a final determination. Interested parties are invited to make a submission on the Authority's draft determination by 5 pm on Tuesday 13 August 2019. We will consider all submissions received, and make a final determination on each UFE.

We also invite comment on the system operator's calculations of the megawatts (MW) lost during the events, which the system operator uses for calculating the UFE charge.

Contents

2 What you need to know to make a submission

What this consultation paper is about

2.1 The purpose of this paper is to consult with interested parties on our draft determinations that:

(a) Genesis was the causer of the 13 December 2018 UFE at 2.25 pm, when the frequency dropped to 49.238 in the North Island

(b) Transpower, as the grid owner, was the causer of the 14 December 2018 UFE at 12.20 pm, when the frequency dropped to 49.207 in the North Island.

How to make a submission

2.2 Our preference is to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix A. Submissions in electronic form should be emailed to submissions@ea.govt.nz with "Consultation Paper—13 and 14 December 2018 under-frequency events" in the subject line.

2.3 If you can't send your submission electronically, post one hard copy to either of the addresses below, or fax it to 04 460 8879.

Postal address	Physical address
Submissions Electricity Authority PO Box 10041 Wellington 6143	Submissions Electricity Authority Level 7, Harbour Tower 2 Hunter Street Wellington

2.4 Please note we want to publish all submissions we receive. If you consider that we shouldn't publish any part of your submission, please

(a) indicate which part shouldn't be published

(b) explain why you consider we shouldn't publish that part

(c) provide a version of your submission that we can publish (if we agree not to publish your full submission).

2.5 If you indicate there is part of your submission that shouldn't be published, we will discuss with you before deciding whether to not publish that part of your submission.

2.6 However, please note that all submissions we receive, including any parts that we don't publish, can be requested under the Official Information Act 1982. This means we would be required to release material that we didn't publish unless good reason existed under the Official Information Act to withhold it. We would normally consult with you before releasing any material that you said shouldn't be published.

When to make a submission

2.7 Please deliver your submissions by **5pm** on Tuesday **13 August 2019**.

2.8 We will acknowledge receipt of all submissions electronically. Please contact the Submissions' Administrator if you don't receive electronic acknowledgement of your submission within two business days.

3 Introduction

3.1 Clause 8.60 of the Code requires the system operator to investigate the causer of a UFE and provide a report to us.

3.2 Clause 8.61(2) requires us to publish a draft determination that states whether a UFE was caused by a generator or grid owner, and, if so, the identity of the causer. Clause 8.61(3) requires us to give reasons for our findings in the draft determination.

4 The 13 December 2018 UFE draft determination

Genesis was the causer of the 13 December UFE

4.1 Our draft determination under clause 8.61 is that Genesis, as the generator that owns Huntly Unit 5, was the causer of the UFE on 13 December 2018 at 2.25 pm.

The system operator investigated the causer of the UFE

4.2 The system operator's report (dated February 2019) to us on the 13 December 2018 UFE is attached as Appendix B.

4.3 The circumstances described in the report are summarised below:

(a) At 2.25 pm on 13 December 2018, a reduction of generation at Huntly Unit 5 caused the frequency in the North Island to fall to 49.238 Hz.

(b) The frequency fall and the quantum of MW lost (greater than the 60 MW minimum) meant that a UFE, as defined in Part 1 of the Code, had occurred.

(c) No other event was identified as contributing to or causing the event.

(d) On 19 December 2018, the system operator wrote to Genesis setting out its view that the UFE was initiated at Huntly Unit 5 resulting in a loss of injection, and requesting any information Genesis could provide. On 25 January 2019, in reply to the system operator, Genesis agreed it was the causer. Genesis did not provide any further information.

(e) On 1 February 2019, the system operator wrote to Genesis acknowledging an error in the calculation for the loss of injection and provision of information[1] from Genesis. On 4 February, Genesis acknowledged and accepted the letter.

We considered the circumstances of the UFE

4.4 We have considered the system operator's report on the 13 December 2018 UFE, including the system operator's correspondence with Genesis. Our reasons for the draft determination that Genesis is the causer are:

(a) a UFE occurred on 13 December 2018 at 2.24 pm when frequency dropped to 49.238 Hz in the North Island

(b) the interruption/reduction of electricity occurred at the grid injection point for Huntly Unit 5, which belongs to Genesis

(c) no other asset was identified as having caused or potentially caused the UFE

(d) the system operator and Genesis agree that Genesis was the causer of the UFE.

[1] The system operator later clarified to the Authority the information was regarding the provision of reserves (FIR and SIR) after the event and had no relationship to identifying a causer for the event.

4.5 Having considered the system operator's report and the relevant elements of the Code, we (based on the information available to us at this time) agree with the system operator's findings on the 13 December 2018 UFE.

Q1. Do you agree with the Authority's draft determination that Genesis, as a generator, was the causer of the 13 December 2018 UFE? If not, please state your alternative view on the causer and give your reasons.

5 The 14 December 2018 draft determination

The grid owner was the causer of the 14 December UFE

5.1 Our draft determination under clause 8.61 is that Transpower, as the grid owner that owns the Stratford circuit, was the causer of the UFE on 14 December 2018 at 12.20 pm.

The system operator investigated the causer of the UFE

5.2 The system operator's report (dated February 2019) to the Authority on the 14 December 2018 UFE is attached as Appendix C.

5.3 The circumstances described in the system operator's report are summarised below:

(a) On 14 December there was a planned outage of Huntly's bus B. A known consequence of the outage was that the output of Huntly Unit 4 would have only one electrical path available the Stratford circuit. Prior to the outage, the grid owner considered:

(i) overall system security

(ii) the weather situation

(iii) details of the outage.

(b) Grid owner staff were aware of a potential thunderstorm and took into account the system risk and outage circumstances before deciding to proceed with the outage.

(c) At 12.20 pm, lightning struck the Stratford circuit. The grid owner's protection equipment detected the disturbance and electrically isolated the Stratford circuit to protect several assets from damage. The removal of the Stratford circuit as an electrical path caused an interruption or reduction of electricity at the grid injection point for Huntly Unit 4. The subsequent drop in North Island frequency was arrested at 49.207 Hz.

(d) The frequency fall and the quantum of MW lost (greater than the 60 MW minimum) meant that a UFE, as defined in Part 1 of the Code, had occurred.

(e) No other event was identified as contributing to or causing the event.

(f) No information was requested from any participants.

5.4 Paragraph (c) in the Code definition of 'causer' requires that an interruption or reduction of electricity which occurs in order to comply with the Code be disregarded for the purposes of determining the causer. The Code definition for 'causer' is set out in Appendix D.

5.5 The system operator proposes the interruption or reduction of electricity that arose from the operation of protection equipment occurred in order to comply with obligations in

clauses 8.25(1) and 4(4)(a) of Technical Code A in Schedule 8.3, therefore paragraph (c) of the definition of causer applies.

5.6 The system operator recommended there was no causer for the UFE.

5.7 In May 2019, the system operator provided:

(a) an addendum to its original report, confirming its recommendation (Appendix D)

(b) correspondence with the grid owner in which the grid owner set out its view that they weren't the causer because they believe paragraph (c) applies (Appendix E).

We considered the circumstances of the UFE

5.8 Having considered the relevant information and elements of the Code, we (based on the information available to us at this time) agree with the system operator's:

(a) conclusion that an UFE occurred at 12.20 pm on 14 December 2018

(b) description of the circumstances leading up to the UFE.

5.9 We don't agree with the system operator's recommendation that there was no causer of the UFE.

Transpower meets the definition of causer under (a)(i)

5.10 We consider the circumstances of the UFE meet the criteria in sub-paragraph (a)(i) of the definition of causer.

5.11 The UFE was caused by the interruption or reduction of electricity at the Huntly Unit 4 grid injection point ('a single generator's asset'). However, that interruption or reduction was caused by Transpower's property (the Stratford circuit). Consequently, under (a)(i) of the definition of 'causer', Transpower (as a grid owner) is the causer.

The exception under (c) of the definition of causer does not apply

5.12 We considered whether the exception under paragraph (c) of the definition of causer applied in a manner that would exclude Transpower from being the causer. Our consideration included the system operator's recommendation that (c) applies because protection equipment is a Code requirement.

5.13 The operation of protection equipment is not the relevant aspect of the circumstances to focus on when determining whether an interruption or reduction of electricity occurred in order to comply with the Code. Protection systems are designed to protect assets by managing the failure of assets in a controlled way. The interruption or reduction of electricity wouldn't have occurred without the lightning strike, but almost certainly would have occurred without the operation of the protection equipment.[2] As such, the lightning strike is the most relevant aspect of the circumstances for understanding why the interruption or reduction occurred.

5.14 A principle of statutory interpretation is that the meaning of a provision must be determined from its text and in light of its purpose. An Electricity Commission (Commission) paper[3] notes that excluding events caused by the acts of third parties or acts of God would provide an incentive to increase asset owners' efforts to prove an

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2 The existence and operation of protection equipment is required by the Code. The power system would likely have suffered greater damage without the controlled disconnection provided by the protection equipment.

3 Recommendation to the Minister of Energy and Resources to make amendments to the Electricity Governance Rules 2003, 22 June 2010.

event was out of their control, which would be unproductive and undermine the benefits of the regime.

5.15 The Commission amended the definition of causer in 2010 and summarised the purpose as follows:

> "The Commission's view is that the purpose of the under-frequency event charge regime is to make explicit the costs of asset owner decisions (investment, operation and maintenance) that can affect the cost of instantaneous reserve procurement, and therefore incentivise asset owners to take reliability and risk into account when designing, maintaining and operating their assets."[4]

5.16 The Commission acknowledged that "that the proposed changes to the definition of causer may lead to an increased number of event charges being imposed."[5]

5.17 We aren't aware of any UFEs that didn't involve the operation of protection equipment and only a handful that involve incorrect operation of protection equipment. An interpretation that concludes the (correct) operation of protection equipment provides an exception for being a causer would result in far fewer UFEs being determined to have a causer. Such an interpretation would be contrary to the intent of the regime.

5.18 Our review of consultation papers (including Board papers and minutes) revealed no evidence that the regime was intended to only find a causer in the absence of protection equipment operating in compliance with the Code. We did find many examples showing the definition of causer was intended to be interpreted much more broadly.

