System Operator Reports
February 2016

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority for February 2016

Purpose of Report

This report is Transpower's review of its performance as system operator for February 2016, as required under clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

Operational issues are provided for the information of the Electricity Authority (Authority). A separate detailed System Performance report will be provided to Authority staff.

1. Business Plan Progress Update

The System Operator Business Plan outlines the key business initiatives to be undertaken in the 2015/16 financial year to enable us to meet the strategic goals set out in the System Operator Strategic Plan 2015-2020.

There are eight key business initiatives, each pertaining to one or more strategic goals, with a number of associated key performance indicators (KPIs). Performance to date is good with just under 82% (31/38) of the measurable 2015/16 KPI's completed, or forecast to be completed, on track. Two KPIs have now been missed. Performance on each key business initiative is summarised in Appendix A.

2. February Summary from an Operational and System Performance Perspective

Operational and System Performance

No material system events occurred during the month and very few weather events were observed. It is now over a year since there has been a tripping of a major thermal generator. However, on Saturday 27 February, prolonged thunderstorm activity in the Manapouri region resulted in a reclassification of the double circuits around Manapouri as a contingent event (CE) risk (with modest market price effects).

High numbers of planned transmission asset outages continued, with reduced security in a number of locations, including Hamilton and Frankton (Queenstown and Wanaka areas). This resulted in high workloads for planners and system co-ordinators.

On 15 February a fire at Islington substation damaged SVC 9, rendering the equipment unserviceable. No return to service date is yet available. Studies indicate system voltages in the upper South Island during the next two months, with remaining assets in service, should be manageable. An initial review of winter peak periods also shows voltage management should be satisfactory (with all remaining assets in service). A more detailed study (underway) will assess this position accounting for outages currently planned during winter months. Use of Orion's Upper South Island load controller is being considered as a mitigation to provide added headroom and enable planned outages over winter. We are presently considering options for planned outages that impact security without SVC 9.

A successful test of Tokaanu generation station's black start capability was held on 21 February. This test, a requirement of the ancillary service contract arrangements, required de-synchronising two generators and de-livening circuits from Tokaanu to Bunnythorpe and T9 at Bunnythorpe. The test required assets to be restarted, synchronised and re-livened, and was completed successfully.

3. Market

There were no market systems outages exceeding two hours in duration in February.

4. Business Performance

Significant Project Update – Reserves and Frequency Management Programme

The Reserves and Frequency Management (RFM) programme continued to progress per the agreed schedule. Industry collaboration remains a high priority and is critical to maintaining a positive relationship with industry stakeholders, with an engagement group held on 18 February. The RFM programme forms part of key business initiative 4.

Programme component projects are progressing at different stages as follows:

- MFK Refinement (TASC SOW 055) – Final MFK testing was completed by 17 February; with test results analysed and documented in a report. The report will be submitted to the Authority for final review on completion of the internal review presently underway. The project is forecast to be delivered within approved timelines.

- System Stability (TASC SOW 056) – This project was completed during February, following a presentation given to the Authority. The presentation summarised findings of the literature review and provided several recommendations.

- National Market for Frequency Keeping – On hold awaiting outcomes from the Normal Frequency Management Strategy.

- National Market for Instantaneous Reserve – High Level Design was completed and circulated to interested stakeholders. The delivery business case was completed and submitted to reviewers and approvers. The Electricity Authority has provided approval for the project to move into the build, test and deployment phase.

- Review of Instantaneous Reserve Markets Stage 2 (TASC SOW 053) – Proof of concept work continued on the SIR at less than 1:1 option, and has now migrated to the Integrated Market System test environment where analysis continues. Studies and investigation work continues on the remaining scope items, while report drafting has commenced.

- RMT Study Tool – Release 2 was made available in early February for further testing. Further development and minor defect fixes continued, with release 3 scheduled for late March. The project is forecast to complete on time and under budget.

Significant Project Update – Efficient Procurement of Extended Reserves Implementation

During this period the project has developed a methodology for assessing the selection of extended reserve, and continued its assessment of the implementation phase. A third workshop with industry is being planned, scheduled for late April. Transpower continues to assist the Authority developing the operational approach of the regime.

Significant Project Update – PRISM

A disaster recovery test was successfully completed, with outcomes documented and distributed to the project advisory team. A commissioning "go" decision has been confirmed. The project is forecast to commission during the week of 14-18 March, with go-live planned for 16 March. Close out will be 30 June 2016.

