Security and Reliability Council

The adequacy of generation capacity for winter 2017

The New Zealand Generation Balance outlook for adequacy of generation capacity for the 200 days from 10 March 2017

28 March 2017

Note: This paper has been prepared for the purpose of the Security and Reliability Council (SRC). Content should not be interpreted as representing the views or policy of the Electricity Authority.

Background

The Security and Reliability Council's (SRC) functions include offering advice to the Electricity Authority on the security of the power system.

From 2008 to 2016, the National Winter Group (NWG) reported annually on the ability of the power system to meet peak demand for each coming winter. In practice, the system operator was the author and driving force of the NWG. The NWG reporting has been abandoned and replaced by a regular system operator publication: New Zealand Generation Balance (NZGB).

The key advantage of NZGB for past users of NWG reporting is that NZGB is updated daily with a rolling 200-day outlook. By contrast, NWG was published once or twice before each winter and was quickly out of date.

Points to consider when interpreting NZGB results

Like its NWG predecessor, the NZGB reporting is an assessment of whether, given certain assumptions, there are any periods forecast during which normal security cannot be maintained (in other words, whether load can be supplied and whether desired levels of reserves can be procured).

A key benefit of the NZGB reporting is that it initiates discussion and action with respect to the scheduling of generation outages. Such rescheduling might be to restore forecasts to normal security, or to improve the capacity margins by which normal security is achieved. Given the inherent uncertainty with taking a fixed set of assumptions about a complex system, increasing the minimum margins is likely of benefit to consumers if it comes at a low cost. Well-planned and coordinated outages are part of the efficient operation of the industry.

As this is the first year of the NZGB, the system operator has included explanations of differences between the NWG and NZGB methodologies.

NZGB results for winter 2017

The high level conclusion from the NZGB is that "It is unlikely there will be major issues meeting peak winter demand and the power system should be able to meet the peak winter demand in a normal, secure state."

For the North Island, the period with the forecast lowest margins is the morning peak on 10 August 2017. At that time, the North Island 'N-1' capacity margin is 444 MW and the 'N-G-1' capacity margin is 84 MW. These compare favourably to NWG results in recent years, though the methodologies have some differences.

For the South Island, the period with the forecast lowest margins is the morning peak on 3 June 2017. The 'N-1' capacity margin is 497 MW. The NZGB does not measure a N-G-1 margin for the South Island.

The SRC is next scheduled to meet on 7 July 2017 (before the forecast minimum North Island margin) and could receive an up-to-date version of the NZGB at that time, should it be requested. Given the margin results, this does not appear necessary. The secretariat will re-present NZGB results if there is a substantial adverse change in results.

The SRC may wish to consider the following questions.

Q1.	Does the SRC have any concerns with the transition from NWG to NZGB reporting?

Q2.	Does the result of the NZGB report give the SRC confidence in the suitability of power system capabilities for winter 2017?
Q3.	What further information, if any, does the SRC wish to have provided to it by the secretariat?
Q4.	What advice, if any, does the SRC wish to provide to the Authority?

WINTER 2017 CAPACITY MARGIN REPORT

NEW ZEALAND GENERATION BALANCE ANALYSIS

Transpower New Zealand Limited
March 2017

Keeping the energy flowing




TRANSPOWER

Transpower New Zealand Limited The National Grid

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Executive Summary

The power system is well prepared for winter 2017. It is unlikely there will be major issues meeting peak winter demand and the power system should be able to meet the peak winter demand in a normal, secure state.

The winter is characterised by a minimum North Island N-1[1] capacity margin of 694 MW[2], occurring in the morning peak of 10 August. This is an improvement over the capacity margins for the winters of 2015 and 2016 (136 MW and 287 MW respectively).

Should a capacity issue eventuate, Transpower expects normal market response would mitigate much of the potential impact. Transpower, as system operator, monitors NZGB margins and will signal any concerns to the market should they arise.

This year the analysis has been performed using the Transpower New Zealand Generation Balance (NZGB) tool. Previously Transpower has undertaken winter capacity analysis using the National Winter Group (NWG) analysis format (2007-2016)[3].

This report contains the results of the NZGB based assessment of the capacity of the power system to meet peak demand over the winter of 2017. NZGB analysis is fundamentally the same as NWG analysis; a comparison is made between generation assumed to be available and a forecast peak load.

Transpower performs other security of supply reporting which covers energy availability, such as the Security of Supply Annual Assessment most recently published in February 2017.

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[1] N-1 capacity margin - the ability of the power system to maintain energy supply following the loss of the largest (single) source of MW.

[2] As at 10 March 2017.

[3] NWG reports covering 2009 to 2016 are available at https://www.transpower.co.nz/system-operator/stakeholder-interaction/national-winter-group

1 Purpose

This report provides electricity industry participants with a summary of the peak capacity outlook for winter 2017, as identified by analysis of the NZGB results. The aim is to identify potential issues in meeting peak winter demand allowing remedial actions to be considered, such as they may be. It takes a precautionary view and is not intended as a prediction of actual operating margins expected to eventuate on the power system.