5.19 This approach is consistent with the intent of the regime, as it would make explicit the costs of the grid owner's investment and operational decisions that contributed to this UFE.

Q2. Do you agree with the Authority's draft determination that Transpower, as the grid owner, was the causer of the 14 December 2018 UFE? If not, please state your alternative view on the causer and give your reasons.

6 We will consider submissions and make a final determination

6.1 Clause 8.61(4) of the Code requires us to consult every generator, grid owner and other participant substantially affected by the UFEs in relation to a draft determination. We have allowed a consultation period of four weeks for these draft determinations.[6] Accordingly, the deadline for submissions is 5 pm on Tuesday 18 June 2019.

6.2 We will consider submissions received, and publish its final determinations. Clauses 8.62 and 8.63 of the Code set out provisions relating to any disputes regarding our determinations.

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4 Paragraph 3.2.5 of *Consultation Paper: Under-Frequency Event Charge Causer Determination*, published April 2010 by the Electricity Commission.

5 Paragraph 3.2.6 of *Consultation Paper: Under-Frequency Event Charge Causer Determination*.

6 The Authority discusses its approach to setting consultation periods for draft determinations in its consultation on the 8 September 2016 UFE.

7 The system operator has calculated the MW lost during the event based on its investigations

7.1 The Code sets out how to calculate the event charge payable by the causer of a UFE. This in turn enables calculation of the rebates paid for UFEs (clauses Clause 8.64 of 8.65 of the Code).

7.2 Central to the event charge calculation is determining the MW of injection lost at one or more grid injection points as a result of the UFE. The system operator determines the MW lost as part of its investigations into a UFE.

7.3 The system operator followed its procedure *PR-RR-017 Calculating the Amount of MW lost* to determine the MW value (provided to the clearing manager for calculating UFE charges).

7.4 The system operator has determined the loss of injection into the grid:

(a) The 13 December event was 200.1 MW at the grid injection point for Huntly Unit 4, resulting in an event charge of $175,125.

(b) The 14 December event was 240.7 MW at the grid injection point for Huntly Unit 5, resulting in an event charge of $225,875.

7.5 The system operator's calculations of the MW lost is included in its reports. These calculations don't form part of the Authority's draft determinations. However, we acknowledge that the calculation is central to determining the UFE charge payable by the causer, and therefore also to the rebates paid for UFEs. Accordingly, we invite comment on the system operator's calculation of the MW lost.

Q3. Do you agree with the system operator's calculation that, for the purposes of calculating the UFE charge, 200.1 MW was lost at the grid injection point for Huntly Unit 5 as a result of the 13 December 2018 UFE? If not, please state your alternative view on the MW lost and give your reasons.

Q4. Do you agree with the system operator's calculation that, for the purposes of calculating the UFE charge, 240.7 MW was lost at the grid injection point for Huntly Unit 4 as a result of the 14 December 2018 UFE? If not, please state your alternative view on the MW lost and give your reasons.

Appendix A Format for submissions

Submitter	

Question	Comment
Q1 Do you agree with the Authority's draft determination that Genesis, as a generator, was the causer of the 13 December 2018 UFE? If not, please state your alternative view on the causer and give your reasons.	
Q2 Do you agree with the Authority's draft determination that Transpower, as the grid owner, was the causer of the 14 December 2018 UFE? If not, please state your alternative view on the causer and give your reasons.	
Q3 Do you agree with the system operator's calculation that, for the purposes of calculating the UFE charge, 200.1 MW was lost at the grid injection point for Huntly Unit 5 as a result of the 13 December 2018 UFE? If not, please state your alternative view on the MW lost and give your reasons.	
Q4 Do you agree with the system operator's calculation that, for the purposes of calculating the UFE charge, 240.7 MW was lost at the grid injection point for Huntly Unit 4 as a result of the 14 December 2018 UFE? If not, please state your alternative view on the MW lost and give your reasons.	

Appendix B Under-frequency event causation report – 13 December 2018

Under Frequency Event Causation Report - 13 December 2018

Reference 3634

System Operator

Transpower New Zealand Limited
February 2019

Keeping the energy flowing




TRANSPOWER

Version	Date	Change
01	15 Feb 2019	Initial Draft

	Position	Date
Prepared By:	Gina Gate, Audit and Compliance Specialist	15 Feb 2019
Reviewed By:	Matthew Copland, Power Systems Group Manager	

IMPORTANT

Contact Details

Address: Transpower New Zealand Ltd
22 Boulcott Street
PO Box 1021
Wellington 6140
New Zealand

Telephone: +64 4 495 7000

Fax: +64 4 498 2671

Email: system.operator@transpower.co.nz

Website: http://www.systemoperator.co.nz

SUMMARY

1. On 13 December 2018 at 14:25 the North Island frequency dropped to 49.238 Hz. The fall in frequency below 49.25 Hz means that the event is categorised as an under frequency event (UFE) as per the definition in Part One, Electricity Industry Participation Code 2010 (EIPC).
2. As per Part 8, 8.60 of the EIPC, Transpower as system operator has investigated this event.
3. The result of this investigation is this report prepared under clause 8.60(5) of the EIPC, provided to the Authority, and includes:
   - Whether in the system operator's view, the UFE was caused by the grid owner or a generator and identifies that potential causer;
   - The reasons for forming this view; and
   - The information considered in reaching this view.

UNDER FREQUENCY EVENT DETAILS

4. On 13 December 2018 at 14:25 Huntly Unit 5 tripped. The North Island frequency in response to the trip dropped to 49.238 Hz.
5. On 13 December 2018 all market participants were notified of the under-frequency event.
6. Analysis of the power system identified one generator that had reduced output around the time of the event, this being unit 5 at Huntly.
7. On 19 December 2018, a causer investigation letter was sent to Genesis Energy asking:
    a. Whether Genesis Energy accepts itself as the “casuer” of the UFE as defined by the Code; and
    b. Whether Genesis Energy agrees to the loss of injection calculation as 190.1 MW.
8. On 25 January 2019, Genesis Energy responded “Genesis Energy considers it (Huntly Unit 5) was the causer of the 13 December North Island under-frequency event and accepts the outlined loss of injection figure.”
9. The system operator subsequently identified the loss of MW calculation was incorrect and an updated letter containtaing the updated calculation was sent to Genesis on 1 February 2019.
10. Genesis Energy responsed on 4 February 2019 to confirm them as the causer and to accept the corrected calculation.

FINDING

11. The Code outlines that a generator or grid owner is the causer of an under frequency event if the interruption or reduction of energy into the grid was a caused by the generator or grid owner's assets.
12. The reduction of generation from Huntly unit 5 into the grid caused the frequency to fall below 49.25 Hz.
13. Genesis Energy accept they are the causer of the UFE on 13 December 2018,
14. The system operator recommends that Genesis Energy be found as the causer of the event.

6

CALCULATION OF MW LOST

15. The purpose of this calculation is to determine the MW value provided to the clearing manager for the purposes of calculating the under-frequency event charge. Transpower as system operator follows procedure PR-RR-017 "Calculating the Amount of MW lost".

16. This procedure follows the formula set out under section 8.64 of the Code for evaluating an event charge.

    The **event charge** payable by the **causer** of an **under-frequency event** (referred to as "Event e" below) must be calculated in accordance with the following formula:

    EC = ECR * (∑y (INTye for all y) – INJd)

    where

    EC is the **event charge** payable by the causer

    ECR is $1,250 per **MW**

    INJd is 60**MW**

    INTye is the electric power (expressed in **MW**) lost at point y by reason of Event e (being the net reduction in the **injection** of **electricity** (expressed in **MW**) experienced at point y by reason of Event e) excluding any loss at point y by reason of secondary Event e

    y is a **point of connection** or the **HVDC injection point** at which the **injection** of **electricity** was interrupted or reduced by reason Event e

17. As the ECR and INJd values are constants the values to calculate and complete the formula are y and INTye.

18. To establish the amount of MW lost, SCADA data was extracted for the 60 seconds prior to the frequency reaching 49.25 Hz for generation into the Huntly grid injection point.

19. After evaluation, the amount of MW lost causing the frequency to fall below 49.25 Hz was determined to be 200.1 MW.

20. The calculation is as follows

    Event Charge = (1250 * (200.1 – 60))

    Event Charge = $175,125

Appendix 1: SYSTEM OPERATIONS CORRESPONDENCE

1.1 NOTICE TO MARKET PARTICIPANTS

Date: 13 December 2018

To: Market Participants
cc: Clearing Manager
From: System Operator

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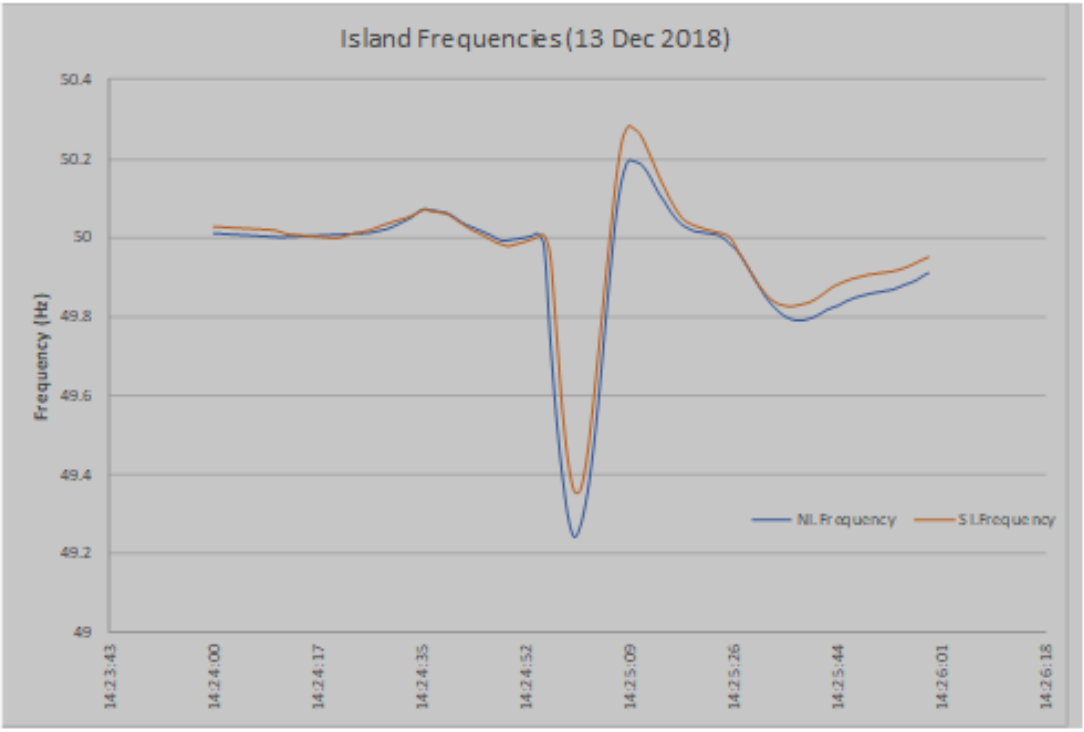
Under-Frequency Event Confirmation

The System Operator wishes to advise market participants of the under-frequency event which occurred in the North Island on 13 December 2018.