SOSPA Transition Project Update

Implementation towards the new SOSPA is currently underway, with a transition plan in place. Work has commenced with the Authority to complete the transitional provisions and agree the scope of new deliverables. Internal process reviews have commenced, together with communications to support a common understanding for those affected by the contract changes.

5. Security of Supply Update

The 2016 Security of Supply annual assessment has been published. It is based on advised generation availability to 2025, but does not include scenarios as presented in the thermal exit assessment. With little new generation committed and advice of the Huntly closure at end of 2018, the resulting conclusion is both energy and capacity margins are adequate until 2018. However, the outlook beyond that is uncertain.

Storage returned to above average levels during January and February, due to a number of large inflow events. Current storage levels should be sufficient to manage winter demand barring major outages or unprecedented low inflows.

NZ aggregate storage levels are 102% of average for this time of year. The hydro risk meter is currently set at "normal". In the unlikely event of significant equipment failure, the security of supply status could change quickly.

National Winter Group Review – The outlook for winter 2016 has been published, with increased margins for meeting expected peak demand when compared to 2015. This is despite thermal exits, and is due to reduced planned generator outages and lower forecast demand. North Island capacity margins for 2016 are second only to those in 2013 during the period from 2009-2016.

6. Compliance Report

There were no breaches of the principal performance obligations during February.

One breach of the Code was reported to the Authority; this related to a modelling error that appeared in a long schedule. Once identified the error was remedied for future schedules.

7. Ancillary Services

The review of the system operator's ancillary services cost allocation processes is now complete – the key deliverable being an end-to-end process document outlining the roles, responsibilities and high level actions of all parties involved in the process. An external auditor has been engaged to review this process during March.

Ancillary Service Costs

The costs of ancillary services for the month are in Appendix B.

8. Code 7.10: Separation of Transpower Roles

In performing its role as system operator, Transpower has not been materially affected by any other role or capacity Transpower has under the Code or under any agreement.

Appendix A – Business Planning Update KPI Table

Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
1. Assisting the Authority to meet its competition, reliability and efficiency objective (the CRE objective)	2	1	1	-	-	-	One KPI, relating to applying the CRE objective to 25% of our policies and procedures, has been completed ahead of schedule. However, we will continue to monitor progress. The other KPI, relating to releasing $1m of market benefits, is on track with a short list of projects/initiatives identified and initial analysis to commence shortly.
2. Developing an efficient balance between risk, reliability and resilience	3	1	2	-	-	-	One KPI, relating to updating risk management to reflect the bowtie methodology, has been completed ahead of schedule. Work on the remaining two KPIs is ongoing and presently on track.
3. Seeking opportunities to add value through the provision of information to support an efficient market	3	-	3	-	-	-	Work has now commenced on all three KPIs with all presently on track.
4. Improvements to deliver a system operator service that meets or exceeds expectations and represents value for money	6	1	5	-	-	-	One KPI, relating to recognising and addressing the Authority's concerns about increasing capital spend, has been completed ahead of schedule. Work is ongoing on the remaining five KPIs, with all presently on track.
5. A transparent business and requirements roadmap for investments required to deliver the system operator service	2	1	1	-	-	-	One KPI, related to aligning our capital investments, is now complete following the completion of project Aardwolf. Completion was ahead of schedule. The second KPI remains on track for completion in March/April, ahead of the 30 June target.
6. Building capability, and promoting a professional, responsive service culture	5	1	4	-	-	-	One KPI, relating to implementing a study version of vSPD for analyst use, has been completed ahead of schedule. Work continues on the remaining four KPIs, with all presently on track. The previous resourcing issue with the potential to affect one of the KPIs has been resolved.

