

# **Draft determination of causer: 24 January 2023 under-frequency event**

Consultation paper

31 August 2023

## Executive summary

### Under-frequency events occurred on 24 January 2023

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

The purpose of this paper is to:

- (a) set out the Authority's draft determination of the causer for the 24 January 2023 UFE
- (b) consult with interested parties on the draft determination.

The Authority's draft determination is that Genesis was the causer for the 24 January 2023 UFE

**The Authority's draft determination under clause 8.61 of the Code is that Genesis Energy Limited (Genesis), as a generator, was the causer of the 24 January 2023 UFE.**

The reasons for the draft determination are:

- (a) the interruption/reduction of energy injected into the grid occurred at Unit 5 of 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 the system operator's letter, Genesis accepted that it was the causer.

### Submissions are invited from interested parties

The Authority 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 3 October 2023. The Authority will then carefully consider all submissions received and make a final determination on the UFE.

The Authority also invites comment on the system operator's calculation of the megawatts of power lost during the event, which the system operator uses for calculating the UFE charge.

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# 1. What you need to know to make a submission

## What this consultation is about

- 1.1. The purpose of this paper is to consult with interested parties on the Authority's draft determination that Genesis Energy Limited, as the generator that owns Huntly Unit 5, was the causer of the UFE on 24 January 2023 at 3:49pm.

## How to make a submission

- 1.2. The Authority's 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 [compliance@ea.govt.nz](mailto:compliance@ea.govt.nz) with "Consultation Paper—24 January 2023 under-frequency event" in the subject line.
- 1.3. If you cannot send your submission electronically, please contact the Authority ([info@ea.govt.nz](mailto:info@ea.govt.nz) or 04 460 8860) to discuss alternative arrangements.
- 1.4. Please note the Authority intends to publish all submissions it receives. If you consider that the Authority should not publish any part of your submission, please:
  - (a) indicate which part should not be published,
  - (b) explain why you consider we should not publish that part, and
  - (c) provide a version of your submission that the Authority can publish (if we agree not to publish your full submission).
- 1.5. If you indicate part of your submission should not be published, the Authority will discuss this with you before deciding whether to not publish that part of your submission.
- 1.6. However, please note that all submissions received by the Authority, including any parts that the Authority does not publish, can be requested under the Official Information Act 1982. This means the Authority would be required to release material not published unless good reason existed under the Official Information Act to withhold it. The Authority would normally consult with you before releasing any material that you said should not be published.

## When to make a submission

- 1.7. Please deliver your submission by 5pm on 3 October 2023
- 1.8. Authority staff will acknowledge receipt of all submissions electronically. Please contact the Authority [compliance@ea.govt.nz](mailto:compliance@ea.govt.nz) or 04 460 8860 if you do not receive electronic acknowledgement of your submission within two business days.

# 2. Introduction

- 2.1. Clause 8.60 of the Code requires the system operator to investigate the causer of a UFE and provide a report to the Authority.
- 2.2. Clause 8.61(2) requires the Authority 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 the Authority to give reasons for its findings in the draft determination.

### **3. Genesis was the causer of the 24 January 2023 UFE**

- 3.1. The Authority's draft determination under clause 8.61 is that Genesis, as the generator that owns Huntly Unit 5, was the causer of the UFE on 24 January 2023 at 3:49pm.

#### **The system operator investigated the causer of the UFE**

- 3.2. The system operator's report (dated March 2023) is attached as Appendix B.

- 3.3. The circumstances described in the report are summarised below:

- (a) At 3:49pm Huntly Unit 5 tripped removing 377.695 MW of generation, and the frequency fell to 48.98 Hz in the North Island and 49.13 Hz in the South Island.
- (b) The frequency fall and the quantity of MW lost (greater than the 60 MW minimum) meant that a UFE as defined in Part 1 of the Code had occurred because there was an interruption/reduction of energy injected into the grid.
- (c) Instantaneous reserves in the North and South Islands responded, returning the frequency to the normal band within 7 seconds.
- (d) Huntly Unit 5 tripped due a loss of condensate flow to the heat recovery system. Genesis believes this is what caused the UFE.
- (e) No other event or asset operation was identified as occurring at or around the time of the UFE.
- (f) On 2 February 2023, the system operator requested the grid owner provide information on the circumstances of the UFE. On 8 February 2023, the grid owner provided some supporting information. The grid owner did not believe it was the causer of the 24 January 2023 UFE.
- (g) On 3 February 2023, the system operator wrote to Genesis setting out its view that Huntly Unit 5 tripped resulting in a loss of injection and requesting any information Genesis could provide. On 10 February 2023, Genesis replied, agreeing that it was the causer.

#### **The Authority considered the circumstances of the UFE**

- 3.4. The Authority has considered the system operator's report and correspondence with Genesis and the grid owner. The Authority's reasons for the draft determination that Genesis is the causer are:

- (a) A UFE occurred on 24 January 2023 at 3:49pm when frequency dropped to 48.98 Hz in the North Island and 49.13 Hz in the South 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 potentially causing the UFE.
- (d) The system operator and Genesis agree that Genesis was the causer of the UFE.

