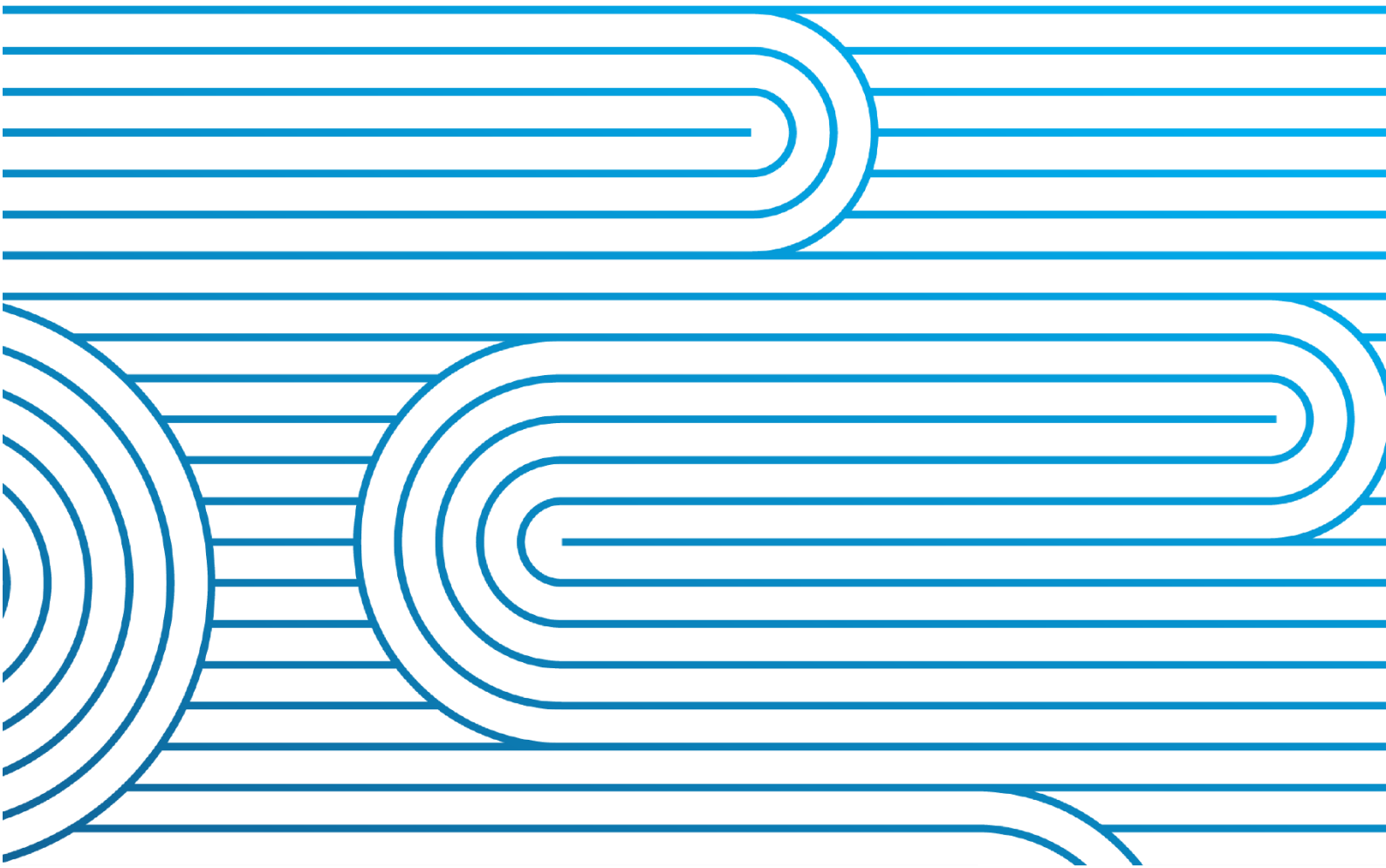
TRANSPOWER

Monthly System Operator and system performance report

for the Electricity Authority

August 2021



Report Purpose

This report is Transpower's review of its performance as system operator for July 2021, in accordance with clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

A detailed system performance report (Code obligated) is provided for the information of the Electricity Authority (Authority).