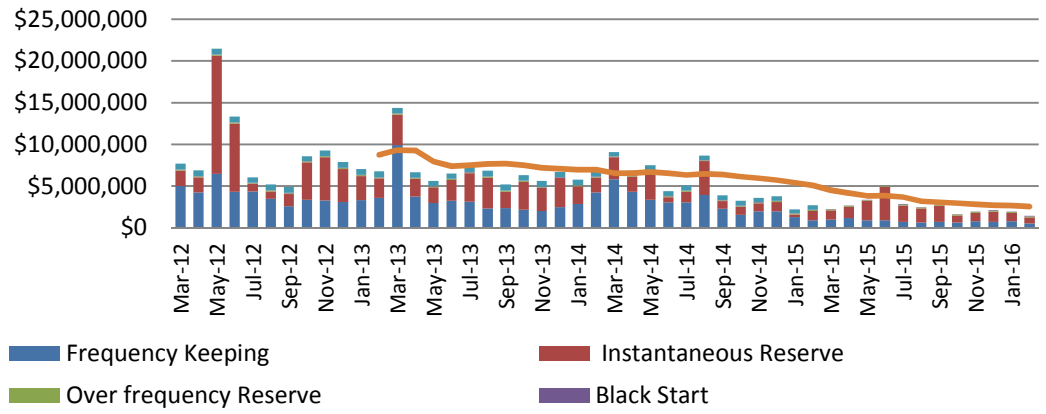
Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
7. Engaging with and understanding the Authority, market participants and consumers	5	1	1	3	-	-	One KPI, relating to the completion of a 'building connections' customer video, has now been completed ahead of schedule. Three KPIs, relating to the publication of newsletters, the publication of an update stakeholder engagement plan, and holding at least three industry participant presentations, are presently at risk. The other KPI remains on track.
8. Maximising opportunities arising from being part of the wider Transpower business	12	4	4	2	-	2	Four KPIs, relating to an MOU for generator commissioning, a baseline for comparing future staff turnover, an engineering progression programme, and the introduction of an annual site visit safety assessment programme have been completed ahead of, or on, schedule. Two KPIs, related to the development of a common fatigue management policy, and the investigation and implementation of changes to reduce the quantity of reserves required to cover HVDC operation, are presently at risk. A further two KPIs, regarding the introduction of a market analyst progression programme, and the development of recruitment and retention guidelines, have been missed. Work has commenced, or is shortly planned to commence, on the remaining KPIs, with these presently on track.
Totals	**38**	**10**	**21**	**5**	**0**	**2**	

Appendix B – Ancillary Service Costs for February 2016

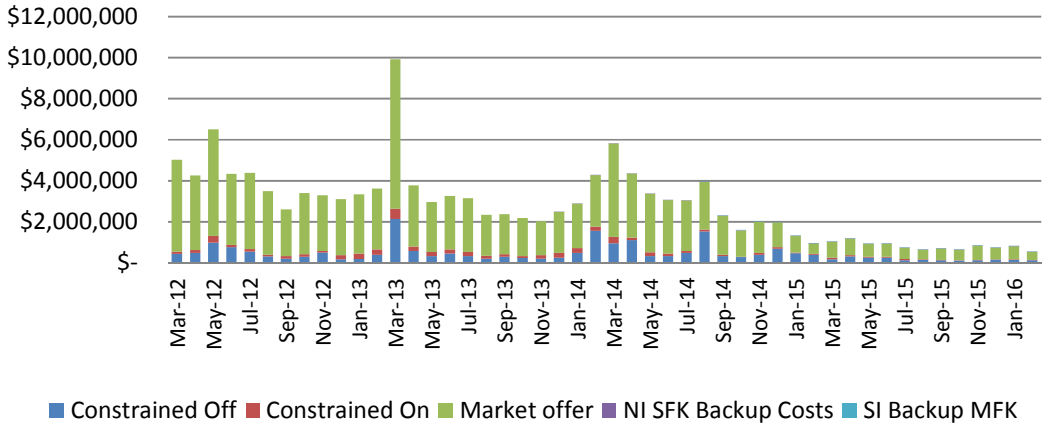
Note: The scale for the Instantaneous Reserve (Past 4 Years) graph has been reduced to clarify detail. Two months data, May and June 2012, overly influenced the graph scale.