- 3.5. Having considered the relevant clauses of the Code, the Authority (based on the information available at this time) agrees with the system operator's findings on the causer of the 24 January 2023 UFE.

Q1. Do you agree with the draft determination that Genesis Energy Limited is the causer of the under-frequency event on 24 January 2023 at 3.49pm? If not, please advise your view on the causer and give reasons.

#### **4. The Authority will consider submissions and make a final determination**

- 4.1. Clause 8.61(4) of the Code requires the Authority to consult every generator, grid owner and other participant substantially affected by a UFE in relation to a draft determination. The Authority has allowed a consultation period of four weeks for this draft determination.
- 4.2. Accordingly, the deadline for submissions is 5pm on 3 October 2023.
- 4.3. The Authority will consider submissions received and publish its final determination. Clauses 8.62 and 8.63 of the Code set out provisions relating to any disputes regarding the Authority's determination.

#### **5. The system operator has calculated the MW lost during the event based on its investigation**

- 5.1. 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 8.64 and 8.65 of the Code).
- 5.2. 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 investigation into a UFE.
- 5.3. 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).
- 5.4. The system operator has determined the loss of injection into the grid for the 24 January 2023 event was 377.695MW at the grid injection point for Huntly Unit 5, resulting in an event charge of \$397,118.75.
- 5.5. The system operator's calculation of the MW lost for this event is included in the report. The system operator's calculation does not form part of the Authority's draft determination. However, the Authority acknowledges that the calculation is central to determining the UFE charge payable by the causer, and therefore also to the rebate paid for a UFE. Accordingly, the Authority invites comment on the system operator's calculation of the MW lost.

Q2. Do you agree with the system operator's assessment that 377.695MW was lost from the power system in the 24 January 2023 UFE? If not, please advise your view on the MW lost and give reasons.

## Appendix A Format for submissions

Submitter	
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Questions	Comments
Q1. Do you agree with the draft determination that Genesis Energy Limited is the causer of the under-frequency event on 24 January 2023 at 3.49 pm? If not, please advise your view on the causer and give reasons.	
Q.2 Do you agree with the system operator's assessment that 377.695MW was lost from the power system in the 24 January 2023 UFE? If not, please advise your view on the MW lost and give reasons.	

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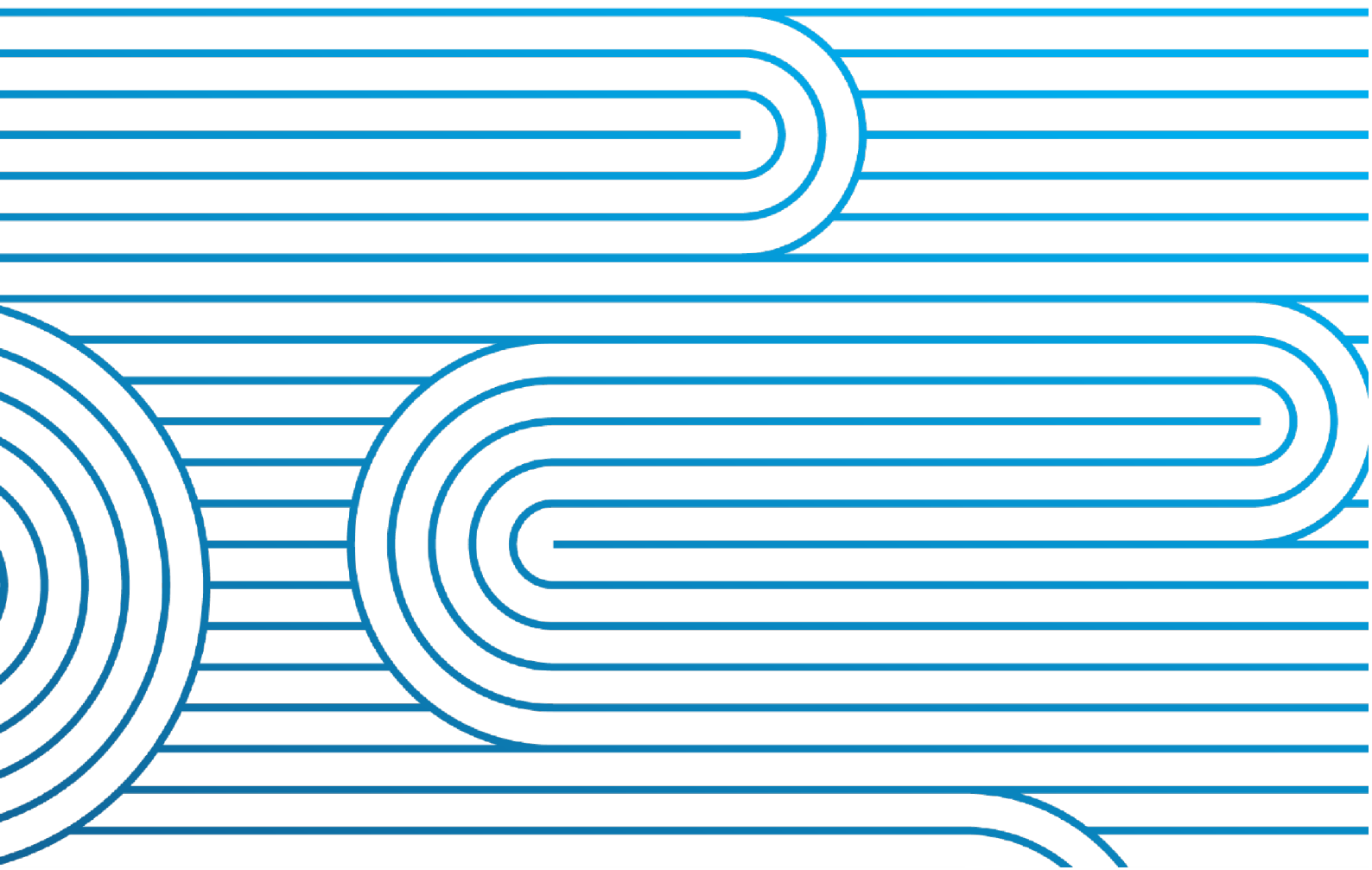
## **Appendix B Causation report 24 January 2023**