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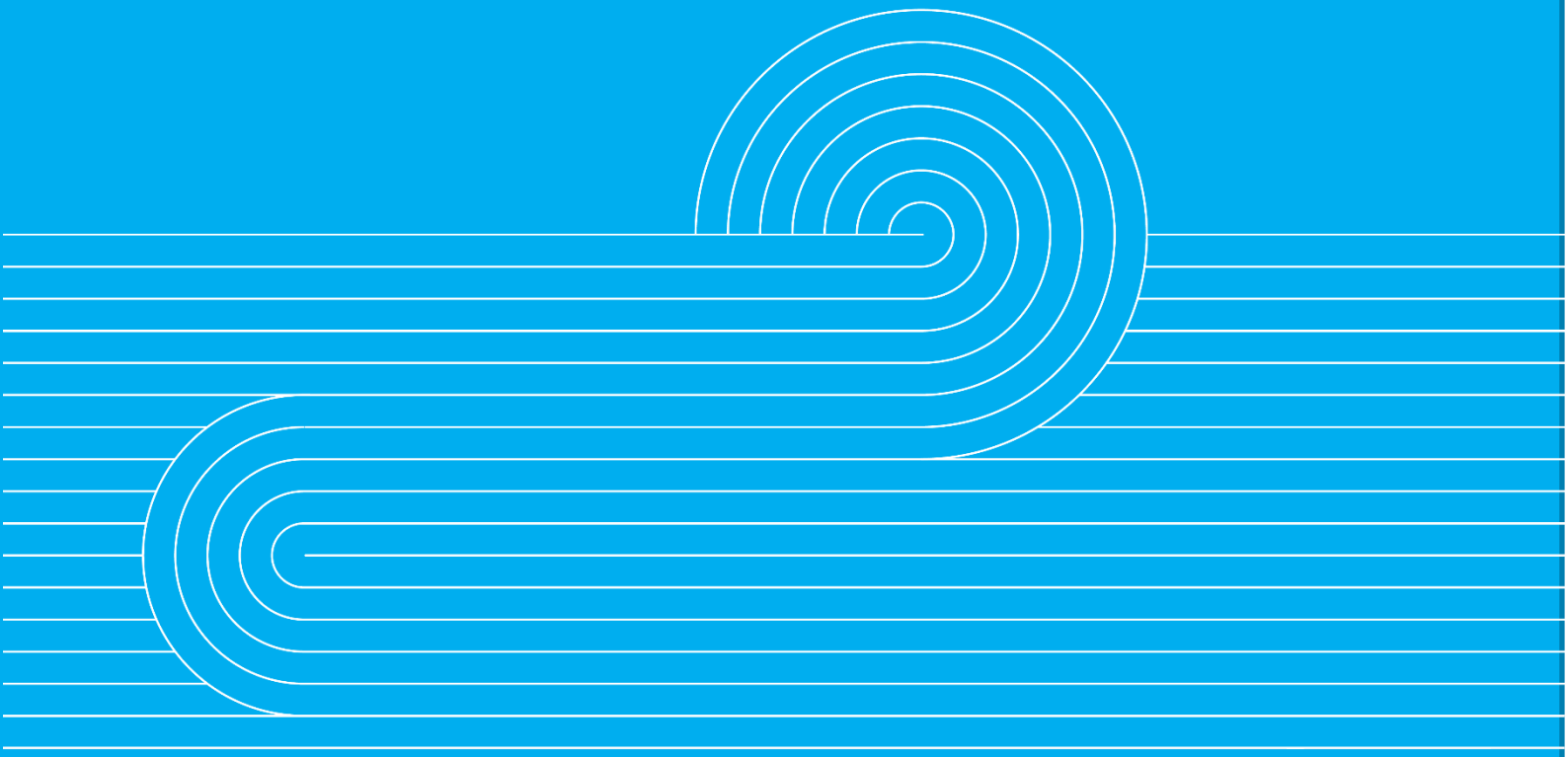
System operator performance



1 Highlights this month

- On 9 August the System Operator forecasted and communicated a residual shortfall over the evening peak. As the country approached the evening peak a generation shortfall coupled with high demand resulted in a Grid Emergency being declared. An instruction to reduce demand was issued resulting in some consumers being disconnected. An independent investigator has been engaged by Transpower to review this event. The System Operator is also supporting the Authority and MBIE with their own investigations.
- A generation failure took place at Tuai over the morning peak on 16 August (7:37am-8:00am). This was resolved with a demand reduction of 26MW which was managed by local EDB's without any loss of supply.
- HVDC Pole 2 conductor was damaged by high winds just after 3pm on the 17 August. As a result, a forecast shortfall for the evening peak period was signalled via a Grid Emergency Notice and communicated via an industry conference. A demand response by EDB's using controllable load in the North Island ensured the system was secure and additional generation was made available in subsequent days. HVDC Pole 2 bi-pole service returned at 13:00 on 26 August.
- The System Operator Annual Self-Review for the 20/21 financial year was delivered to the Authority. The Authority will now carry out their own review of System Operator performance for 20/21 which will be published later this year.
- With the change to National Alert Level 4 (AL4) across New Zealand on 17 August, Operations activated its incident management response team, notified the Authority and commenced regular situational reporting. In addition, a number of health and safety measures are being implemented to ensure the safety of staff and the security of the system.
- As of 29 August, national hydro storage sits at 117% of average for the time of year. This follows a winter of heavy rainfall which has enabled the country to recover quickly from the dry scenario which took place earlier in the year. South Island winter inflows have been the second highest on record (compared to previous winter seasons), reaching 1,278 GWh.
- Cold weather across the country lead to a new national peak demand record, which was set on Monday 9 August when demand reached 7,080 MW (half-hourly average).
- The Electricity Authority announced the FSR programme of work to industry on 10 August. Phase 1 of the work programme is on track with a draft report outlining future challenges and opportunities due at the end of September.

2 Customers and other relationships

SOSPA Management

This month the System Operator Annual Self-Review for the 20/21 financial year was delivered to the Authority. The Authority will now carry out their own review of System Operator performance for 20/21 which will be published later this year.

The annual publication of the Joint Development Programme was prepared and published on the Authority's website. This joint obligation includes a combination of the Authority's work programme and the System Operator's capital and investigation work planned across the next five years.

An update to the System Security Forecast was published during the month which incorporates Tiwai's deferred exit and other new committed assets such as Harapaki wind farm, transformer replacements at Edgecumbe and Fernhill to name a few. These and other asset changes have resulted in a number of security issues being resolved, and two new N-1-1 [1] issues to manage due to the new Bombay interconnecting transformers (more on this here). The SSF confirmed that we will be able to meet our Principal Performance Obligation over the next three years.

3 Risk & Assurance

COVID-19 Response

With the change to COVID-19 Alert Level 4 (AL4) across New Zealand on 17 August, Operations activated its incident management response team, notified the Authority and commenced regular situational reporting. Under AL4 we implemented our planned COVID-19 protocols into our control rooms, including restricted access, physical room separation within control rooms, shift bubbles and increased cleaning. Note: our four Transpower control rooms across New Zealand operate to the highest alert level any one of them is exposed to. We have also been investigating additional protocols such as saliva testing.

Other steps required to account for changing demand with alert levels included adjusting load forecasts, adjusting our reserve management tool parameters for exempt AUFLS industrial load, and reminding Participants to inform us of changes to their AUFLS provision and any changes in demand greater than 50 MW. We will continue to monitor the situation and adjust as required to account for changing alert levels.

[1] A. When HLY-DRY 1 220 kV circuit or the HLY-TAK-OTA 2 220 kV circuit is on outage and the other trips causing a Bombay-Hamilton circuit to overload. This occurs as one of the Bombay-Hamilton circuits is disconnected as part of the Bombay interconnection grid upgrade.
B. When the DRY-TAK-OTA 1 220 kV circuit is on outage and a BOB-WIR-OTA 110 kV circuit trips overloading the other. This is a by-product of having more power injected into the Bombay 110 kV system.