		Cost	
Frequency Keeping	Constrained Off	$	120,757
	Constrained On	$	20,569
	Market offer	$	385,075
	NI SFK Backup Costs	$	2,916.67
	SI Backup MFK	$	3,832.00
	Total monthly Cost	**$**	**533,150**
Instantaneous Reserve	Spinning reserve	$	304,463
	Interruptible Load	$	451,513
	Constrained On	$	2,585
	Total monthly Cost	**$**	**758,561**
Over Frequency Reserve	**Total monthly Cost**	**$**	**123,349**
Black Start	**Total monthly Cost**	**$**	**55,285**
Voltage Support	**Total monthly Cost**	**$**	**-**
All Ancillary Services	**Total monthly Cost**	**$**	**1,470,344**

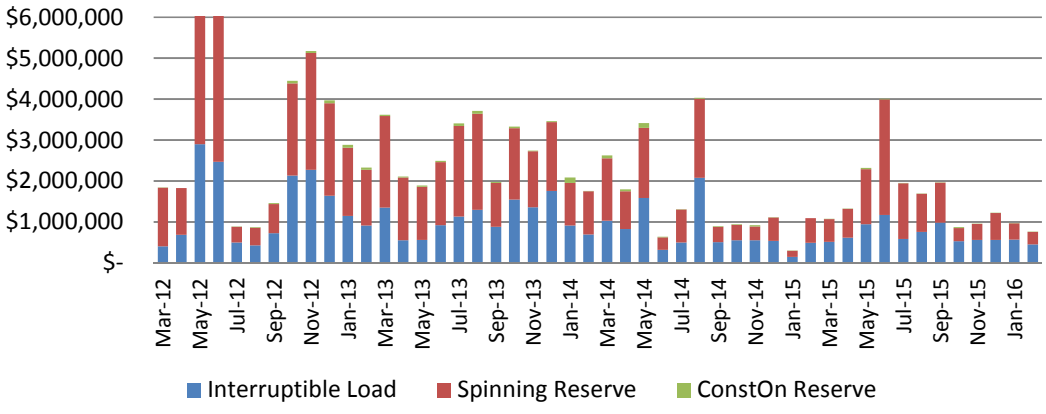
Ancillary Services Costs (past 4 years)



Frequency Keeping (past 4 years)



Instantaneous Reserve (past 4 years)



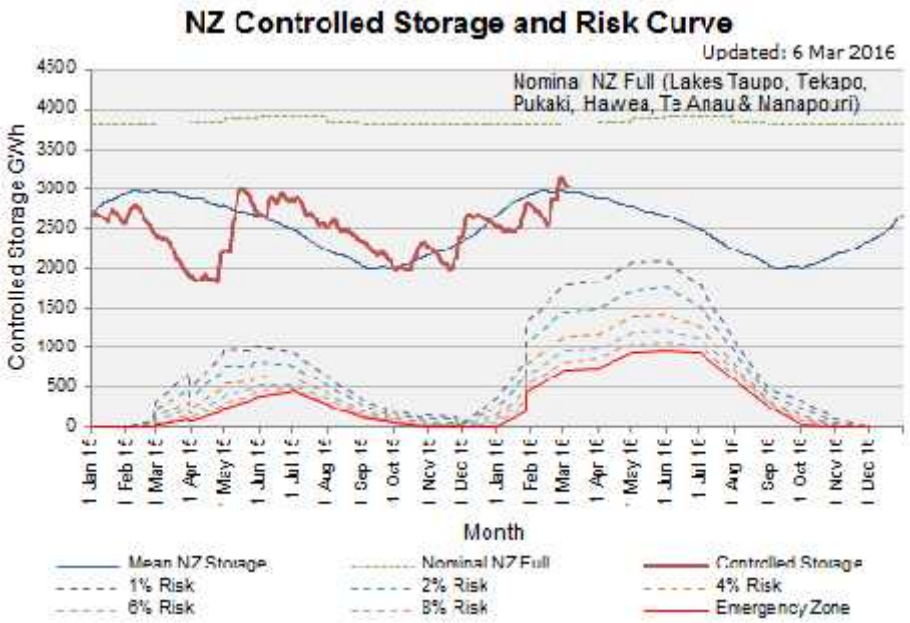
Note: IR Cost May 2012 = 14.129M, IR Cost Jun 2012 = 8.164M

Appendix C – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

As at 7 March 2016, aggregate primary New Zealand storage was 102% of average.

The graph below compares New Zealand hydro storage to the hydro risk curves.



Hydro Storage and Generation in February

North Island inflows were 89% of average.

South Island inflows were 132% of average.

Measurements are based on daily inflow values.

Hydro generation met 63% of demand.

System Performance Report

To the Electricity Authority

February 2016

Purpose

This System Performance Report summarises power system performance each month. The detailed reporting of system events is intended to provide an understanding of the nature of system events that occur in the normal course of the real time co-ordination of security and to identify emerging issues in system operation.

