Keeping the energy flowing

QUALITY PERFORMANCE REPORT

2013/14

TRANSPOWER

Transpower New Zealand Ltd The National Grid

Contents

Cover image: The thyristor valve hall of the HVDC Pole 3 converter station at Haywards. The photo shows three quadrivalves each comprising a stack of high voltage thyristor assemblies with their associated cooling systems and surge arrestors.

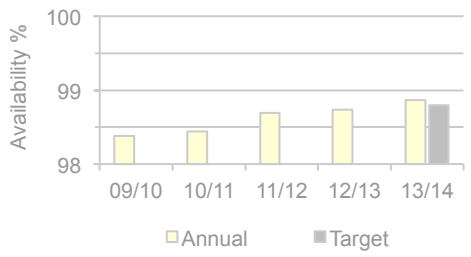
Highlights

The targets in the Statement of Corporate Intent and the actual performance for 2013/14 are summarised below. In 2013/14 we met two of the targets and missed two of the targets.

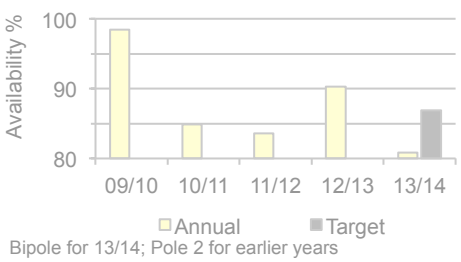
	Actual	Target
High Voltage Alternating Current (HVAC) Circuit Availability[1]	98.9%	98.8%
High Voltage Direct Current (HVDC) Link Availability	80.8%	86.9%
Number of loss of supply events greater than 0.05 System Minutes[2]	17	≤ 15
Number of loss of supply events greater than 1.0 System Minutes	2	≤ 3

Operating Statistics – 2013/14	
Energy Injected into the Grid	38,484 GWh
Energy Supplied from the Grid	37,183 GWh
Energy Transferred by HVDC link (sent, both directions)	3,620 GWh
System Maximum Demand	6,414 MW

High Voltage Alternating Current (HVAC) Circuit Availability

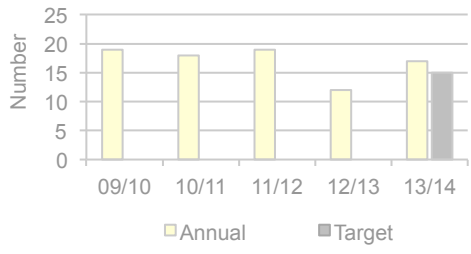


High Voltage Direct Current (HVDC) Link Availability

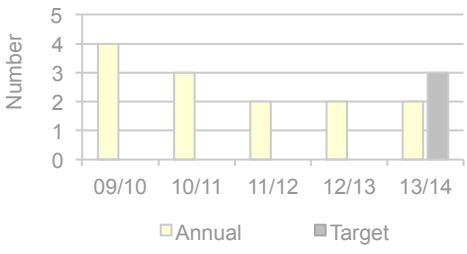


Bipole for 13/14; Pole 2 for earlier years

Number of Unplanned Events greater than 0.05 system minutes



Number of Unplanned Events greater than 1.0 system minute



[1] The definition of the HVAC availability target was revised in 2010/11 to exclude the "non-availability" of assets that are removed from service at the request of the System Operator. The revised definition aligns with new Commerce Commission measures for regulatory monitoring of quality performance.

[2] The number of events greater than 0.05 system minutes includes the events greater than 1.0 system minutes.

From the Chief Executive

This is Transpower New Zealand Limited's 23rd annual Quality Performance Report. It sets out operational performance data to assist our stakeholders to assess our performance against measures included in our 2013/14 Statement of Corporate Intent.

As in previous years, the 2013/14 report details High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) availability, and reliability performance at specific points on the grid, and accounts for any significant interruptions of supply. The report also includes performance information that the company is required to disclose as per the Electricity Information Disclosure Requirements for the 12 months to 30 June 2014, and the Commerce Act (Transpower Individual Price-Quality Path) Determination 2010.

This year we met two of the targets for network performance set out in the 2013/14 Statement of Corporate Intent, and missed two targets. There were 17 interruption events greater than 0.05 system minutes compared to a target of less than or equal to 15, and there were two events greater than 1.0 system minute compared to the target of less than or equal to three. HVAC availability of 98.9 percent was above (better than) the target of 98.8 percent. The 2013/14 target for the HVDC link was set relatively low at 86.9 percent to allow for the outages required for upgrades to Pole 2 and remaining project work on the new Pole 3. The HVDC availability of 80.8% was below target as a result of these outages being longer than anticipated but, apart from this, the HVDC link has performed well during the year.

The total planned and unplanned interruptions for the 2013/14 year were 12.1 system minutes. This compares with 7.6 system minutes in 2012/13 and 14.5 system minutes incurred in 2011/12.

The total energy injected onto the grid during 2013/14 decreased by 1.2 percent to 38,484 GWh compared to 38,939 GWh for the previous year. Total energy delivered for the year also decreased by 1.2 percent from 2012/13.

The system maximum demand of 6414 MW was recorded at 6:00 pm on 15 July 2013, and was 1.2 percent lower than the maximum of 6494 MW recorded for 2012/13. The average trend over the last five years has been that system maximum demand has decreased at approximately 0.6 percent per annum.

South Island generation injected onto the grid was 10.5 percent higher than in 2012/13 and, as a result, there was an increase in the net energy transfer across the HVDC link from South to North. Northwards transfers across the link were 3495 GWh compared to the previous year's 1976 GWh, and southwards transfers were only 125 GWh compared to 322 GWh in 2012/13.

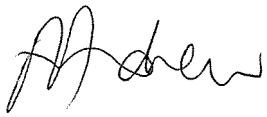
A wide range of initiatives is in progress to achieve sustained improvements in performance and to reduce interruptions. These include:

- Transpower has submitted an asset management framework for Regulatory Control Period 2, under the Commerce Act. This framework includes a wide range of improvement strategies and performance objectives, and will guide our focus for the period 2015-2020.
- We are continuing to improve our overall asset management framework, and have achieved compliance with an internationally recognised standard in Asset Management BSI publication PAS55:2008.
- We have recently established a Criticality Framework. This allows us to focus on the assets which are most important to keeping the energy flowing.
- Further Asset Health Indices are being developed and existing indices are being enhanced. These provide long-range forecasts of asset condition and support asset replacement strategies.
- A tactical reliability improvement plan has been developed and is being implemented. This will address poorly performing assets and improve their reliability in the future.

- Over the last two years, we have successfully established new Asset Management Information Systems (AMIS) capability for Transpower and our service providers. This includes integration of several major systems, and a new data warehouse and business intelligence system. This has enabled and embedded improved work management practices, and improved visibility of our grid asset reliability and performance.

- We have continued our efforts to improve the way we respond to unplanned grid outages to minimise the impact on end-consumers. We are continuing to invest in improvements in systems used for grid operations, leveraging our investment in AMIS, and in the training and development of our asset operations personnel.

This Quality Performance Report is part of our on-going commitment to provide a comprehensive information base for our customers and stakeholders. A range of other publications is available at www.transpower.co.nz including our Annual Report, Annual Planning Report, Customer-facing Grid Performance Measures, System Security Forecast, our Asset Management Framework and Statement of Corporate Intent.



Alison Andrew

Chief Executive

1 Management and Operation of Transpower's System

The transmission assets that we own and operate are summarised in Table 1. The HVAC systems in the North and South Islands form an integrated system, joined by an HVDC link, and managed from two national control centres in Hamilton and Wellington, and two regional operating centres in Otahuhu and Islington.

The management of the system is facilitated by our communications network, which comprises fibre optic links, ultra-high frequency (UHF) and microwave radio links, and telephone networks supplemented by leased circuits.

We contract the grid's maintenance and construction fieldwork to specialist service providers. Our staff set and manage these contracts to strict standards.

Table 1: Transpower's Operational Power System Assets as at 30 June 2014

Asset	Specification
Length of HVAC and HVDC transmission lines	11,567 route-km
Length of HVAC underground transmission cable	61 route-km
Number of substations (includes cable stations)	178
HVAC transmission line voltages – kV	220, 110, 66, 50, 33
HVDC transmission line voltage – kV	350
HVDC link capacity[3]	
- Pole 2	500 MW
- Pole 3	700 MW
Length of Cook Strait HVDC cables (3 cables)	40 route-km

2 Interruptions to Supply

An important measure of our performance is the energy not supplied because of unplanned interruptions originating in the Transpower system. We record interruptions to supply (i.e. non-supply of electricity, or power cuts) in system minutes. A system minute is defined as the energy in megawatt-minutes not supplied from the system to consumers divided by the system maximum demand in megawatts for the year in question. The system maximum demand figure for 2013/14 was 6414 MW.

An example to demonstrate the non-supply of one system minute would be to imagine Hamilton City (population approximately 148,000) losing supply during winter at peak demand (around dinnertime) for about 40 minutes.

In 2013/14, unplanned interruptions to supply originating in our system amounted to 10.9 system minutes. This is higher than the 6.9 system minutes recorded for 2012/13 but lower than the 12.0 system minutes recorded for 2011/12.

In 2013/14, there were two significant unplanned events (events greater than 1.0 system minute). These were:

- In November during a series of high power tests on the recently upgraded HVDC link, a protection issue resulted in an unexpected, simultaneous disconnection of three filter banks at Benmore and a rapid runback of the HVDC transfer from 1024 to 145 MW. This caused the North Island frequency to drop sufficiently to partially trigger the first block of the Automatic Under Frequency Load Shedding relays. These relays disconnected 401 MW of North Island load. A further 204 MW of interruptible load was also disconnected. Total non-supply caused by this event was 4.2 system minutes.

- In April the two 220 kV circuits supplying the Hawke's Bay region tripped simultaneously because of lightning. This resulted in interruptions to supply at seven points of service on the East Coast of the North Island with approximately 220 MW of load lost. This event resulted in approximately 3.3 system minutes of non-supply.

[3] Maximum capacity. HVDC link capacity is dependent on operating conditions on the HVAC system.

Table 11 on page 32 lists the significant unplanned interruptions originating on the Transpower system since 1987.

Figure 1 shows performance in terms of the unplanned supply interruptions for the last six years. Events resulting in supply interruptions amounting to more than one system minute are categorised as significant, and the remainder are categorised as underlying.

Figure 1 Unplanned Supply Interruptions

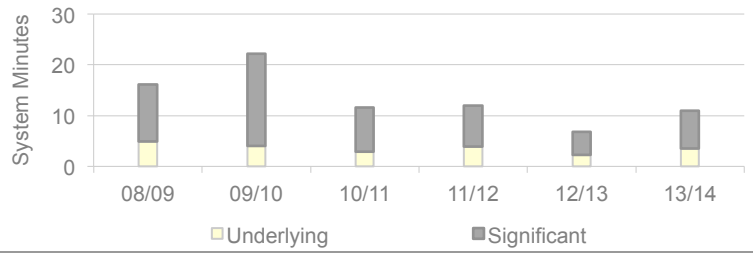


Figure 2 shows monthly performance in terms of underlying unplanned supply interruptions for the 2013/14 year compared to the average of the previous five years. This wide monthly variation is to be expected given the relatively random nature of unplanned interruption-to-supply events. Interruptions are generally less frequent in the winter months because there are fewer circuit and transformer outages for maintenance and the grid is therefore more secure.

Figure 2 Unplanned Supply Interruptions – Underlying Events by Month

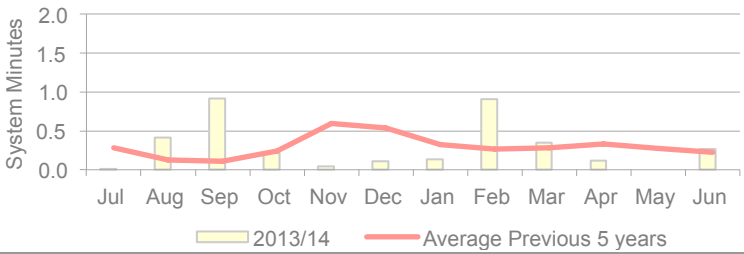


Figure 3 illustrates both the number and impact of significant unplanned non-supply events for 2013/14 and the preceding five years.

