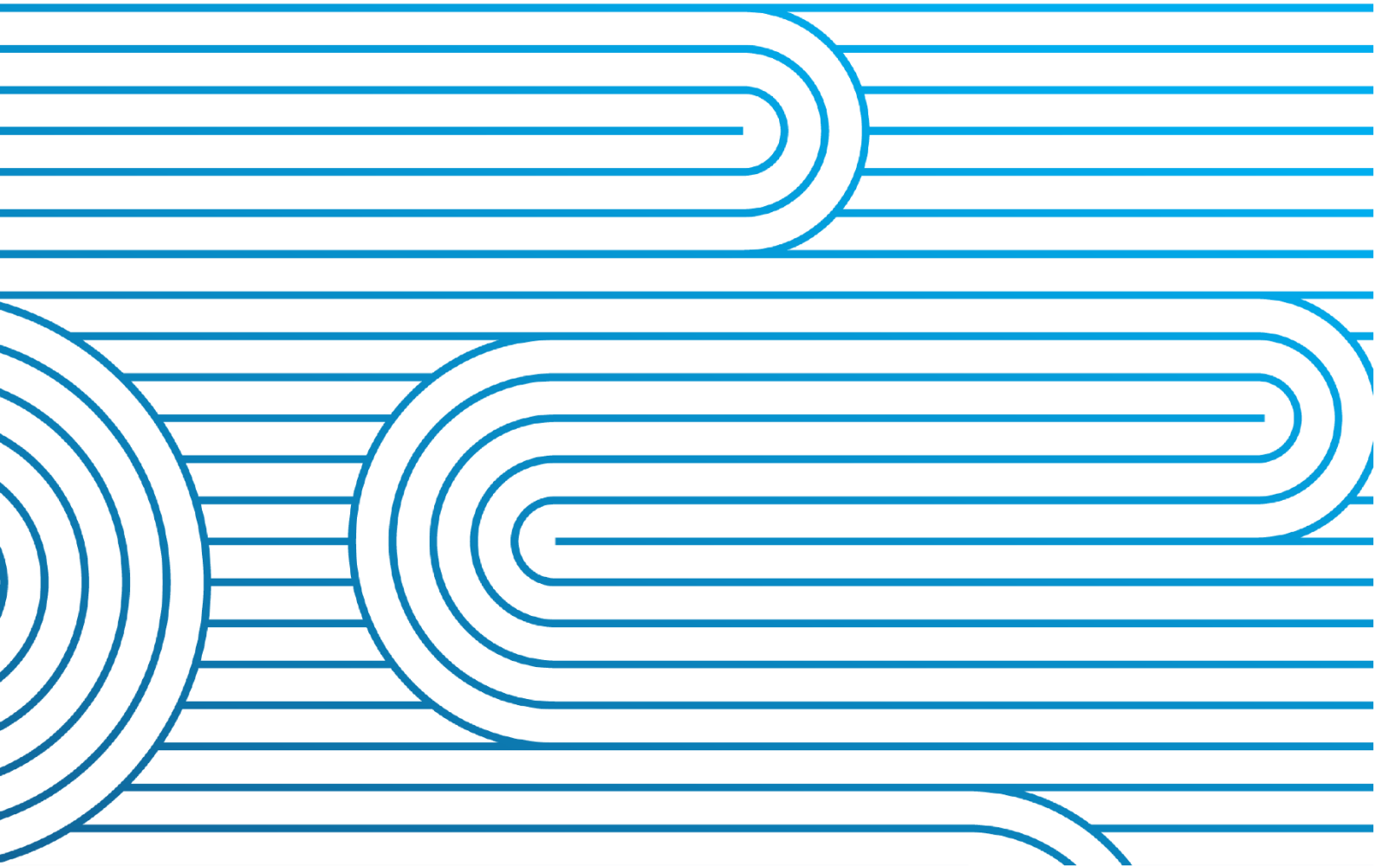
TRANSPOWER

# Causation Report
# 21 April 2025
# Under-Frequency Event

System Operator event 4550

**4 July 2025**



**IMPORTANT**

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## PURPOSE

On 21 April 2025 a reduction of energy into the power system caused the system frequency in the North Island to fall below 49.25 Hz, resulting in an under-frequency event.