# Causation Report 24<sup>th</sup> January 2023 Under-Frequency Event

System operator event #47

March 2023



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## 6. IMPORTANT

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## 7. Disclaimer

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## 9. Contact Details

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Email: [system.operator@transpower.co.nz](mailto:system.operator@transpower.co.nz)

Website: <http://www.transpower.co.nz>

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## 10. PURPOSE

On 24<sup>th</sup> January 2023 a reduction of energy into the power system caused the system frequency in the North and South Islands to fall below 49.25 Hz, resulting in an under-frequency event.

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Pursuant to clause 8.60 of the Electricity Industry Participation Code (**Code**), the system operator investigated the event to assist the Electricity Authority (**Authority**) in determining a causer of the under-frequency event.

This Causation Report is provided to the Authority pursuant to clause 8.60(5) of the Code and includes the following:

- The system operator's recommendation of the causer of the under-frequency event.
- The system operator's reasons for forming its view.
- The information considered in reaching this view.

## 11. EXECUTIVE SUMMARY

At 15:49:44 on 24<sup>th</sup> January 2023 Genesis Energy's Huntly Unit 5 tripped.

The disconnection of generation from Huntly Unit 5 removed 377.695 MW of injection into the power system.

At 15:49:46 the South Island frequency fell to 49.13 Hz and at 15:49:48 the North Island frequency fell to 48.98 Hz. Either of the North or South Island frequencies falling below 49.25 Hz constitutes an under-frequency event, as defined in the Code.

Genesis has stated that it believes the tripping of Huntly Unit 5 was the cause of the under-frequency on 24<sup>th</sup> January 2023.

Investigation into the tripping and other system events supports Genesis' position that the trip of Huntly Unit 5 caused the under-frequency event.

Accordingly, the system operator recommends Genesis be found as the causer of the under-frequency event on 24<sup>th</sup> January 2023.



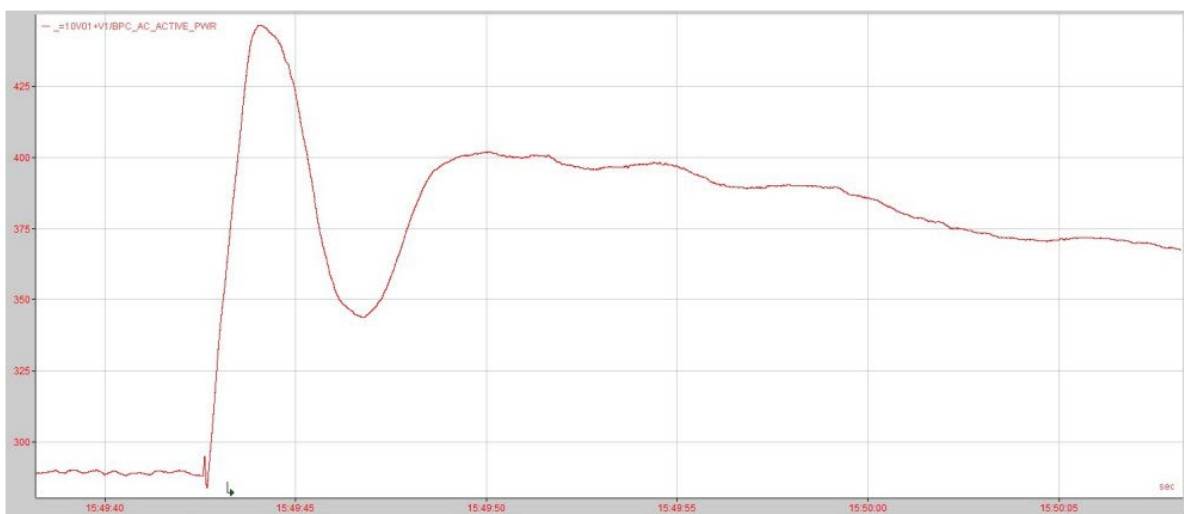
## 12. SYSTEM EVENTS – 24<sup>TH</sup> JANUARY 2023