Figure 3 Unplanned Events > 1 System Minute (Significant Events)

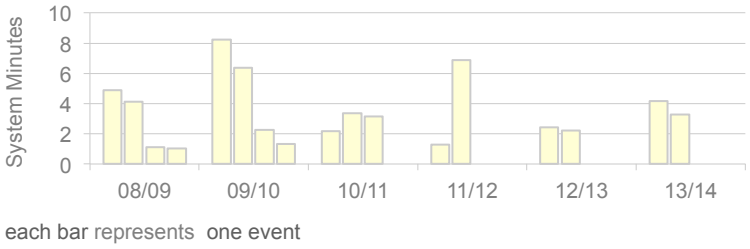
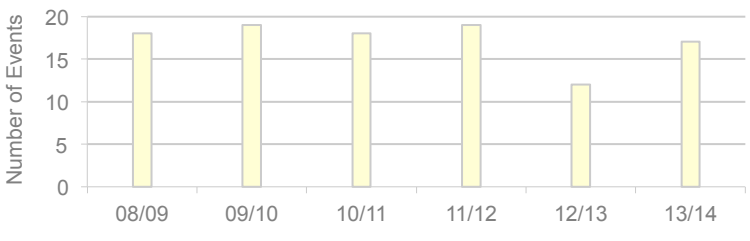


Figure 4 shows the numbers of unplanned events greater than 0.05 system minutes for 2013/14 and the preceding five years. (This includes events greater than 1.0 system minutes.)

Figure 4 Unplanned Events > 0.05 System Minutes



During 2013/14 there were 17 unplanned events resulting in greater than 0.05 system minutes. These 17 events are listed in Table 2. Of these 17 events, two were greater than 1.0 system minute. There were a further 30 events that each resulted in less than 0.05 system minutes of non-supply.

Table 2: Unplanned Events greater than 0.05 system minutes – 2013/14

Date	System Minutes	Event Description
15-Aug-13	0.31	Stoke. Bus coupler tripped during commissioning project. New protection settings not applied correctly.
15-Aug-13	0.08	Albury, Tekapo A. Tekapo-Albury-Timaru circuit tripped for a transient fault. Cause not found.
13-Sep-13	0.35	Bombay, Meremere, Wiri. A circuit breaker at Bombay failed causing a supply bus trip. A nearby circuit tripped and autoreclosed causing supply transformer at Wiri to trip.
16-Sep-13	0.10	Arapuni. An operating error resulted in a 110 kV bus trip. A grid emergency was declared and load reductions were required at Hangatiki.
17-Sep-13	0.26	Upper Hutt. The supply bus tripped when a feeder circuit breaker failed to open for a customer fault.
20-Sep-13	0.16	Gracefield. Both circuits from Haywards tripped because of lightning.
14-Oct-13	0.16	Dannevirke, Waipawa. Multiple trippings of Waipawa-Dannevirke-Woodville circuits during high winds.
12-Nov-13	4.18	North Island. Widespread load shedding when HVDC ran back unexpectedly during commissioning testing.
10-Dec-13	0.09	Fernhill. During switching for maintenance, the in-service supply transformer tripped because of a wiring error.
1-Jan-14	0.14	Woodville. A bird strike in the switchyard caused a 110 kV bus fault, which resulted in supply interruptions at Woodville, Dannevirke and Waipawa.
8-Feb-14	0.90	Whirinaki. Both circuits into Whirinaki tripped because of a transient line fault.
7-Mar-14	0.06	Blackpoint. The Oamaru-Blackpoint-Waitaki circuit and Waitaki 220/110 kV transformer T24 were forced out of service to check a noisy bushing on the transformer.
31-Mar-14	0.27	Gisborne. The Gisborne-Tuai 1 circuit tripped because of a failed conductor joint. The other circuit was out of service for maintenance.
10-Apr-14	3.27	Hawke's Bay. The Redclyffe-Wairakei and Wairakei-Whirinaki circuits tripped for a double circuit three phase fault caused by lightning, causing supply interruptions to Gisborne and Hawke's Bay
11-Apr-14	0.07	Wilton. During a planned outage of a supply transformer for protection testing, the in-service transformer was tripped inadvertently causing a supply interruption.
7-Jun-14	0.06	Albury, Tekapo A. The Tekapo-Albury-Timaru circuit tripped for a transient fault. Cause not found.
11-Jun-14	0.20	Stoke. The Stoke 110/66 kV transformer T3 tripped due to leaking oil causing supply interruptions to the Golden Bay area.

Causes of Supply Interruptions

Table 3 provides an analysis of supply interruptions originating in the Transpower system for the last five years broken down into the following categories:

Unplanned

- Environment – lightning, storms, earthquakes, high wind, snow, ice, tree contact, bird contact or fouling, etc.
- Equipment related – caused by inadequate design, installation, or maintenance, or by ageing or wear and tear.
- Human Element – initiated by an action by Transpower staff or service providers (although inadequate design or other factors may be an underlying cause).
- Not known – mainly transient line faults with no positive cause or evidence found.
- Miscellaneous – unplanned causes not covered by the above and including non-Transpower human interference.

Planned

- Planned - outages planned for maintenance, replacement or refurbishment, as well as for new construction.

Events causing unplanned supply interruptions are categorised as being significant or underlying. Interruptions are measured in system minutes, and significant events are those events resulting in more than 1.0 system minute of non-supply. Underlying events are those resulting in supply interruptions totalling 1.0 system minute or less.

Interruptions to supply that occurred when Transpower equipment tripped correctly in response to a fault in the connected customer's system are excluded from Table 3.

The data in Table 3 is presented graphically in Figure 5, Figure 6 and Figure 7.

Table 3: Causes of Supply Interruptions

Cause of Interruption	Annual Performance (System Minutes)					Significant Events (System Minutes)					Underlying Events (System Minutes)				
	09/10	10/11	11/12	12/13	13/14	09/10	10/11	11/12	12/13	13/14	09/10	10/11	11/12	12/13	13/14
TP Unplanned															
Environment	3.4	10.0	2.6	0.3	3.8	2.3	8.7	1.3	0.0	3.3[1]	1.1	1.3	1.4	0.3	0.5
Equipment	6.8	0.2	8.4	3.0	2.1	6.4	0.0	6.9	2.2	0.0	0.5	0.2	1.5	0.7	2.1
Human Element	3.2	0.3	0.4	3.5	0.6	1.3	0.0	0.0	2.4	0.0	1.8	0.3	0.4	1.1	0.6
Miscellaneous	8.2	0.7	0.0	0.0	4.2	8.2	0.0	0.0	0.0	4.2[2]	0.0	0.7	0.0	0.0	0.0
Not Known	0.6	0.4	0.6	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.6	0.1	0.2
Total	22.2	11.6	12.0	6.9	10.9	18.2	8.7	8.2	4.6	7.4	4.0	2.9	3.9	2.2	3.5
TP Planned	1.2	3.6	2.4	0.8	1.2	0.0	2.5	1.1	0.0	0.0	1.2	1.1	1.4	0.8	1.2
Total Transpower	23.5	15.2	14.5	7.6	12.1	18.2	11.2	9.2	4.6	7.4	5.3	4.0	5.2	3.0	4.7

Notes
Minor differences between totals and breakdowns are due to rounding.
[1] Double circuit trip on Wairakei-Whirinaki line into Hawke's Bay, 10 April 2014
[2] AUFLS event during HVDC testing, 12 November 2013

Figure 5 shows the system minutes of non-supply by cause for each of the last five years.

In the 2013/14 data, the HVDC AUFLS event appears in Miscellaneous, and the Hawke's Bay event is in Environmental.

Figure 6 shows the data for Figure 5 expressed as percentages of the total annual system minutes of non-supply.

Figure 7 shows the causes of underlying supply interruptions for the last five years. In this graph, significant interruptions (greater than one system minute) have been excluded.

Figure 5 **Supply Interruptions by Cause**

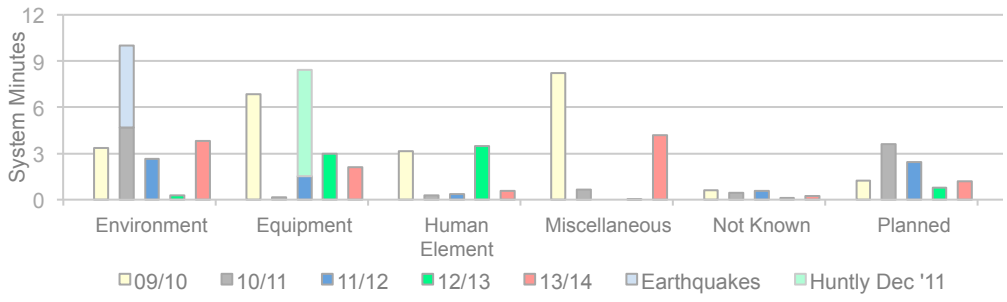


Figure 6 **Supply Interruptions by Cause - Percentage of Annual Total**

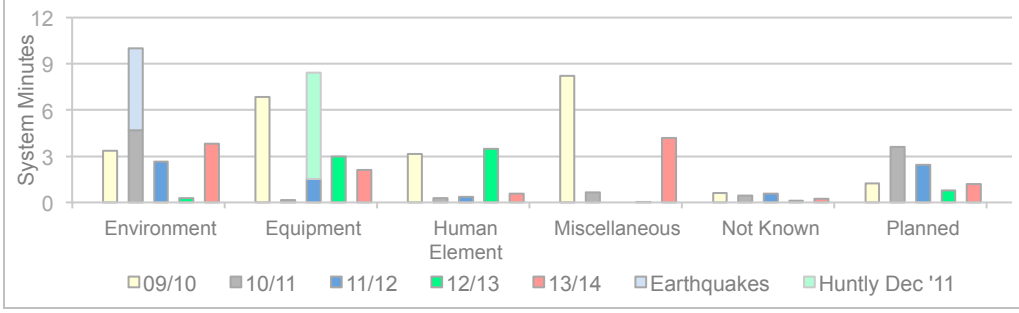
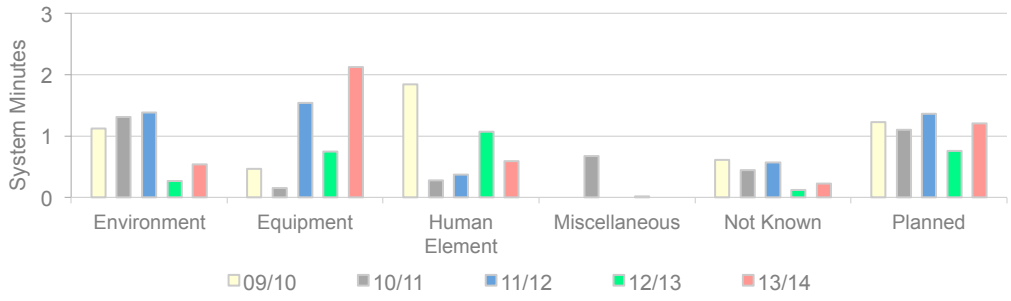


Figure 7 **Underlying Supply Interruptions by Cause**



Unplanned Supply Interruptions by Equipment Area and Cause

Figures 8 to 11 provide a further breakdown that takes into account the source (i.e. the item of equipment or initiating agent) of the non-supply event as well as the cause. Note that one event may comprise several interruptions. For example, a circuit fault on the Coleridge-Otira circuits caused interruptions at five different points of supply.

Figure 8 shows the numbers of events causing interruptions in 2013/14 and Figure 9 shows the five-year average number of events. Figure 10 and Figure 11 show a similar analysis for the system minutes of non-supply.

Figure 8 Events Numbers – 2013/14

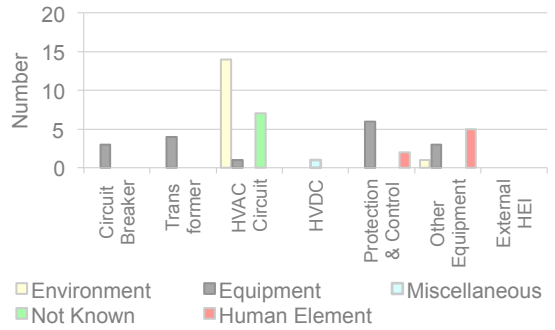


Figure 9 Event Numbers – 5 Years to June 14

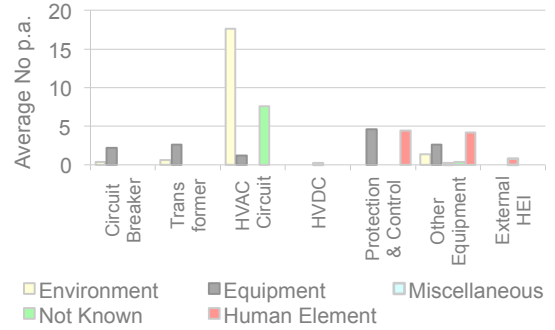


Figure 10 System Minutes – 2013/14

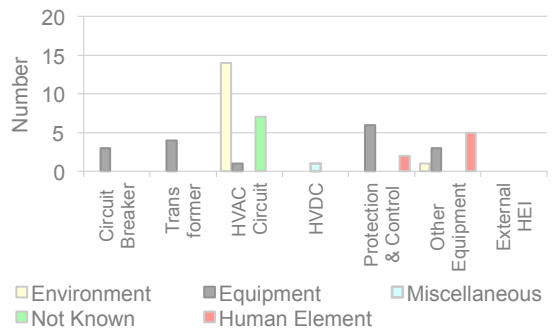
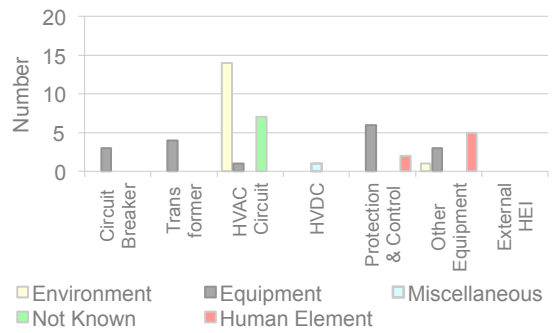


Figure 11 System Minutes – 5 Years to June 14



The following paragraphs provide brief summaries of performance grouped by the equipment group responsible for the non-supply events - circuit breakers, transformers, HVAC circuits, HVDC link, protection and control, other equipment, and external (third party) human element incidents (HEIs). Human element incidents caused by Transpower staff and service providers in the course of operating, maintaining, and developing the grid are included in the equipment categories.