Event ID	3634
Affected Islands:	North Island
North Island Minimum Frequency:	49.238 Hz
Time (start of UFE):	14:25:00
Time (of min. frequency):	14:25:00



Market Operations
Transpower NZ Ltd
P.O. Box 1021,
Wellington,
New Zealand
Telephone: 04 495 7000

1.2 PRIOR NOTIFICATION OF CAUSER

TRANSPOWER

Lauren Butler
Tel: (04) 590 7166

Waikoukou
22 Boulcott Street
PO Box 1021
Wellington 6140
New Zealand
P 64 4 495 7000
F 64 4 495 7100
www.transpower.co.nz

19 December 2018

Steve Leppien
Genesis Energy
Private Bag 3131
Hamilton

9

Dear Steve

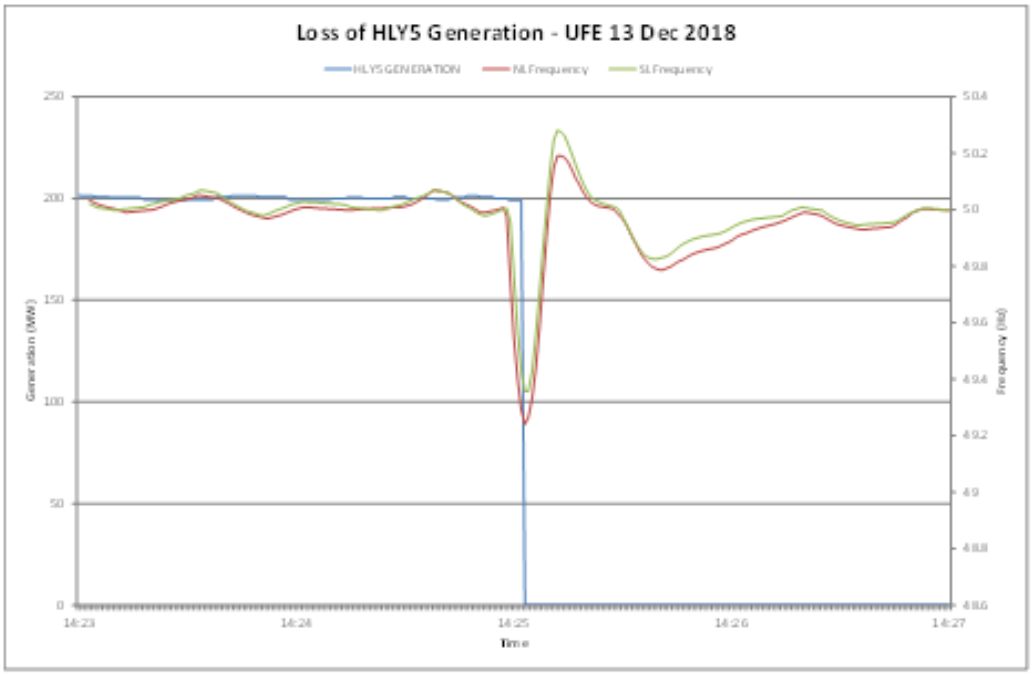
13 December 2018 North Island Under-Frequency Event

On 13 December 2018, an under-frequency event occurred in the North Island at 14:25. Based on the information available we believe that the event was initiated at a Huntly generator resulting in a loss of injection from Huntly Unit 5.

In order to report to the Electricity Authority as required by clause 8.60 of the Electricity Industry Participation Code 2010, we would appreciate any information you can provide around this event, and whether you accept Genesis Energy is the causer of the under-frequency event.

We have also calculated the loss of injection of electricity to the grid for the event as 190.1 MW (200.1 MW × 95% - to account for the margin of error). If you have a view on the amount of electricity lost during this event, please include that information in your response.

After receipt of your information Transpower, as the System Operator will prepare a report for the Electricity Authority including a recommendation of the potential causer, the reasons for and all the information considered in reaching our view.



1.3 REVISED LETTER SENT TO GENESIS ENERGY

1 February 2019

Steve Leppien
Genesis Energy
Private Bag 3131
Hamilton

Dear Steve

13 December 2018 North Island Under-Frequency Event

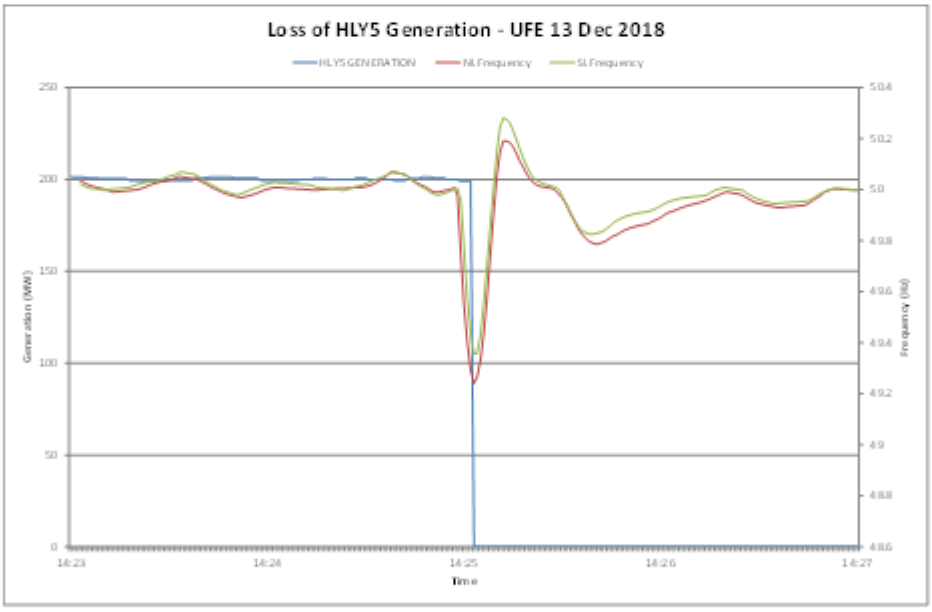
10

After your conversation with Scott Avery, we are re-issuing the causer investigation letter with the corrected calculation for the loss of injection.

On 13 December 2018, an under-frequency event occurred in the North Island at 14:25. Based on the information available we believe that the event was initiated at a Huntly generator resulting in a loss of injection from Huntly Unit 5.

We acknowledge receipt of the information you have provided around this event. This will be used to report to the Electricity Authority as required by clause 8.60 of the Electricity Industry Participation Code 2010.

We have calculated the loss of injection of electricity to the grid for the event as 200.1 MW.



Could you please respond to the System Operator to confirm your agreement with the corrected loss of injection amount of 200.1 MW by 8 February 2019.

Return email address: market.operations@transpower.co.nz

Appendix 2: GENESIS ENERGY CORRESPONDENCE

2.1 GENESIS ENERGY INITIAL RESPONSE

Genesis Energy Limited
The Genesis Energy Building
94 Bryce Street
Private Bag 3131
Hamilton 3204
New Zealand

T. 07 982 7909

25 January 2018

Lauren Butler
Market analyst, Market Operations
Transpower New Zealand Limited
P O Box 1021
WELLINGTON 6140

By email: market.operations@transpower.co.nz

Dear Lauren,

RE: 13 December 2018 North Island Under-Frequency Event

I refer your letter dated 19 December 2018 requesting whether Genesis Energy considers itself to be the causer of the 13 December 2018 North Island under-frequency event.

Genesis Energy considers it (Huntly Unit 5) was the causer of the 13 December North Island under-frequency event and accepts the outlined loss of injection figure.

Yours faithfully
GENESIS ENERGY LIMITED

Steve Leppien
Regulatory Compliance Manager

Cc: Scott.Avery@transpower.co.nz

2.2 GENESIS ENERGY REVISED RESPONSE

From: Steve Leppien <Steve.Leppien@genesisenergy.co.nz>
Sent: Monday, 4 February 2019 9:57 AM
To: Market Operations <Market.Operations@transpower.co.nz>
Subject: RE: Under-Frequency Event on 13 Dec 2018

Cyber Security Warning – External E-Mail CAUTION: Please ensure you take **EXTRA CARE** when opening any links

Good morning Lauren,

Updated causer investigation letter received and accepted.

Kind regards

12

Steve Leppien | Regulatory Compliance Manager
Genesis Energy Ltd | Private Bag 3131, Hamilton, 3204
M. 021 649 748 DDI. 07 982 7909

From: Market Operations [mailto:Market.Operations@transpower.co.nz]
Sent: 1 February 2019 15:20
To: Steve Leppien <Steve.Leppien@genesisenergy.co.nz>
Cc: Scott Avery <Scott.Avery@transpower.co.nz>; Monina Sta Romana <Monina.StaRomana@transpower.co.nz>
Subject: RE: Under-Frequency Event on 13 Dec 2018

Hi Steve

Attached is an updated causer investigation letter with the corrected loss of injection amount. Please come back to us to confirm your acceptance of this.