### Prior to the under-frequency event

According to the grid owner, there were no protection operations on any grid assets on 24<sup>th</sup> January 2023 that may have contributed to the frequency falling below 49.25 Hz. The grid owner confirmed the Frequency Keeping Control (FKC) modulation on the HVDC was active when Huntly generation tripped. The system allowed the transfer to change dispatch up to 250MW in either direction to allow reserve sharing between the islands. The grid owner provided the below graph for how the HVDC output modulated during the event (received

frequency to go down in the South Island as well however the grid owner confirmed this normal

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power at Haywards) – this action is what caused the and expected behaviour.

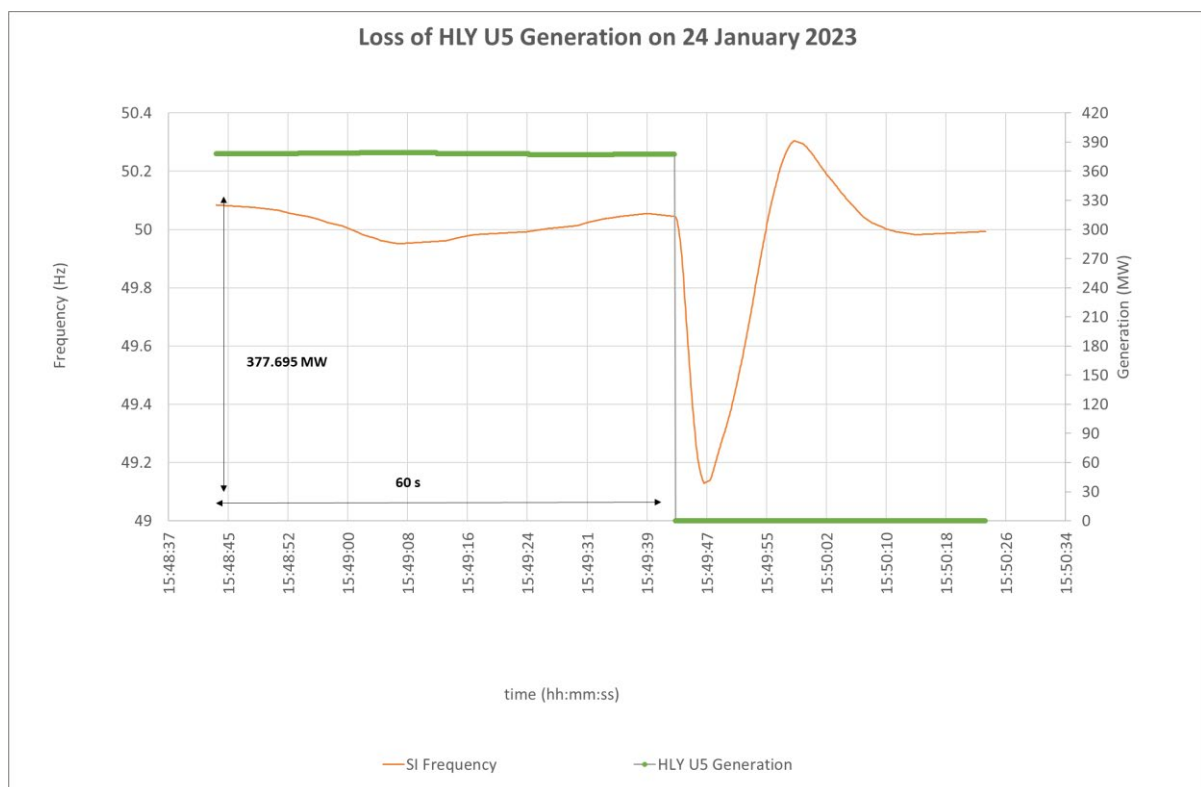
### The under-frequency event

According to Genesis, Huntly Unit 5 tripped from a loss of condensate flow to the heat recovery steam generator during reinstatement of the condensate polishing plant. Genesis confirmed an issue was identified with the resin trap drain valve. This inhibited condensate flow which subsequently triggered the condenser level protection. Genesis confirmed the issue has been resolved and actions taken to prevent a reoccurrence.

