

Meeting Date: 12 March 2020

REVIEW OF MARCH 2020 NEW ZEALAND GENERATION BALANCE REPORT

SECURITY
AND
RELIABILITY
COUNCIL

This paper comments on the latest New Zealand Generation Balance report issued by the system operator, which covers six months from March 2020. The report illustrates the resilience of the generation fleet and transmission network to perturbations in supply and demand.

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.

1. The New Zealand Generation Balance report

- 1.1. As part of its role of providing advice on reliability of supply, the SRC regularly receives the New Zealand Generation Balance (NZGB) report at its first meeting every calendar year. NZGB forecasts capacity security over the coming six months, which means that reviewing it at this time of year provides an opportunity to identify risks associated with the coming winter.
- 1.2. The NZGB report quantifies the security risk by calculating the MW capacity difference between daily peak demand and generation for a range of scenarios. The risk for each scenario is tested by accounting for planned outages, and then assuming certain other large transmission and generation assets are not available.
- 1.1 The default tests shown in the NZGB report are “N-1” and “N-1-G”. N-1 is a test in which the largest asset (transmission or generation) is unavailable. N-1-G is a test in which the two largest assets are unavailable.
- 1.2 If either of these tests shows a negative value, it indicates normal security levels cannot be maintained. This does not indicate that there will be interruption to supply, but rather (for the N-1 test) that if a large asset is unavailable for some reason, the system will operate with a reduced level of instantaneous reserves cover. However, if large deficits were to occur, then it would require forced demand cuts (i.e. emergency load shedding).
- 1.3 Since the SRC last received an NZGB report (at its 24 October 2019 meeting), the system operator has enhanced the report. The report now includes additional analysis to illustrate how sensitive the power system is to perturbations of supply and demand. While the system operator has succeeded in choosing scenarios that are grounded in reality, readers should be careful not to interpret them as predictions.
- 1.4 The March 2020 NZGB report (attached as Appendix A) highlights that:
- a) the power system is presently quite resilient to adverse circumstances—it could meet demand and reserve requirements even with the loss of all gas-fired generation, all wind generation and the next largest asset
 - b) despite a number of significant asset outages in the energy sector, asset owners have scheduled outages in a way that tends to minimise and smooth out the impact on the security of generation and transmission capacity
 - c) the periods of least security occur in mid-May and late-July to mid-August.

2. Questions for the SRC to consider

- 2.1 The SRC may wish to consider the following questions.

Q1. What further information, if any, does the SRC wish to have provided to it by the secretariat?

Q2. What advice, if any, does the SRC wish to provide to the Authority?

Appendix A: October 2019 NZGB report

New Zealand Generation Balance – March 2020

Executive Summary

The purpose of the March 2020 New Zealand Generation Balance report is to advise market participants of any forecasted generation balance risks. The report is divided into two sections: the standard NZGB assessment, and analyses of possible risk scenarios including a low gas scenario across the next six months and analysis looking across the HVDC 2020 outages ending in April 2020.

Using our standard NZGB assessment, the generation balance for the next 6 months does not indicate any anticipated shortfalls under normal conditions (N-1-G). Under a sensitivity scenario conditions of an additional major, slow starting North Island generating unit not being offered, shortfalls may be seen over May, July and August 2020 (please refer to table 2 for specific dates). These shortfalls are due to a combination of increasing loads and several generator outages.

Considering additional scenarios for a reduced gas supply and the HVDC outages, the generation balance is showing potential shortfalls.

The March report assessment is based on the 27/2/20 data and now includes August and the beginning of September 2020 in the study.