2 NZGB

Winter 2017 capacity margin analysis was undertaken using Transpower's NZGB tool. NZGB:

- is a web hosted (www.nzgb.redspider.co.nz) capacity margin analysis tool.
- calculates morning and evening peak capacity margins (N-1 and N-G-1) for a rolling 200-day horizon[4]
- receives daily updates of notified generation outages from the Planned Outage Co-ordination Protocol (POCP) website.
- data and calculation formula are downloadable.
- continues to be evolved and improved as opportunities arise.

To protect from malicious cyber-attacks NZGB access is restricted. However, recent changes have added the chart of the generation balance (N-G-1) capacity margin to the unrestricted landing page. All POCP account holders have access to NZGB.

NZGB's components are described in detail in the section 4. When appropriate the methodologies of the NZGB and the superseded NWG are compared.

In comparison to the methodology overview given above NWG analysis was performed on a singular worst-case scenario for each island; the peak load occurring co-incident with the lowest availability of generation.

3 Capacity margin results

Winter 2017 is characterised by a minimum North Island (N-1) capacity margin of 694 MW, occurring in the AM peak of 10 August. This is an improvement over the capacity margins for the winters of 2015 and 2016 (136 MW and 287 MW respectively).

The lowest North Island N-G-1[5] capacity margin calculated for winter 2017 is 334 MW, occurring coincident with the lowest N-1 capacity margin (AM peak 10 August).

[4] By comparing the generation assumed to be available with a forecast peak load; the margin between those two values allowing for the provision of reserves.

[5] N-G-1 capacity margin - the ability of the power system to maintain energy supply following the loss of the largest (single) source of MW and restock reserves to cover the next largest risk.

The lowest calculated South Island N-1 capacity margin during winter 2017 is 497 MW. This occurs in the morning peak of 3rd June.

The daily AM and PM peak capacity margins for the winter 2017 period are shown in the following charts. Source www.nzgb.redspider.co.nz.

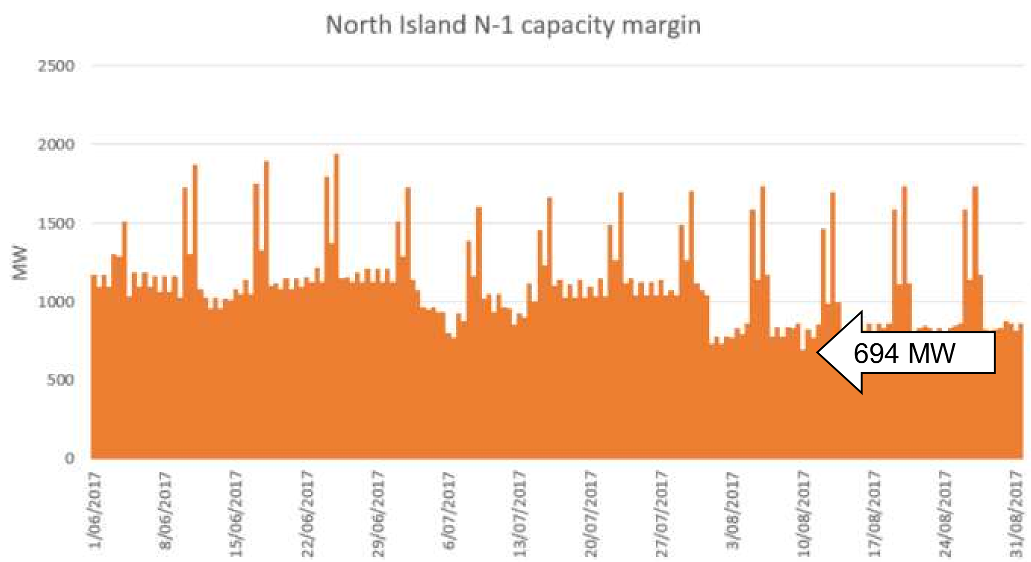

Chart 1 - North Island N-1 capacity margins at 10/03/2017
Source www.nzgb.redspider.co.nz.

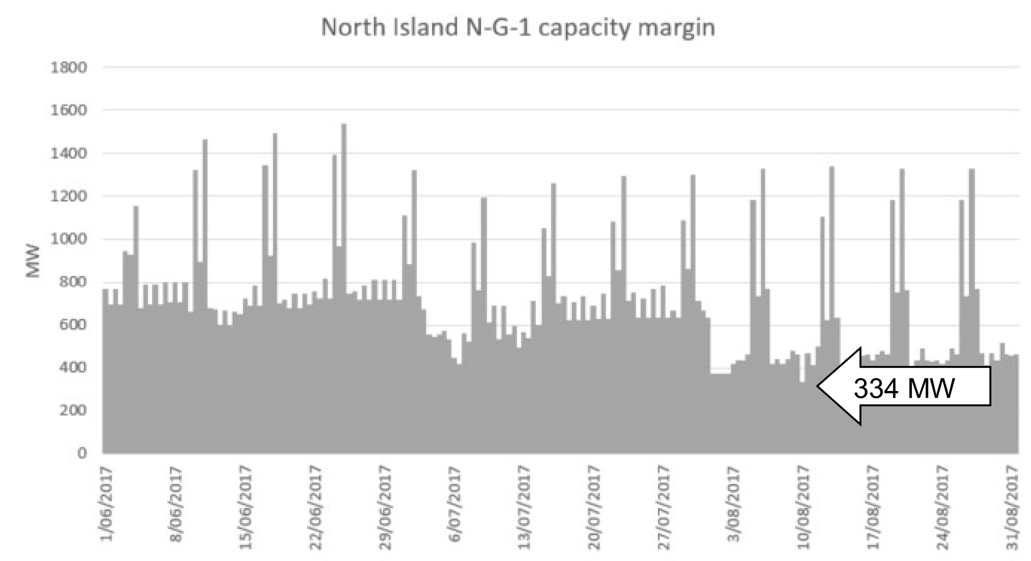

Chart 2 - North Island N-G-1 capacity margins at 10/03/2017
Source www.nzgb.redspider.co.nz.

