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Regulation Branch
Commerce Commission

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Normalisation Application under clause 20.3 of the Transpower Individual Price-Quality Path Determination 2020 (2020 IPP)

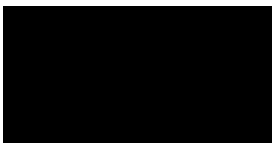
In the early hours of 14 February 2023, severe weather from Cyclone Gabrielle started to impact the operation of the National Grid in the Hawke's Bay and neighbouring regions. The Redclyffe (RDF) 220 kV and Whirinaki (WHI) substations tripped because of inundation; we saw a 103 MW loss of supply across the five grid substations in the region (RDF, WHI, Whakatu (WTU), Tuai (TUI) and Fernhill (FHL)), as well as disconnecting generation at TUI and WHI.

Implementation of a series of temporary solutions enabled us to partially restore supply in stages, and fully restore supply (to customers ready to take it) on 22 February with single protection. Recovery work has begun to fully restore the system with appropriate levels of protection. The recovery work is scheduled to take 3-4 months.

This normalisation application covers the initial interruptions until single-protected supply was available, related outages in the Central North Island in the 12 hours preceding the loss of Redclyffe substation, and planned outages taken (or planned to be taken) after the initial response ('recovery' phase) to return the system to normal operation.

Our normalisation event application, in accordance with clause 20.3 of the IPP 2020, is **attached**.

Yours sincerely



Mark Ryall
General Manager, Grid Delivery

ATTACHMENT – APPLICATION TO THE COMMERCE COMMISSION UNDER CLAUSE 20.3 OF THE TRANSPOWER INDIVIDUAL PRICE-QUALITY PATH DETERMINATION 2020

The outages

The Redclyffe (RDF) and Whirinaki (WHI) substations were out of service for an extended period after being inundated by flood waters. Other points of connection in the region were affected by these losses. The time and actions taken to return assets to service are discussed in this application; more detail is provided in our periodic reporting on this event, which is available on Transpower's website.

Cyclone Gabrielle's heavy rain and strong winds also caused several outages in the Central North Island. These preceded the loss of supply in Hawke's Bay and were resolved relatively quickly. These outages are included in this application due to being part of the same weather event.

Several post-restoration outages have been taken, or are scheduled to be taken, to return the system to normal operation, and these are also included in this application.

The outages affect our Grid Performance (GP) measures (clauses 14 and 16 of Transpower's Individual Price-Quality Path) and Asset Performance (AP) measures (clauses 17.1 and 18.1). The GP measures focus on number and duration of unplanned interruptions by point of service sub-categories. The AP measures report on unavailability of specified outage blocks. The outages relevant to these performance measures are set out in the tables below.

Table 1: Unplanned interruptions by point of service sub-category – relevant to GP measures

Point of service sub-category	Point of service	Out of service	Return to service	Interruption (hrs)
N Security Generator	KPA110I1	13/2/2023 2126	13/2/2023 2302	1.60
N-1 Security Generator	RP0220I1	14/2/2023 0116	14/2/2023 0130	0.23
N-1 Security Generator	RP0220I1	14/2/2023 0141	14/2/2023 1008	8.45
N-1 Security Material Economic Consequence	FHL033S1	14/2/2023 0739	14/02/2021 0954	2.25
N-1 Security Material Economic Consequence	RDF033S1	14/2/2023 0739	20/02/2023 2114	157.58
N-1 Security Generator	TUI110I1	14/2/2023 0739	14/02/2023 1201	4.37
N-1 Security High Economic Consequence	TUI110S2	14/2/2023 0739	14/02/2023 1352	6.22
N-1 Security High Economic Consequence	WTU033S1	14/2/2023 0739	17/02/2023 1631	80.87

N Security High Economic Consequence	WHI011S2	14/2/2023 0532	8/03/2023 1531	537.98 ¹
N-1 Security Generator	WHI220I1	14/2/2023 1056	8/03/2023 1017	527.35 ¹

Table 2: Outage blocks affected by unplanned interruption – relevant to AP measures

Outage block	Outage start	Outage end	Planned/ unplanned	Outage (hrs)
RDF-T3	14/2/2023 0739	4/04/2023 2257	unplanned	1192.30
RDF-T4	14/2/2023 0739	10/03/2023 1612	unplanned	584.55
RPO_TNG_1	14/2/2023 0116	14/2/2023 0129	unplanned	0.22
RPO_TNG_1	14/2/2023 0141	14/2/2023 1005	unplanned	8.40
RPO_WRK_1	14/2/2023 0116	14/2/2023 0130	unplanned	0.23
RPO_WRK_1	14/2/2023 0141	14/2/2023 1004	unplanned	8.38
RPO_TNG_1	27/3/2023 0739	27/3/2023 0824	planned	0.75
RPO_TNG_1	1/4/2023 1640	1/4/2023 1712	planned	0.53
RPO_WRK_1	27/3/2023 0742	1/4/2023 1711	planned	129.48
RDF-T3	4/4/2023 2300	5/4/2023 0445	planned	5.75
RDF-T4	4/4/2023 2335	5/4/2023 0024	planned	0.82
RDF-T3	3/5/2023 0752	20/5/2023 1542	planned	415.84
RDF-T4	01/6/2023 0749	28/6/2023 1730**	planned	657.7

** outages not yet completed.

¹ Note that the duration of this interruption will be capped at 7 days (168 hours) for the purposes of Grid Performance measure calculations, per the definition of “duration” in the IPP.