Table 1: Significant generation outage dates

	Outage	Start	End
Generation	MAN_4	11/10/19	10/04/20
	HLY_2	14/02/20	31/12/22
	CYD_1	2/03/20	17/04/20
	MAN_3	4/03/20	4/03/20
	MAN_2	11/03/20	20/03/20
	TCC_1	13/03/20	16/03/20
	SFD_21	14/03/20	14/03/20
	OHB_STN	21/03/20	22/03/20
	OHA_STN	21/03/20	22/03/20
	OHC_STN	21/03/20	22/03/20
	MAN_6	23/03/20	3/04/20
	MAN_5	20/04/20	5/05/20
	HLY_1	15/05/20	25/05/20
	MAN_3	19/05/20	21/05/20
	MAN_7	25/05/20	10/06/20
	MAN_6	5/06/20	8/06/20
	MAN_6	15/06/20	15/06/20
	MAN_2	16/06/20	16/06/20
	MAN_4	16/06/20	16/06/20
	MAN_5	17/06/20	17/06/20
	MAN_1	18/06/20	18/06/20
	MAN_6	23/06/20	24/06/20
	MAN_2	6/07/20	24/07/20
	MAN_7	16/07/20	17/07/20
	MAN_1	6/08/20	7/08/20
	CYD_3	17/08/20	30/10/20
	RPO_STN	4/09/20	6/09/20
Transmission	HVDC Pole 3	27/02/20	06/03/20
	HVDC Bipole	07/03/20	07/03/20
	HVDC Pole 3	08/03/20	09/04/20
	HVDC Electrode	08/03/20	20/03/20
	HVDC Bipole	21/03/20	21/03/20
	CYD_CML_TWZ_2	17/03/20	22/04/20
	CYD Bypass	18/03/20	21/04/20
	MNI_MKE_SFD_1	20/04/20	24/04/20
	THI_WRK_1	29/04/20	30/04/20



SYSTEM OPERATOR

To mitigate the risk of a shortfall on dates where a tight generation balance margin is forecasted market participants should:

1. avoid scheduling additional outages which may remove or constrain generation; and
2. adjust demand and generation offers to minimise the risk of shortfall.

1. Standard NZGB Assessments

Long-term studies of N-1 and N-1-G generation balance have been done for both base and sensitivity scenario where a large North Island thermal generator is not offered. Figures 1 and 2 show the margins for the base and sensitivity scenarios, respectively.