Managing high voltages during trough periods overnight has required additional effort. On 29 August we switched out 11 circuits to keep voltages to an acceptable pre contingent limit, as compared to 3 circuits for the same time last year. We will continue to carefully monitor and plan for this, however increasing load due to the reducing COVID-19 national alert levels (excluding Auckland) will improve the situation.

4 Compliance

We submitted an interim system operator self-breach report to the Authority on 13 August relating to the grid emergency event of 9 August. The report identified three Code provisions that were potentially breached on 9 August. However, the report was only an interim report pending a full investigation of the event. The system operator has engaged an external consultant to investigate the event and the terms of reference include assistance in identifying any potential Code breaches. The investigation report is due to the Authority by 9 November under the system operator's Significant Incident Reporting procedure (the event is classified as a 'moderate' event under the procedure). We will not be able to determine if any Code provisions were breached until we have the investigation is complete and the interim self-breach report was submitted on that basis.

5 Impartiality of Transpower roles

No items were opened in the register during August.

We have five open items in the register that are being actively managed in accordance with our Conflict of Interest procedure.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
29	**Preparing the Net Benefit test – system operator involvement:** The system operator is reviewing how it can provide information for use by the grid owner undertaking a Net Benefit Test.	Operations Planning Manager
31	**Discussions concerning Demand Response:** A system operator employee is part of a Transpower working group investigating the possible future use of the Transpower demand response platform. The system operator role is to provide the system operator perspective on any demand response proposals. Impartiality mitigations have been implemented to ensure the grid owner is not treated more favourably than any other participant with respect to demand response.	SO Market and Business Manager
39	**New SO Compliance & Impartiality Manager:** This relates to potential perception; the person filling this role also works for Transpower's legal team on a part-time basis. Workstreams will be allocated accordingly.	GM Operations
40	**General system operator/grid owner dual roles:** This is a general item that will remain permanently open to cover all employees with a dual system operator/grid owner role. The item documents the actions necessary to ensure impartiality in these circumstances; these items will be monitored to ensure their continue effectiveness.	SO Compliance & Impartiality Manager
41	**General relationship situation:** This is a general item that will remain permanently open to cover all potential conflicts of interest arising under a relationship situation. This item documents the actions necessary to prevent an actual conflict arising and will be monitored by the SO Compliance & Impartiality Manager to ensure their continued effectiveness.	SO Compliance & Impartiality Manager

6 Project updates

6.1 Market design and service enhancement project updates

Progress against high value, in-flight market design, service enhancement and service maintenance projects are included below along with details of any variances from the current capex plan.

Real Time Pricing (RTP)

All phase one defects have now been resolved or scheduled for release. Phase two work is progressing. Additional resourcing has been assigned to assist with progress on development of one component which has been hindered by increased childcare impacts associated with the Covid-19 lockdown; this work is not on critical path. Completion of SCADA Data Validation (SDV) development has taken seven weeks longer than originally forecast with delays managed so as not to affect critical path (e.g testing of components as they become available). Phase 3 is in progress with work being undertaken on component design, detailed requirements, user interface and business process.

Inter-project scheduling and environment conflicts continue to be monitored with no significant issues arising.

Phase two business procedure reviews and updates continue to progress and training development continued through August. Phase three requirement validation and system functional requirement workshops continued through August.

The August industry engagement session was held and primarily featured the NZX talking about changes to the WITS trading platform. Work is now underway on the final two webinars of this engagement cycle which will focus on demand side market changes.

AUFLS Customer Portal Launch

This month we progressed the onboarding of all affected North Island AUFLS providers onto the AUFLS application in the customer portal. All providers have been set up, except Eastland Network - due to a lack of engagement on their end. This matter has been raised with the EA. The next training workshops are scheduled for 20 and 21 September.

This month, the Electricity Authority published its decision on the extended reserve Code Consultation after which the System Operator commenced its consultation on the AUFLS Technical Requirements (ATR) document. The ATR Document details the performance and compliance requirements of a 4-block AUFLS scheme to be connected to the power system in the North Island to meet the Code obligations set out in Part 8, Technical Code B – Emergencies. In meeting these obligations, the System Operator can plan to comply, and comply with its Principal Performance Obligations. The consultation period will close on 15 September.

7 Technical advisory hours and services

Technical advisory hours and a summary of technical advisory services to which those hours related (SOSPA 12.3 (d) refers) will be provided in the next quarterly report.

Future Security & Resilience (FSR)

The Electricity Authority announced the FSR programme of work to industry on 10 August. Phase one of the work programme is on track with a draft report outlining future challenges and opportunities due at the end of September. Sapere have been engaged to undertake an independent review of the report prior to it being finalised.

Upcoming TAS work

TAS work relating to Battery Offering Reserves (TAS100) and the December 2019 UTS (TAS 101) are awaiting approval and will begin in September.

8 Outage planning and coordination

Outage Planning – near real time

Whilst outage numbers have been low during August, the Covid-19 level 4 lockdown led to increased outage changes and uncertainty, with the grid owner and distributors postponing and re-planning work. We anticipate increased workloads in October and November as a result.

NZGB analysis

September's New Zealand Generation Balance Report forecasts no N-1-G shortfalls for the base scenario for the next six months. Applying low gas and no wind assumptions we see some N-1-G scenarios with small shortfalls in early September and early to mid-October. The system operator has changed the load growth factor applied to NZGB for the period 1 September 2021 to 31 August 2022 from 2% to 4% to reflect possible changes to load management practices when regional coincident peak demand incentives within the transmission pricing methodology are removed.

An industry conference was held on 19 August to provide an update on recent market events, progress on the restoration of Pole 2 and to give an update on issues affecting outputs from the NZGB tool. Slides presented on NZGB are here.

9 Power systems investigations and reporting

No items to report.

10 Performance metrics and monitoring

System operator performance against the performance metrics for the financial year as required by SOSPA 12.3 (a) will be provided in the next quarterly report.

11 Cost-of-services reporting

This will be provided to the Authority in late 2021.

12 Actions taken

A full list of actions taken regarding the system operator business plan, statutory objective work plan, participant survey responses and any remedial plan, as required by SOSPA 12.3 (b) will be provided in the next quarterly report.