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

Transpower New Zealand Ltd The National Grid

Table of Contents

1. Summary of System Performance

This system performance report covers the month of February 2016.

Principal Performance Obligations

The system operator met the Principal Performance Obligations during the reporting period.

System Events

- On 10 February, at 15:56, an emergency potline off-load at Tiwai Point Aluminium Smelter resulted in a momentary frequency increase in the South Island to 50.59 Hz.

Other noteworthy events occurring during the reporting period:

- On 7 February, at 06:21, 66 kV Coleridge – Otira circuits 1 and 2 tripped and auto-reclosed. A momentary loss of supply to Arthurs Pass and Castle Hill substations resulted.
- On 17 February, at 22:37, 110 kV Inangahua – Murchison - Kikiwa circuit 1 tripped and auto-reclosed, resulting in a momentary loss of supply to Murchison substation.
- On 21 February, at 01:02, 66 kV Coleridge – Otira circuit 1 tripped and auto-reclosed, resulting in a momentary loss of supply to Arthurs Pass and Castle Hill substations.

2. Principal Performance Obligations

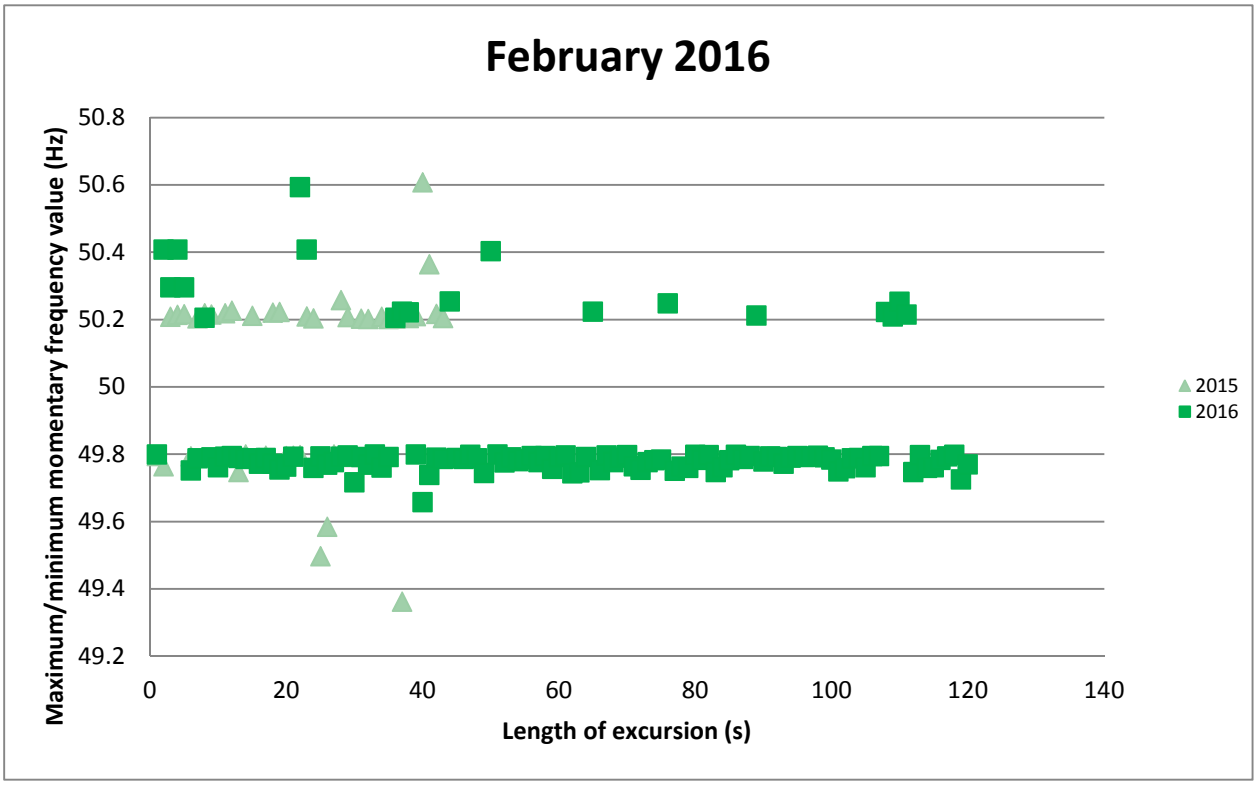
2.1 Avoid Cascade Failure

No instances of cascade failure occurred during the reporting period.