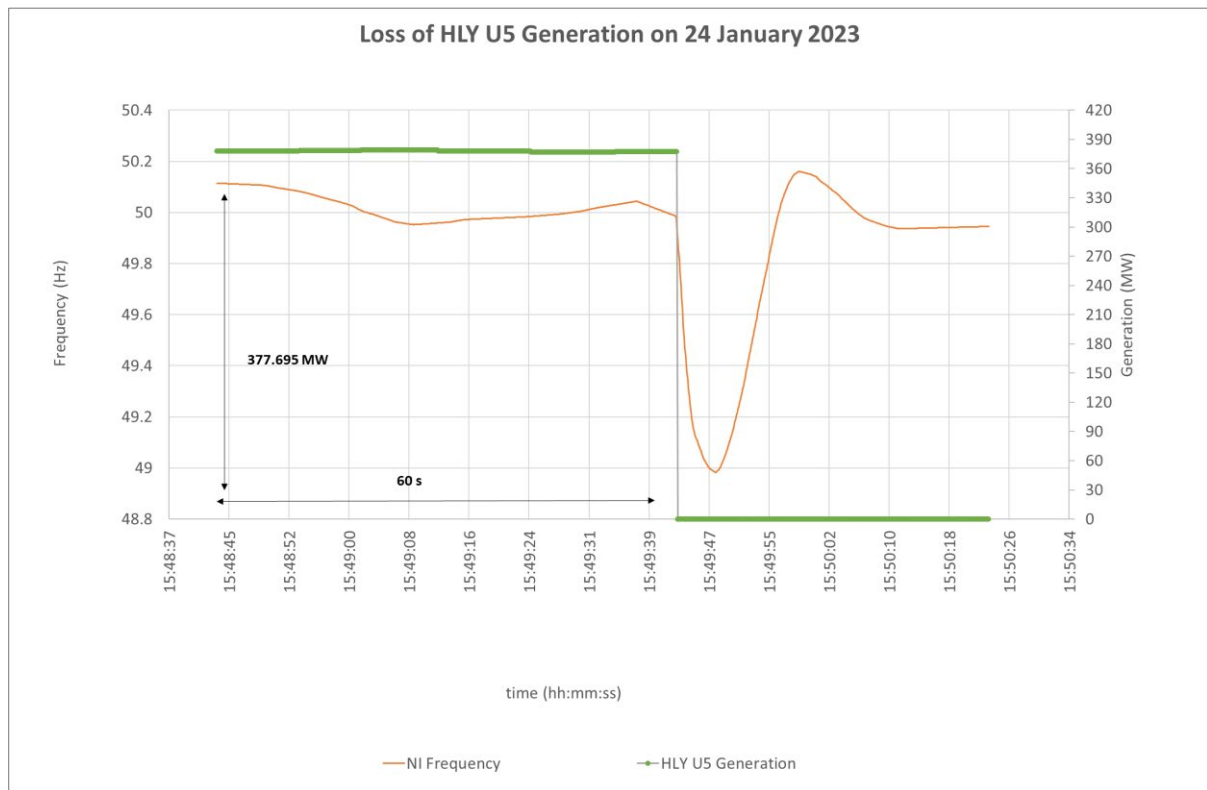
At 15:49:44 the disconnection of Huntly Unit 5 removed 377.695 MW of generation injection into the power system. Consequently, this reduced the system frequency in the South Island below 49.25 Hz at 15:49:46 (49.13 Hz) and in the North Island at 15:49:48 (48.98 Hz).

Genesis confirmed the MW lost as 377.695.

### South Island Frequency



## North Island Frequency



### After the under-frequency event

At the time of the event, the system operator had dispatched:

- North Island (generation) instantaneous reserve providers to be available to provide 238.7 MW FIR and 305.4 MW SIR;
- North Island interruptible load providers to be available to trip 135.7 MW FIR and 170.7 MW SIR; and
- South Island (generation) instantaneous reserve providers to be available to provide 69.4 MW FIR and 78.0 MW SIR.

These reserve providers responded, returning the frequency to the normal band within seven seconds.

Performance of instantaneous reserve providers in an under-frequency event is assessed by the system operator to ascertain if these providers are meeting their respective ancillary service contracts. Two ancillary service providers fell short of their respective contractual obligations: one by 6.79 MW and one by 1.02 MW. The system operator has reduced the maximum contractual quantities of both providers by their respective deficit amounts until the



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service providers can demonstrate the implementation of measures to prevent recurrence. The system operator is comfortable with the remedial action plans proposed by the service providers.

No other event or asset operation was identified as occurring at or around the time of the underfrequency event.

## 13. RATIONAL FOR RECOMMENDATION

### Factors considered

Only one event occurred in close proximity to the North Island and South Island frequencies falling below 49.25 Hz, namely the tripping of Huntly unit 5 at 15:49:44.

Accordingly, assessment of this information confirms that only the tripping of Huntly Unit 5 can be linked with the North and South Island frequencies falling below 49.25Hz.

Genesis and the grid owner were both asked if they considered themselves the causer of the underfrequency event.

Genesis confirmed that the tripping of Huntly Unit 5 caused the under-frequency event.

The grid owner does not believe it caused the under-frequency event.



## CALCULATION OF MW LOST

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.

The system operator follows the procedure 'Calculating the Amount of MW lost' (PR-RR-017) to determine the MW lost. This procedure follows the formula set out in clause 8.64 of the Code for calculating an event charge.