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.

## EXECUTIVE SUMMARY

At 16:43:10 on 21 April 2025 Genesis Energy's Huntly Unit 4 tripped.

The disconnection of generation from Huntly Unit 4 removed 233.843 MW of injection into the power system.

At 16:43:11 the North Island frequency fell to 49.16 Hz and at 16:43:13 the South Island frequency fell to 49.29 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 Energy has stated that it believes the tripping of Huntly Unit 4 was the cause of the under-frequency on 21 April 2025.

Investigation into the tripping and other system events supports Genesis Energy's position that the trip of Huntly Unit 4 caused the under-frequency event.

Accordingly, the System Operator recommends Genesis Energy be found as the causer of the under-frequency event on 21 April 2025.

# SYSTEM EVENTS – 21 APRIL 2025

## Prior to the under-frequency event

According to the Grid Owner, there were no protection operations on any grid assets on 21 April 2025 that may have contributed to the frequency falling below 49.25 Hz. Additionally, there were no HVDC events that contributed to this event, and the HVDC system responded appropriately during the event. HVDC was transferring 50 MW south. During the event, the transfer was modulated to 170 MW north, thereby reducing the severity of the under-frequency event.

## The under-frequency event



According to Genesis Energy, Unit 4 protection settings initiated a unit trip. They confirmed (see Genesis letter attached) that their investigation identified the Buchholz protection had operated. They confirmed that further analysis identified moisture ingress and momentary conductive tracking to the trip contact within the Buchholz terminal box as the likely cause of the trip.

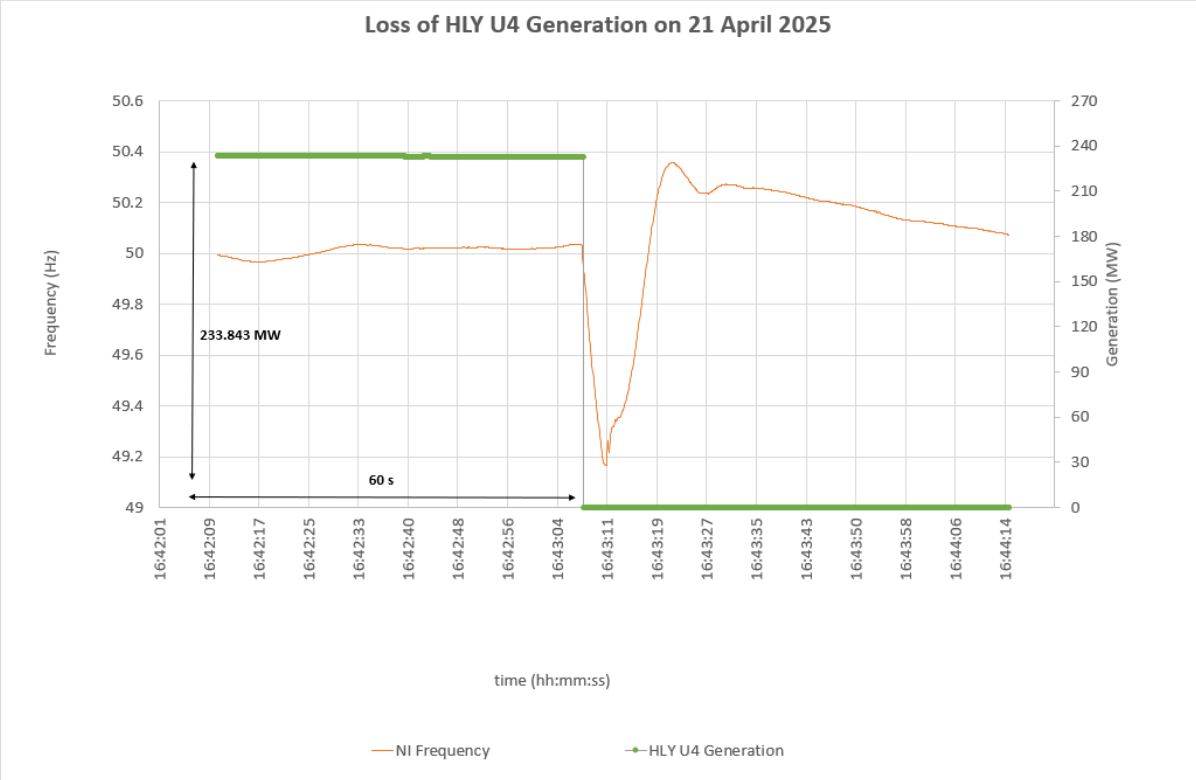
This means after their investigation, Genesis found that Unit 4 shut down automatically for safety reasons. This was because moisture had entered the Buchholz terminal box (part of a system that detects problems in transformers), causing a brief electrical connection that triggered the shut down of Unit 4.