System performance

13 Security of supply

As of 29 August, national hydro storage sits at 117% of average for the time of year. This follows a winter of heavy rainfall which has enabled the country to recover quickly from the dry scenario which took place earlier in the year. South Island winter inflows have been the second highest on record (compared to previous winter seasons), reaching 1,278 GWh. These are the highest inflows seen during winter since 1970.

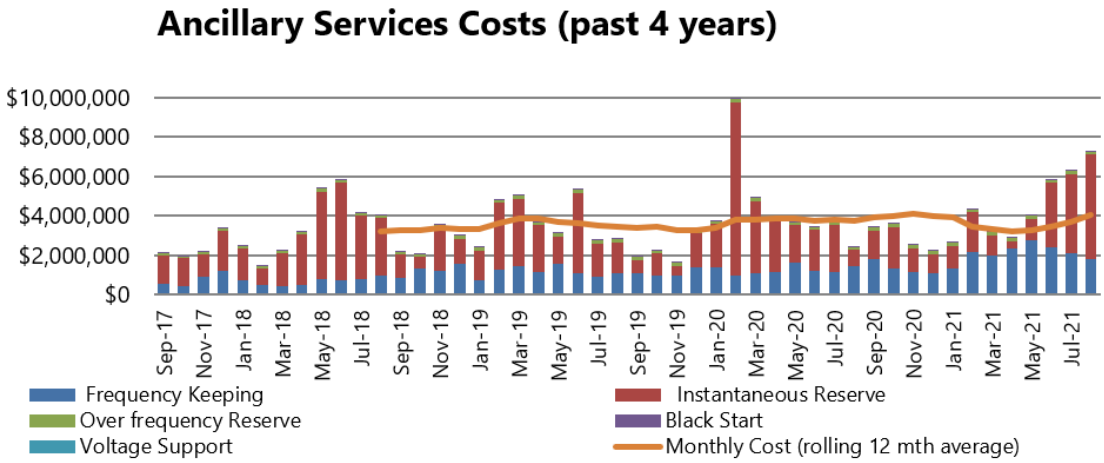
Wind generation has been high in the latter half of August, comprising 8% of the generation mix for the week ending 22 August and 7% for the week ending 29 August. However, variability in wind generation has resulted in some tight evening peaks; this has been particularly noticeable with less baseload thermal generation running.

Improved hydro storage levels coupled with strong wind have seen the average price at Haywards drop to $194/MWh for the month of July. This is down from an average price for May of $280/MWh which was seen in the midst of this year's dry scenario, when hydro storage was well below average. With the onset of the National Alert Level 4 Covid-19 lockdown, which saw a drop in demand, August prices at Haywards dropped further, averaging $145/MWh. These lowered prices have corresponded with a reduction in baseload thermal, with TCC and the third Rankine offering out of the market.

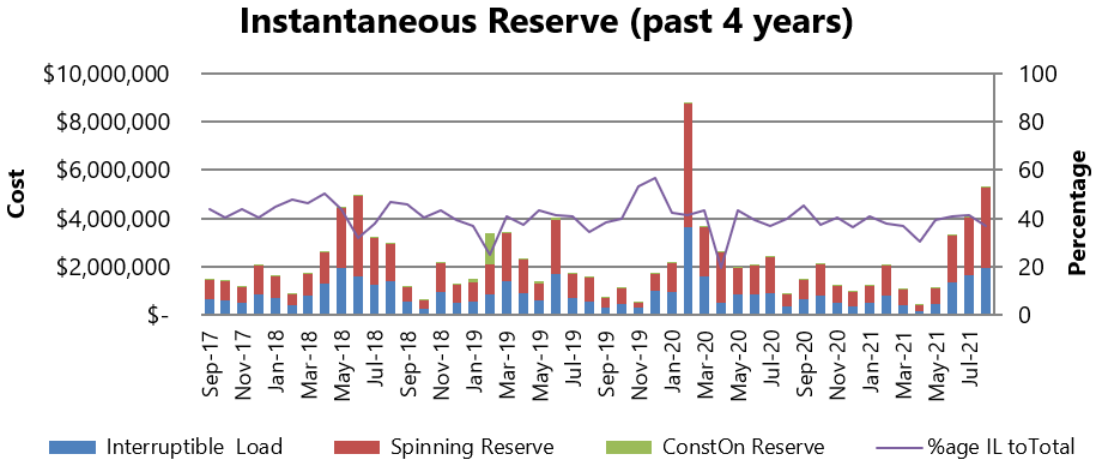
Cold weather across the country lead to a new national peak demand record, which was set on Monday 9 August when demand reached 7,080 MW (half-hourly average). Over this peak there was insufficient generation to meet demand resulting in operations instructing load to be shed. More on the cause and learnings from this event will come from ongoing investigations. With TCC and the third Rankine not offering in the market through August, energy margins over peaks were tighter than during the previous peak demand period on 29 June 2021.

Inter-island price separation was experienced in late July and August due to HVDC constraints and outages. This was resolved when Pole 2 returned to service on 26 August.