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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:  $EC = ECR * (\sum_y (INT_{ye} \text{ for all } y) - INJ_d)$  where

EC is the event charge payable by the causer

ECR is \$1,250 per MW

INJ<sub>d</sub> is 60 MW

INT<sub>ye</sub> 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

As the ECR and INJ<sub>d</sub> values are constants the values to calculate and complete the formula are y and INT<sub>ye</sub>.

Using the event charge formula the calculation is as follows:

$$\text{Event Charge} = \$1250 * (377.695\text{MW} - 60\text{MW})$$

$$\text{Event Charge} = \$397,118.75$$

## Appendix 1: CORRESPONDENCE

### 1.1 CONFIRMATION OF EVENT NOTICE



#### Customer Advice Notice

**To:** CAN NZ Participants  
**Sent:** 27-jan-2023 13:12  
**Ref:** 4640967197

**From:** The System Operator  
**Telephone:** 0800 488 500  
**Email:** NMData@transpower.co.nz

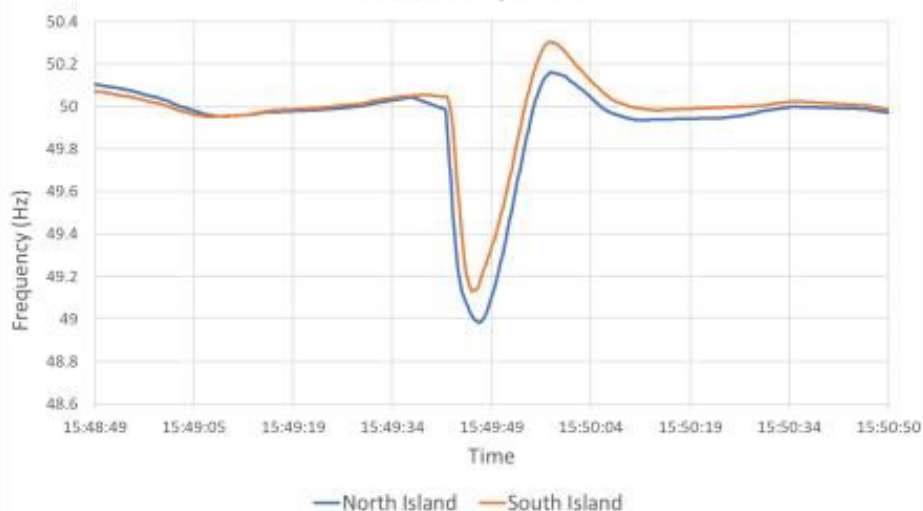
**Revision of:**

#### Under-Frequency Event Confirmation

The system operator wishes to advise market participants of an under-frequency event which occurred in the North Island and South Island on 24 January 2023.

<b>Event ID</b>	4347
<b>Affected Islands:</b>	North Island & South Island
<b>North Island Minimum Frequency:</b>	48.98 Hz
<b>Time (start of UFE):</b>	15:49:44
<b>Time (of min. frequency):</b>	15:49:48
<b>South Island Minimum Frequency:</b>	49.13 Hz
<b>Time (start of UFE):</b>	15:49:46
<b>Time (of min. frequency):</b>	15:49:46

North Island & South Island Frequency  
- 24 January 2023



#### Market Operations

Transpower NZ Ltd  
P.O. Box 1021,  
Wellington 6140.



**TRANSPOWER**

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PO Box 1021, Wellington  
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Telephone +64-4-590 7000  
Facsimile: +64-4-495 7100  
[richard.renouf@transpower.co.nz](mailto:richard.renouf@transpower.co.nz)

3 February 2023

Steve Leppien  
Genesis Energy  
Private Bag 3131  
Hamilton

Dear Steve,

**24<sup>th</sup> January 2023 Under-Frequency Event**

At 15:49 on 24<sup>th</sup> January 2023 an under-frequency event occurred in both the North and South Islands. We are investigating the event and require the following information from you:

- Could you provide information regarding the event and what you believe may have caused the under-frequency to occur on 24<sup>th</sup> January 2023.
- We have assessed the MW lost during the event as 377.695 MW at Huntly. Can you please confirm this assessment or provide data that indicates a different value of MW lost. We rely on SCADA data, but your data from site may be more accurate.
- Could you also confirm whether or not you could have been the causer of the under-frequency event as per the Code.

The information you provide will be used by the system operator to recommend to the Electricity Authority who the causer of the event was. The Electricity Authority will make the final determination of causer.

Please contact me if you require any further information.

Yours sincerely,

**Richard Renouf**  
SO Compliance & Impartiality Manager



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2 February 2023

Mao Reyes  
Grid Compliance Manager  
Grid Owner  
Transpower  
Wellington

Dear Mao,

**24<sup>th</sup> January 2023 Under-Frequency Event**

At 15:49 on 24<sup>th</sup> January 2023 an under-frequency event occurred in both the North and South Islands. We are investigating the event and require the following information from you:

- Could you provide information regarding the event and what you believe may have caused the under-frequency to occur on 24<sup>th</sup> January 2023.
- Could you also confirm whether or not you could have been the causer of the under-frequency event as per the Code.

The information you provide will be used by the system operator to recommend to the Electricity Authority who the causer of the event was. The Electricity Authority will make the final determination of causer.