Regards,
Lauren

LAUREN BUTLER
Analyst, Market Insights

Appendix C Under-frequency event causation report – 14 December 2018

Causation Report
14 December 2018
Under-Frequency Event

System Operator event 3635

February 2019

Keeping the energy flowing




TRANSPOWER

Transpower New Zealand Limited The National Grid

Version	Date	Change
1.0	19 February 2019	Initial draft

	Position	Date
Prepared By:	Scott Avery, Risk and Compliance Manager, System Operations	19 February 2019
Reviewed By:	Matthew Copland, Power Systems Group Manager	26 February 2019

IMPORTANT

Contact Details

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Email: system.operator@transpower.co.nz

Website: *http://www.transpower.co.nz*

PURPOSE

1. On Friday 14 December 2018 a reduction of energy into the power system reduced the system frequency below 49.25Hz constituting an under-frequency event.
2. As per clause 8.60 of the Electricity Industry Participation Code (Code), Transpower as system operator investigated this event to assist the Electricity Authority in determining causers for under-frequency events.
3. The results of this investigation report are prepared under clause 8.60(5) of the Code, provided to the Authority, and relating to each identified under-frequency event includes:
    - Whether in Transpower's view each under-frequency event was caused by the grid owner or a generator and identifies that potential causer;
    - The reasons for forming this view; and
    - The information considered in reaching this view.

EXECUTIVE SUMMARY

4. At 12:20 on 14 December 2018 lightning struck the Huntly Stratford 1 circuit in North Taranaki.
5. Protection systems associated with the Huntly Stratford 1 circuit detected the fault created by the lightning strike and disconnected the circuit.
6. At the time of the lightning strike, the power system configuration included an outage at Huntly which had split the generation Bus. The tripping of the Huntly-Stratford 1 circuit in response to the lightning strike removed generation from Huntly Unit 4 into the power system.
7. The North Island frequency fell to 49.207Hz constituting an under-frequency event.
8. Huntly generation was disconnected by action of a grid owner asset, the Huntly-Stratford 1 circuit, and as such Genesis cannot be the causer of the under-frequency event as per clause (a)(i) under the definition of **causer** in Part 1 of the Electricity Industry Participation.
9. Operation of protection on the Huntly Stratford 1 circuit activated to protect the asset and connected assets from the impacts of a fault such as a lightning strike. The grid owner cannot be the causer as the grid owner asset (protection system) operated as expected under the Code, and as such exception (c) under the definition of **causer** in Part 1 of the Electricity Industry Participation applies.
10. As a result, the system operator recommends that no causer be found for this under-frequency event.

DETAILS OF THE EVENT

The lightning strike

11. At 12:20:59 lightning struck the Huntly-Stratford 1 circuit in north Taranaki.
12. The lightning strike prompted protection on the circuit to operate to protect the asset and opened circuit breaker 522.
13. This disconnection removed the only connection Huntly 4 generation had to the power system.
14. This single connection was as a result of a planned outage of the Huntly Bus to reconfigure the Bus sections and upgrade protection.

Date	Time	Minimum Hz	Island
14-Dec-2018	12:20:59	49.207	North

Date	Time	Maximum Hz	Island
14-Dec-2018	12:21:08	50.537	North

Date	Time	Minimum Hz	Island
14-Dec-2018	12:20:59	49.27	South

Date	Time	Maximum Hz	Island
14-Dec-2018	12:21:08	50.658	South

Under Frequency Event notification values

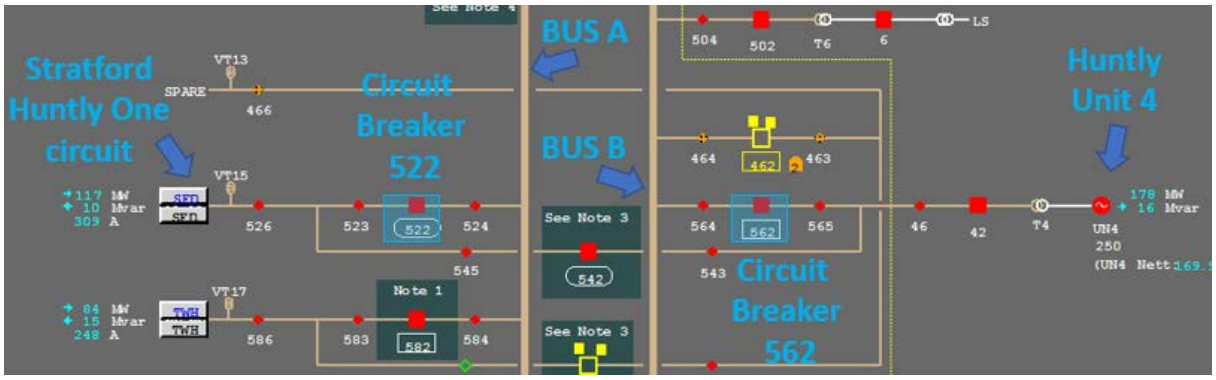
15. The disconnection of Huntly Unit 4 removed 240.7 MW of generation into the power system and as a consequence, reduced the system frequency to 49.207Hz in the North Island and 49.27Hz in the South Island.
16. Interruptible load and instantaneous reserves in the North Island responded, returning the frequency to the normal band within 35 seconds.
17. The Huntly Stratford One circuit was returned to service at 12:54.

The Huntly Bus outage

18. At the time of the lightning strike an outage at Huntly split the generation Bus. This was a planned outage.
19. This outage was not unusual and did not create out of the ordinary issues for the power system. The relevant factor for this event is that the generation from Huntly was placed on n-security. The use of n-security for assets is not uncommon for planned outages.
20. During the week of 10 December 2018 System Security Engineers were assessing and planning for the management of 291 planned outages across the following twelve weeks. Of these outages 145 involved generation and/or load assets on n-security.
21. The Bus at Huntly has two sections, Bus A and Bus B. Under normal operation these sections are tied together. The split configuration allows for work to be undertaken on a Bus section and still provide generation from the Huntly generating units into the power system through the other Bus section.

    With the split configuration in place:

- Huntly Unit 4 was connected through the Huntly Stratford 1 circuit to Bus A
- Circuit Breaker 562 was open, disconnecting Huntly Unit 4 from Bus B
- Huntly Unit 5 was connected through the Huntly Drury 1 circuit to Bus A
- Circuit Breaker 682 was open, disconnecting Huntly Unit 5 from Bus B



Single Line Diagram – Huntly Bus

The weather

22. Prior to permission to proceed being provided to the grid owner's National Grid Operating Centre (NGOC) to begin the Huntly outage the following aspects of the outage were considered by the Security Co-ordinator in the system operator's National Co-ordination Centre (NCC), the NGOC and onsite work teams:

    - Overall system security
        - Stability of the system – The system was stable no wider issues were impacting the system in the vicinity of Huntly.
        - Other conflicting outages – There were no conflicting outages that could impact the outage.
        - The size of the risk posed by the outage - Loss of a single generator, reserves are procured to cover this risk.
    - The weather situation
        - Current local weather conditions – Weather at Huntly was acceptable to the work teams for work to start, on site no adverse conditions existed.
        - Forecast weather conditions - These indicated potential storms later in the day.
        - Situational awareness - Lightning tools did not indicate any activity in the vicinity of the Huntly outage. On site weather assessment by work crews.
    - The outage details
        - The start time – Scheduled to start at 9:30 am.
        - The complexity – the isolation work was complex but the project work relatively straight forward.
        - The recall time – Once underway the recall time for the outage is 2 hours, this reflects the complexity of the isolation aspects of the outage.
        - The end time – Work is scheduled for completion at 14:00.

23. The decision was made between the NCC, NGOC and the onsite work teams to proceed with the outage.
24. On the balance of the information provided and available to the NCC there was no immediate reason to prevent the outage from beginning work at 9:30.
25. The real-time teams in the NGOC and NCC were very aware of the weather conditions and taking into account the system risk and the outage circumstances the outage commenced.

CALCULATION OF MW LOST

26. The purpose of this calculation is to determine the MW value provided to the clearing manager for the purposes of calculating the under-frequency event charge. Transpower as system operator follows procedure PR-RR-017 “Calculating the Amount of MW lost”.

27. This procedure follows the formula set out under section 8.64 of the Code for evaluating an event charge.

    The **event charge** payable by the **causer** of an **under-frequency event** (referred to as “Event e” below) must be calculated in accordance with the following formula:

    EC = ECR * (∑y (INTye for all y) – INJd)

    where

    EC is the **event charge** payable by the causer

    ECR is $1,250 per **MW**

    INJd is 60**MW**

    INTye is the electric power (expressed in **MW**) lost at point y by reason of Event e (being the net reduction in the **injection** of **electricity** (expressed in **MW**) experienced at point Y by reason of Event e) excluding any loss at point y by reason of secondary Event e

    y is a **point of connection** or the **HVDC injection point** at which the **injection** of **electricity** was interrupted or reduced by reason Event e

28. As the ECR and INJd values are constants the values to calculate and complete the formula are y and INTye.

29. To establish the amount of MW lost, SCADA data was extracted for the 60 seconds prior to the frequency reaching 49.25 Hz for generation into the Huntly grid injection point.