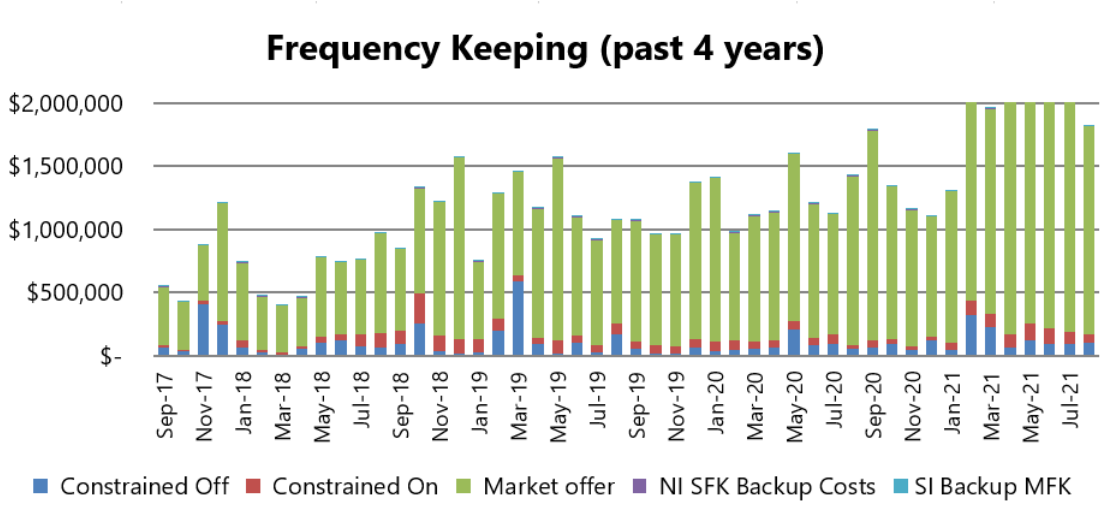
14 Ancillary services



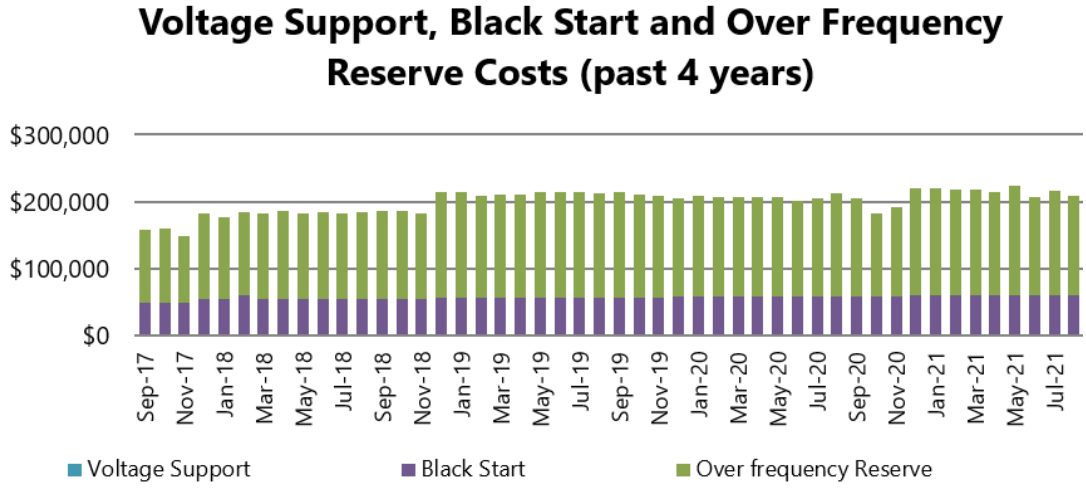
This month's ancillary services costs were $7.31 million, an increase of $960k (15.1% increase) from the previous month. While the cost of frequency keeping fell slightly, the overall costs rose due to a significant increase in costs associated with instantaneous reserves.



This month's instantaneous reserve costs were $5.28 million, an increase of $1.26 million (31% increase) from the previous month. We saw a slight increase in the quantity of North Island fast instantaneous reserves procured. However, the major contributor to this month's increase was a significant jump in the average price for fast instantaneous reserves in the North Island.



This month's frequency keeping costs were $1.8 million, a decrease of $$286k on the previous month (14% decrease). The decrease was primarily due to a $278k (20% decrease) in North Island frequency keeping costs. Additionally, constrained on payments decreased by $29k (32% decrease) on the previous month.



Over frequency costs decreased slightly this month to $148k. Black start costs remained at $60k. There are currently no voltage support costs.

15 Commissioning and Testing

Commissioning of Turitea Wind Farm continued in August. Commissioning of the full station (118 MW) will run through until November 2021.

16 Operational and system events

9 August Demand Management Event

On 9 August the System Operator forecasted and communicated a residual shortfall over the evening peak. As the country approached the evening peak Tokaanu generation had an unplanned reduction in output due to weed which coincided with a significant reduction in wind generation; the result was a generation shortfall. Coupled with high levels of demand and no further available generation offered the residual shortfall became too large and frequency could not be maintained. This resulted in a Grid Emergency being declared to rebalance the system and increase overall security in order to avoid the potential activation of AUFLS should a contingent event have occurred during the shortfall period. An instruction to reduce demand was issued to all connected parties resulting in some consumers being disconnected. The prompt action and immediate response by most EDB's averted a potentially more widespread event.

An independent investigator has been engaged by Transpower to review and report on this event. The System Operator is supporting the Authority and MBIE with their investigations.

16 August Hawkes Bay GEN

A generation failure at Tuai over the morning peak on 16 August (7:37am-8:00am) was resolved with a demand reduction of 26MW managed by the local EDB's through a combination of discretionary load, local generation, and load redirection without loss of supply.

17 August HVDC Pole 2 Failure

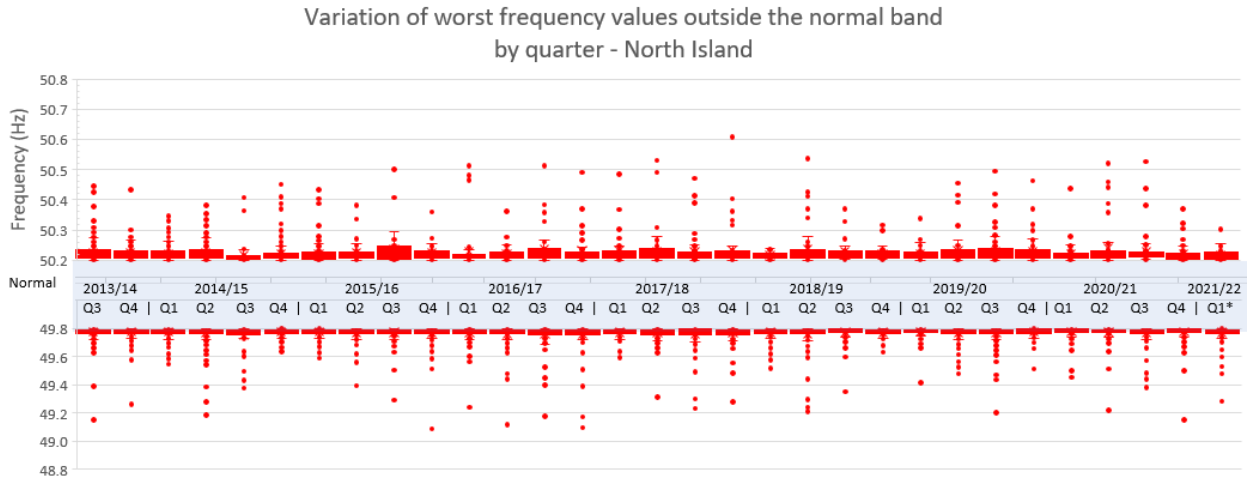
Due to severe weather in Weka Pass in the Upper South Island damage was sustained to transmission towers and conductors and resulted in unavailability of HVDC Pole 2 from 15:12 on 17 August. Without Pole 2 in place a forecast shortfall for the evening peak period was signalled via a GEN and further communicated via an industry conference. Communications included signalling of the required Bi-Pole outages needed to complete repairs. Weather conditions and COVID-19 restrictions made for a highly challenging restoration. However, response by EDB's using controllable demand and additional NI generation made available on subsequent days ensured a stable system. The HVDC Pole 2 bi-pole service returned at 13:00 on 26 August without any loss of power.