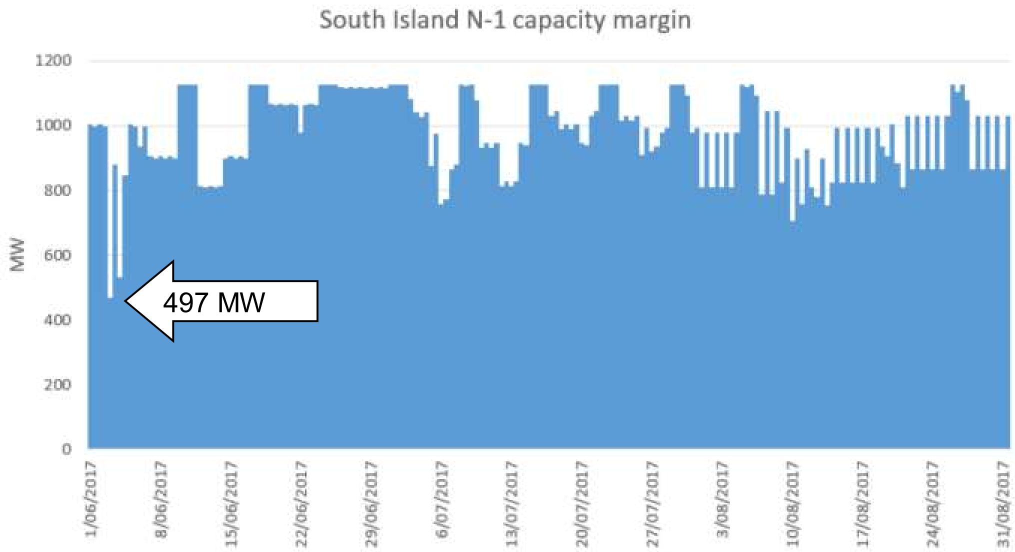

Chart 3 - South Island N-1 capacity margins at 10/03/2017
Source www.nzgb.redspider.co.nz.

These are good results and indicates it is unlikely there will be major issues meeting peak winter demand. Provided there is full availability of plant not covered by notified outages, the power system will be able to be run in a normal secure state over expected winter peaks in 2017. If there is an outage of a major thermal plant (possibly up to 400 MW), there are periods when the power system may be run in an emergency secure state. However, load will only be shed if there is a further unplanned outage of major thermal plant or the HVDC link.

The assumptions used in these calculations are covered in section 4 and the relevant generator outages in appendix A.3.

The lowest capacity margin calculations for winter 2017 are detailed in appendix A.1.

3.1 Historic margins

The chart below shows the identified worst-week North Island capacity margins by year from 2009 (when this metric was first reported) as stated in each year's final NWG report. The 2017 result is an improvement on all years apart from 2013[6]. This supports the view that no major peak capacity issues are expected in 2017.

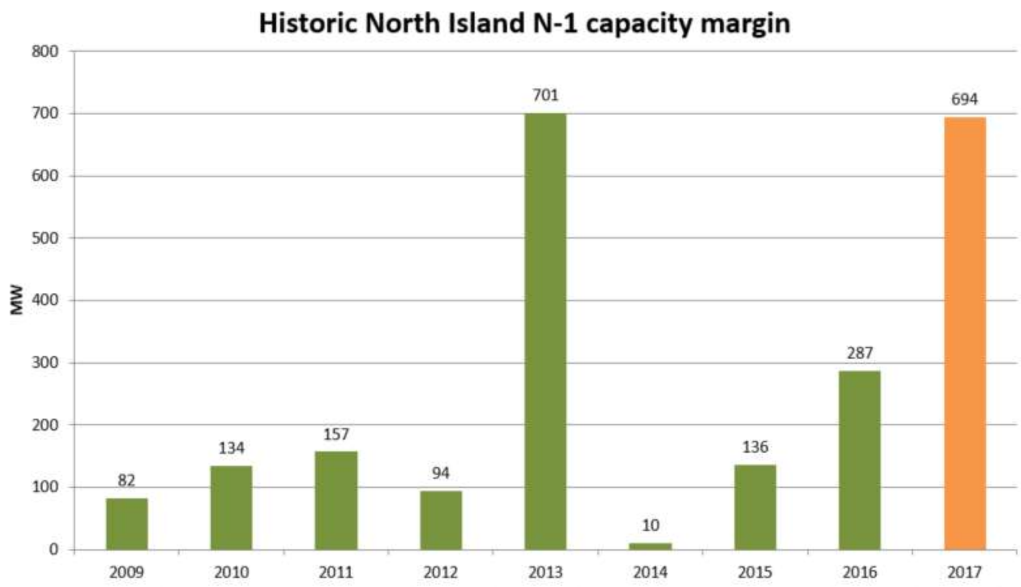

Chart 4 - Historic North Island N-1 capacity margins
Source https://www.transpower.co.nz/system-operator/stakeholder-interaction/national-winter-group and www.nzgb.redspider.co.nz.