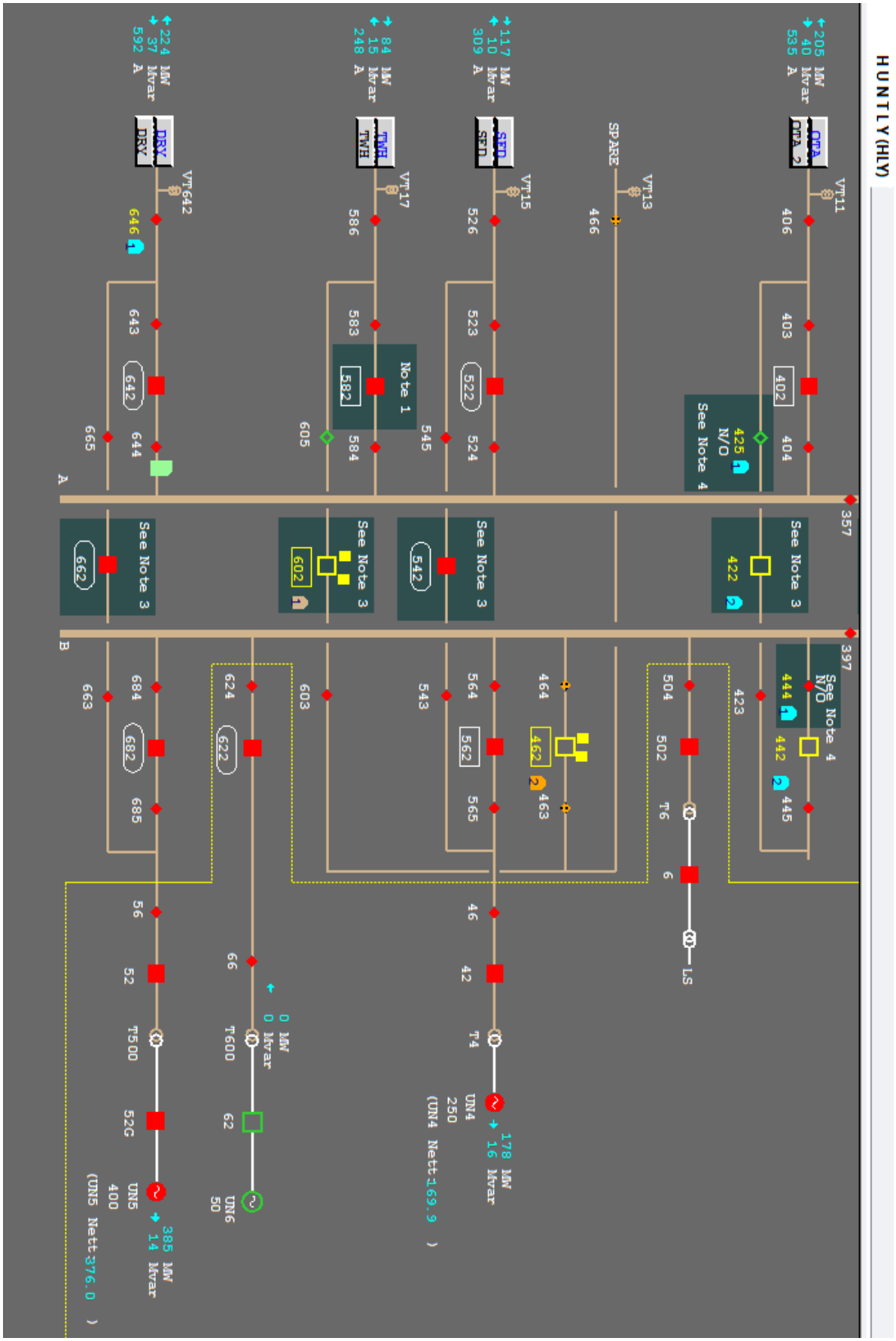
30. After evaluation, the amount of MW lost causing the frequency to fall below 49.25 Hz was determined to be 240.7 MW.

31. The calculation is as follows

    Event Charge = (1250 * (240.7 – 60))

    Event Charge = $225,875

Appendix 1: SINGLE LINE DIAGRAM: HUNTLY



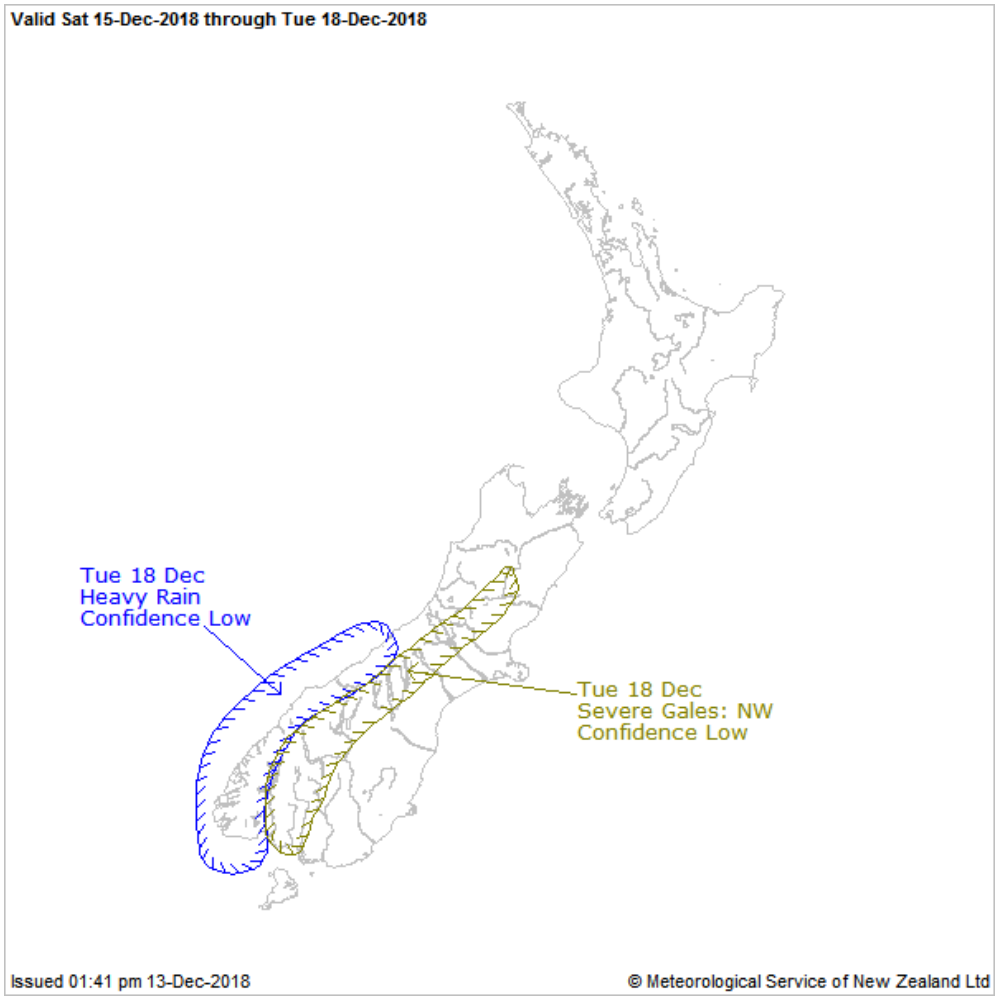
Appendix 2: MET-SERVICE WEATHER FORECAST

Severe Weather Outlook for New Zealand

Issued 01:41pm Thursday 13 Dec 2018
Valid from Saturday 15 Dec 2018 to Tuesday 18 Dec 2018

A low west of the North Island drifts northwards during the weekend and weakens, while a large ridge of high pressure spreads onto the country from the Tasman Sea and remains slow moving through to Monday. A combination of afternoon heating and wind convergences are likely to produce showers over some inland parts of both islands during this period, with possible thunderstorms and localised heavy rain.

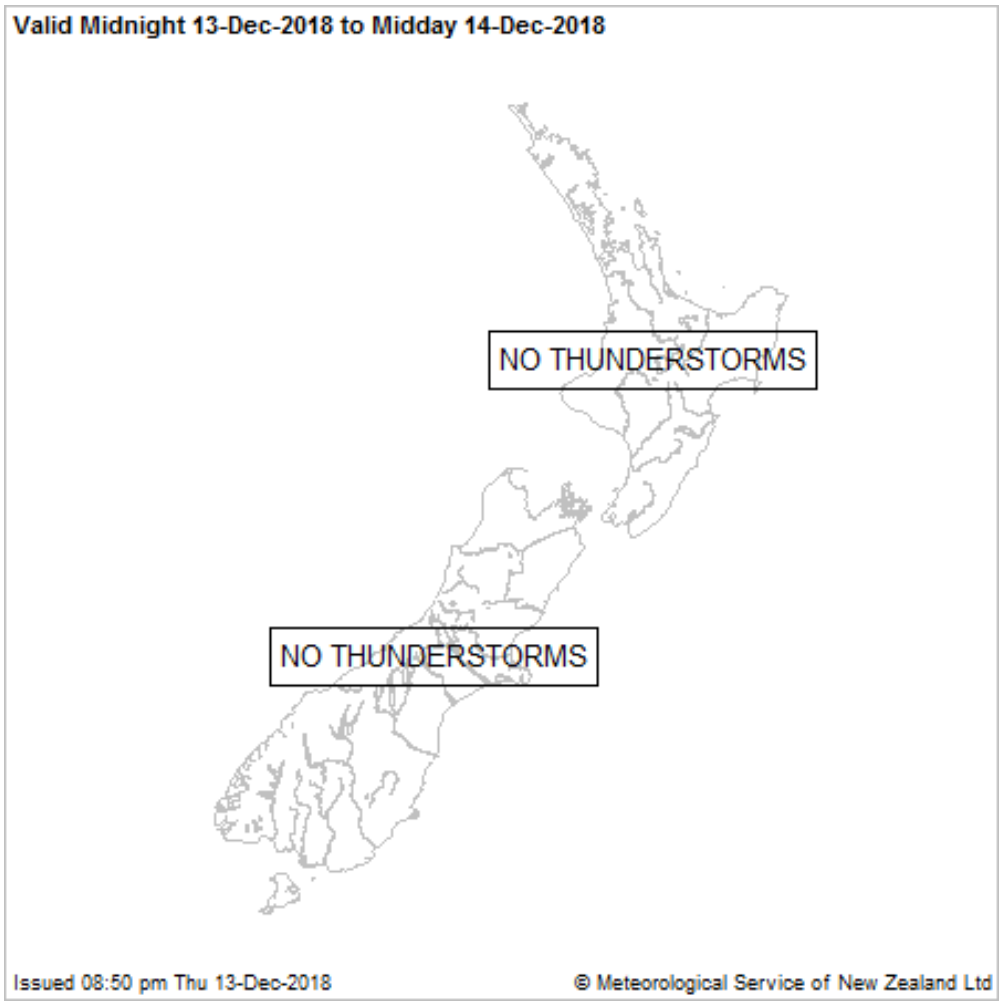
The ridge drifts off to the east on Tuesday as an active front moves onto the lower South Island from the south Tasman Sea bringing rain to the western districts. There is low confidence of rainfall accumulations approaching warning criteria in Fiordland and southern Westland on Tuesday. Additionally, strengthening north-westerlies precede this front and there is low confidence of northwest gales becoming severe in exposed parts of inland Canterbury, Otago and Southland during Tuesday.