2.2 Frequency

Maintain frequency in normal band and recover quickly from a fluctuation

The chart below shows the maximum or minimum frequency reached and length of each frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period. The majority of excursions are within 0.4 Hz of the normal band and frequency typically returns to within the normal band within 2 minutes.



Maintain Frequency and limit rate occurrences during momentary fluctuations

The table below shows the total number of momentary fluctuations outside the frequency normal band, recorded in both Islands, over the last 12 months. The 12 month cumulative totals, grouped by frequency band, are compared to the frequency performance objective (PPO).

Frequency Band	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Annual rate	PPO target
55.00 > Freq >= 53.75														**0.2***
53.75 > Freq >= 52.00														**2***
52.00 > Freq >= 51.25														**7**
51.25 > Freq >= 50.50	2	1	1	4	2	2		1	1	3		1	**18**	**50**
50.50 > Freq >= 50.20	47	153	252	308	104	131	146	52	52	37	10	18	**1310**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	44	174	315	295	141	170	172	128	173	111	84	101	**1908**	
49.50 >= Freq > 48.75	1					1				1	1		**4**	**60**
48.75 >= Freq > 48.00														**6**
48.00 >= Freq > 47.00														**0.2**
47.00 >= Freq > 45.00														**0.2**

***** South Island

Manage time error and eliminate time error once per day

- The time error performance criteria are:
- Time error must be managed within +/- 5 seconds.
- Time error must be eliminated at least once every day.

Time Error Compliance Table		Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16
Time Error Management	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Error Elimination	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. Operational Management

3.1 Security Notices

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

Notices issued	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	2	3	1	-	-	-	1	2	1	4	2
Warning Notice	31	10	12	-	-	1	-	3	-	-	-	-
Customer Advice Notice	12	13	32	11	5	6	10	7	9	16	3	7

3.2 GRID EMERGENCIES

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

Date	Time	Summary Details	Island
17/02/16	10:27	A grid emergency was declared to close the 110 kV Arapuni Bus split, due to an unplanned outage of 220 kV Ohakuri-Wairakei circuit 1.	N
06/02/16	18:35	A grid emergency was declared to close the 110 kV Arapuni Bus split following the tripping of generation on the Arapuni south bus.	N

A summary of grid emergencies that have occurred in the last 12 months is shown in the following table.

Island	Region	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16		Total
North Island	Northland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Auckland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 1	-	1	-	-	-	-	-	-	-	-	-	-	**1**
	Waikato	-	-	3	-	-	-	-	1	1	1	4	2	**12**
	Bay of Plenty	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Hawkes Bay	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Taranaki	-	-	-	-	-	-	-	-	--	-	-	-	**0**
	Bunnythorpe	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Wellington	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	North Island (all)	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Lower North Island	-	-	-	-	-	-	-	-	-	-	-	-	**0**
North & South Islands		-	-	1	-	-	-	-	-	-	-	-	-	**1**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	West Coast	-	-	-	-	-	-	-	-	1	-	-	-	**1**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Otago	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Southland	-	1	-	1	-	-	-	-	-	-	-	-	**2**
	South Island (all)	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 Customer Advice Notices

Seven customer advice notices (CANs) were issued in the reporting period, included:

- three related to the temporary reclassification of the 220 kV double circuit lines around Manapouri as a single contingent risk on 26 February, due to an electrical storm in the vicinity
- two related to the impact of planned Harmonic Filter outages on HVDC transmission limits
- one advising of a teleconference on 25 February regarding outages associated with the 220 kV Aviemore – Livingstone line duplexing
- one updating the status of Islington SVC9 following the fire on 15 February.

3.4 Forecast Standby Reserve Shortfall (SRS) notices

Three SRS notices were issued during the reporting period based on the SDS (the system operator's own load forecasting tool). These SRS notices were in respect of trading periods on 16 and 29 February.

3.5 Voltage Management

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

3.6 Outage Management

The following table shows the number of outages over the last 12 months where operational measures (generation agreements, load management agreements or grid re-configurations) were required to allow the outage to proceed. Load agreements generally require the distributor to manage load at one or more grid exit points. Generation agreements are required to ensure sufficient regional generation is available to provide energy or reactive support during the outage to maintain security standards. Grid re-configurations typically involve splitting the network during the outage to manage post contingency power flows. Security of supply is sometimes reduced by grid re-configuration.