3.2 NZGB and NWG comparison

While the basis of the NZGB and NWG capacity margin calculations are fundamentally the same there are a few notable exceptions. These are described briefly here along with their approximate impact on the calculations.

HVDC

NZGB calculates an actual available transfer quantity, the result of the South Island N-1 capacity margin calculation, for each AM peak and PM peak. NWG assumes 1140 MW HVDC north transfer received. On 10 August for the AM peak (lowest North Island N-1 capacity margin) the difference between the NZGB value of 705 MW received and the NWG assumption is 435 MW **less** in the NZGB North Island capacity margin analysis.

Generation

[6] Commissioning of Pole 3 saw the HVDC restored to full bi-pole capacity prior to winter 2013. Additionally, North Island thermal capacity had yet to be retired.

As detailed in section 4.2 there are differences between NZGB and NWG analysis with regard to the generation NWG considered variable. Variable generation in NWG was included on a P10 basis of historic outputs. In the NZGB all generation except wind generation are included at installed capacity levels. NZGB assumes wind generation of 20% of installed capacity.

These respective methodologies give rise to some notable variation in the assumed output of this generation. These variations are summarised in the table below (MW).

Type	Island	NZGB	NWG	Variance
Run-of-river/cogen	North	599	335	264
	South	60	27	23
Wind	North	112	56	56
	South	18	1	17
Total				360

The sum effect of the different methodologies is the inclusion of 360 MW **more** in the NZGB capacity margin analysis; 320 MW in the North Island and 40 MW in the South Island.

4 NZGB Inputs

4.1 Load

The NZGB calculation reported in this report is the highest loads for weekday AM & PM, Saturday AM & PM, and Sunday AM & PM (peak categories; 6 in total) with a 2% load growth applied respectively. The load data is grouped on a monthly basis, ie the highest historical peak load from June 2016 for each peak category will form the basis of the June 2017 peak load input for the same peak category. The AM time period is 06:00 to 11:30 hours and the PM is 16:00 to 20:00 hours.

The raw data for the historical load is the North Island and South Island daily peak AM and PM 30-minute metered generation (MW) from PTPIX. By using these values system losses are included in the estimated load calculation. The island values are then adjusted by the equivalent HVDC transfer (MW) to derive each island's 'load and losses' peak.

Using a generation dataset to derive load requires all of the generation which is included in the load dataset to be included in the generation dataset too. Omission of this generation would therefore overstate any potential shortfalls. Consequently 4 generation stations are included in NZGB analysis which were not included in NWG analysis. These are listed in appendix 0.

NWG used a singular evening peak demand forecast for each island; assumed to only have a 5% chance of exceedance. This value was derived from a Transpower peak demand forecast calculated using linear regression. An allowance for losses was also made.

4.2 Generation

NZGB works from a list of dispatched generation (excluding wind) in POCP for each island. This list is included in appendix 0 and compared to NWG data.

The available generation in each island is calculated by subtracting the generation outages 'MW loss' reported in POCP from the total dispatched generation (excluding wind) for each island during the specific date and peak of the calculation. For the AM peak this is all generation outages between 06:00 to 11:30 and for the PM peak, all generation outages between 16:00 to 20:00 hours.

The list assumes all stations to offer their maximum continuous capability. This includes hydro stations, as the tool does not take into account lake levels.

The following are excluded from the generation totals:

- Embedded generation (as individually, the generators are too small to be recorded in POCP).
- Any dispatched generation whose outages are not recorded in POCP.

NWG generation values were calculated on a very similar basis. A base list of generation was adjusted manually for concurrent outages during the weekday evening peak periods (17:00-18:30). No allowance was made for fuel availability.

A difference between NZGB and NWG occurs however with the treatment of run-of-river hydro and co-generation. NWG calculated probabilistic outputs for these stations based on historic performance over winter evening peaks. In the capacity margin analysis, the 10th percentile outputs were used. A comparison of these differences, at the aggregate level, is contained in appendix 0.

Further differences have been observed for individual generation stations which are considered to have a fixed output capacity. These reflect different sources of this data and the dynamic nature of this information. Efforts will be made to get generation owners to confirm the maximum output of their plant. The results of which will see NZGB updated as appropriate. The current differences between NZGB and NWG are included in appendix 0.

4.2.1 Wind generation

Wind generation is included in the NZGB at 20% of installed capacity. NWG included wind generation at the 10th percentile of historic outputs over winter evening peaks. A comparison of these respective methodologies is included in appendix 0.

4.3 HVDC

NZGB analysis calculates the amount by which the available generation exceeds the peak load and IR requirements in the South Island for each trading period. The minimum of this excess and the HVDC capability is then assumed to be transferred to the North Island. Losses are calculated on the transferred quantity.

While NWG calculated a South Island capacity margin this was not used to be a limiting factor for HVDC transfer to the North Island; it was assumed[7] the peaks in both islands would not occur concurrently. NWG assumed a HVDC transfer of 1,140 MW received (1,200 MW sent less losses) in the North Island.