At 16:43:10 the disconnection of Huntly Unit 4 removed 233.84 MW of generation injection into the power system. Consequently, this reduced the system frequency in the North Island to below 49.25 Hz at 16:43:11 (49.16 Hz).

Genesis confirmed the MW lost as 233.84.

*Please note the system operator's graph below does not precisely time the tripping of Huntly Unit 4. This is because there is a time delay in the system operator's SCADA data (which resulted in the delayed recording of Huntly Unit 4 tripping).*

## North Island Frequency



# RATIONAL FOR RECOMMENDATION

## Factors considered

A review of trippings and alarms at HLY and surrounding stations was conducted. The only protection indications observed were autoreclose block alarms, which were a consequence of the tripping of Huntly Unit 4. No other fault indications were observed from Transpower protection systems, and all equipment operated as expected.

Additionally, there were no HVDC events that contributed to this event, and the HVDC system responded appropriately during the event.



Accordingly, assessment of this information confirms that only the tripping of Huntly Unit 4 can be linked with North Island frequency falling below 49.25Hz.

Genesis Energy and the Grid Owner were both asked if they considered themselves the causer of the under-frequency event.

Genesis Energy confirmed that the tripping of Huntly Unit 4 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.

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:



$$EC = ECR \times \left( \sum_{y} INT_{y,e} - INJ_D \right)$$

where

$EC$ is the event charge payable by the causer

$ECR$ is $1,250 per MW

$INJ_D$ is 60 MW

$INT_{y,e}$ 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 $INJ_D$ values are constants the values to calculate and complete the formula are y and $INT_{y,e}$.

Using the event charge formula the calculation is as follows:

Event Charge = $1250/MW * (233.84MW – 60MW)

Event Charge = $217,300.00

# Appendix 1: CORRESPONDENCE

## 1.1 CONFIRMATION OF EVENT NOTICE

TRANSPOWER CAN

## Customer Advice Notice

| | | | |
|---|---|---|---|
| **To:** | CAN NZ Participants | **From:** | The System Operator |
| **Sent:** | 28-apr-2025 14:26 | **Telephone:** | 0800 488 500 |
| **Ref:** | 6219621826 | **Email:** | NMData@transpower.co.nz |