Low confidence: a 20% likelihood (or 1 chance in 5) that the event will actually happen.
Moderate confidence: a 40% likelihood (or 2 chances in 5) that the event will actually happen.
High confidence: a 60% likelihood (or 3 chances in 5) that the event will actually happen

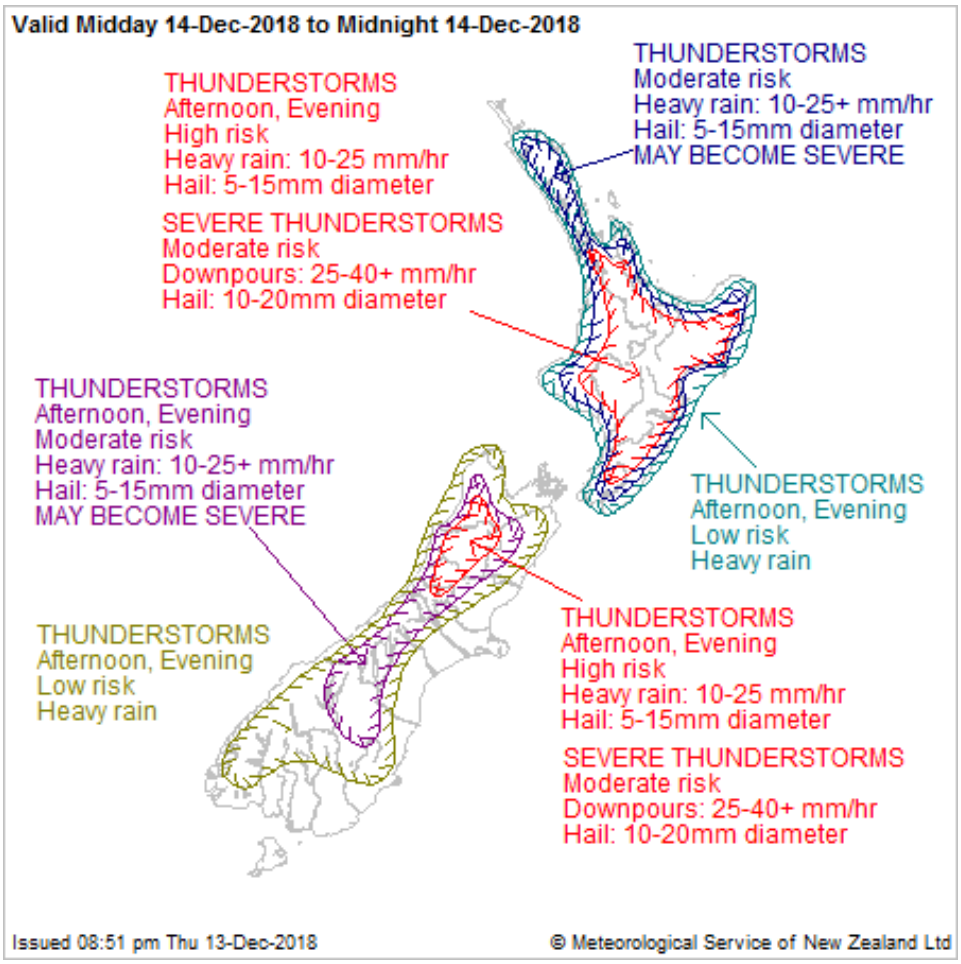
Thunderstorm Outlook for New Zealand

Issued 08:50pm Thursday 13-Dec-2018
Valid to Noon Friday 14-Dec-2018
No thunderstorms or significant convection expected during this period.



Issued 08:51pm Thursday 13-Dec-2018
Valid to Midnight Friday 14-Dec-2018
Daytime heating and wind convergence are expected to produce showers and possible thunderstorms over much of the country during the second half of Friday. There is a moderate to high risk of thunderstorms from early afternoon and well into the evening over much of the North Island, mainly inland. Any thunderstorms that do form are likely to produce localised heavy rain of 10 to 25mm per hour and hail of 5 to 15mm diameter. Over inland areas from Auckland southwards, there is also a moderate risk that some of the thunderstorms may become SEVERE, producing localised downpours of 25 to 40mm per hour or possibly more and hail of 10 to 20mm diameter, and a SEVERE THUNDERSTORM WATCH is likely to be issued friday morning. There is also a moderate risk of thunderstorms during the afternoon and evening over inland parts of the South Island from the ranges of Nelson and Marlborough down through the ranges of Buller and the Southern Alps to northern parts of the Southern Lakes and Central Otago, with a slightly broader low risk extending beyond this area down into Fiordland and across into Dunedin and western parts of North Otago as indicated on the chart. Any thunderstorms that form here are also likely to produce localised heavy rain of 10 to

25mm per hour, or possibly higher in a few places, and hail of 5 to 15mm diameter. There is also a moderate risk that some of the thunderstorms about Nelson Lakes, and the ranges of Buller and far northern Westland may become SEVERE producing localised downpours of 25 to 40mm per hour or possibly more and hail of 10 to 20mm diameter, and a SEVERE THUNDERSTORM WATCH could be issued Friday morning. No thunderstorms or significant convection expected elsewhere.



Severe Thunderstorm Criteria

In New Zealand, MetService classifies a thunderstorm as severe if one or more of the following criteria are met:

- **Heavy rain (from thunderstorms): Rainfall of 25 millimetres per hour, or more.**
- **Large hail: Hailstones 20 millimetres in diameter, or larger.**
- **Strong wind gusts (from thunderstorms): Gusts of 110 kilometres per hour / 60 knots or stronger.**
- **Damaging tornadoes: Fujita F1 (wind speeds greater than 116 kilometres per hour / 63 knots) or stronger.**

Appendix 3: SYSTEM OPERATOR CORRESPONDENCE

3.1 CONFIRMATION OF EVENT NOTICE

TRANSPOWER

Monina Sta Romana
Tel: (04) 590 6615
Fax: (04) 495 7154

Waikoukou
22 Boulcott Street
PO Box 1021
Wellington 6140
New Zealand
P 64 4 495 7000
F 64 4 495 7100
www.transpower.co.nz

14

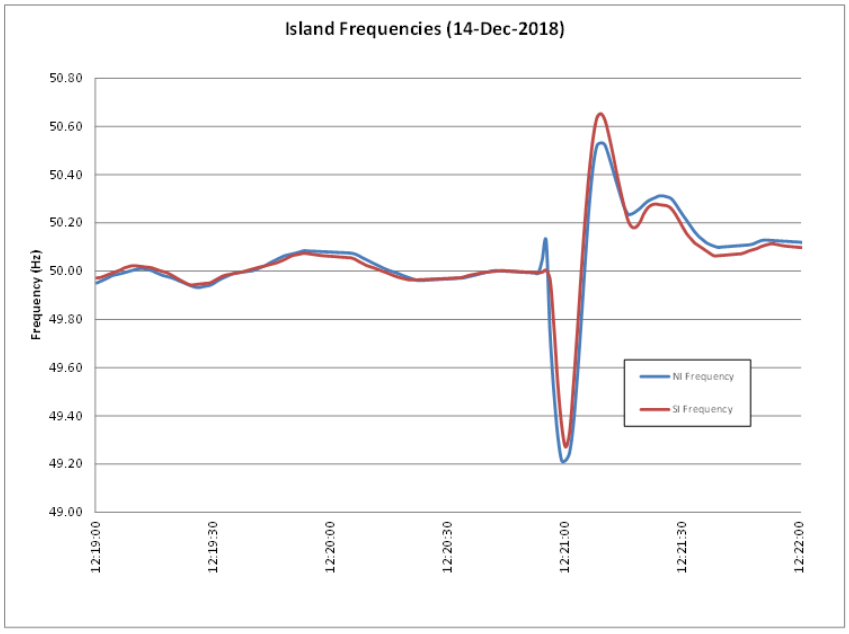
Date: 14 December 2018

To: Market Participants
cc: Clearing Manager
From: System Operator

Under-Frequency Event Confirmation

The System Operator wishes to advise market participants of the under-frequency event which occurred in the North Island on 14 December 2018.

Event ID	3635
Affected Islands:	North Island
North Island Minimum Frequency:	49.207 Hz
Time (start of UFE):	12:20:59
Time (of min. frequency):	12:20:59



Market Operations
Transpower NZ Ltd
P.O. Box 1021,
Wellington,
New Zealand
Telephone : 04 590 7470
Facsimile : 04 495 7154

3.2 CALCULATION OF MW LOST FOR EVENT

TRANSPOWER

Monina Sta Romana
Tel: (04) 590 6615
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Waikoukou
22 Boulcott Street
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Wellington 6140
New Zealand
P 64 4 495 7000
F 64 4 495 7100
www.transpower.co.nz

1 February 2019

Steve Leppien
Genesis Energy
Private Bag 3131
Hamilton

Dear Steve,

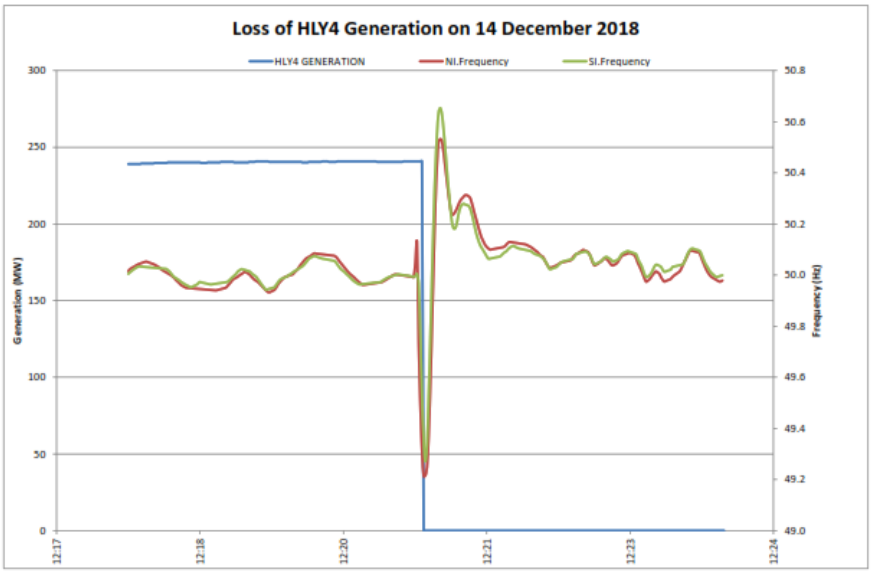
14 December 2018 North Island Under-Frequency Event

After your conversation with Scott Avery, we are re-issuing the causer investigation letter with the corrected calculation for the loss of injection.