4.4 Instantaneous Reserve (IR)

NZGB assumes 200MW of North Island IR will be provided by Interruptible Load (IL).

NWG used a 10th percentile value based on historic offers over winter evening peak periods.

A comparison of the NWG data with the NZGB assumption shows 200MW is approx. the 40th percentile for IL offers made during winter of 2016. The 10th percentile value is 123MW.

[7] Based on historical observations.

4.5 IR Requirements

NZGB uses a fixed assumption of 125MW as the South Island Contingent Event (CE) risk required to be covered by IR. This is the same assumption as the NWG.

The North Island CE risk required to be covered by IR is the highest of the available generators[8] or the at risk HVDC transfer. The at risk HVDC transfer is the amount of the received HVDC transfer which would be unable to be maintained should one pole of the HVDC trip. If HVDC received exceeds 933 MW then the HVDC will be setting the CE IR requirements in the North Island.

Note the impacts on NZGB calculations due to launch of the National Market for Instantaneous Reserve (NMIR) are currently being assessed. Any changes implemented would likely be reduction in IR requirements. Due to the complicated inter-relationships between several variables under NMIR pragmatic assumptions may be made and reflected in the changes implemented.

4.6 Frequency keeping requirements

The NZGB website currently uses a frequency keeping requirements of 50 MW in the North Island and 25 MW in the South Island. For data consistency reasons those values have been used in this analysis. An enhancement to NZGB due to completion in mid-2017 will see those values set to 15MW in each island per current operating conditions.

The effect of the current settings is to understate the South Island capacity margin by 10 MW and the North Island by 45 MW (35 MW in the North Island plus 10 MW HVDC received due to South Island increase).

[8] North Island CE generation risks are currently HLY5 and TCC (SPL).

A.1 Capacity margin calculations

10 August 2017 - North Island capacity margin

Calculation			AM Period	PM Period
A	South Island load estimate		2432	2240
B1	Available SI non-wind		3321	3321
B2	Available SI wind		92	92
B	Available SI generation	B = B1 + (B2 * 0.2)	3339	3339
C	South Island reserves	125MW reserves + 25MW frequency keeping	150	150
D	Available South Island generation for North Island	D = B - (A + C)	757	948
E	Available HVDC transfer capacity	Before transmission loss	1200	1200
F	**Estimated energy transfer north**	**F = minimum(D, E) - HVDC losses**	705	896
G	**North Island load estimate**		4636	4718
H1	Available NI non-wind		4769	4794
H2	Available NI wind		559	559
H	**Available NI generation**	**H = H1 + (H2 * 0.2)**	4881	4906
I	Highest ranked NI reserve risk		405	405
J	**Required North Island reserves**	**J = (I + 50) – 200 (reserves + frequency keeping) – interruptible load reserves assumption**	255	255
K	**Generation balance after an N-1 contingency**	**K = (F + H) - (G + J)**	**694**	**829**
L	**Allowance to restock the NI reserves**		360	360
M	Gas available		Yes	Yes
N	**Generation balance after restocking the reserves N-G-1 contingency**	**N = (F + H - (G + J + L))**	**334**	**469**

Source - http://nzgb.redspider.co.nz/day/2017/08/10/ (login required)

3 June 2017 – South Island capacity margin

Calculation			AM Period	PM Period
A	**South Island load estimate**		**1948**	1991
B1	Available SI non-wind		2578	3054
B2	Available SI wind		92	92
B	**Available SI generation**	**B = B1 + (B2 * 0.2)**	**2596**	3072
C	**South Island reserves**	**125MW reserves + 25MW frequency keeping**	**150**	150
D	**Available South Island generation for North Island**	**D = B - (A + C)**	**497**	930

Source - http://nzgb.redspider.co.nz/day/2017/06/03/ (login required)

A.2 Generation details

The following tables detail the NZGB generation inputs including a comparison with NWG values and commentary as appropriate.

As mentioned previously efforts will be made to ascertain the correct values from generation owners. NZGB will be updated accordingly.

North Island run-of-river and cogeneration

Name	POCP Code	NZGB	NWG	difference	NWG type
Glenbrook	GLN	74	-	-	Cogen
Kinleith	KIN	39	40	-1	Cogen
Kapuni	KPI	24	-	-	Cogen
Te Rapa Co-gen	TRC	45	45	0	Cogen
Whareroa (Nett)	WAA	64	64	0	Cogen
Aniwhenua	ANI	25	-	-	RoR
Kaimai	TGA_STN	42	-	-	RoR
Matahina	MAT_STN	72	-	-	RoR
Mangahao	MHO	38	-	-	RoR
Patea	HWA_STN	31	-	-	RoR
Rangipo	RPO_STN	120	-	-	RoR
Wheao / Flaxy	ROT_STN	25	-	-	RoR
Total (MW)		**599**		**-1**	

In NWG analysis run-of-river (RoR) generation and cogeneration (Apart from Kinleith, Te Rapa, and Whareroa) are assessed on a percentile basis of historical outputs. Analysis of the 2016 historical data gives a P10 value of 335 MW and a P100 value of 683 MW. These values are inclusive of Kinleith, Te Rapa, and Whareroa generation.