17 Frequency fluctuations

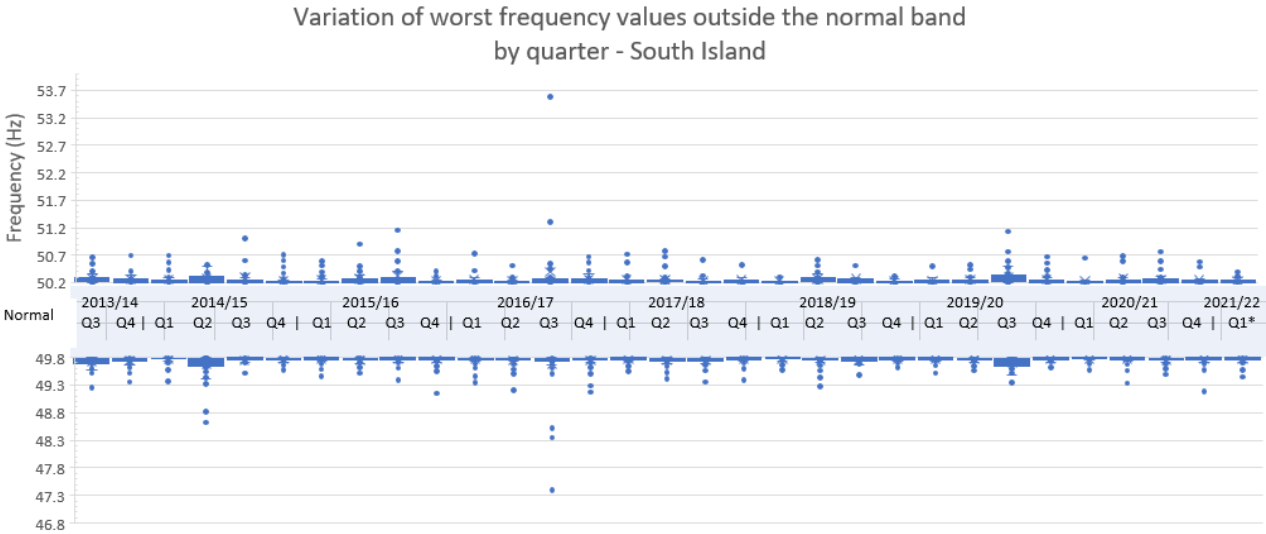
17.1 Maintain frequency in normal band (Frequency value)

The following charts show the distribution of the worst frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period.

North Island



South Island



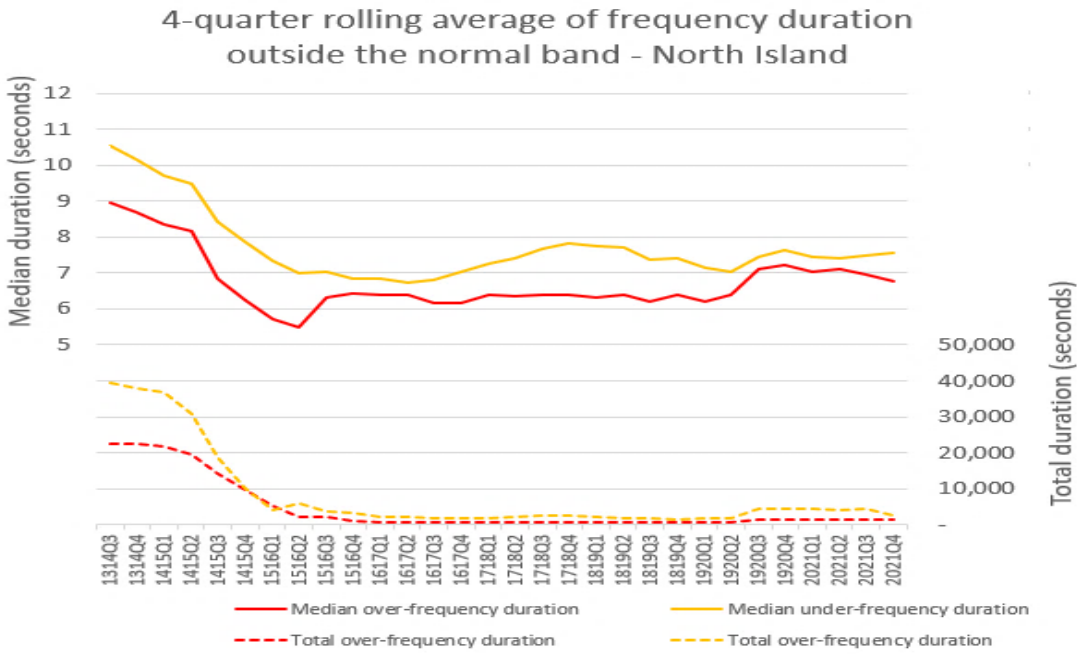
*2021/22 Q1 contains data for July and August only

Note: These box and whisker charts show the distribution of data. The “box” represents the distribution of the middle 50% of the data, the “whiskers” indicate variability, and outliers are shown as single data points.