On 14 December 2018, an under-frequency event occurred in the North Island at 12:20. We are investigating where the event was initiated.

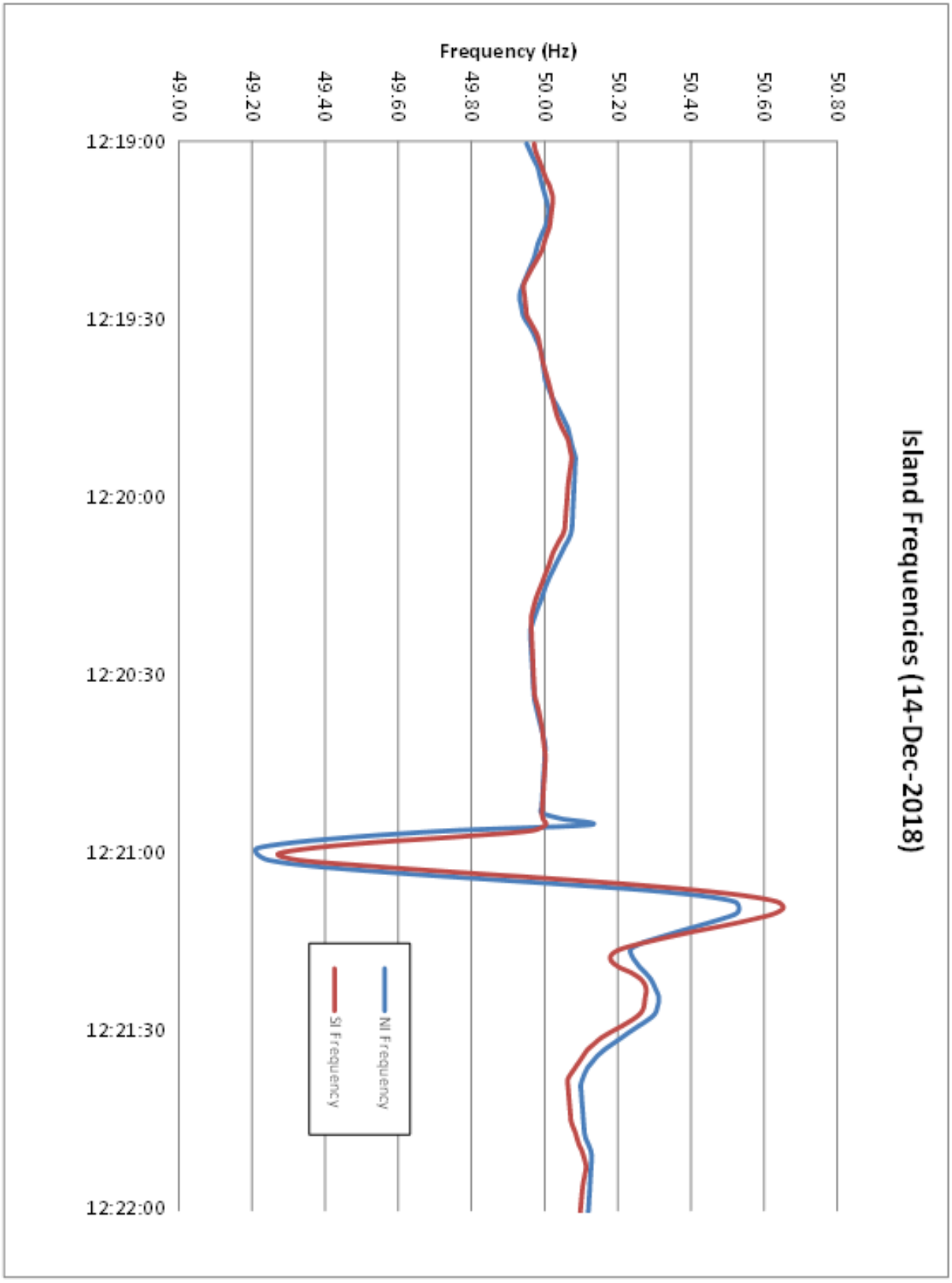
We acknowledge receipt of the information you have provided around this event. This will be used to report to the Electricity Authority as required by clause 8.60 of the Electricity Industry Participation Code 2010.

We have calculated the loss of injection of electricity to the grid for the event as 240.7 MW.



Return email address: market.operations@transpower.co.nz

Appendix 4: CHARTS



Appendix D Under-frequency event causation report addendum – 14 December 2018 Under-frequency event causation report – 14 December 2018

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Facsimile: +64-4-495 7100
www.transpower.co.nz
scott.avery@transpower.co.nz
04 590 6144

10 May 2019

Electricity Authority
Level 7, ASB Tower
2 Hunter Street
Wellington

Attention: Callum McLean

Dear Callum

Addendum to Under Frequency Causer recommendation

This letter provides additional information as part of the system operator's recommendation made as to the causer of the under-frequency event of 14 December 2018. It explains:

- the process the system operator undertook to obtain information to inform our recommendation;
- the rationale for its recommendation;
- consideration of previous under-frequency events.

Process

The system operator's usual process following an under-frequency event is to request relevant data and information from ancillary service providers and asset owners relating to asset performance (e.g. the amount of instantaneous reserves provided, the amount of MW lost, the operation of protection assets) to provide the system operator with a picture of the circumstances of the event.

Following receipt of this information, an assessment of the circumstances is made based on that information, alongside the SCADA information the system operator has access to (in Transpower's role as system operator). That assessment is to analyse if the circumstances of the event allow a potential causer to be identified.

If a potential causer can be identified, the system operator will send a notice to the relevant asset owner informing it may be a potential causer and seeking any additional information required to confirm the system operator's analysis.

Following the 14 December 2018 event, the system operator sought information from ancillary service providers as to their instantaneous reserves performance, and Genesis Energy Ltd (Genesis) regarding the amount of MW lost at Huntly Unit 4. No specific information was requested from the grid owner regarding performance of their protection as sufficient information was immediately available in our role as system operator.

We understand, and agree with the Authority, our initial report and recommendation did not make clear the basis on which the system operator reached its decision that the grid owner was not the causer and that there was in fact no causer of the event. Implicit in our report was the reliance the system operator placed on its own information and assessment of the legal requirements and position relevant to the determination made.

We acknowledge this reliance does not adequately demonstrate the independence expected of the system operator in performing its role in making the causer recommendation. We have therefore taken the following additional steps to provide greater assurance about the substance of the system operator's recommendation:

- we sought and received a formal response from the grid owner regarding the performance of its assets;
- we obtained an independent legal opinion on the interpretation of the Code provisions relevant to the system operator's decision that it was not able to conclude (under the Code) there was a causer of the event.

We have attached copies of the request to, and response from, the grid owner, as well as a copy of our legal advice.

Rationale for recommendation

In making its recommendation, the system operator considered the circumstances of the event, the definition of causer under the Code and relevant previous under-frequency events.

The rationale for our recommendation follows.

Event circumstances

On 14 December 2018 at 12:20 lightning struck the Huntly Stratford One circuit. On striking the circuit, protection on the circuit detected the fault created by the lightning and disconnected the circuit. This operation prevents the fault from potentially damaging other connected assets. At the time of the strike Huntly Unit 4 was connected to the grid only via the Huntly Stratford One circuit. Disconnection of the circuit had the

effect of removing the path for generation from Huntly Unit 4 to reach the grid. In response Huntly Unit 4 tripped.

The interruption of electricity from Huntly Unit 4 into the grid reduced system frequency below 49.25Hz and triggered ancillary services to operate to restore the system frequency. This constituted an under-frequency event as defined in Part One of the Code.

Definition of causer

The definition of causer is contained within Part One of the Code.

causer, in relation to an **under-frequency event**, means—

(a) if the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator's** or **grid owner's asset** or **assets**, the **generator** or **grid owner**; unless—

  (i) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator's asset** or **assets** but another **generator's** or a **grid owner's** act or omission or property causes the interruption or reduction of **electricity**, in which case the other **generator** or the **grid owner** is the **causer**; or

  (ii) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **grid owner's asset** or **assets** but a **generator's** or another **grid owner's** act or omission or property causes the interruption or reduction of **electricity**, in which case the **generator** or other **grid owner** is the **causer**; or

(b) if the **under-frequency event** is caused by more than 1 interruption or reduction of **electricity**, the **generator** or **grid owner** who, in accordance with paragraph (a), would be the **causer** of the **under-frequency event** if it had been caused by the first in time of the interruption or reduction of **electricity**; but

(c) if an interruption or reduction of **electricity** occurs in order to comply with this Code, the interruption or reduction of **electricity** must be disregarded for the purposes of determining the **causer** of the **under-frequency event**

Figure 1 : Electricity Industry Participation Code 2010, Part One, **causer**

When assessing which asset owner could be the causer, the system operator's rationale and analysis follows:

Application of para (a)

(a) if the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator's** or **grid owner's asset** or **assets**, the **generator** or **grid owner**; unless—

The initial assessment suggested there were two possible causers, Genesis and the grid owner; both had assets which were relevant to the circumstances of the event.

Application of para (a)(i) to Genesis

(i) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator's asset** or **assets** but another **generator's** or a **grid owner's** act or omission or property causes the interruption or reduction of **electricity**, in which case the other **generator** or the **grid owner** is the **causer**; or

In this under-frequency event, the system operator believed the order of events was critical to its determining a causer. It believed that:

- generation at Huntly Unit 4 tripped in response to the disconnection of the Huntly Stratford One circuit
- the disconnection of this circuit was an "act" [for the purposes of para (a)(i)] by the grid owner's protection system attached to that circuit
- without the circuit having disconnected Huntly Unit 4 would have continued to generate electricity into the grid, meaning Genesis as a possible causer of the under-frequency event
- in the absence of Genesis as a causer the grid owner was the only possible causer.

Application of para (a)(ii) to the grid owner

(ii) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **grid owner's asset** or **assets** but a **generator's** or another **grid owner's** act or omission or property causes the interruption or reduction of **electricity**, in which case the **generator** or other **grid owner** is the **causer**; or

In this event, operation of the grid owner's protection asset disconnected the Huntly Stratford circuit. This operation was in response to the fault detected on the circuit after it was struck by lightning. No evidence existed which pointed to any other party's act, omission or property as causal to operation of the grid owner's protection system. At this point, the analysis left the grid owner as still a potential (and the only potential) causer.