Please contact me if you require any further information.

Yours sincerely,

**Richard Renouf**  
SO Compliance & Impartiality Manager



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

T. 07 982 7909

10 February 2023

Richard Renouf  
SO Compliance and Impartiality Manager  
Transpower New Zealand Limited  
P O Box 1021  
WELLINGTON 6140

By email: [Richard.Renouf@transpower.co.nz](mailto:Richard.Renouf@transpower.co.nz)

Dear Richard,

**RE: 24<sup>th</sup> January 2023 Under-Frequency Event**

I refer your letter dated 03 February 2023 requesting information from Genesis Energy to help identify the causer of the 24 January 2023 under-frequency event.

**Information regarding the event**

A Huntly Unit 5 trip resulted from loss of condensate flow to the heat recovery steam generator during reinstatement of the condensate polishing plant. An issue was identified with the resin trap drain valve. This inhibited condensate flow which subsequently triggered the condenser level protection. The issue has been resolved and actions taken to prevent a reoccurrence.

**Loss of Injection Figure:**

Genesis concurs with Transpower's assessment of the loss of injection figure.

**Causer:**

Genesis Energy considers it (Huntly Unit 5) was the causer of the 24 January 2023 under-frequency event.

Yours faithfully

**GENESIS ENERGY LIMITED**

A handwritten signature in black ink, appearing to read "Steve".

Steve Leppien  
Regulatory and Quality Assurance Manager

## 1.5 GRID OWNER RESPONSE





TRANSPOWER

*Keeping the energy flowing*

Waikoukou  
22 Boulcott Street  
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Wellington 6140  
New Zealand  
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F 64 4 590 6968  
[www.transpower.co.nz](http://www.transpower.co.nz)

8 February 2023

Richard Renouf  
Compliance and Impartiality Manager  
System Operations  
Transpower  
Wellington

Dear Richard

#### 24th January 2023 North and South Island Under-Frequency Event

Thank you for your letter dated 2 February 2023 regarding the under-frequency event that occurred on 24<sup>th</sup> January 2023 in the North and South Islands. My understanding of the event is as follows:

- At 15:49 on 24<sup>th</sup> January Huntly unit 5 tripped, resulting in an under-frequency event occurring in the North and South Islands.
- Market participants were notified by a frequency excursion notice issued at 15:59 on 24<sup>th</sup> January, that Huntly generation had tripped and that the North and South Islands' frequency had fallen to 48.98Hz and 49.13Hz, respectively.
- A customer advice notice issued at 13:12 on 27<sup>th</sup> January confirmed that an under-frequency event occurred in the North (15:49:44) and South (15:49:46) Islands on 24<sup>th</sup> January 2023.
- There were no protection operations of any grid assets on 24<sup>th</sup> January 2023 and the only tripping event reported on this day was the Huntly generation tripping.
- The Frequency Keeping Control (FKC) modulation on the HVDC was active when Huntly generation tripped. The system allowed the transfer to change dispatch up to 250MW in either direction to allow reserve sharing between the islands. See below for how the HVDC output modulated during this event (received power at Haywards) – this action is what caused the frequency to go down in the South Island as well, however this is normal and expected behaviour.





Considering the above information, I do not believe that the Grid Owner was the causer of the under-frequency event that occurred on this day.