Island	Region	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Total
North Island	Northland	6	12	8	7	-	3	3	5	6	3	-	3	**56**
	Auckland	4	8	11	5	3	7	9	5	8	2	6	3	**71**
	Waikato	9	8	11	7	4	6	9	5	4	1	3	6	**73**
	Bay of Plenty	4	6	4	4	3	2	5	2	4	-	3	3	**40**
	Hawkes Bay	6	6	7	3	-	-	3	2	2	1	1	2	**33**
	Taranaki	3	2	5	2	-	-	2	2	3	2	-	4	**25**
	Bunnythorpe	4	8	7	4	2	2	-	5	4	-	4	7	**47**
	Wellington	8	9	6	7	-	3	4	5	6	3	3	6	**60**
Total		44	59	59	39	12	23	35	31	37	12	20	34	**405**
South Island	Nelson Marlborough	4	6	8	3	2	2	4	4	7	2	7	2	**55**
	West Coast	6	5	10	7	6	3	3	5	9	3	7	5	**72**
	Christchurch	7	7	7	6	6	4	3	2	7	3	6	2	**66**
	Canterbury	2	2	6	1	2	2	3	1	5	2	6	2	**37**
	Otago	2	3	5	-	-	2	2	3	2	-	-	-	**22**
	Southland	4	5	3	1	4	2	1	4	-	2	1	1	**29**
Total		25	28	39	18	20	15	16	19	30	12	27	12	**281**

3.7 CONSTRAINTS

SUMMARY: Security constraints binding during the month

The following table shows the binding constraints during the reporting period.

Additional information on security constraints can be found on the following website address: *http://www.systemoperator.co.nz/security-management#cs-147305*. This information includes constraint equations and a brief summary of their purpose.

Island	Region	Branch	Description	Total
North Island	Hamilton	ARI_KIN1.1__ARI_KIN2.1__ARI_KIN2__ARI__LN	This is an SFT generated constraint. Its purpose is to protect Arapuni-Kinleith 1 for a tripping of Arapuni-Kinleith 2	1
		HAM_KPO1.2__HIN_KPO.1__HIN_KPO__CBG__LN	This is an SFT generated constraint. Its purpose is to protect Hamilton-Karapiro 1 for a tripping of Hinuera-Karapiro 1.	2
		HAM_KPO_1_S_O_2	The effect of this constraint is to manage flows through the Hamilton Karapiro circuit 2 for a contingency of a Karapiro generator unit when Hamilton Karapiro circuit 1 is out of service.	2
		HAM_KPO_2_S_O_2	The effect of this constraint is to manage flows through the Hamilton Karapiro circuit 1 for a contingency of a Karapiro generator unit when Hamilton Karapiro circuit 2 is out of service.	10
	Hawkes Bay	FHL_RDF2.1__FHL_RDF1.1__FHL_RDF1__RDF__LN	This is an SFT generated constraint. Its purpose is to protect Fernhill-Redclyffe 2 for a tripping of Fernhill-Redclyffe 1.	1
		FHL_RDF1.1__FHL_RDF2.1__FHL_RDF2__RDF__LN	This is an SFT generated constraint. Its purpose is to protect Fernhill-Redclyffe 1 for a tripping of Fernhill-Redclyffe 2.	23
South Island & HVDC	Otago	NSY_ROX.1__CYD_TWZ2.1__:S__CYD_TWZ2__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 2.	5
		NSY_ROX.1__CYD_TWZ1.1__:S__CYD_TWZ1__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 1.	11
	Southland	MAN_NMA3.1__MAN_NMA1.1__MANNMA12__MAN__LN	This is an SFT generated constraint. Its purpose is to protect Manapouri-North Makarewa 3 for a tripping of Manapouri-North Makarewa 1.	3
	West Coast	COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	This is an SFT generated constraint. Its purpose is to protect Coleridge-Hororata 3 for a tripping of Coleridge-Hororata 2	4
Grand Total				**62**

Constraints binding during last 12 months

The following table shows constraints which bound during the reporting period for four or more trading periods, and those binding for more than 48 trading periods during the year.