Application of para (b)

(b) if the **under-frequency event** is caused by more than 1 interruption or reduction of **electricity**, the **generator** or **grid owner** who, in accordance with paragraph (a), would be the **causer** of the **under-frequency event** if it had been caused by the first in time of the interruption or reduction of **electricity**; but

The circumstances of this event showed only one interruption or reduction of electricity into the grid occurred. This clause was not relevant to the system operator's conclusion.

Application of para (c)

(c) if an interruption or reduction of **electricity** occurs in order to comply with this Code, the interruption or reduction of **electricity** must be disregarded for the purposes of determining the **causer** of the **under-frequency event**

The circumstances showed that operation of the grid owner's protection system on the circuit was in response to detection of the fault created by the lightning strike.

The grid owner is required by the Code to have protection systems on circuits to detect and protect its own and other participant assets from faults. In detecting and disconnecting the Huntly Stratford One circuit the protection system performed as designed and required by the Code.

The system operator believed (and continues to believe) para (c) applied in this case because the existence and performance of the asset (the protection system) complied with the Code. It followed that the system operator was required to disregard the interruption or reduction of electricity in deciding if the grid owner could be attributed to be the causer.

Consequently, the grid owner could not be the causer of the event. Given there was no other asset owner which could be the causer, the system operator was unable to conclude there was a causer (as defined in the Code).

<u>Consideration of previous under-frequency events</u>

In making its assessment, the system operator also considered previous under-frequency events.

We considered the under-frequency event on 16 May 2016 to be relevant to this case because it involved the operation of an asset owner's protection system. In that case, a false indication of a problem caused the protection system to operate. This false indication was made by the generator's 'property' [for the purpose of para a(i)] – a water sensor. In these circumstances the operation of the protection was not performed in order to comply with the Code. The generator was recommended as the causer.

Independent legal advice

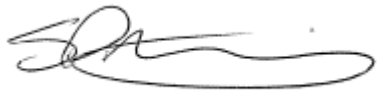
To provide assurance of its interpretation of the relevant Code provisions, the system operator has received independent legal advice which supports its recommendation, namely the grid owner is not, for the purposes of the Code, the causer. It also supports the proposition it is possible for there to be no causer of an under-frequency event.

A copy of the opinion from Simpson Grierson is attached. This advice is confidential to Transpower and legal privilege is waived only in favour of the Electricity Authority (and must not be disclosed to any other person or party).

General observation

We believe the 'causer regime' in the Code exists to encourage asset owners to build and maintain assets to a level that supports safe and reliable operation of the power system. It seems clear to the system operator the operation of protection equipment in this case was essential to proper power system operation and did so exactly as required by the Code and as expected by all asset owners.

Yours sincerely



Scott Avery

Risk and Compliance Manager

Operations

Transpower

Appendix E System operator and grid owner correspondence

TRANSPOWER

Scott Avery
Tel: (04) 590 6144
Fax: (04) 495 7154

Waikoukou
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Wellington 6140
New Zealand
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F 64 4 495 7100
www.transpower.co.nz

7 May 2019

Kent Murrell
Compliance Manager
Grid Owner
Transpower
Wellington

Dear Kent,

14 December 2018 North Island Under-Frequency Event

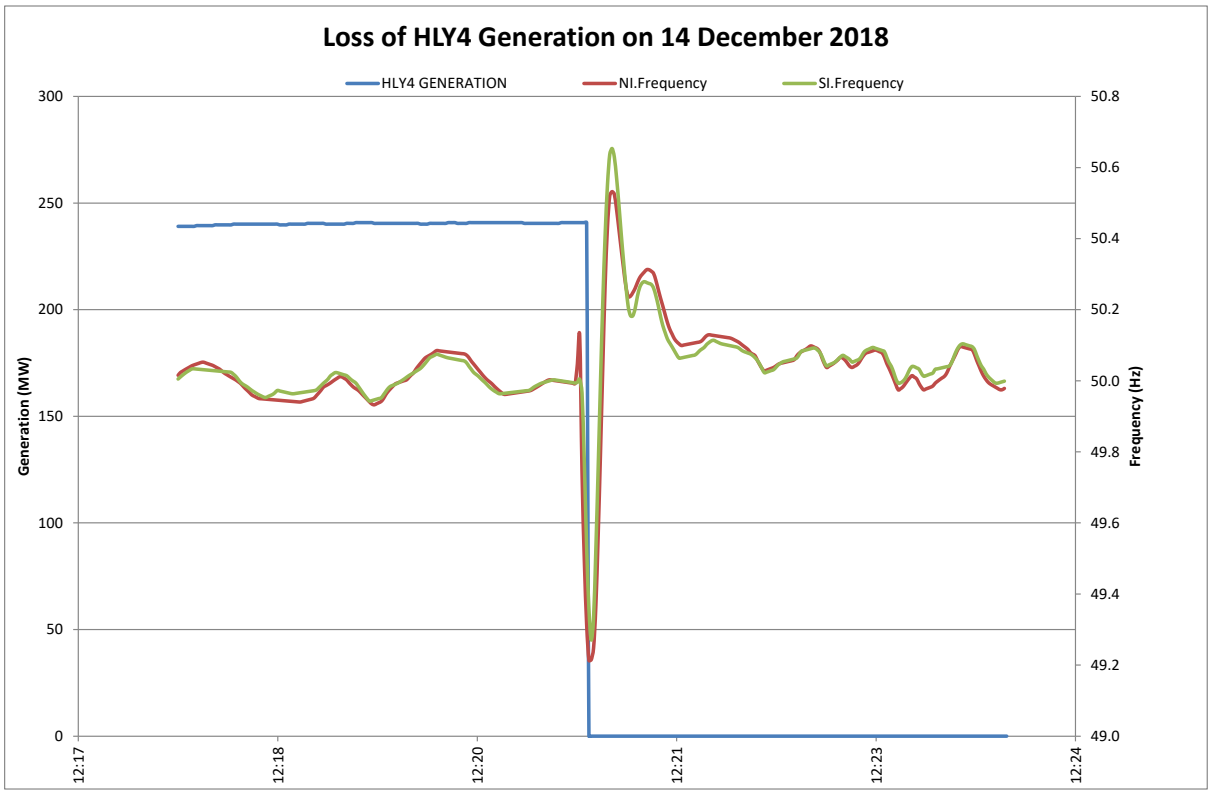
On 14 December 2018, an under-frequency event occurred in the North Island at 12:20. From our investigation the event appears to have been initiated by a lightning strike to the HLY_SFD_1 circuit.

Can the Grid Owner review the circumstances of the event on the HLY_SFD_1 circuit and confirm the performance of the Grid Owners assets as well any further information regarding the circumstances of this event.

Please also consider whether or not you could be the causer of this under frequency event as per the Code.

This information is used by the System Operator to form a recommendation to the Electricity Authority who make the determination of causer.

If you require any further details please let me know



Regards,

Scott Avery
Risk and Compliance Manager
System Operations

TRANSPOWER
Keeping the energy flowing

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09 May 2019

Scott Avery
Risk and Compliance Manager
System Operations
Transpower
Wellington

Dear Scott

14 December 2018 North Island Under-frequency event

On 14 December 2018 Huntly 220kV busbar B was removed from service for maintenance work from 09:30 to 15:00. With Huntly busbar B out of service, Huntly unit G4 was directly connected to Huntly – Stratford circuit 1 via Huntly circuit breaker 542. Huntly unit G4 was generating around 250MW for the duration of the outage. As is normal practice for such an outage, the auto-reclose for the Huntly – Stratford circuit was disabled for personnel safety.

At approximately12:21 there were two almost simultaneous lightning strikes on the Huntly – Stratford circuit 1 resulting in a phase to earth fault on the circuit. The line protection on the circuit responded to the lightning strikes and disconnected the circuit at both Huntly and Stratford. The tripping of the circuit resulted in Huntly unit G4 being immediately disconnected from the grid.

Schedule 8.3, Technical Code A, clause (4)(a) of the Code requires a grid owner to provide protection that will electrically disconnect any faulted asset in the minimum practical time. The line protection on the Huntly Stratford circuit responded to the lightning strikes and disconnected the circuit at both Huntly and Stratford. The line protection operated as designed, and required by the Code, to clear the phase to earth fault that was initiated by the lightning strikes.

The definition of causer in the Code at clause (c) states that; "*if an interruption or reduction of electricity occurs in order to comply with this Code, the interruption or reduction of electricity must be disregarded for the purposes of determining the causer of the under-frequency event*".

The Stratford – Huntly line protection was designed and installed in compliance with Schedule 8.3, Technical Code A, clause (4) of the Code and operated as required. Based on this, and the definition of causer clause (c) of the Code, I do not believe the circuit tripping can be considered to be the causer of the under-frequency event that occurred on 14 Decemeber 2018.

Yours sincerely

Kent Murrell

Kent Murrell
Grid Compliance Manager

Appendix F Code definition of ‘causer’

causer, in relation to an **under-frequency event**, means—

(a) if the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator’s** or **grid owner’s asset** or **assets**, the **generator** or **grid owner**; unless—

(i) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **generator’s asset** or **assets** but another **generator’s** or a **grid owner’s** act or omission or property causes the interruption or reduction of **electricity**, in which case the other **generator** or the **grid owner** is the **causer**; or

(ii) the **under-frequency event** is caused by an interruption or reduction of **electricity** from a single **grid owner’s asset** or **assets** but a **generator’s** or another **grid owner’s** act or omission or property causes the interruption or reduction of **electricity**, in which case the **generator** or other **grid owner** is the **causer**; or

(b) if the **under-frequency event** is caused by more than 1 interruption or reduction of **electricity**, the **generator** or **grid owner** who, in accordance with paragraph (a), would be the **causer** of the **under-frequency event** if it had been caused by the first in time of the interruption or reduction of **electricity**; but

(c) if an interruption or reduction of **electricity** occurs in order to comply with this Code, the interruption or reduction of **electricity** must be disregarded for the purposes of determining the **causer** of the **under-frequency event**

Glossary of abbreviations and terms

Authority	Electricity Authority
Act	Electricity Industry Act 2010
Code	Electricity Industry Participation Code 2010
UFE	Under-frequency event