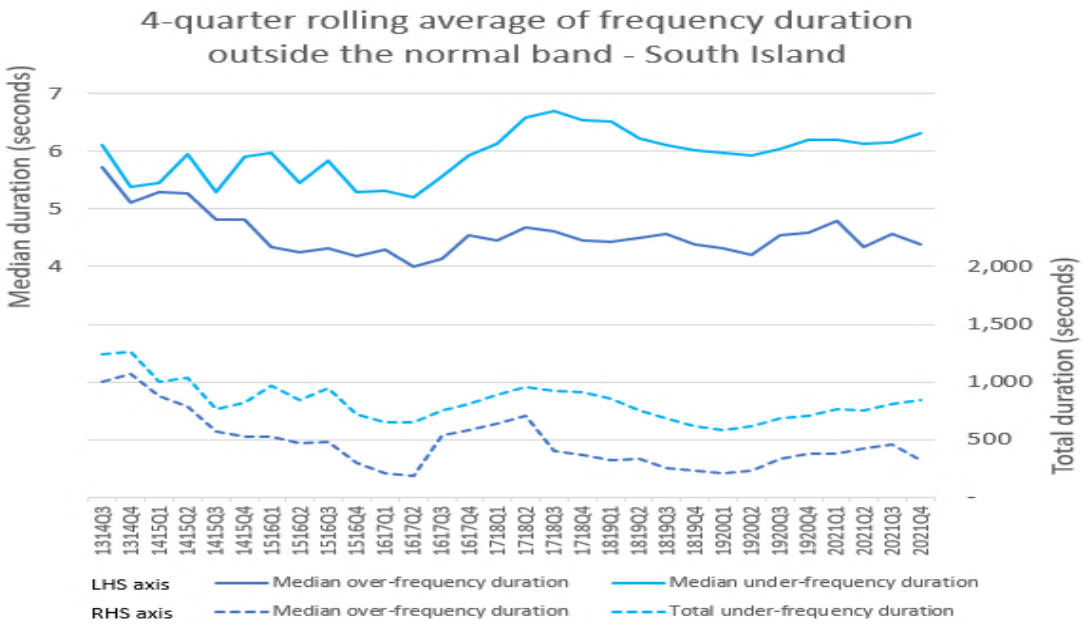
17.2 Recover quickly from a fluctuation (Time)

The following charts show the median and total duration of all the momentary fluctuations above and below the normal band for each island. The information is shown as a 4-quarter rolling average to illustrate trends in the data.

North Island



South Island

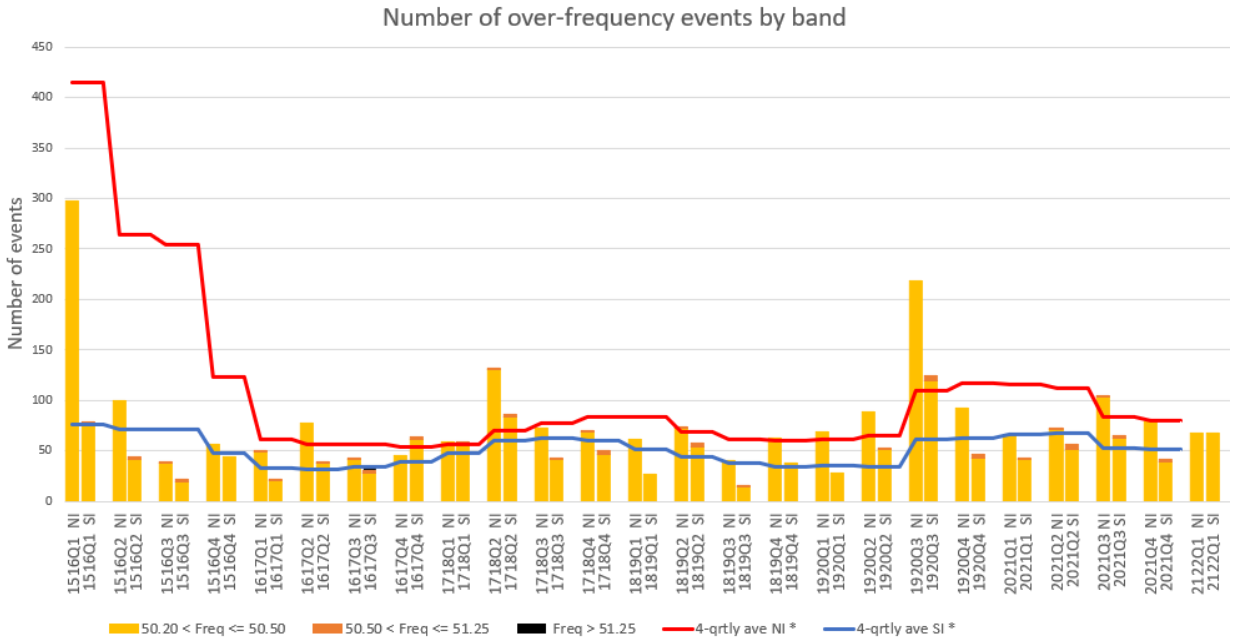


*These graphs have not been updated since 2020/21 Q4; they will only be updated at the end of each quarter