North Island geothermal generation

Name	POCP Code	NZGB	NWG	difference	NWG type
Kawerau	KAG_1	106	103	3	Geothermal
Mokai	MOK	105	114	-9	Geothermal
Nga Awa Purua	NAP_1	147	146	1	Geothermal
Nga Tamariki	NTM	82	82	0	Geothermal
Ohaaki	OKI_Stn	56	45	11	Geothermal
Onepu	ONU	60	39	21	Geothermal
Pohipi	PPI_STN	51	51	0	Geothermal
Rotokawa	RKA	31	30	1	Geothermal
Te Huka Binary Plant	TAA	30	26	4	Geothermal
Te Mihi Geothermal	THI_Stn	166	158	8	Geothermal
Wairakei	WRK_STN	157	125	32	Geothermal
Total (MW)		**991**	**919**	**72**	

North Island geothermal generation

Name	POCP Code	NZGB	NWG	difference	NWG type
Kaitawa - Waikaremoana	KTW	36	32	4	Hydro
Piripaua - Waikaremoana	PRI_STN	44	44	0	Hydro
Tuai - Waikaremoana	TUI_STN	52	52	0	Hydro
Tokaanu	TKU_STN	240	240	0	Hydro
Aratiatia	ARA	78	84	-6	Hydro
Arapuni	ARI	192	176.4	15.6	Hydro
Atiamuri	ATI	80	80	0	Hydro
Karapiro	KPO	96	96	0	Hydro
Maraetai	MTI	350	360	-10	Hydro
Ohakuri	OHK	108	112	-4	Hydro
Whakamaru	WKM_STN	100	100	0	Hydro
Waipapa	WPA	51	51	0	Hydro
Total (MW)		**1427**	**1427.4**	**-0.4**	

North Island thermal generation

Name	POCP Code	NZGB	NWG	difference	NWG type
Huntly	HLY	945	953	-8	Thermal
McKee	MKE	100	94	6	Thermal
Stratford	SFD	200	208	-8	Thermal
Stratford Power Ltd	TCC_Stn	360	377	-17	Thermal
Whirinaki	WHI_STN	157	156	1	Thermal
Total (MW)		**1762**	**1788**	**-26**	

North Island wind generation

Name	POCP Code	NZGB	NWG	difference	NWG type
Mill Creek	MCK	60	-	-	Wind
Te Apiti	TAP	90	-	-	Wind
Te Rere Hau	TRH	48	-	-	Wind
Te Uku Wind Farm	TUK	63	-	-	Wind
Tararua Central	TWC	93	-	-	Wind
Tararua Wind Farm - Stages 1 & 2	BPE_STN	65	-	-	Wind
West Wind	WWD	140	-	-	Wind
		559	-	-	

The NZGB tool assumes wind generation of 20% of installed capacity; excluding plant on notified outages. Therefore, the maximum NZGB North Island wind value is 112 MW.

In NWG analysis wind generation is assessed on a percentile basis of historical outputs. Analysis of the 2016 historical data gives a P10 value of 56 MW and a P100 value of 501 MW. The NZGB value of 112 MW approximately equates to P27 of the NWG data.

South Island hydro

Name	POCP Code	NZGB	NWG	difference	NWG type
Clyde	CYD	432	464	-32	Hydro
Roxburgh	ROX	320	320	0	Hydro
Aviemore	AVI	220	220	0	Hydro
Benmore	BEN	540	540	0	Hydro
Manapouri	MAN	847	800	47	Hydro
Ohau A	OHA	264	264	0	Hydro
Ohau B	OHB	212	212	0	Hydro
Ohau C	OHC	212	212	0	Hydro
Tekapo A	TKA	25	25	0	Hydro
Tekapo B	TKB	146	151	-5	Hydro
Waitaki	WTK	90	90	0	Hydro
Cobb	COB_STN	32	32	0	Hydro
Coleridge	COL_STN	45	39	6	Hydro
Waipori	BWK_STN, HWB_STN	84	80	4	Hydro
Total (MW)		**3469**	**3449**	**20**	

South Island run-of-river

Name	POCP Code	NZGB	NWG	difference	NWG type
Branch River (Wairau/Argyle)	ARG_STN	11	-	-	RoR
Highbank & Montalto	ASB_STN	27	-	-	RoR
Kumara	KUM_STN	10	-	-	RoR
Paerau/ Patearoa (Naseby/ Upper Taieri)	NSY_STN	12	-	-	RoR
Total (MW)		**60**	**-**	**-**	

In NWG analysis run-of-river (RoR) generation is assessed on a percentile basis of historical outputs. Analysis of the 2016 historical data gives a P10 value of 27 MW and a P100 value of 59 MW.

South Island wind

Name	POCP Code	NZGB	NWG	difference	NWG type
Mahinerangi	MAH	36	-	-	Wind
White Hill	WHL	56	-	-	Wind
Total (MW)		**92**	**-**	**-**	

The NZGB tool assumes wind generation of 20% of installed capacity; excluding plant on notified outages. Therefore, the maximum NZGB South Island wind value is 18 MW.

In NWG analysis wind generation is assessed on a percentile basis of historical outputs. Analysis of the 2016 historical data gives a P10 value of 1 MW and a P100 value of 89 MW. The NZGB value of 18 MW approximately equates to P35 of the NWG data.