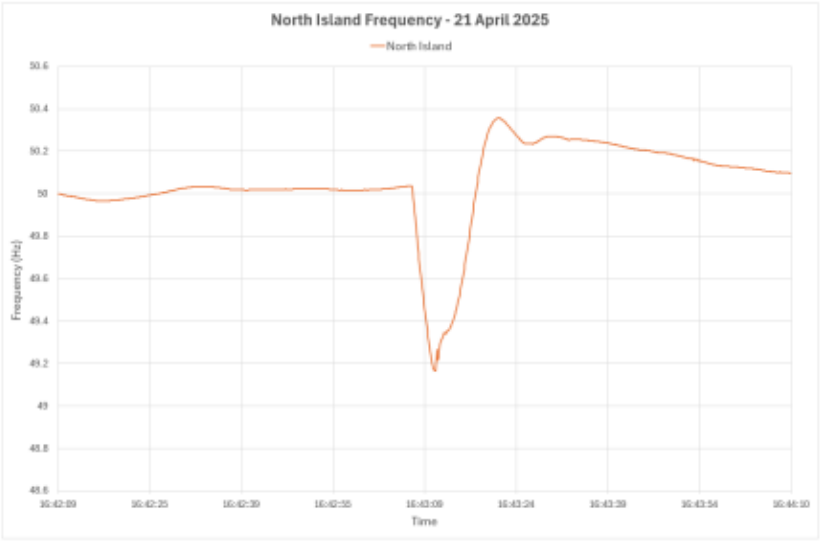
**Revision of:**



### Under-Frequency Event Confirmation

The system operator wishes to advise market participants of an under-frequency event which occurred in the North Island on 21 April 2025.

| | |
|---|---|
| **Event ID** | 4550 |
| **Affected Islands:** | North Island |
| **North Island Minimum Frequency:** | 49.16 Hz |
| **Time (start of UFE):** | 16:43:11 |
| **Time (of min. frequency):** | 16:43:11 |




The System Operator is investigating the cause of the following under-frequency event in accordance with Part 8, clause 8.60 (1) of the Electricity Industry Participation Code 2010. Ancillary Services Agents who were dispatched to provide instantaneous reserves at the time of the event should be prepared to provide information to the System Operator within 5 Business Days of receiving a request for information in accordance with clause 8.60(4) of the Electricity Industry Participation Code 2010.

Market Operations

Transpower NZ Ltd
P.O. Box 1021,
Wellington 6140,
New Zealand
Telephone: 04 590 7470
market.operations@transpower.co.nz

A revision of this notice will be issued if there is any change to the situation above.

Transpower New Zealand Ltd The National Grid

## 1.2 SYSTEM OPERATOR REQUEST FOR INFORMATION – GENESIS ENERGY

TRANSPOWER

Waikoukou
22 Boulcott Street
PO Box 1021, Wellington
New Zealand
Telephone +64-4-590 7000
Facsimile: +64-4-495 7100

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6 May 2025

Steve Leppien
Genesis Energy Limited
Private Bag 3131
Hamilton

Dear Steve,

**21 April 2025 Under-Frequency Event**

On 21 April 2025 at 16:43:11 an under-frequency event occurred in the North Island. We are investigating the event and require the following information from you:

- **Detailed account of the event:** Could you please provide a thorough description of the sequence of events as observed from your perspective during the under-frequency event. Furthermore, we request your assessment of the potential causes that may have contributed to the under-frequency frequency event that occurred on 21 April 2025. This should include any operational anomalies, equipment behaviour, or control actions taken around the time of the event. Furthermore, we request your assessment of the potential causes that may have contributed to the under-frequency event.
- **Confirmation or alternative data for MW loss:** Our preliminary assessment of SCADA data indicates a loss of **233.843 MW** at HLY Unit 4 during the event. Could you please confirm this value based on your site-specific data. If your data indicates a different value for the MW loss, please provide the alternative figure and any supporting information or logs.
- **Assessment of causation under the Code:** Based on your operational data could you please provide your assessment of whether or not your actions or the behaviour of your assets could have been the causer of the under-frequency event as per the Code. Please provide a reasoned explanation for your assessment.

Please provide the above information to us in writing by **5pm on 4 June 2025**.