Circuit Breakers

There were three events caused by circuit breaker faults in 2013/14. Two of these resulted in supply interruptions totalling more than 0.05 system minutes. The largest of these was at Bombay in September 2013 when a 33 kV feeder circuit breaker exploded when clearing a feeder fault. This caused a total loss of supply at Bombay and a partial interruption at Wiri and resulted in 0.35 system minutes of non-supply. Also in September, a 33 kV feeder circuit breaker at Upper Hutt failed to trip for a customer fault causing the supply bus to trip and resulting in 0.26 system minutes of non-supply.

Transformers

There were four small transformer related events in 2013/14. The largest of these occurred when the 110/66 kV transformer at Stoke supplying the Golden Bay area tripped because of an oil leak and resulted in 0.20 system minutes of non-supply.

HVAC Circuits

Outages due to environmental causes dominate circuit performance; the most usual reason being lightning, although snow and high winds cause a number of outages. Outages categorised as “not known” are usually transient faults that cause a circuit to trip but for which no positive cause or evidence has been found. These could be caused by environmental factors, or possibly by faulty hardware.

The number of events caused by transmission line faults in 2013/14 was lower than the five-year average, although because of the Hawke’s Bay event in April, the impact was greater.

Other large events in this category in 2013/14 were Gisborne-Tuai circuit 1 tripped because of a joint failure when circuit 2 was out for maintenance, a series of trips of the Waipawa-Dannevirke-Woodville circuits during high winds, simultaneous faults on both Gracefield-Haywards circuits, and two separate trippings of the Tekapo A-Albury-Timaru circuit. All these events resulted in more than 0.05 system minutes of non-supply.

HVDC Link

The HVDC AUFLS event in November 2013 (described on page 5) was the first HVDC related event to cause supply interruptions (other than to interruptible load) for the last 20 years.

Protection and Control

This category includes interruptions caused by equipment faults or problems with protection, SCADA, and control equipment. In 2013/14, the most common causes of events in this category were protection mal-operations, and incorrect protection settings being applied.

The number of non-supply events in this group in 2013/14 is similar to the five-year average for this group, but the resultant system minutes were a little above the average. The largest event in this category was at Whirinaki when the Redclyffe-Whirinaki circuit tripped incorrectly for a transient double-circuit fault on the Wairakei-Whirinaki and Redclyffe-Wairakei circuits. This resulted in 0.90 system minutes of non-supply.

Other Equipment

The “Other Equipment” category includes interruptions caused by faults on equipment not included in the categories above, for example, disconnectors, current transformers, bus work, and station services. The most common causes of events in this category are bus insulator and bus connector faults and disconnector problems.

The number of events in this category in 2013/14 is similar to the five-year average for this group; however, the system minutes of non-supply are significantly lower than the five-year average. The largest event in 2013/14 was at Woodville when the 110 kV bus tripped following flashover caused by a magpie. This event resulted in 0.14 system minutes of non-supply.

External Human Element

This category is for events caused by interference by third parties. In 2013/14 there were no events in this category. The five-year average for system minutes is dominated by the tripping of the Henderson-Otahuhu circuit in 2009/10 when a container hoist contacted the blue phase conductor causing widespread interruptions in Auckland and Northland.

3 Interruptions to Generator Connections

This section summarises the performance of the Transpower assets connecting generator customers to the grid. Generally, interruptions to generators do not result in interruptions to end-consumers except for possibly some load management such as water heating switching.

Figures 12 to 15 provide a summary of the unplanned interruptions to direct connected generators by equipment type and cause. The categories used are the same as those used for Figures 8 to 11.

Figure 12 and Figure 13 show the numbers of events causing unplanned interruptions to connection for direct connected generators for the 2013/14 year, and the five-year average respectively. In 2013/14 there were 28 events compared to the five-year average of 25.6 events.

Figure 14 and Figure 15 show the total duration in minutes for unplanned interruptions to connection for direct connected generators. The total duration of generator interruptions for 2013/14 was 3269 minutes and is substantially better than the five-year average of 8385 minutes. The longest duration events were: a fault on a 110 kV circuit breaker at Karapiro required a bus outage causing an interruption of 404 minutes; and a faulty 110 kV disconnector at Kawerau required a bus outage to enable repairs and resulted in an interruption to the Kawerau Geothermal plant lasting 331 minutes.

Figure 12 Event Numbers – 2013/14

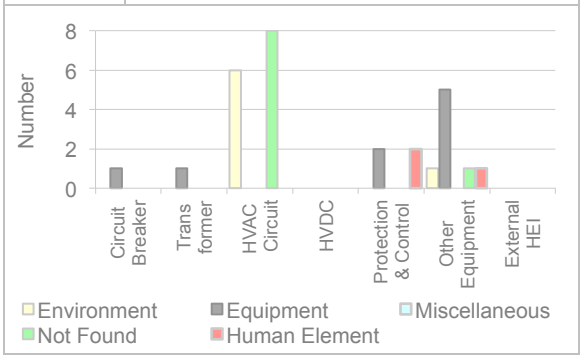


Figure 13 Event Numbers – 5 Years to June 2014

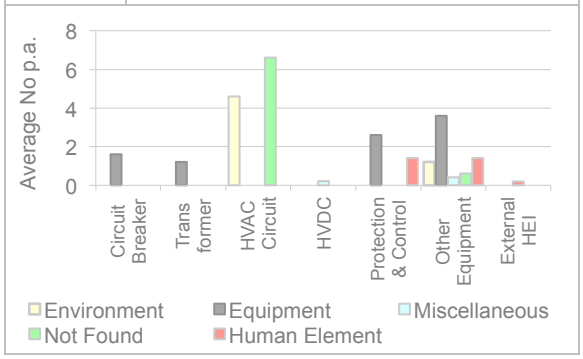


Figure 14 Duration of Interruptions – 2013/14

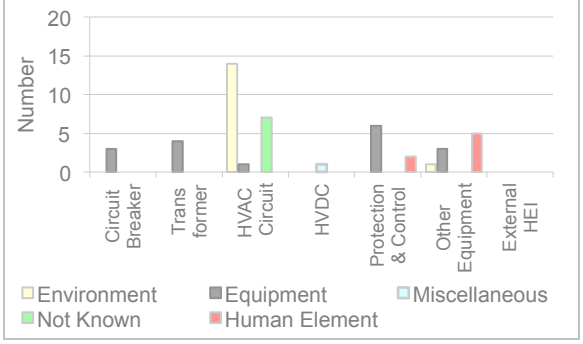
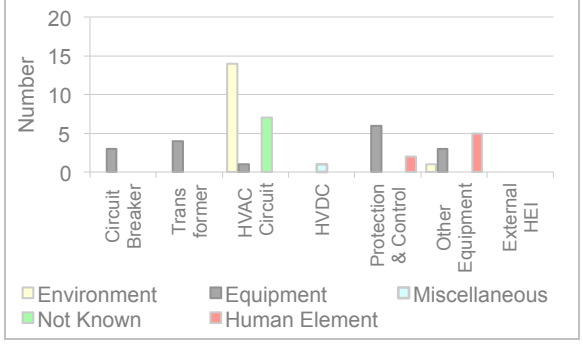


Figure 15 Durations – 5 Years to June 2014



4 HVAC Transmission Performance

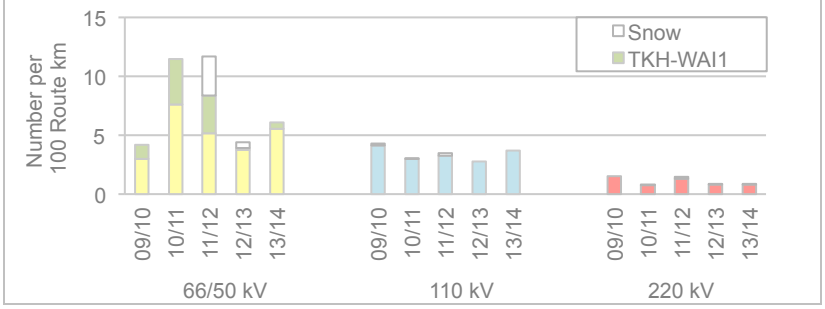
Unplanned Circuit Outages

Figure 16 and Figure 17 summarise unplanned circuit outages. These are unplanned outages for any reason including faults on other equipment.

Figure 16 shows the total number of unplanned outages per 100 route km by voltage. The number of unplanned circuit outages of 220 kV circuits in 2013/14 was similar to that for 2012/13. For the 110 kV and 66/50 kV circuits the numbers of unplanned outages increased slightly compared to the previous year.

The performance of the 66/50 kV group improved significantly in 2012/13 as the result of work on the Te Kaha-Waiotahi circuit to improve its performance. The increase in outages for the 110 kV and 66/50 kV groups in 2013/14 is the result of a general increase in the number of transient faults rather than poor performance of a particular circuit.

Figure 16 **Number of Unplanned Circuit Outages**

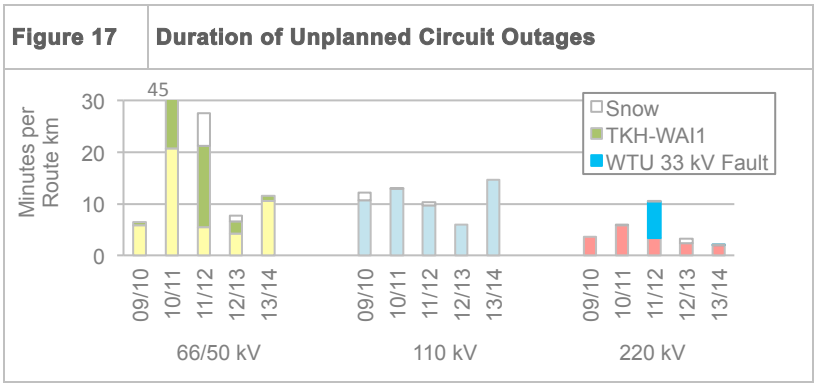


(excluding successful autorecloses)

Figure 17 shows HVAC circuit performance measured by outage duration per route-km and by voltage. Performance for the 220 kV group has improved for 2013/14, but outage durations have increased for the 110 kV and 66/50 kV groups.

Higher durations for the 110 kV group during 2013/14 were, in part, due to a long outage of the Dannevirke-Waipawa 2 section because of flashovers to jumpers during gales, and a long unplanned outage of Atarau-Reefton-Inangahua 1 circuit to replace one pole of a circuit breaker at Inangahua which had developed a serious SF_6 leak.

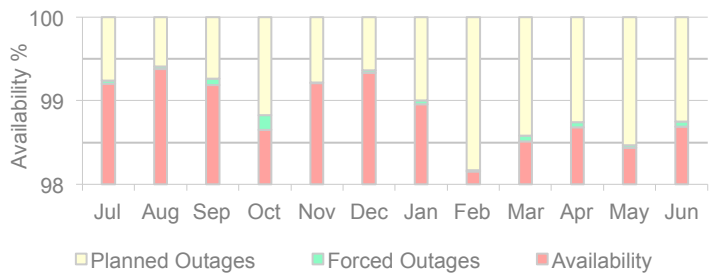
Figure 17 **Duration of Unplanned Circuit Outages**



HVAC Transmission Circuit Availability

Figure 18 shows the monthly HVAC transmission circuit availability for 2013/14. The overall availability of HVAC circuits after allowing for planned and unplanned outages[4] was 98.9 percent, and was better than the target of 98.8 percent.

Figure 18 **HVAC Transmission Availability 2013/14**



In 2013/14, planned circuit outages accounted for 1.08 percent of annual unavailability, and unplanned outages accounted for only 0.05 percent.

[4] An outage is the removal from service of a transmission asset. An outage does not necessarily result in an interruption to a customer, depending on whether the asset is the only connection between a customer and the grid, or one of a number of parallel paths.