Island	Region	Constraint	Reporting period		Previous 12 months	
			Number of trading periods that constraint bound	Percentage of trading periods	Number of trading periods that constraint bound	Percentage of Trading periods
North Island	Hamilton	HAM_KPO_2_S_O_2	10	0.74%	0	0.00%
	Hawkes Bay	FHL_RDF1.1__FHL_RDF2.1__FHL_RDF2__RDF__LN	23	1.71%	0	0.00%
South Island & HVDC	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	0	0.00%	48	0.27%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	4	0.30%	44	0.25%
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	0	0.00%	77	0.44%
		NSY_ROX.1__CYD_TWZ1.1__:S__CYD_TWZ1__ROX__LN	11	0.82%	42	0.24%
		NSY_ROX.1__CYD_TWZ2.1__:S__CYD_TWZ2__ROX__LN	5	0.37%	22	0.13%

4. System Events

4.1 Significant System Events

The following table shows significant events (frequency excursions and connection point events) which occurred during the reporting period.

Significant frequency excursions

Date	Time	Summary Details	Island	Freq (Hz)
10/02/16	15:56	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.59

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
		None.		

4.2 SYSTEM EVENTS DURING REPORTING PERIOD

System events that occurred during the reporting period were:

Contingent events

Event	Number	Summary
Loss of single AC transmission circuit	8	These related to trippings of: • Arapuni-Kinleith 1 (auto reclose) • Coleridge-Otira 1 (auto reclose) • Fernhill-Waipawa 1 (auto reclose) • Inangahua-Kikiwa 1 (auto reclose) • Islington-Tekapo B 1 • Ohakuri-Wairakei 1 • Wanganui-Waverley 1 • Woodville-Dannevirke-Waipawa 1
HVDC Start/Stop	0	
Supply Transformer	4	This related to tripping of: • Frankton T2 • Kawerau T11 • Tangiwai T2 • Temuka T2
Loss of grid reactive plant	3	These related to trippings of: • Kikiwa Static Synchronous Compensator STC2B • Islington Static Var Compensator SVC9 • Penrose Static Synchronous Compensator STC1
Loss of single generation units	19	These related to trippings of: • Aniwhenua generation • Arapuni G8 • Benmore G2 • Cobb G5 (2 x), G6 • Ohau A G5 • Onepu TA2 • Kinleith Co-generation (3 x) • Mokai STG10 (3 x), STG30 • Ohaaki G2 (2 x) • Poihipi G1 • Te Mihi G1
Total during reporting period	**34**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	
Loss of interconnecting transformer	0	
Loss of bus bar section	0	
Total during reporting period	**0**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	2	These related to: • Coleridge-Otira 1 & 2 (auto reclose) • Kumara-Otira 1 & Hokitika-Otira 2
Demand change	3	These related to: • Trippings in the connected party's network fed from Naseby Substation • Trippings in the connected party's network fed from Islington Substation • Tiwai NZAS Standby Potline Emergency off-load
Generation	2	This related the tripping of: • McKee G61 & G62 • Wairakei G4 & G10
Total during reporting period	**7**	

Other disturbances

Event	Number	Summary
Feeder trippings	37	Various locations
Total during reporting period	**37**	

4.3 System Events – Trend

	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Total	Average Events per month
Contingent Event – transmission	8	13	8	26	11	7	8	6	20	14	17	8	**146**	12.2
Contingent Event – generation	14	6	11	11	13	6	16	19	27	16	12	19	**170**	14.2
Contingent Event – Supply transformer	2	3	3	4	0	1	2	1	2	9	1	4	**32**	2.7
Contingent Event – Reactive plant	2	3	6	4	3	2	5	1	2	4	2	3	**37**	3.1
Contingent Event - HVDC	3	0	0	0	0	0	1	0	0	0	3	0	**7**	0.6
Extended Contingent Event HVDC	0	0	0	0	0	0	0	0	0	1	0	0	**1**	0.1
Extended Contingent Event Inter-connecting Transformers	1	0	2	0	0	0	0	0	0	0	0	0	**3**	0.3
Extended Contingent Event Busbar	1	2	1	2	0	1	0	1	0	0	0	0	**8**	0.7
Other Event – AC transmission	4	0	1	8	0	0	3	2	1	0	3	2	**24**	2.0
Other Event – Demand	1	1	2	5	2	3	0	3	3	3	3	3	**29**	2.4
Other Event – Generation	4	0	1	0	0	1	3	0	0	0	1	2	**12**	1.0