Non NWG generation

Name	POCP Code	NZGB	Island
Ngawha	NGA	26	North
Arnold (Dobson)	DOB_STN	3	South
Wahapo (Okarito Forks)	HKK_STN	3	South
Waihopai	BLN_STN	2	South
Total (MW)		**34**	**-**

This generation is included in the NZGB tool because it is included in the data from which the load values are derived. Omission of this generation would therefore overstate any potential shortfalls.

A.3 Generation outages

North Island

Generation outages influencing the capacity margins for 10 August; lowest North Island N-1 and N-G-1 capacity margins.

Plant/Circuit	Planning Status	Start	End	MW Loss
HLY[9]	Confirmed	1/07/2015 0:00	5/09/2018 0:00	250
MAN_1	Confirmed	10/08/2017 6:00	11/08/2017 20:00	121
OHC12	Confirmed	10/08/2017 6:00	10/08/2017 18:00	53
SWN	Confirmed	1/01/2016 0:00	30/12/1930 23:30	50
SWN	Confirmed	30/12/2015 23:30	31/12/1930 0:00	45
SWN	Confirmed	30/12/2015 23:30	31/12/1930 0:00	45
ROX_5	Tentative	26/07/2017 7:00	18/08/2017 17:30	40
OHK_2	Confirmed	10/08/2017 8:00	10/08/2017 16:00	26
WKM_1	Confirmed	10/08/2017 13:00	10/08/2017 14:00	25

Source - http://nzgb.redspider.co.nz/day/2017/08/10/ (login required)

South Island

Generation outages influencing the capacity margins for 3 June; lowest South Island N-1 capacity margin.

Plant/Circuit	Planning Status	Start	End	MW Loss
OHA	Confirmed	3/06/2017 8:00	3/06/2017 16:00	264
HLY[9]	Confirmed	1/07/2015 0:00	5/09/2018 0:00	250
OHB	Confirmed	3/06/2017 8:00	3/06/2017 16:00	212
MAN_3	Confirmed	27/03/2017 6:00	16/06/2017 20:00	121
BEN1	Confirmed	3/06/2017 6:30	4/06/2017 18:00	90
BEN3	Confirmed	3/06/2017 6:30	4/06/2017 18:00	90
BEN4	Confirmed	3/06/2017 6:30	4/06/2017 18:00	90
BEN2	Confirmed	3/06/2017 6:30	4/06/2017 18:00	90
SWN	Confirmed	1/01/2016 0:00	30/12/1930 23:30	50
SWN	Confirmed	30/12/2015 23:30	31/12/1930 0:00	45
SWN	Confirmed	30/12/2015 23:30	31/12/1930 0:00	45
MTI_1	Confirmed	22/02/2017 8:00	21/06/2017 18:00	35
WHE	Tentative	3/06/2017 23:30	4/06/2017 1:30	19

Source - http://nzgb.redspider.co.nz/day/2017/06/03/ (login required)

[9] NB this outage has been included for consistency with the NZGB/POCP website results. It relates to a HLY unit which is in long term storage. The HLY generation values have been adjusted 'behind-the-scenes' to account for this entry.

Notable Outages

Notable generator outages scheduled to occur during winter 2017 are shown below in figure 2.

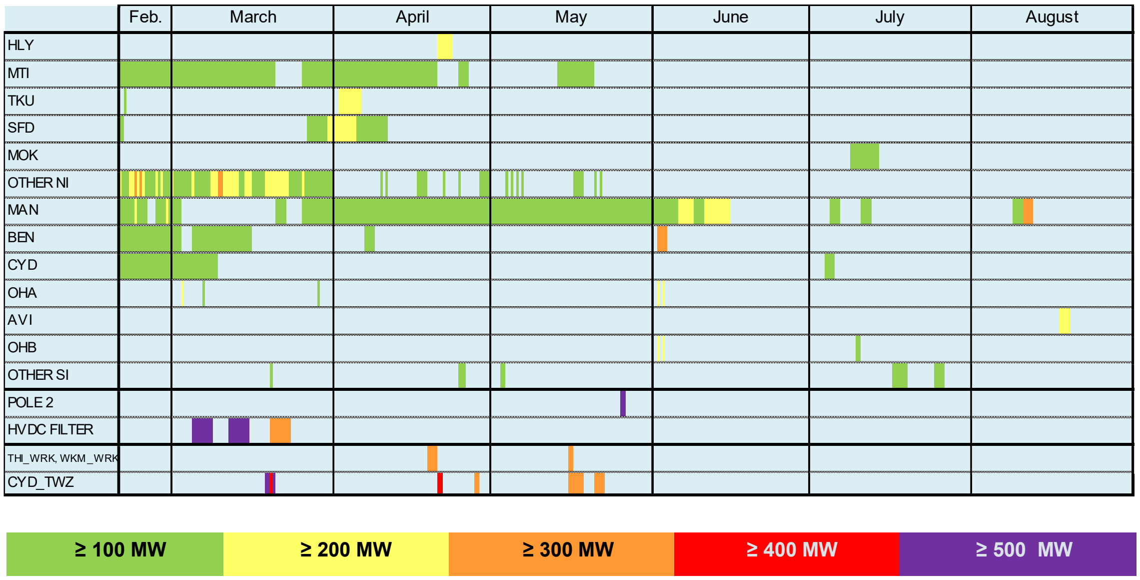

Figure 1: Significant generation and transmission equipment outages.