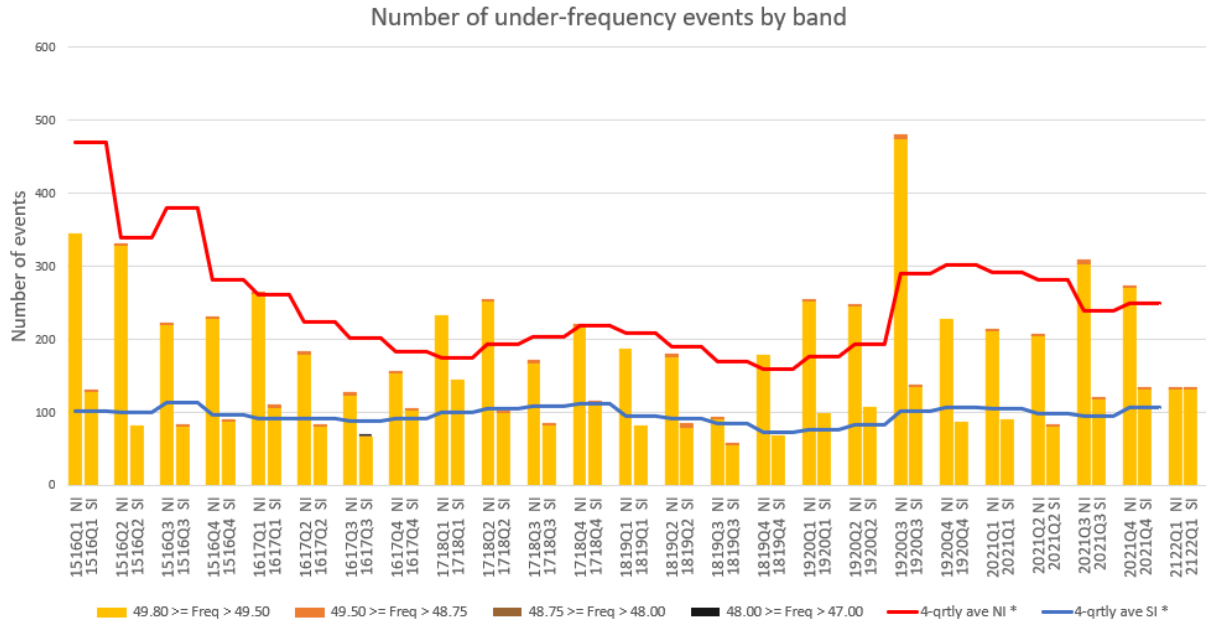
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

The following charts show the number of momentary fluctuations outside the frequency normal band, grouped by frequency band, for each quarter since Q1 2015/16. The information is shown by island, including a 4-quarter rolling average to show the prevailing trend.

Over-frequency events



Under-frequency events



* 4-quarterly rolling averages for NI and SI are only updated at the end of each quarter

17.4 Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

18 Voltage management

Grid voltages did not exceed the Code voltage ranges during the reporting period.

19 Security notices

The following table shows the number of Warning Notices, Grid Emergency Notices and Customer Advice Notices issued over the last 12 months.

Notices issued	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	1
Grid Emergency Notice	-	1	-	2	-	1	1	-	-	1	-	4
Warning Notice	-	-	-	-	-	1	-	-	-	-	1	4
Customer Advice Notice	9	6	12	10	8	4	4	8	14	14	11	42

20 Grid emergencies

The following table shows grid emergencies declared by the system operator.

Date	Time	Summary Details	Island
09/08/21	18:00	A grid emergency was declared due to insufficient generation offers to meet national demand.	N + S
10/08/21	07:30		
16/08/21	07:37	A grid emergency was declared due to insufficient transmission capacity to meet Hawkes Bay demand.	N
17/08/21	17:00	A grid emergency was declared due to insufficient generation offers to meet North Island demand.	N

Appendices

Appendix A: Discretion

Event Date and Time	Description
02-Aug-2021 17:52:44	WHI2201 WHI0 Discretion Clause 13.70, Part 13 ENR Min : 10 Start: 02-Aug-2021 17:52 End: 02-Aug-2021 18:00 Notes: Minimum run 10MW, required due to low residual. Last Dispatched Mw: 5.21
02-Aug-2021 18:10:03	WHI2201 WHI0 Discretion Clause 13.70, Part 13 EN Min : 10 Start: 02-Aug-2021 18:10 End: 02-Aug-2021 18:30 Notes: Low residual, minimum run 10MW. Last Dispatched Mw: 9.76
09-Aug-2021 17:01:02	WHI2201 WHI0 Discretion Clause 13.70, Part 13 ENR Min : 10 Start: 09-Aug-2021 17:01 End: 09-Aug-2021 21:00 Notes: Keep on minimum for security over PMPK. Extended until duration of the GEN i.e 21:00. Last Dispatched Mw: 45.6
09-Aug-2021 20:38:20	WHI2201 WHI0 Discretion Clause 13.70, Part 13 EN Min : 10 Start: 09-Aug-2021 20:38 End: 09-Aug-2021 21:00 Notes: Just a Change of the type of Discretion from 'Total Capability' to 'Energy Only' .Last Dispatched Mw: 10
10-Aug-2021 07:00:00	WHI2201 WHI0 Discretion Clause 13.70, Part 13 EN Min : 10 Start: 10-Aug-2021 07:00 End: 10-Aug-2021 07:30 Notes: Required for morning peak security of supply. Last Dispatched Mw: 25
12-Aug-2021 08:46:45	ARG1101 BRR0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 12-Aug-2021 08:46 End: 12-Aug-2021 09:00 Notes: Planned switching. Last Dispatched Mw: 11.5
12-Aug-2021 09:19:00	ARG1101 BRR0 Discretion ended following completion of planned switching.
13-Aug-2021 11:27:12	ARG1101 BRR0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 13-Aug-2021 11:27 End: 13-Aug-2021 12:00 Notes: Planned switching. Last Dispatched Mw: 10.0MW
13-Aug-2021 11:51:00	ARG1101 BRR0 Discretion ended following completion of planned switching.
17-Aug-2021 16:32:49	BWK1101 WPI0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 17-Aug-2021 16:32 End: 17-Aug-2021 17:00 Notes: BWK_WPI tripped, BWK unable to generate onto the grid. Last Dispatched Mw: 8
17-Aug-2021 16:33:11	HWB0331 WPI0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 17-Aug-2021 16:33 End: 17-Aug-2021 17:00 Notes: BWK_WPI tripped, discretion applied but removed before being dispatch as not required. Last Dispatched Mw: 2
23-Aug-2021 18:20:46	WHI2201 WHI0 Discretion Clause 13.70, Part 13 ENR Min : 10 Start: 23-Aug-2021 18:20 End: 23-Aug-2021 19:00 Notes: SC requests WHI remain on at minimum 10 MW over PM Peak. DC at Capacity, wind at 250, residual at 390. Last Dispatched Mw: 25