5 Transmission System Utilisation

HVAC System Utilisation

Figure 19 and Figure 20 show monthly generation and load by island for 2013/14 and, for comparison, the previous year's generation and load. In 2013/14, the load patterns were similar to the previous year, but increased generation in the South Island because of higher hydro inflows resulted in decreased generation from fossil-fired generation in the North Island. Compared to 2012/13, South Island generation onto the grid increased by 1683 GWh or 10.5 percent. North Island generation decreased by 2138 GWh; a reduction of 9.4 percent.

Figure 19 North Island Generation and Load

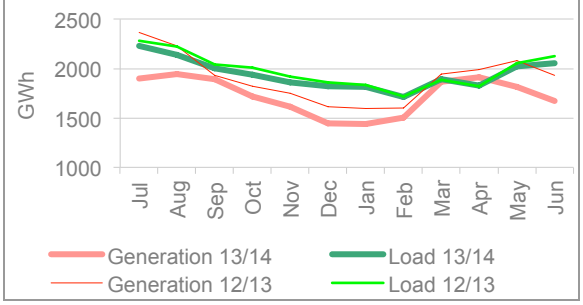
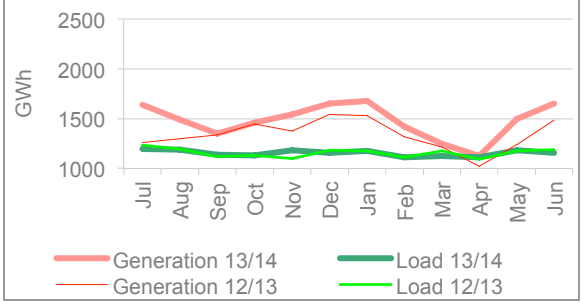


Figure 20 South Island Generation and Load



HVDC Utilisation

In 2013/14, there was a net northwards HVDC transfer of 3227 GWh, compared to a net northwards transfer of 1654 GWh for 2012/13. Northwards transfers were 3495 GWh (sent from Benmore) compared to 1976 GWh in 2012/13 (Figure 21). The southwards energy transfer decreased from 322 GWh in 2012/13 to 125 GWh in 2013/14.

The average utilisation of the HVDC Bipole link for 2013/14 was 34.4 percent, based on 1200 MW capacity.

In 2013/14, the HVDC link contributed approximately 13 percent of the injection into the North Island grid. This is a return to normal patterns from 2011/12 when there were net southwards HVDC link transfers which contributed 1.5 percent of the total energy supplied into the South Island grid, and in 2012/13 the link contributed 7 percent of the injection into the North Island. Figure 22 shows link transfers for 2011/12, 2012/13, and 2013/14.

Figure 21 HVDC Link Long Term Energy Transfer

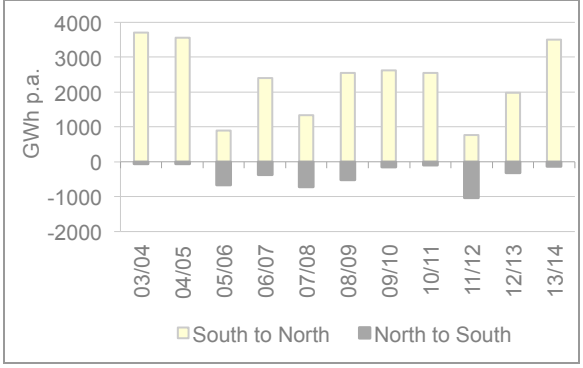
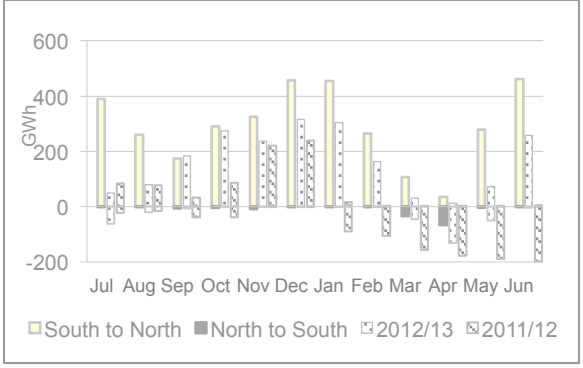


Figure 22 HVDC Link Energy Transfer 2013/14



6 HVDC Link Availability[5]

Bipole Availability

The Bipole link, which comprises Pole 2 and Pole 3, performed very well in terms of reliability during 2013/14. The annual availability of 80.8 percent was somewhat lower than the target of 86.9 percent. The target was based on estimated outage requirements for the HVDC upgrade, but the outages were longer than anticipated.

Pole 2

Availability of Pole 2 in 2013/14 was 66.5 percent. The main reason for this low availability was the Pole 2 planned outage from August 2013 to early October, for a control systems upgrade as part of the HVDC upgrade. There were further outages in November 2013 for testing and remedial work.

There were four unplanned outages in 2013/14. This compares to 23 in 2012/13 of which 14 were related to HVDC upgrade work. Pole 2 Unplanned Unavailability in 2013/14 was 0.09 percent (0.68 percent in 2012/13).

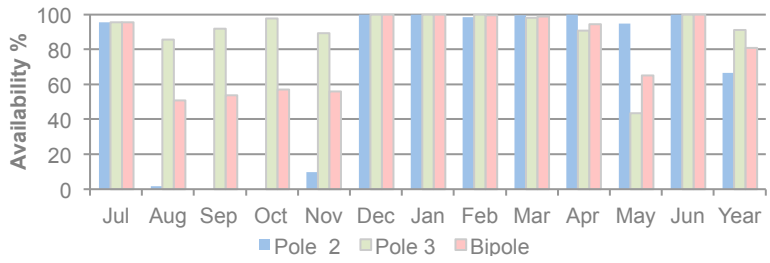
Pole 3

Pole 3 was commissioned in May 2013 and has performed very well. For 2013/14 it achieved availability of 90.94, with most of the unavailability being due to planned outages related to testing and remedial work post commissioning.

There were two unplanned outages in 2013/14 and Pole 3 Unplanned Unavailability was 0.06 percent.

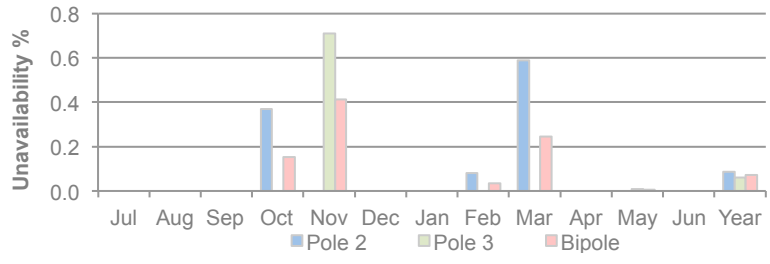
Monthly availability for the HVDC link is shown in Figure 23.

Figure 23 HVDC Link Availability



Monthly unplanned unavailability for the HVDC link is shown in Figure 26.

Figure 24 HVDC Link Unplanned Unavailability



[5] The term "availability", in relation to HVDC link performance follows the definition of "Energy Availability" used by CIGRE Study Committee 14 Protocol for Reporting the Operational Performance of HVDC Transmission Systems.

7 International Comparison of Transmission Performance

Every two years Transpower participates in an international comparison of performance that covers the operation and maintenance of transmission assets operating at 60 kV and above.

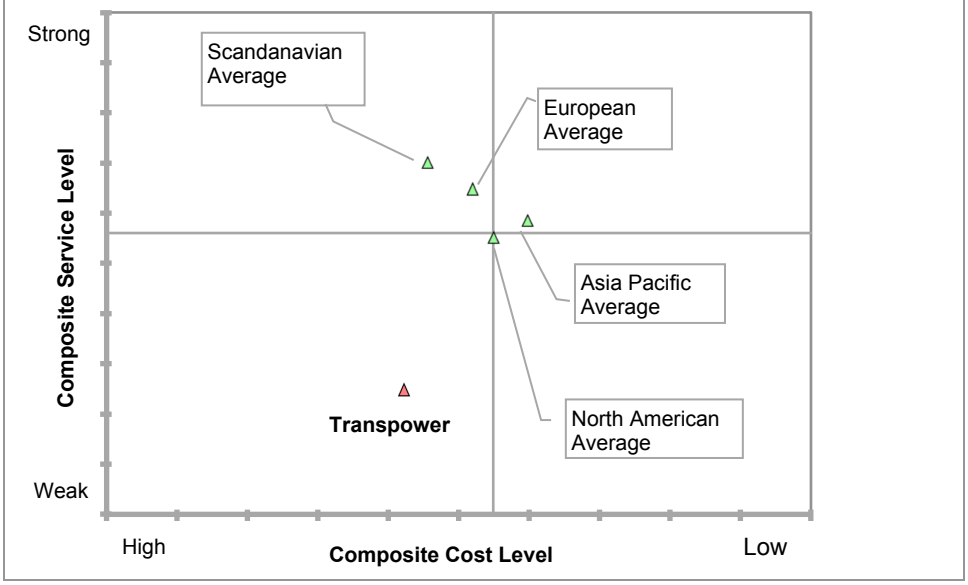
The 2013 study involved 28 transmission utilities from North America, Europe, Asia, Middle East, Australia and New Zealand. International benchmarking provides the opportunity to compare our performance with some of the world's best performers, and more importantly to identify opportunities for improvement. The study encompasses costs and unplanned outages for 19 areas of operations and maintenance activities including, for example, overhead lines, substation equipment and protection systems. Maintenance practices are also compared.

Overall, the 2013 study showed that our composite service level[6] is down in relation to other participants. Maintenance costs were roughly the same relative to others. Transpower's composite service level in the 2013 study was below average, and the composite cost level was above the average.

The main differences in relative performance are due to unplanned trips on 110 kV transmission lines, reliability of 110 kV circuit breakers, and maintenance issues with disconnectors.

Figure 25 shows Transpower's result for the ITOMS 2013 study.

Figure 25 **ITOMS 2013 Benchmarking Results**



Transpower has started a number of initiatives to address performance problem areas, including the following:

- Protection improvements to enable automatic reclosing of transmission circuits after transient faults.
- Increased emphasis on the early detection and remediation of SF_6 leaks on circuit breakers.
- Earlier replacement of circuit breakers with known generic problems to reduce the frequency of SF_6 leaks and mechanical issues.
- Asset management improvement initiatives for disconnectors, to improve reliability and performance.

[6] The composite service level is calculated for each sub-functional area of the business, by service level metric for each sub-function. These are converted into a relative score on a 0 to 2 scale, where 2 indicates strong service level performance. This relative 0 to 2 score is calculated by comparing the company's service level performance for a particular sub-function vs. the performance of the rest of the peer group.

8 Supply Performance Summary

Figure 26 shows the number and duration of unplanned supply interruptions for 2013/14 and provides a comparison to previous years.

The interruption durations are grouped into five-minute blocks, up to a maximum of 180 minutes, which for 2013/14 covers 98 percent of interruptions to supply. The remaining two percent (two interruptions) are aggregated in the >180 group at the right of the graph.

In Figure 26 the grey vertical bar indicates the spread of results, from the maximum value to the minimum value over the previous five-year period up to June 2013, with the average value indicated. The 2013/14 and 2012/13 results are shown as line graphs.

Interruptions with durations up to approximately 30 minutes are generally those that can be restored remotely, while those of longer durations are typically those that require an operator to attend or where investigation or remedial action is required before equipment is restored.

During 2013/14, there were 143 unplanned supply interruptions that originated on the Transpower system. This includes 73 interruptions resulting from the HVDC AUFLS event in November, but even allowing for these, there were more interruptions in 2013/14 than the 54 interruptions during 2012/13. The HVDC AUFLS event in November 2013 has caused the distinct bulge for durations between 45 and 70 minutes in Figure 26.