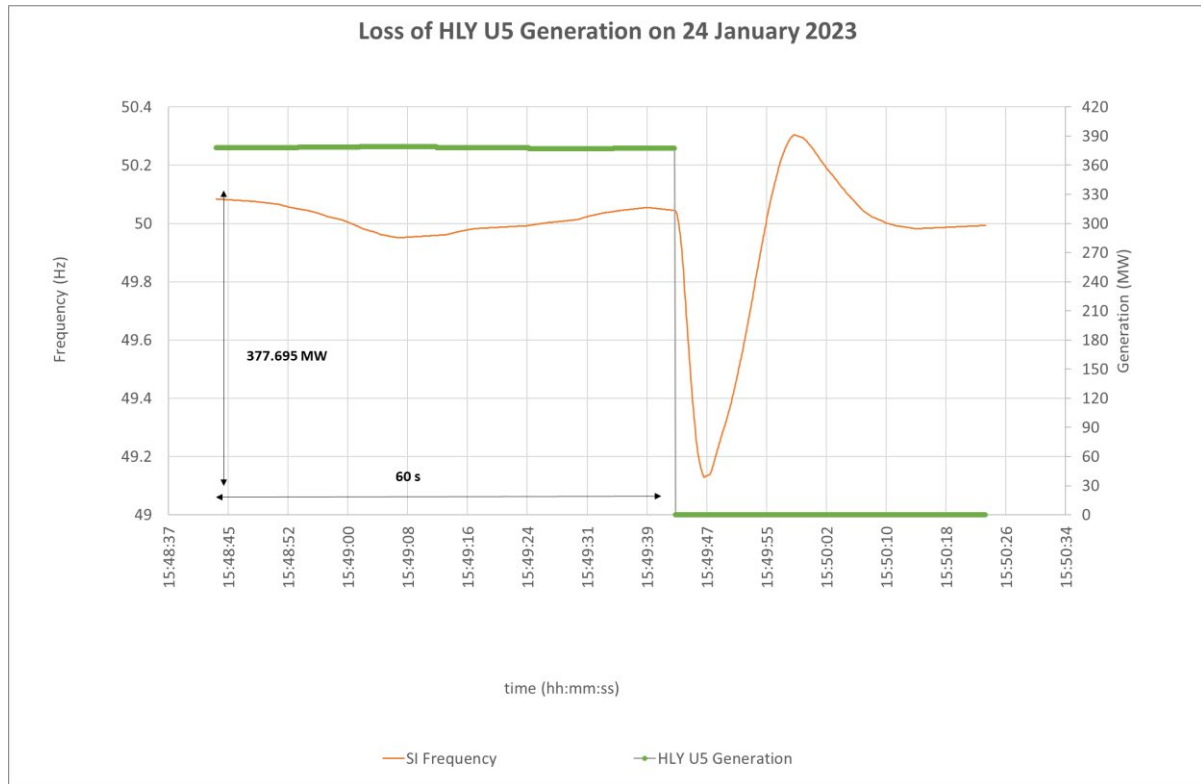
Yours sincerely

A handwritten signature in blue ink, appearing to read 'Mao Reyes'.

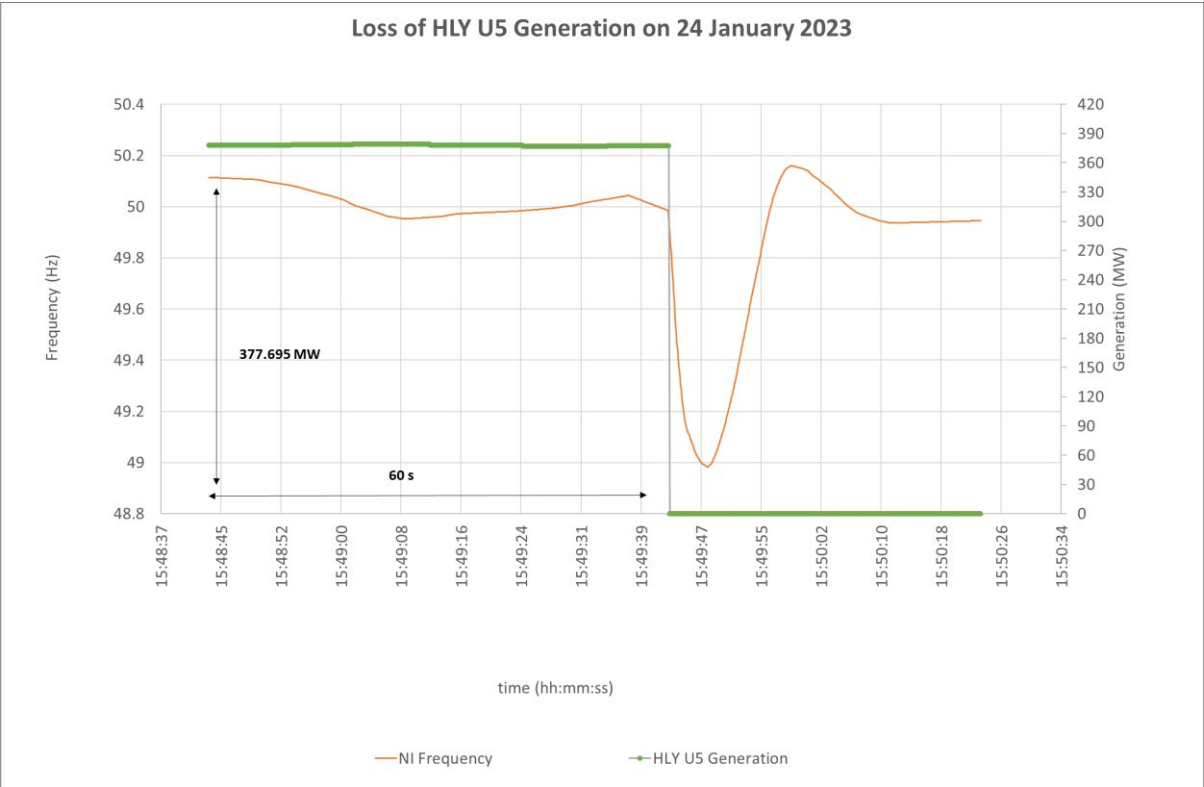
**Mao Reyes**  
Grid Compliance Manager

## Appendix 2: CHARTS

### System Frequency (South and North Islands) and MW Trace 24<sup>th</sup> January 2023



Loss of HLY U5 Generation on 24 January 2023



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## **Glossary of abbreviations and terms**

Authority	Electricity Authority
Act	Electricity Industry Act 2010
Code	Electricity Industry Participation Code 2010
Regulations	Electricity Industry (Enforcement) Regulations 2010