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,

**Samantha Naidoo**
Corporate Counsel - Compliance & Impartiality

## 1.3 SYSTEM OPERATOR REQUEST FOR INFORMATION – GRID OWNER

TRANSPOWER

Waikoukou
22 Boulcott Street
PO Box 1021, Wellington
New Zealand
Telephone +64-4-590 7000
Facsimile: +64-4-495 7100

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6 May 2025

Mao Reyes
Grid Compliance Manager
Grid Owner
Transpower
Wellington

Dear Mao,

**21 April 2025 Under-Frequency Event**

On 21 April at 16:43:11 an under-frequency event occurred in the North Island. We are investigating the event and require the following information from you:

- **Detailed account of the event:** Could you please provide a thorough description of the sequence of events as observed from your perspective during the under-frequency event that occurred on 21 April 2025. This should include any operational anomalies, equipment behaviour, or control actions taken around the time of the event. Furthermore, we request your assessment of the potential causes that may have contributed to the under-frequency event.
- **Assessment of causation under the Code**: Based on your operational data could you please provide your assessment of whether or not your actions or the behaviour of your assets could have been the causer of the under-frequency event as per the Code. Please provide a reasoned explanation for your assessment.

Please provide the above information to us in writing by **5pm on 4 June 2025**.

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,

**Samantha Naidoo**
Corporate Counsel - Compliance & Impartiality

## 1.4 GENESIS ENERGY RESPONSE

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

T. 07 982 7909

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12 May 2025

Samantha Naidoo
Corporate Counsel - Compliance and Impartiality
Transpower New Zealand Limited
P O Box 1021
WELLINGTON 6140

By email: samantha.naidoo@transpower.co.nz

Dear Samantha,

**RE: 21st April 2025 Under-Frequency Event**

I refer your letter dated 6 May 2025 requesting information from Genesis to help identify the causer of the 21st of April 2025 under-frequency event.

**Detailed account of the event:**
On the 21st of April Huntly generating units were running within normal operational parameters. At 16:43 Unit 4 protection initiated a unit trp. Investigation identified the T14 (16.5/3/3kV unit supply transformer) Buchholz protection had operated. Further analysis identified moisture ingress and momentary conductive tracking to the trip contact within the Buchholz terminal box as the likely cause of the trip.

Remedial work and tests were undertaken to resolve the fault and Unit 4 returned to service on the 23rd of April.

**Loss of Injection Figure:**
Genesis concurs with Transpower's assessment of the loss of injection figure.

**Causer:**
Genesis considers it (Huntly Unit 4) was the causer of the 21st of April 2025 under-frequency event as per the detailed account of the event above.

Yours faithfully
**GENESIS ENERGY LIMITED**

Steve Leppien
**Regulatory and Quality Assurance Manager**

## 1.5 GRID OWNER RESPONSE

TRANSPOWER

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22 Boulcott Street
PO Box 1021
Wellington 6140
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www.transpower.co.nz

03 June 2025

Samantha Naidoo
Corporate Counsel – Compliance & Impartiality Manager
System Operations
Transpower
Wellington

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Dear Samantha,

Thank you for your request regarding the under-frequency event that occurred on **21 April 2025 at 16:43**. Please find below our response:

**1. Detailed Account of the Event**

- At 16:43:11 on the 21 April 2025, Genesis Unit 4 tripped.
- A review of trippings and alarms at HLY and surrounding stations was conducted. The only protection indications observed were autoreclose block alarms, which were a consequence of the tripping of Genesis Unit 4. This resulted in the following sequence of events:
  - HLY CB542 (half breaker) and HLY CB522 (HLY-SFD-1) autoreclose protection was blocked.
  - HLY CB562 (connected to Unit 4) opened.
  - HLY CB542 then opened, followed by Genesis-owned CB42 (Unit 4).

  These events occurred within approximately 60 milliseconds. No other fault indications were observed from Transpower protection systems, and all equipment operated as expected.
- Additionally, there were no HVDC events that contributed to this event, and the HVDC system responded appropriately during the event. Prior to the event, HVDC was transferring 50 MW south. During the event, the transfer was modulated to 170 MW north, thereby reducing the severity of the under-frequency event.

**2. Assessment of Causation Under the Code**

Based on our operational data and protection system review, we assess that our assets and operational actions were not the cause of this under-frequency event.

Please let us know if any further information is required.

Yours sincerely,

Melanie Marr
Grid Compliance Manager

# Appendix 2: CHARTS

## System Frequency (North Island) and MW Trace 21 April 2025

### North Island Frequency