Source – NZGB sensitivity studies report. Future enhancements will see this published to the NZGB website.

A.4 Load assumption details

The maximum South Island peak load estimate is 2432 MW; applying in the NZGB tool for the weekday AM peak during August. This compares with a NWG 2016 forecast peak load of 2347 MW and a recorded actual winter 2016 peak of 2286 MW. The South Island peak 2016 winter load occurred in the AM peak of 11 August.

The maximum North Island peak load estimate is 4718 MW; applying in the NZGB tool for the weekday PM peak during August. This compares with a NWG 2016 forecast peak load of 4751 MW and a recorded actual winter 2016 peak of 4627 MW. The North Island peak 2016 winter load occurred in the PM peak of 9 August.

The peak forecast load applied to each of the days within the winter period for the AM and PM peaks are included in the following table.

	AM		PM	
Date	SI load estimate	NI Load estimate	SI load estimate	NI Load estimate
1-Jun	2205	4363	2210	4455
2-Jun	2205	4363	2210	4455
3-Jun	1949	3787	1992	4212
4-Jun	1885	3640	2024	4432
5-Jun	2205	4363	2210	4455
6-Jun	2205	4363	2210	4455
7-Jun	2205	4363	2210	4455
8-Jun	2205	4363	2210	4455
9-Jun	2205	4363	2210	4455
10-Jun	1949	3787	1992	4212
11-Jun	1885	3640	2024	4432
12-Jun	2205	4363	2210	4455
13-Jun	2205	4363	2210	4455
14-Jun	2205	4363	2210	4455
15-Jun	2205	4363	2210	4455
16-Jun	2205	4363	2210	4455
17-Jun	1949	3787	1992	4212
18-Jun	1885	3640	2024	4432
19-Jun	2205	4363	2210	4455
20-Jun	2205	4363	2210	4455
21-Jun	2205	4363	2210	4455
22-Jun	2205	4363	2210	4455
23-Jun	2205	4363	2210	4455
24-Jun	1949	3787	1992	4212
25-Jun	1885	3640	2024	4432
26-Jun	2205	4363	2210	4455
27-Jun	2205	4363	2210	4455
28-Jun	2205	4363	2210	4455
29-Jun	2205	4363	2210	4455

1-Jul	2074	4065	2081	4288
2-Jul	2013	3853	2125	4438
3-Jul	2242	4403	2228	4517
4-Jul	2242	4403	2228	4517
5-Jul	2242	4403	2228	4517
6-Jul	2242	4403	2228	4517
7-Jul	2242	4403	2228	4517
8-Jul	2074	4065	2081	4288
9-Jul	2013	3853	2125	4438
10-Jul	2242	4403	2228	4517
11-Jul	2242	4403	2228	4517
12-Jul	2242	4403	2228	4517
13-Jul	2242	4403	2228	4517
14-Jul	2242	4403	2228	4517
15-Jul	2074	4065	2081	4288
16-Jul	2013	3853	2125	4438
17-Jul	2242	4403	2228	4517
18-Jul	2242	4403	2228	4517
19-Jul	2242	4403	2228	4517
20-Jul	2242	4403	2228	4517
21-Jul	2242	4403	2228	4517
22-Jul	2074	4065	2081	4288
23-Jul	2013	3853	2125	4438
24-Jul	2242	4403	2228	4517
25-Jul	2242	4403	2228	4517
26-Jul	2242	4403	2228	4517
27-Jul	2242	4403	2228	4517
28-Jul	2242	4403	2228	4517
29-Jul	2074	4065	2081	4288
30-Jul	2013	3853	2125	4438
31-Jul	2242	4403	2228	4517
1-Aug	2432	4637	2241	4718
2-Aug	2432	4637	2241	4718
3-Aug	2432	4637	2241	4718
4-Aug	2432	4637	2241	4718
5-Aug	2139	3994	2168	4445
6-Aug	2050	3852	2192	4411
7-Aug	2432	4637	2241	4718
8-Aug	2432	4637	2241	4718
9-Aug	2432	4637	2241	4718
10-Aug	2432	4637	2241	4718
11-Aug	2432	4637	2241	4718
12-Aug	2139	3994	2168	4445
13-Aug	2050	3852	2192	4411

14-Aug	2432	4637	2241	4718
15-Aug	2432	4637	2241	4718
16-Aug	2432	4637	2241	4718
17-Aug	2432	4637	2241	4718
18-Aug	2432	4637	2241	4718
19-Aug	2139	3994	2168	4445
20-Aug	2050	3852	2192	4411
21-Aug	2432	4637	2241	4718
22-Aug	2432	4637	2241	4718
23-Aug	2432	4637	2241	4718
24-Aug	2432	4637	2241	4718
25-Aug	2432	4637	2241	4718
26-Aug	2139	3994	2168	4445
27-Aug	2050	3852	2192	4411
28-Aug	2432	4637	2241	4718
29-Aug	2432	4637	2241	4718
30-Aug	2432	4637	2241	4718
31-Aug	2432	4637	2241	4718