Figure 26 **Duration of Unplanned Interruptions to Supply**

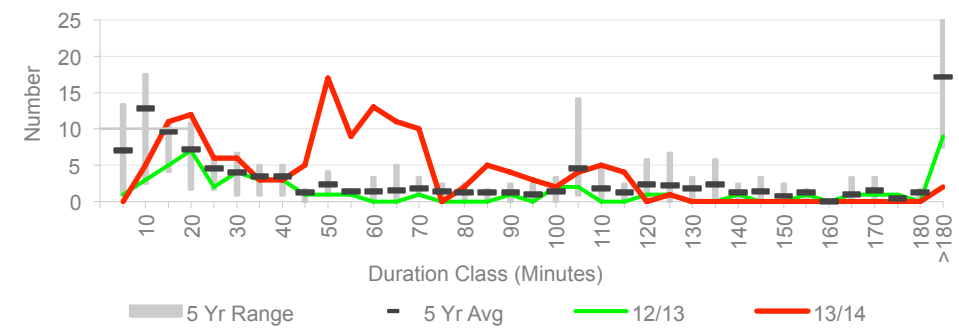
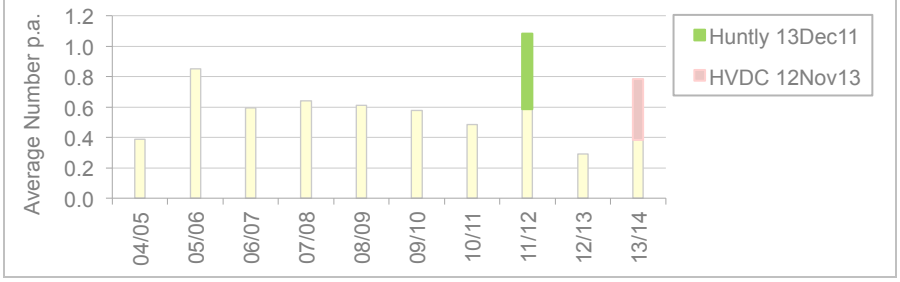


Figure 27 shows the average number of unplanned supply interruptions per point of service[7] for the last ten years. In 2013/14, there was an average of 0.79 interruptions per point of service. This is a relatively high rate when compared to 2012/13 when the rate was 0.29 interruptions per point of service. The HVDC AUFLS event in November 2013 has contributed significantly to this, and with this event excluded the result for 2013/14 would be 0.38 interruptions per point of service. The average for the previous five years with the Huntly event in 2011 excluded is 0.51 interruptions per point of service per annum.

Figure 27 **Unplanned Supply Interruptions per Point of Service**



9 Point of Service Performance

The tables on the following pages summarise performance at individual points of service[7]. These measures indicate the impact on service of Transpower-caused unplanned interruptions. These include both partial and full interruptions to connection due to a fault or human interference. The measures are aggregated at each point of service, but include interruptions originating anywhere on the Transpower system up to the point of connection[8]. The tables cover points of service for both supply customers and direct-connected generator customers. The points of service listed are those in service as at 30 June 2014.

Supply Customers

Tables 4 to 7 summarise unplanned interruptions to supply originating in the Transpower system including interference caused by the public. The tables show the number of interruptions, and the unserved energy expressed as a percentage of the total energy that would have been supplied during the year had there not been any supply interruptions.

Data is shown separately for each supply voltage at the station. If two customers are supplied from a station at the same voltage then these are shown separately as Station (A) and Station (B). Tables 4 and 5 present the data for the North Island sorted both alphabetically, and by five-year average unserved energy, and Tables 6 and 7 similarly for the South Island.

Generator Customers

For direct-connected generator customers, the point of service performance is shown in Tables 8 and 9 as the number of unplanned interruptions to service and the duration in minutes of the interruptions. The data is shown sorted both alphabetically and by five-year[9] average annual duration.

[7] Point of service is a bus where a customer takes service from Transpower

[8] Point of connection is the point where customer assets are connected to Transpower assets. One point of service will have one or more points of connection.

[9] For points of service that have been in service for less than five years, the figure given is the average for the years in service.

Point of Service Performance - Supply

Table 4: North Island Supply Points of Service – Unplanned Interruptions (listed alphabetically)

Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100	Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100
Albany 110 kV	0	1	0.00	0.09	0.8	0.65	Mt Maunganui 33 kV	1	1	1.03	0.07	0.8	0.48
Albany 33 kV	1	1	0.09	0.11	0.8	0.52	Mt Roskill 110 kV	0	1	0.00	0.16	0.6	0.13
Bombay 110 kV	0	1	0.00	0.13	0.6	0.22	Mt Roskill 22 kV	0	1	0.00	0.53	0.6	0.24
Bombay 33 kV	0	2	0.00	2.75	0.8	0.90	National Park	0	1	0.00	0.33	1.6	0.64
Bream Bay	0	1	0.00	0.03	0.8	0.22	New Plymouth 33 kV	0	0	0.00	0.00	0.3	0.29
Brunswick	0	2	0.00	0.17	0.6	0.08	New Plymouth 33 kV	-	0	-	0.00	0.0	0.00
Bunnythorpe 33 kV	0	1	0.00	0.00	0.4	0.14	Ohakune (A)	0	0	0.00	0.00	0.6	0.64
Bunnythorpe 55 kV	0	0	0.00	0.00	0.2	0.24	Ohakune (B)	0	0	0.00	0.00	0.4	0.75
Cambridge	1	1	12.06	0.15	0.8	2.54	Ongarue	0	0	0.00	0.00	0.6	0.84
Carrington St	0	1	0.00	0.06	0.8	0.28	Opunake	0	1	0.00	0.14	1.0	2.85
Central Park 11 kV	0	0	0.00	0.00	0.2	0.32	Otahuhu 22 kV (A)	0	1	0.00	0.08	0.6	0.28
Central Park 33 kV	0	1	0.00	0.00	0.6	0.30	Otahuhu 22 kV (B)	0	0	0.00	0.00	0.0	0.00
Dannevirke	1	4	0.29	2.18	1.4	0.61	Owhata	0	2	0.00	0.46	0.6	0.31
Edgecumbe	0	1	0.00	0.28	0.4	0.16	Pakuranga	0	1	0.00	0.10	0.6	0.17
Fernhill	1	3	1.84	3.15	1.0	1.06	Paraparaumu	0	1	0.00	0.09	0.6	0.20
Gisborne	3	3	5.25	4.12	1.6	2.04	Pauatahanui	0	0	0.00	0.00	0.2	0.04
Glenbrook (A)	0	1	0.00	0.25	0.4	0.66	Penrose 110 kV	0	0	0.00	0.00	0.4	0.10
Glenbrook (B)	0	0	0.00	0.00	0.6	1.20	Penrose 22 kV	0	1	0.00	0.26	0.6	0.19
Gracefield	0	2	0.00	0.73	1.4	0.91	Penrose 25 kV	0	0	0.00	0.00	0.0	0.00
Greytown	1	0	0.41	0.00	0.4	0.41	Penrose 33 kV (A)	0	1	0.00	0.12	0.6	0.19
Hamilton 11 kV	1	1	0.13	0.01	0.6	0.10	Penrose 33 kV (B)	0	0	0.00	0.00	0.0	0.00
Hamilton 33 kV	0	1	0.00	0.03	0.4	0.03	Piako	0	0	0.00	0.00	0.0	0.00
Hamilton 55 kV	0	0	0.00	0.00	0.0	0.00	Redclyffe	1	3	1.02	2.87	1.0	0.90
Hangatiki	0	1	0.00	0.72	1.0	1.07	Rotorua 11 kV	0	1	0.00	0.11	0.6	0.12
Hawera (A)	0	0	0.00	0.00	0.6	0.88	Rotorua 33 kV	0	1	0.00	0.26	0.4	0.14
Hawera (B)	0	0	0.00	0.00	0.2	0.44	Silverdale	1	1	0.04	0.05	1.0	0.60
Haywards 11 kV	1	0	1.72	0.00	0.6	0.55	Southdown 25 kV	-	0	-	0.00	0.0	0.00
Haywards 33 kV	1	1	0.00	0.11	0.6	0.06	Stratford	0	1	0.00	0.91	0.4	0.32
Henderson	0	1	0.00	0.23	0.8	0.29	Takanini	0	1	0.00	0.05	0.6	0.17
Hepburn Road	0	1	0.00	0.04	0.8	0.70	Takapu Road	0	1	0.00	0.05	0.4	0.09
Hinuera	1	1	0.53	0.13	1.0	0.70	Tangiwai 11 kV	0	1	0.00	0.30	0.4	0.27
Hobson Street	-	0	-	0.00	0.0	0.00	Tangiwai 55 kV	1	0	0.00	0.00	0.2	0.00
Huirangi	0	0	0.00	0.00	0.4	0.08	Tarukenga	0	1	0.00	0.19	0.6	0.44
Huntly	0	1	0.00	0.03	0.4	0.07	Taumarunui	4	2	0.12	0.09	2.8	0.21
Kaikohe	1	1	0.37	0.31	0.7	0.22	Tauranga 11 kV	1	1	0.85	0.11	0.6	0.28
Kaitimako	1	1	0.53	0.35	0.6	0.37	Tauranga 33 kV	1	1	2.32	0.11	0.6	0.82
Kaiwharawhara	1	0	0.23	0.00	0.8	0.46	Te Awamutu	0	1	0.00	0.21	1.8	2.22
Kawerau (A)	0	0	0.00	0.00	0.0	0.00	Te Kaha	1	3	3.83	3.93	11.8	28.77
Kawerau (B)	0	1	0.00	2.90	0.6	1.18	Te Kowhai	0	0	0.00	0.00	0.2	0.26
Kensington	0	1	0.00	0.18	0.8	1.02	Te Matai	0	1	0.00	0.06	0.4	0.08
Kinleith 11 kV	1	0	0.56	0.00	1.2	0.29	Tokaanu (A)	0	0	0.00	0.00	0.2	0.06
Kinleith 33 kV	0	1	0.00	0.33	0.8	1.07	Tuai	1	6	0.33	2.10	2.2	0.85
Kopu	0	1	0.00	0.19	0.2	0.04	Upper Hutt	0	2	0.00	2.31	0.6	0.63
Lichfield	0	1	0.00	0.29	0.2	0.06	Waihou	0	1	0.00	0.19	0.8	0.13
Linton	0	1	0.00	0.07	0.8	0.52	Waikino	0	1	0.00	0.09	0.4	0.07
Mangahao	0	1	0.00	0.31	0.6	0.81	Waiotahi	0	1	0.00	0.40	0.8	0.77
Mangamaire	0	0	0.00	0.00	0.2	0.22	Waipawa 33 & 11 kV	3	9	5.95	1.57	3.0	1.59
Mangere 110 kV	0	0	0.00	0.00	0.4	0.11	Wairakei	0	1	0.00	14.10	0.4	3.15
Mangere 33 kV	0	0	0.00	0.00	0.4	0.15	Wairau Road	0	0	0.00	0.00	0.0	0.00
Marton	0	0	0.00	0.00	0.4	0.22	Wairoa	1	1	4.50	1.29	1.0	1.47
Masterton	0	1	0.00	0.12	0.4	0.19	Wanganui	2	1	0.39	0.15	1.0	0.49
Mataroa	0	0	0.00	0.00	0.0	0.00	Waverley	1	0	0.12	0.00	0.6	0.92
Maungatapere	0	1	0.00	0.03	0.5	0.01	Wellsford	0	1	0.00	0.74	0.4	0.83
Maungaturoto	1	1	0.47	0.30	1.2	1.44	Whakatu	0	2	0.00	2.12	0.8	0.52
Melling 11kV	0	0	0.00	0.00	0.4	0.29	Whirinaki	0	3	0.00	3.81	1.4	1.27
Melling 33 kV	0	1	0.00	1.48	0.4	0.64	Wilton	0	2	0.00	0.37	0.6	0.08
Meremere	1	1	1.79	10.08	0.8	2.52	Wiri	0	2	0.00	0.24	0.8	0.23
Motunui	0	0	0.00	0.00	0.0	0.00	Woodville	0	1	0.00	1.32	0.2	0.26

New points of service are averaged for years in service

Table 5: North Island Supply Points of Service – Unplanned Interruptions (listed by five-year average unserved energy)

Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100	Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100
Te Kaha	1	3	3.83	3.93	11.8	28.77	Carrington St	0	1	0.00	0.06	0.8	0.28
Wairakei	0	1	0.00	14.10	0.4	3.15	Otahuhu 22 kV (A)	0	1	0.00	0.08	0.6	0.28
Opunake	0	1	0.00	0.14	1.0	2.85	Tauranga 11 kV	1	1	0.85	0.11	0.6	0.28
Cambridge	1	1	12.06	0.15	0.8	2.54	Tangiwai 11 kV	0	1	0.00	0.30	0.4	0.27
Meremere	1	1	1.79	10.08	0.8	2.52	Te Kowhai	0	0	0.00	0.00	0.2	0.26
Te Awamutu	0	1	0.00	0.21	1.8	2.22	Woodville	0	1	0.00	1.32	0.2	0.26
Gisborne	3	3	5.25	4.12	1.6	2.04	Bunnythorpe 55 kV	0	0	0.00	0.00	0.2	0.24
Waipawa 33 & 11 kV	3	9	5.95	1.57	3.0	1.59	Mt Roskill 22 kV	0	1	0.00	0.53	0.6	0.24
Wairoa	1	1	4.50	1.29	1.0	1.47	Wiri	0	2	0.00	0.24	0.8	0.23
Maungaturoto	1	1	0.47	0.30	1.2	1.44	Bombay 110 kV	0	1	0.00	0.13	0.6	0.22
Whirinaki	0	3	0.00	3.81	1.4	1.27	Bream Bay	0	1	0.00	0.03	0.8	0.22
Glenbrook (B)	0	0	0.00	0.00	0.6	1.20	Kaikohe	1	1	0.37	0.31	0.7	0.22
Kawerau (B)	0	1	0.00	2.90	0.6	1.18	Mangamaire	0	0	0.00	0.00	0.2	0.22
Hangatiki	0	1	0.00	0.72	1.0	1.07	Marton	0	0	0.00	0.00	0.4	0.22
Kinleith 33 kV	0	1	0.00	0.33	0.8	1.07	Taumarunui	4	2	0.12	0.09	2.8	0.21
Fernhill	1	3	1.84	3.15	1.0	1.06	Paraparaumu	0	1	0.00	0.09	0.6	0.20
Kensington	0	1	0.00	0.18	0.8	1.02	Masterton	0	1	0.00	0.12	0.4	0.19
Waverley	1	0	0.12	0.00	0.6	0.92	Penrose 22 kV	0	1	0.00	0.26	0.6	0.19
Gracefield	0	2	0.00	0.73	1.4	0.91	Penrose 33 kV (A)	0	1	0.00	0.12	0.6	0.19
Bombay 33 kV	0	2	0.00	2.75	0.8	0.90	Pakuranga	0	1	0.00	0.10	0.6	0.17
Redclyffe	1	3	1.02	2.87	1.0	0.90	Takanini	0	1	0.00	0.05	0.6	0.17
Hawera (A)	0	0	0.00	0.00	0.6	0.88	Edgecumbe	0	1	0.00	0.28	0.4	0.16
Tuai	1	6	0.33	2.10	2.2	0.85	Mangere 33 kV	0	0	0.00	0.00	0.4	0.15
Ongarue	0	0	0.00	0.00	0.6	0.84	Bunnythorpe 33 kV	0	1	0.00	0.00	0.4	0.14
Wellsford	0	1	0.00	0.74	0.4	0.83	Rotorua 33 kV	0	1	0.00	0.26	0.4	0.14
Tauranga 33 kV	1	1	2.32	0.11	0.6	0.82	Mt Roskill 110 kV	0	1	0.00	0.16	0.6	0.13
Mangahao	0	1	0.00	0.31	0.6	0.81	Waihou	0	1	0.00	0.19	0.8	0.13
Waiotahi	0	1	0.00	0.40	0.8	0.77	Rotorua 11 kV	0	1	0.00	0.11	0.6	0.12
Ohakune (B)	0	0	0.00	0.00	0.4	0.75	Mangere 110 kV	0	0	0.00	0.00	0.4	0.11
Hepburn Road	0	1	0.00	0.04	0.8	0.70	Hamilton 11 kV	1	1	0.13	0.01	0.6	0.10
Hinuera	1	1	0.53	0.13	1.0	0.70	Penrose 110 kV	0	0	0.00	0.00	0.4	0.10
Glenbrook (A)	0	1	0.00	0.25	0.4	0.66	Takapu Road	0	1	0.00	0.05	0.4	0.09
Albany 110 kV	0	1	0.00	0.09	0.8	0.65	Brunswick	0	2	0.00	0.17	0.6	0.08
Melling 33 kV	0	1	0.00	1.48	0.4	0.64	Huirangi	0	0	0.00	0.00	0.4	0.08
National Park	0	1	0.00	0.33	1.6	0.64	Te Matai	0	1	0.00	0.06	0.4	0.08
Ohakune (A)	0	0	0.00	0.00	0.6	0.64	Wilton	0	2	0.00	0.37	0.6	0.08
Upper Hutt	0	2	0.00	2.31	0.6	0.63	Huntly	0	1	0.00	0.03	0.4	0.07
Dannevirke	1	4	0.29	2.18	1.4	0.61	Waikino	0	1	0.00	0.09	0.4	0.07
Silverdale	1	1	0.04	0.05	1.0	0.60	Haywards 33 kV	1	1	0.00	0.11	0.6	0.06
Haywards 11 kV	1	0	1.72	0.00	0.6	0.55	Lichfield	0	1	0.00	0.29	0.2	0.06
Albany 33 kV	1	1	0.09	0.11	0.8	0.52	Tokaanu (A)	0	0	0.00	0.00	0.2	0.06
Linton	0	1	0.00	0.07	0.8	0.52	Kopu	0	1	0.00	0.19	0.2	0.04
Whakatu	0	2	0.00	2.12	0.8	0.52	Pauatahanui	0	0	0.00	0.00	0.2	0.04
Wanganui	2	1	0.39	0.15	1.0	0.49	Hamilton 33 kV	0	1	0.00	0.03	0.4	0.03
Mt Maunganui 33 kV	1	1	1.03	0.07	0.8	0.48	Maungatapere	0	1	0.00	0.03	0.5	0.01
Kaiwharawhara	1	0	0.23	0.00	0.8	0.46	Hamilton 55 kV	0	0	0.00	0.00	0.0	0.00
Hawera (B)	0	0	0.00	0.00	0.2	0.44	Hobson Street	-	0	-	0.00	0.0	0.00
Tarukenga	0	1	0.00	0.19	0.6	0.44	Kawerau (A)	0	0	0.00	0.00	0.0	0.00
Greytown	1	0	0.41	0.00	0.4	0.41	Mataroa	0	0	0.00	0.00	0.0	0.00
Kaitimako	1	1	0.53	0.35	0.6	0.37	Motunui	0	0	0.00	0.00	0.0	0.00
Central Park 11 kV	0	0	0.00	0.00	0.2	0.32	New Plymouth 33 kV	-	0	-	0.00	0.0	0.00
Stratford	0	1	0.00	0.91	0.4	0.32	Otahuhu 22 kV (B)	0	0	0.00	0.00	0.0	0.00
Owhata	0	2	0.00	0.46	0.6	0.31	Penrose 25 kV	0	0	0.00	0.00	0.0	0.00
Central Park 33 kV	0	1	0.00	0.00	0.6	0.30	Penrose 33 kV (B)	0	0	0.00	0.00	0.0	0.00
Henderson	0	1	0.00	0.23	0.8	0.29	Piako	0	0	0.00	0.00	0.0	0.00
Kinleith 11 kV	1	0	0.56	0.00	1.2	0.29	Southdown 25 kV	-	0	-	0.00	0.0	0.00
Melling 11kV	0	0	0.00	0.00	0.4	0.29	Tangiwai 55 kV	1	0	0.00	0.00	0.2	0.00
New Plymouth 33 kV	0	0	0.00	0.00	0.3	0.29	Wairau Road	0	0	0.00	0.00	0.0	0.00
New points of service are averaged for years in service							OVERALL AVERAGE			0.41	0.64		0.76
							MIDDLE AVERAGE			0.28	0.44		0.45
							Middle Average excludes highest five and lowest five.						

Table 6: South Island Supply Points of Service – Unplanned Interruptions (listed alphabetically)

Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100	Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100
Addington 11 kV	0	0	0.00	0.00	0.2	0.00	Islington 33 kV	0	0	0.00	0.00	0.0	0.00
Addington 66 kV	0	0	0.00	0.00	0.0	0.00	Islington 66 kV	0	0	0.00	0.00	0.0	0.00
Albury	2	5	2.64	13.66	2.2	5.07	Kaiapoi	0	0	0.00	0.00	0.0	0.00
Arthurs Pass	1	2	14.40	1.50	3.8	7.62	Kikiwa	0	1	0.00	0.08	0.4	0.15
Ashburton 33 kV	0	0	0.00	0.00	0.2	0.22	Kimberley	-	1	-	0.27	1.0	0.27
Ashburton 66 kV	0	0	0.00	0.00	0.2	0.03	Kumara	0	0	0.00	0.00	1.0	1.29
Ashley	0	0	0.00	0.00	0.0	0.00	Middleton	0	0	0.00	0.00	0.0	0.00
Atarau	0	1	0.00	0.27	0.2	0.05	Motueka	1	2	0.29	2.21	0.6	0.50
Balclutha	0	0	0.00	0.00	0.0	0.00	Motupipi	0	1	0.00	1.06	0.4	0.56
Bells Pond	2	3	3.99	2.87	1.3	1.72	Murchison	0	1	0.00	0.27	0.4	0.11
BlackPoint	0	2	0.00	4.70	1.8	1.56	Naseby	0	0	0.00	0.00	0.0	0.00
Blenheim	0	0	0.00	0.00	0.0	0.00	North Makarewa	0	0	0.00	0.00	0.2	0.08
Bromley 66 kV	-	0	-	0.00	0.0	0.00	Oamaru	0	0	0.00	0.00	1.2	0.23
Brydone	0	0	0.00	0.00	0.2	0.07	Orowaiti	0	0	0.00	0.00	0.0	0.00
Brydone	0	0	0.00	0.00	0.0	0.00	Otira	0	0	0.00	0.00	1.2	0.57
Castle Hill	1	2	7.58	1.01	4.0	9.45	Reefton	0	0	0.00	0.00	0.0	0.00
Clyde	0	0	0.00	0.00	0.0	0.00	South Dunedin	0	0	0.00	0.00	0.0	0.00
Coleridge	1	0	1.29	0.00	1.4	9.21	Southbrook	0	0	0.00	0.00	0.0	0.00
Cromwell	0	0	0.00	0.00	0.2	0.04	Stoke (A)	1	1	0.18	0.55	0.4	0.15
Culverden	0	0	0.00	0.00	0.4	0.20	Stoke (B)	-	0	-	0.00	0.0	0.00
Culverden	0	0	0.00	0.00	0.0	0.00	Studholme	0	0	0.00	0.00	0.2	0.06
Dobson	0	0	0.00	0.00	0.8	0.53	Tekapo A	3	5	0.71	5.69	2.2	2.04
Edendale	0	0	0.00	0.00	0.0	0.00	Temuka	1	0	0.02	0.00	0.2	0.00
Frankton (A)	0	0	0.00	0.00	0.4	0.32	Timaru	0	0	0.00	0.00	0.0	0.00
Frankton (B)	0	0	0.00	0.00	0.4	0.45	Tiwai	0	0	0.00	0.00	0.0	0.00
Gore	0	0	0.00	0.00	0.0	0.00	Twizel (A)	0	0	0.00	0.00	0.0	0.00
Greymouth	0	0	0.00	0.00	0.6	0.25	Twizel (B)	0	0	0.00	0.00	0.0	0.00
Halfway Bush 110 kV	-	0	-	0.00	0.0	0.00	Twizel (C)	0	0	0.00	0.00	0.0	0.00
Halfway Bush 33 kV	0	0	0.00	0.00	0.2	0.00	Waipara 33 kV	0	1	0.00	1.19	0.2	0.24
Hokitika	1	0	0.38	0.00	1.2	0.64	Waipara 66 kV	0	0	0.00	0.00	0.0	0.00
Hororata 33 kV	0	0	0.00	0.00	0.2	0.61	Waitaki	0	0	0.00	0.00	0.2	0.08
Hororata 66 kV	0	0	0.00	0.00	0.0	0.00	Westport	1	0	0.29	0.00	0.2	0.06
Invercargill	0	0	0.00	0.00	0.0	0.00							

New points of service are averaged for years in service

Table 7: South Island Supply Points of Service – Unplanned Interruptions (listed by five-year average unserved energy

Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100	Point of Service	12/13 Number	13/14 Number	12/13 Unserved Energy % x100	13/14 Unserved Energy % x100	5 Yr Average Number	5 Yr Avg. Unserved Energy % x100
Castle Hill	1	2	7.58	1.01	4.0	9.45	Addington 11 kV	0	0	0.00	0.00	0.2	0.00
Coleridge	1	0	1.29	0.00	1.4	9.21	Addington 66 kV	0	0	0.00	0.00	0.0	0.00
Arthurs Pass	1	2	14.40	1.50	3.8	7.62	Ashley	0	0	0.00	0.00	0.0	0.00
Albury	2	5	2.64	13.6	2.2	5.07	Balclutha	0	0	0.00	0.00	0.0	0.00
Tekapo A	3	5	0.71	5.69	2.2	2.04	Blenheim	0	0	0.00	0.00	0.0	0.00
Bells Pond	2	3	3.99	2.87	1.3	1.72	Bromley 66 kV	-	0	-	0.00	0.0	0.00
BlackPoint	0	2	0.00	4.70	1.8	1.56	Brydone	0	0	0.00	0.00	0.0	0.00
Kumara	0	0	0.00	0.00	1.0	1.29	Clyde	0	0	0.00	0.00	0.0	0.00
Hokitika	1	0	0.38	0.00	1.2	0.64	Culverden	0	0	0.00	0.00	0.0	0.00
Hororata 33 kV	0	0	0.00	0.00	0.2	0.61	Edendale	0	0	0.00	0.00	0.0	0.00
Otira	0	0	0.00	0.00	1.2	0.57	Gore	0	0	0.00	0.00	0.0	0.00
Motupipi	0	1	0.00	1.06	0.4	0.56	Halfway Bush 110	-	0	-	0.00	0.0	0.00
Dobson	0	0	0.00	0.00	0.8	0.53	Halfway Bush 33 kV	0	0	0.00	0.00	0.2	0.00
Motueka	1	2	0.29	2.21	0.6	0.50	Hororata 66 kV	0	0	0.00	0.00	0.0	0.00
Frankton (B)	0	0	0.00	0.00	0.4	0.45	Invercargill	0	0	0.00	0.00	0.0	0.00
Frankton (A)	0	0	0.00	0.00	0.4	0.32	Islington 33 kV	0	0	0.00	0.00	0.0	0.00
Kimberley	-	1	-	0.27	1.0	0.27	Islington 66 kV	0	0	0.00	0.00	0.0	0.00
Greymouth	0	0	0.00	0.00	0.6	0.25	Kaiapoi	0	0	0.00	0.00	0.0	0.00
Waipara 33 kV	0	1	0.00	1.19	0.2	0.24	Middleton	0	0	0.00	0.00	0.0	0.00
Oamaru	0	0	0.00	0.00	1.2	0.23	Naseby	0	0	0.00	0.00	0.0	0.00
Ashburton 33 kV	0	0	0.00	0.00	0.2	0.22	Orowaiti	0	0	0.00	0.00	0.0	0.00
Culverden	0	0	0.00	0.00	0.4	0.20	Reefton	0	0	0.00	0.00	0.0	0.00
Kikiwa	0	1	0.00	0.08	0.4	0.15	South Dunedin	0	0	0.00	0.00	0.0	0.00
Stoke (A)	1	1	0.18	0.55	0.4	0.15	Southbrook	0	0	0.00	0.00	0.0	0.00
Murchison	0	1	0.00	0.27	0.4	0.11	Stoke (B)	-	0	-	0.00	0.0	0.00
North Makarewa	0	0	0.00	0.00	0.2	0.08	Temuka	1	0	0.02	0.00	0.2	0.00
Waitaki	0	0	0.00	0.00	0.2	0.08	Timaru	0	0	0.00	0.00	0.0	0.00
Brydone	0	0	0.00	0.00	0.2	0.07	Tiwai	0	0	0.00	0.00	0.0	0.00
Studholme	0	0	0.00	0.00	0.2	0.06	Twizel (A)	0	0	0.00	0.00	0.0	0.00
Westport	1	0	0.29	0.00	0.2	0.06	Twizel (B)	0	0	0.00	0.00	0.0	0.00
Atarau	0	1	0.00	0.27	0.2	0.05	Twizel (C)	0	0	0.00	0.00	0.0	0.00
Cromwell	0	0	0.00	0.00	0.2	0.04	Waipara 66 kV	0	0	0.00	0.00	0.0	0.00
Ashburton 66 kV	0	0	0.00	0.00	0.2	0.03							
New points of service are averaged for years in service							OVERALL AVERAGE			0.52	0.54		0.68
							MIDDLE AVERAGE			0.10	0.25		0.20
							Middle Average excludes highest five and lowest five.						

Point of Service Performance - Generators

Table 8: Generator Points of Service – Unplanned Interruptions (listed alphabetically)

Point of Service	12/13 Number	13/14 Number	12/13 Duration (mins)	13/14 Duration (mins)	5 Yr Average Number	5 Yr Average Duration (mins)	Point of Service	12/13 Number	13/14 Number	12/13 Duration (mins)	13/14 Duration (mins)	5 Yr Average Number	5 Yr Average Duration (mins)
Arapuni	1	2	27	139	0.8	49	Ohakuri	0	0	0	0	0.0	0
Aratiatia	0	0	0	0	0.2	351	Ohau A	0	0	0	0	0.0	0
Argyle	1	5	46	409	1.8	195	Ohau B	0	0	0	0	0.8	24
Atiamuri	0	0	0	0	0.0	0	Ohau C	0	0	0	0	0.0	0
Aviemore	0	0	0	0	0.4	295	Otahuhu A 110 kV	0	0	0	0	0.0	0
Benmore 220 kV	0	0	0	0	0.0	0	Otahuhu C 220 kV	0	0	0	0	0.0	0
Berwick	2	1	162	16	3.0	327	Poihipi	0	0	0	0	0.4	27
Clyde	0	0	0	0	0.0	0	Rangipo	1	1	477	25	0.8	586
Cobb	0	1	0	80	0.2	16	Rotorua 110 kV	0	0	0	0	0.2	25
Coleridge	1	0	24	0	0.2	5	Roxburgh 110 kV	0	0	0	0	0.0	0
Glenbrook Generation	1	0	120	0	0.2	24	Roxburgh 220 kV	0	0	0	0	0.4	207
Hawera (A)	0	0	0	0	0.2	22	Southdown	0	0	0	0	0.2	11
Hawera (B)	0	0	0	0	0.2	23	Stratford	0	0	0	0	0.6	739
Huntly	1	0	58	0	1.0	252	Tararua Windfarm C	0	0	0	0	0.0	0
Kaponga	0	0	0	0	1.0	131	Te Apiti Wind Farm	0	1	0	100	0.4	25
Karapiro	0	1	0	404	0.4	88	Te Kowhai	0	0	0	0	0.0	0
Kawerau Geo	0	1	0	331	0.2	66	Te Mihi	0	1	0	48	0.2	10
Kinleith	0	0	0	0	0.4	67	Tekapo A	3	6	45	258	2.4	100
Kumara	0	0	0	0	1.0	19	Tekapo B	2	1	19	3	0.8	12
Manapouri	0	0	0	0	0.0	0	Tokaanu	0	0	0	0	0.0	0
Mangahao	0	0	0	0	0.4	189	Tuai	1	1	170	118	0.6	60
Maraetai	2	1	267	173	1.8	252	Waipapa	2	1	269	177	1.4	207
Matahina (A)	0	0	0	0	0.0	0	Wairakei	0	0	0	0	0.0	0
Matahina (B)	1	4	132	385	1.2	132	Waitaki	0	1	0	91	0.6	129
McKee	1	0	197	0	1.0	197	West Wind	2	0	18	0	1.4	666
Nga Awa Purua	0	1	0	87	0.6	66	Whakamaru	0	0	0	0	0.2	5
Ngatamariki	0	1	0	87	1.0	87	Whirinaki	1	2	64	166	0.6	46
Ohaaki	0	0	0	0	0.0	0							

New points of service are averaged for years in service

Table 9: Generator Points of Service – Unplanned Interruptions (listed by five-year average duration)

Point of Service	12/13 Number	13/14 Number	12/13 Duration (mins)	13/14 Duration (mins)	5 Yr Average Number	5 Yr Average Duration (mins)	Point of Service	12/13 Number	13/14 Number	12/13 Duration (mins)	13/14 Duration (mins)	5 Yr Average Number	5 Yr Average Duration (mins)
Stratford	0	0	0	0	0.6	739	Glenbrook	1	0	120	0	0.2	24
West Wind	2	0	18	0	1.4	666	Ohau B	0	0	0	0	0.8	24
Rangipo	1	1	477	25	0.8	586	Hawera (B)	0	0	0	0	0.2	23
Aratiatia	0	0	0	0	0.2	351	Hawera (A)	0	0	0	0	0.2	22
Berwick	2	1	162	16	3.0	327	Kumara	0	0	0	0	1.0	19
Aviemore	0	0	0	0	0.4	295	Cobb	0	1	0	80	0.2	16
Huntly	1	0	58	0	1.0	252	Tekapo B	2	1	19	3	0.8	12
Maraetai	2	1	267	173	1.8	252	Southdown	0	0	0	0	0.2	11
Roxburgh 220 kV	0	0	0	0	0.4	207	Te Mihi	0	1	0	48	0.2	10
Waipapa	2	1	269	177	1.4	207	Coleridge	1	0	24	0	0.2	5
McKee	1	0	197	0	1.0	197	Whakamaru	0	0	0	0	0.2	5
Argyle	1	5	46	409	1.8	195	Atiamuri	0	0	0	0	0.0	0
Mangahao	0	0	0	0	0.4	189	Benmore 220 kV	0	0	0	0	0.0	0
Matahina (B)	1	4	132	385	1.2	132	Clyde	0	0	0	0	0.0	0
Kaponga	0	0	0	0	1.0	131	Manapouri	0	0	0	0	0.0	0
Waitaki	0	1	0	91	0.6	129	Matahina (A)	0	0	0	0	0.0	0
Tekapo A	3	6	45	258	2.4	100	Ohaaki	0	0	0	0	0.0	0
Karapiro	0	1	0	404	0.4	88	Ohakuri	0	0	0	0	0.0	0
Ngatamariki	0	1	0	87	1.0	87	Ohau A	0	0	0	0	0.0	0
Kinleith	0	0	0	0	0.4	67	Ohau C	0	0	0	0	0.0	0
Kawerau Geo	0	1	0	331	0.2	66	Otahuhu A 110 kV	0	0	0	0	0.0	0
Nga Awa Purua	0	1	0	87	0.6	66	Otahuhu C 220 kV	0	0	0	0	0.0	0
Tuai	1	1	170	118	0.6	60	Roxburgh 110 kV	0	0	0	0	0.0	0
Arapuni	1	2	27	139	0.8	49	Tararua Windfarm C	0	0	0	0	0.0	0
Whirinaki	1	2	64	166	0.6	46	Te Kowhai	0	0	0	0	0.0	0
Poihipi	0	0	0	0	0.4	27	Tokaanu	0	0	0	0	0.0	0
Rotorua 110 kV	0	0	0	0	0.2	25	Wairakei	0	0	0	0	0.0	0
Te Apiti Wind Farm	0	1	0	100	0.4	25							

New points of service are averaged for years in service

10 Transpower Individual Price-Quality Path

The Commerce Act (Transpower Individual Price-Quality Path) Determination 2010 included five performance measures, with targets, caps, and collars for four of these. During the Regulatory Control Period 1 (RCP1; 2011/12 to 2014/15), Transpower is required to report annual performance against these targets.

Table 10 details the performance measures and results for 2013/14.

Table 10: Performance Measures from Transpower Individual Price-Quality Path

	2013/14 Result	Target	Cap (for rewards)	Collar (for penalties)	Weighting
Number of Unplanned Events					
Number > 0.05 System minutes	17	21	10	31	25%
Number > 1.0 System minutes	2	3	1	5	25%
Planned & Unplanned system minutes	12.12	16.69	4.31	29.07	25%
HVAC Circuits Unplanned Unavailability[#]	0.051%	0.054%	0.029%	0.083%	25%
HVDC Unplanned Unavailability (BiPole)	0.071%	*	-	-	-

[#] HVAC Unplanned Unavailability target was 0.056% for 2011/12, and 0.054% for the next three years.
* No target was set for HVDC Unplanned Unavailability, but Transpower is required to report on this measure.

In 2013/14 all of the targets for RCP1 were bettered.

Performance for these measures for 2013/14 and the four previous years with the targets, caps, and collars is shown in the following figures.

Figure 28 Planned & Unplanned Supply Interruptions

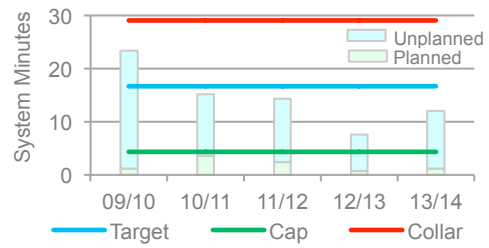


Figure 29 Unplanned Events > 0.05 System Minutes

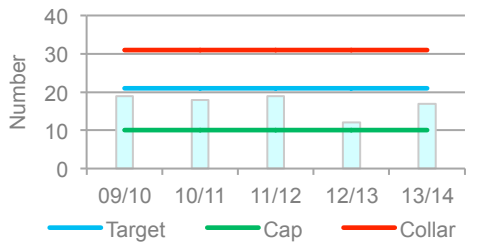


Figure 30 Unplanned Events > 1.0 System Minutes

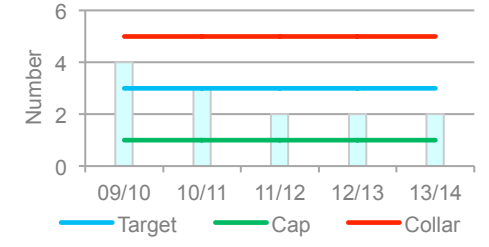


Figure 31 HVAC Circuits Unplanned Unavailability

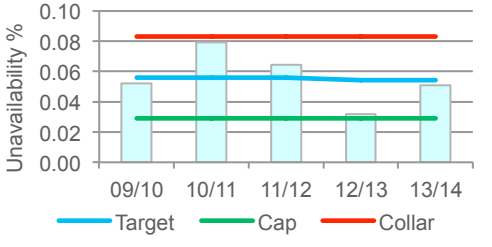
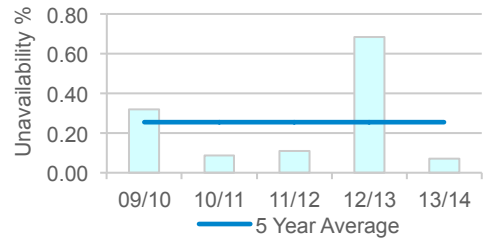


Figure 32 HVDC Unplanned Unavailability



Pole 2 only until 12/13; Bipole for 13/14

In addition to the performance measures defined in the Individual Price-Quality Path Determination, we have also undertaken to track and report on two other possible measures, viz: - average unplanned outage duration for circuits and power transformers. Historical performance for these measures is shown in Figure 33 and Figure 34. For this calculation, outages with long durations are capped at seven days.