Clause 20.3.1 – be made no later than 42 working days after the end of the disclosure year

This application is dated as per cover letter date, and is no later than 42 working days after the end of the disclosure year 2022/23.

Clause 20.3.2 – reasons why Transpower considers a normalisation event has occurred

A normalisation event is defined at clause 20.2 of the IPP 2020. To fit the definition, the event must satisfy four limbs at clauses 20.2.1 to 20.2.4.

Table 3: Definition of normalisation event

Clause	Requirement	Our response
20.2.1	The outage was beyond our reasonable control.	Refer section (a) below.
20.2.2	We did not cause, or materially contribute to the outage, by any failure to exercise good electricity industry practice (GEIP).	Refer section (c) below.
20.2.3	The duration of the outage was 24 hours or more, in circumstances where the duration was beyond our reasonable control; and not caused, or materially contributed to, by our failure to exercise GEIP.	This application is made up of a number of outages. The main outages covered a number of days, so clearly exceed the 24 hours minimum duration. Please also refer sections (b) and (c) below.
20.2.4	The outage was the result of one of the potential causes listed in this clause.	The outage was the result of a natural disaster (clause 20.2.4(a)).

Why we consider:

(a) the outage was beyond Transpower's reasonable control

The Hawke's Bay outages occurred because of inundation of our RDF and WHI substations. In the case of RDF, this was due to flood waters overtopping the stop banks of the Tutaekuri River, together with rains in neighbouring hills. WHI was impacted by the Esk River breaking its banks. The related Central North Island outages were caused by strong winds.

We currently design our assets to be resilient to 1-in-450 Average Recurrence Incidence (ARI) events, and this is the standard to which the RDF 110 kV switch yard was constructed a

decade ago.² However, the RDF 220 kV switch yard was constructed ~50 years ago to the standards in place at the time and assumes the stop banks can be relied upon. Recognising potential vulnerability and criticality of the substation, we carried out a desktop study of the site in 2020. It was estimated that in a 1-in-200-year ARI event, flooding of up to 0.5m may be experienced at the lowest point on the site, and at around a 1-in-500 ARI event upstream, stop banks may be overtopped. It is possible that had we undertaken resilience works at the site, it may still have been significantly impacted.

As a result of the studies of this and other sites, we developed a resilience plan for RCP4 and RCP5, including funding specifically for proactive substation flooding remediation / resilience works. This work identified twelve sites – including RDF, Whakatu (WTU) and WHI – as both vulnerable to flooding and critical for local network resilience. A detailed assessment of risk and planning for improved resilience at the RDF site was scheduled to begin later in 2023.

The outages associated with Cyclone Gabrielle were beyond our reasonable control as they were directly connected to the natural disaster, and beyond the standards to which our older substations were designed. We have work underway to develop plans for the RDF site that may have enabled an event of this type to be prevented, but work was not planned to occur until RCP4, and may not have been sufficient to prevent the interruption. Our response to the outages and solutions implemented to minimise the impact were in line with GEIP, as described in (c) below.

Why we consider:

- (b) that the effect of the outage on the grid, including managing to a shorter duration than that which actually occurred, was beyond Transpower's reasonable control**

Our 110 kV contingency plan for the loss of RDF substation, developed some years ago, enabled us to restore limited service to Fernhill substation in less than 3 hours, and have generation injecting at Tuai (TUI) within 4.5 hours of the interruption.

We implemented innovative solutions to fully restore supply to Hawke's Bay as quickly as possible. This included bypassing the RDF substation to enable supply to WTU to meet Napier load and supplying the RDF 33 kV buses from TUI, and a temporary backfeed from WTU. These solutions, operating with single rather than the normal duplicated protection, gave us time to complete the clean-up at RDF and WHI, complete repairs to towers and circuits, and return the RDF 220/110 kV interconnecting transformers and WHI 220 kV bus to service. These works enabled injection of generation and all load demanded to be supplied.

Work to return the system to normal operation is ongoing. This is planned in advance, and staged in a manner to minimise disruption to our customers.

² Meeting this standard does not rely on stop banks for protection.

Further discussions on Transpower's approach to minimise the effect of outages are discussed in our Periodic Report on the event, submitted on 24 April 2023. We believe that our actions minimised the effects of the outages on the grid.

Why we consider:

(c) Transpower exercised good electricity industry practice³ in relation to the cause and effects of the outage

We consider that Transpower exercised GEIP in relation to the cause and effects of the outages in the following areas:

- Design of our assets and risk assessments
- Incident management
- Temporary solutions
- Customer and stakeholder engagement

Design of our assets and risk assessments

Our older substation assets were developed in line with the standards in place at the time. However, recognising that some of our substations are both critical and vulnerable to damage in the event of extreme weather, in 2020 we commenced work to identify these sites, and develop and implement solutions to improve resilience. Resilience work would be guided by risk-benefit analysis and planned and prioritised recognising the need to undertake the work over an extended period due to both financial and resourcing constraints. We will be reviewing both the scope and funding requirements for resilience works in light of this event.

Work was carried out at our WHI substation following Cyclone Bola in 1988 to raise the height of many of the assets to reduce the risk arising from flooding and tsunamis. The impact in terms of asset damage at this site was less as a result. (RDF was not impacted by Cyclone Bola.)

³ Good electricity industry practice in relation to transmission, means the exercise of that degree of skill, diligence, prudence, foresight and economic management, as determined by reference to good international practice, which would reasonably be expected from a skilled and experienced asset owner engaged in the management of a transmission network under conditions comparable to those applicable to the grid consistent with applicable law, safety and environmental protection. The determination is to take into account factors such as the relative size, duty, age and technological status of the relevant transmission network and the applicable law.

In terms of our towers, we had completed our “slips” flyover two weeks prior to the interruptions. No issues were identified at that time. These routes were re-flown as part of our response, providing a good picture of current and future slip risks.

Incident management

We successfully implemented our standardised approach to response and recovery management for significant events, known as Coordinated Incident Management System (CIMS). This was scaled for the magnitude of the event. Roles were allocated to focus on RDF assessment/restoration, approach to and planning for Hawke’s Bay partial restoration, logistics (equipment and resource requirements), as well as health and safety of workers. Coordination meetings were held twice daily for the first two weeks of the response. The CIMS approach again worked well.

Temporary solutions

We were unable to access RDF substation until the afternoon of the interruption due to flood waters around the site. We had also lost communications with other substations in the region. Given these constraints, we immediately implemented our 110 kV contingency plan which provided limited 110 kV supply from the south (Bunnythorpe via Waipawa) to FHL, and enabled re-synchronisation of the generators at TUI (which could then supply Eastland Network and enable additional supply to FHL).

Our internal telecommunications network, TransGo, which is required for protection signalling, SCADA and data/voice at substations was unavailable for several days. We installed Starlink satellite equipment at WHI and TUI to provide communications for several days until temporary repairs to the fibre could be made.

Over the following days and weeks, we implemented additional temporary measures to provide supply throughout Hawke’s Bay. These are discussed in more detail in our Periodic Reporting on the event. These approaches provided supply with single protection as an interim solution until the RDF interconnecting transformers and WHI 220 kV bus could be restored, enabling 220 kV supply from the Central North Island with more appropriate levels of protection.

Substantial clean up was required, including testing, and assessing the condition of every affected asset. Where assets could not be cleaned and repaired, they were replaced from our stores, or from other projects as required. We have subsequently replenished our stores. We expect to have several equipment failures over the next 24 months due to the assets being submerged. We are preparing for this by identifying affected assets and ensuring sufficient spares are available to allow replacement as quickly as practicable.

Customer and stakeholder management

Throughout the response period, we worked hard to communicate with our connected customers, key stakeholders, and the public. This included:

Working closely with Unison engineers, to develop and implement an innovative staged temporary response to restore supply. While communication channels were limited, we were able to communicate with Eastland Network sufficiently to coordinate restoration of supply,

and with the switcher at TUI who we engaged under our existing Emergency Operating Contract. We kept in close contact with Pan Pac about supply impacts at WHI.

Regular and responsive communications to the public via our website, social media, and in-bound phone calls. This aimed to provide as much transparency as possible while being realistic about impacts and restoration timing. We worked with our network customers to ensure consistency of communications.

Communication with National Emergency Management Agency National Coordination Centre, as well as Central and Local Government. This included Minister's offices, Council Mayors and CEOs, and regulators. We also hosted MP's and media at RDF substation to show the damage and restoration efforts first-hand.

Clause 20.3.4 – proposed reassessed values of measures of grid performance and asset performance measures

Should the Commission decide that the outages set out in this report were a normalisation event, the outages will be excluded from calculations regarding asset performance measures (AP2) and grid performance measures (GP1 and GP2).

The total duration of all outages affecting HVAC outage blocks, including the planned outages required to complete the work, is expected to be about 3005 hours. We propose excluding these outages – set out in Table 2 – from our AP2 performance measure. This exclusion will increase our final AP2 HVAC availability by approximately 0.48 percentage points.⁴

The GP2 measures are average durations of unplanned interruptions. Therefore, the impact of excluding the interruptions listed in Table 1 cannot be calculated until after the end of the disclosure year, when our normalised results are compared against targets in our Service Measures Report.

Clause 20.3.5 – other information that Transpower considers is relevant to this application

No additional supporting information is provided with this application.

⁴ Calculated using the following formula from clause 18.2: total duration of outages on the HVAC assets listed in Schedule G/(71*24*365). Note that 71 relates to the number of selected HVAC assets.