Figure 33 HVAC Circuits Average Unplanned Outage Duration

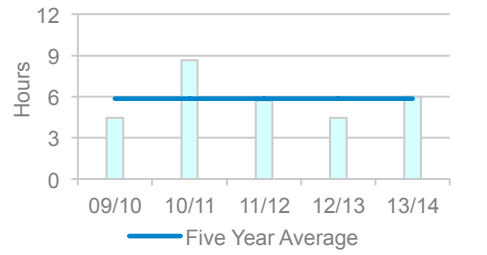
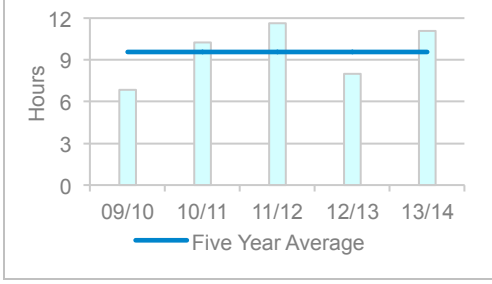


Figure 34 Power Transformers Average Unplanned Outage Duration



Average Outage Duration for HVAC circuits in 2013/14 was at the five-year average, but for Power Transformers performance was slightly higher (worse) than the five-year average.

For the period 2015/16 to 2019/20 (RCP2) there will be incentive payments and penalties associated with a new set of measures which focus on point of service performance and HVAC and HVDC availability.

11 The Electricity Information Disclosure Requirements[10]

(For 12 months ending 30 June 2014, 2013, 2012, and 2011)

Part 4

Energy Delivery Efficiency Performance Measures and Statistics (Disclosure under Requirement 20)	2013/14	2012/13	2011/12	2010/11
1. Energy delivery efficiency performance measures				
(a) Load factor (%) *Electrical energy entering the transmission system as percentage of maximum demand times hours per year*	68.49	68.45	65.51	69.47
(b) Loss ratio (%) *Transmission losses as percentage of energy entering the system*	3.38	3.33	3.76	3.79
(c) Capacity utilisation (%) *Maximum demand as percentage of total transformer capacity*	42.35	43.83	47.34	45.28
2. Statistics				
(a) System length, by voltage (km)				
Total [a]	17,242	17,405	17,094	17,198
350 kV (HVDC)	1,222	1,222	611	611
270 kV (HVDC)	-	-	611	611
0 kV (HVDC earth electrode)	31	31	31	31
220 kV (HVAC)	9,193	9,125	8,639	8,642
110 kV (HVAC)	5,875	6,082	6,157	6,152
66/50/33/11 kV (HVAC) [a]	920	944	1,045	1,151
(b) Circuit length of overhead electric lines, by voltage (km).				
Total [a]	17,093	17,283	17,003	17,108
350 kV (HVDC)	1,142	1,142	571	571
270 kV (HVDC)	-	-	571	571
0 kV (HVDC earth electrode)	31	31	31	31
220 kV (HVAC)	9,135	9,095	8,639	8642
110 kV (HVAC)	5,865	6,072	6,146	6,142
66/50/33/11 kV (HVAC) [a]	920	943	1,045	1,151
(c) Total circuit length of underground cables (km)				
220 kV (HVAC)	58	30	-	-
110 kV (HVAC)	11	11	11	11
66 kV (HVAC)	1	1	1	-
HVDC link submarine power cables				
350 kV (HVDC) [e]	80	80	40	40
270 kV (HVDC)	-	-	40	40
(d) Transformer capacity (kVA)	15.15×10^6	14.82×10^6	14.61×10^6	14.51×10^6
(e) Maximum demand (kilowatts) [bc] (kW)	6.41×10^6	6.49×10^6	6.92×10^6	6.57×10^6
(f) Total electricity entering the system (before losses) [bc] (kWh)	38.48×10^9	38.94×10^9	39.70×10^9	39.98×10^9
(g) Total amount of electricity (in kilowatt hours) supplied from the system (after losses of electricity) during the financial year on behalf of each person that is an electricity generator or an electricity retailer, or both [bcd] (kWh)	37.18×10^9	37.64×10^9	38.21×10^9	38.47×10^9
(h) Total connected customers	53	53	53	53

Notes

a Excludes 61 km of circuits leased from others and operated by Transpower.
b To 2 decimal places only, higher accuracy used in calculations.
c For all years, figures for maximum demand kW and kWh injected and supplied include loads on circuits leased by Transpower. The effect of these circuits cannot be measured as metering equipment is not installed at the interconnection points with Transpower-owned assets, but the difference is estimated to be no more than 0.1% of totals. Loads on Transpower assets leased to others are not included, as Transpower does not collect operational data for these assets.
d Including sales to direct connected customers.
e Three cables of 40 km length configured as two poles operate at 350 kV DC.

[10] Electricity Information Disclosure Requirements issued 31 March 2004 as amended by the Electricity Information Disclosure Amendment Requirements 2004, 2006, 2007, 2008, 2008 (No2), and 2008 (No3).

The Electricity Information Disclosure Requirements

(For 12 months ending 30 June 2014, 2013, 2012, and 2011)

Part 6

Reliability Performance Measures to be Disclosed by Transpower [a] (Disclosure Under Requirement 21)	2013/14	2012/13	2011/12	2010/11
1. Total number of unplanned interruptions [b]	143	54	198	89
Resulting from 47 loss of supply events in 2013/14				
2. Electricity customer interruptions in system minutes [c]	12.1	7.6	14.5	15.2
Planned	1.2	0.8	2.4	3.6
Unplanned	10.9	6.9	12.0	11.6
3. Underlying electricity customer interruptions in system minutes [c]				
Underlying interruptions are those interruptions of one system minute or less duration	4.7	3.0	5.2	4.0
Planned	1.2	0.8	1.4	1.1
Unplanned	3.5	2.2	3.9	2.9
4. Average supply reliability (%)				
Measured by the energy supplied divided by the sum of the energy supplied and not supplied	99.9965	99.9978	99.9956	99.9957
5. Uneconomic generation due to planned and unplanned transmission system unavailability (%) [d]	-	-	-	-
6. Uneconomic generation due to HVDC system unavailability (%) [d]	-	-	-	-
7. Uneconomic generation due to unplanned transmission system unavailability (%) [d]	-	-	-	-
8. Planned interruption restoration performance (%)	84.2	84.2	91.3	68.6
9. Unplanned interruption response (%)	100.0	100.0	99.5	100.0

Notes

a The information compiled using estimated information includes Part 6 sections 2, 3 and 4. The methodology used to calculate the estimated information is documented and available from Transpower upon request.
The reliability performance measures given in Part 6 do not include the performance of the 24 km of circuit leased to other parties because Transpower does not collect operational data for these assets.

b Where two supply voltages, or two customers, at the same station are both interrupted this is counted as two interruptions.

c Any minor differences between the total and the sum of planned and unplanned are due to rounding.
System minutes of interruptions do not include energy made up by backfeed from another point of supply or by embedded generation within a customer's network.

d Uneconomic generation (Part 6 sections 5, 6 and 7) is not relevant in the market environment because scheduling is now based on offered price, not economic cost. In the market, 'offers to generate' are made after taking constraints into account and it is not possible to predict what a generator would have offered if the constraint was not present. As a result, data is not available to allow a calculation and a null entry has been returned.

The High Voltage Transmission System

As at 30 June 2014

North Island National Grid and Major Generation Stations

South Island National Grid and Major Generation Stations

Significant Events from 1987 to 2014

Table 11: Significant Unplanned Events from March 1987 to June 2014

Date	System Minutes	Event description
10/04/14	3.3	Double circuit fault on Redclyffe-Wairakei and Wairakei-Whirinaki circuits caused by lightning, supply interruptions to Gisborne and Hawke's Bay.
12/11/13	4.2	HVDC ran back during commissioning testing, widespread load shedding (AUFLS) in North Island.
18/04/13	2.2	Cambridge 11 kV supply bus damaged and tripped when bus support insulator flashed over.
18/12/12	2.4	Redclyffe interconnecting transformer tripped on high temperature.
13/12/11	6.9	Huntly generation tripped causing load shedding (AUFLS).
15/08/11	1.3	Strong winds and snow to very low levels in Lower North Island and Taranaki.
22/02/11	3.2	Bromley transformers tripped by major earthquake.
2/12/10	3.4	Glenbrook 33 kV bus tripped when a bus insulator flashed over.
4/09/10	2.2	Transformers at Islington, Springston, and Hororata tripped by major earthquake.
22/04/10	1.3	Wilton 110 kV bus fault when maintenance equipment dropped onto bottom bus.
11/03/10	2.3	Kawerau 11 kV bus trip caused by a rat inside switchgear.
25/01/10	6.4	Line faults on Otahuhu Whakamaru C line caused by a tree and a subsequent fire resulted in rolling load cuts in Auckland region.
30/10/09	8.2	A container hoist operating under the Henderson-Otahuhu line caused a line fault and widespread loss of supply in North Auckland and Northland.
17/03/09	1.0	Disconnector at Timaru opened on load causing 110 kV bus fault.
07/03/09	1.1	Kaitimako-Tauranga-Mt Maunganui protection failed to clear fault causing outages in Bay of Plenty.
03/02/09	4.1	Penrose 33 kV supply transformers tripped following a fault on one bank.
01/09/08	4.9	Whirinaki 11 kV cable fault resulted in partial interruption to Pan Pac.
12/10/07	14.1	Kawerau paper mill shut down to investigate and rectify arc noises on 11 kV bus.
07/10/07	3.9	Part of Westport 11 kV bus exploded following a close-in lightning strike.
24/09/07	1.9	Protection relay at Kinleith failed to operate, resulting in interruptions at five points of service.
14/09/06	1.8	Earth sticks left on Islington 220 kV bus in error caused 220 kV bus fault and supply interruptions.
28/08/06	1.1	At Kawerau, a switching error combined with misleading indication resulted in loss of supply.
25/08/06	1.3	Glenbrook 33 kV bus tripped when a bus insulator failed.
12/06/06	29.8	Earth wire failed at Otahuhu causing 110 kV bus fault and widespread loss of load in Auckland area.
11/05/06	1.0	Protection maloperation at Tarukenga resulted in forced disconnection of load in the Bay of Plenty.
16/03/05	1.0	Tap changer problem caused tripping of both 33 kV supply banks at Hamilton.
12/04/01	4.2	Mouse caused flashover on 11 kV bus at Whirinaki.
25-6/09/00	4.4	Heavy wind and snow storm on East Coast, North Island.
26/07/98	1.5	Edgecumbe supply transformer damaged as a result of a human error.
4/06/97	1.1	Hamilton 11 kV supply transformer tripped because of a tap changer fault.
29/11/96	2.2	Widespread outage in Auckland area following circuits trippings during a lightning storm.
19/11/96	1.3	Bird proofing netting blown off Kawerau 110 kV bus in high winds.
8/10/96	2.2	Human error caused tripping of Islington 66 kV bus.
3/03/96	2.4	HVDC pole tripped incorrectly for fault on other pole - protection design problem.
12/07/94	3.9	Kawerau transformer cable bushing fault.
13/01/94	3.5	Tree contacted HVDC lines.
9/03/93	6.9	HVDC bipole trip due to communication circuit crossover.
23/10/92	1.8	Glenbrook transformer tripped due to pollution flashover.
28/08/92	11.4	Heavy snow storms in Canterbury.
26/07/92	1.1	Albany transformer tripped due to lightning.
6/08/91	1.4	Tower failure on Opunake-Stratford line.
16/07/91	1.1	Transformer Buchholz operated during transformer maintenance at Penrose.
30/05/91	6.1	Bus fault at Wilton during maintenance activities.
28/05/91	7.0	Bus fault at Islington due to a circuit breaker dropper failure.
26/04/91	1.6	Supply bank cable fault at Kinleith.
10/09/90	1.7	Conductor joint failure on Hinuera-Karapiro line.
20/01/89	3.5	Non Transpower contractor felled tree onto Otahuhu-Mt Roskill line.
9/12/87	*	A 110 kV circuit breaker failed to open correctly at Haywards.
29/06/87	*	Circuit breakers at Takapu Road failed to trip for a line fault.
2/03/87	*	Bay of Plenty earthquake.

* System minute figures are not available for years prior to 1987/88

QUALITY PERFORMANCE REPORT 2013/14

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