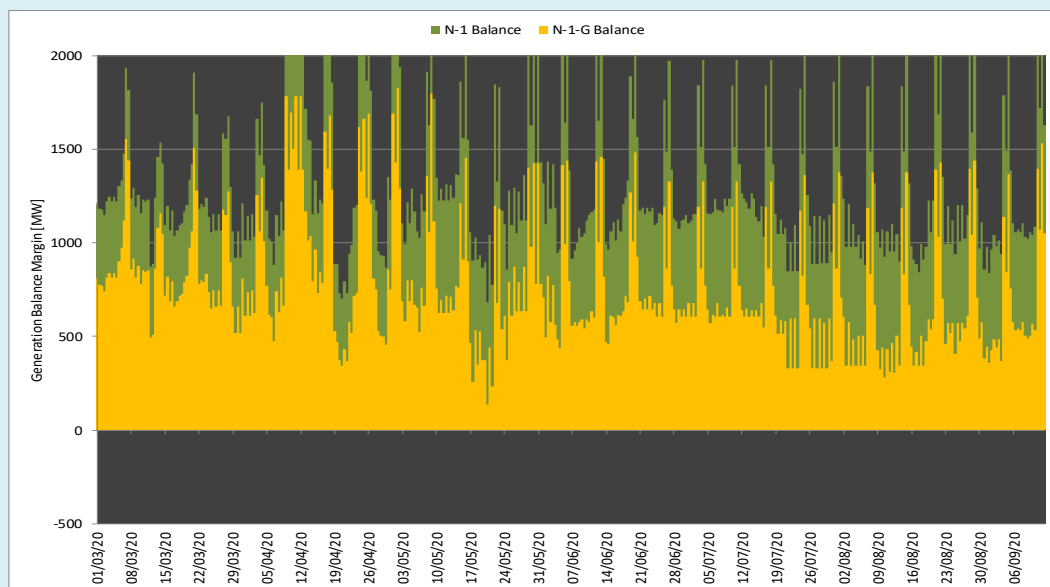


Figure 1: Generation balance study results for the period studied

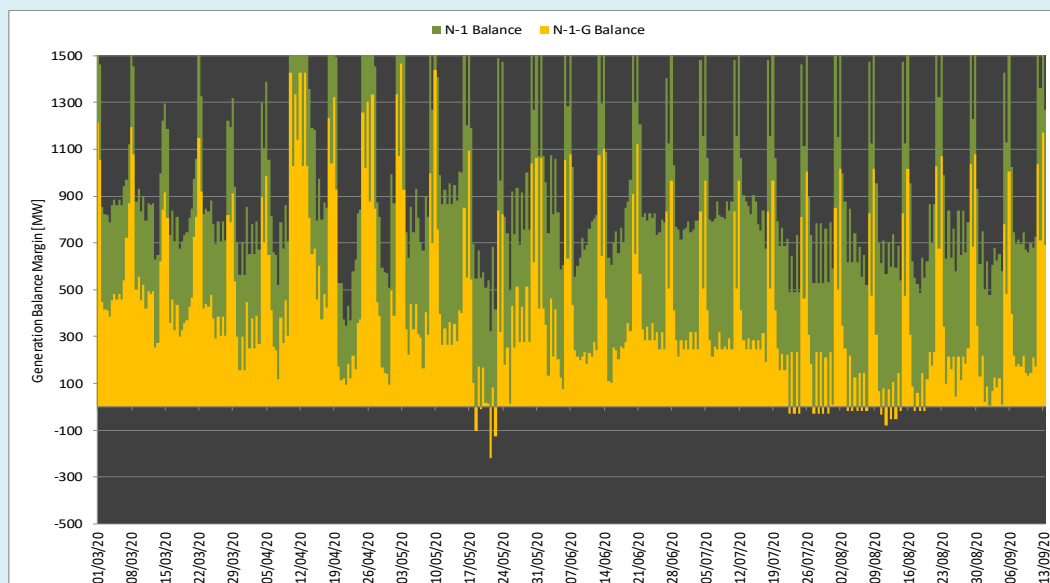


Figure 2: Generation balance sensitivity scenario study results for the period studied

1.1 Low generation balance margins for the period studied

There are no shortfalls (N-1-G) forecasted in the base scenario.

Under sensitivity scenario conditions of a major, slow starting North Island generating unit not being offered, there are several shortfalls forecasted for May, July and August 2020. These are due to potentially high loads, and several generator outages.

A summary of the study results for these dates, as well as a summary of outages causing the low generation balance margins, are detailed in Table 2.

Table 2: Result of the long-term generation balance studies.

	Base Scenario		Worst Case Sensitivity Scenario		Outages				
	N-1 Margin	N-1-G Margin	N-1 Margin	N-1-G Margin	Generation		Transmission		HVDC
					NI	SI	NI	SI	
Mon 18/05/20	908	258	548	-102	750	200	0	0	0
Tue 19/05/20	911	351	551	-9	600	300	100	0	0
Thu 21/05/20	681	138	321	-222	650	300	0	0	0
Fri 22/05/20	775	234	415	-126	450	200	150	0	0
Wed 22/07/20	850	330	490	-30	100	250	0	0	0
Thu 23/07/20	850	330	490	-30	100	350	0	0	0
Fri 24/07/20	850	330	490	-30	100	250	0	0	0
Mon 27/07/20	889	330	529	-30	150	150	0	0	0
Tue 28/07/20	889	330	529	-30	100	150	0	0	0
Wed 29/07/20	890	330	530	-30	100	150	0	0	0
Thu 30/07/20	890	330	530	-30	100	150	0	0	0
Mon 03/08/20	978	343	618	-17	50	50	0	0	0
Tue 04/08/20	978	343	618	-17	100	50	0	0	0
Wed 05/08/20	979	343	619	-17	100	50	0	0	0
Thu 06/08/20	915	343	555	-17	50	200	0	0	0
Fri 07/08/20	882	343	522	-17	50	250	0	0	0
Mon 10/08/20	973	325	613	-35	150	50	0	0	0
Tue 11/08/20	928	280	568	-80	150	50	0	0	0
Wed 12/08/20	956	308	596	-52	150	50	0	0	0
Thu 13/08/20	955	307	595	-53	100	50	0	0	0
Fri 14/08/20	899	343	539	-17	50	150	0	0	0
Mon 17/08/20	912	343	552	-17	100	200	0	0	0
Tue 18/08/20	844	343	484	-17	150	250	0	0	0
Wed 19/08/20	912	343	552	-17	50	250	0	0	0

To mitigate the risk of a shortfall on the dates with low or negative generation balance forecast, market participants should:

1. avoid scheduling additional outages which may remove or constrain generation; and
2. adjust demand and generation offers to minimise any risk of shortfall.

1.2 Changes since the February 2019 report

The following changes have been made since the February report:

1. Nova's Junction Road Gas Generator has been added to the list of generators.
2. Added a *Worst Case Winter Scenario* to section 2.

1.3 Notable outages

Notable outages of generation and transmission equipment that impact the generation balance for the period studied are shown in Figure 5.

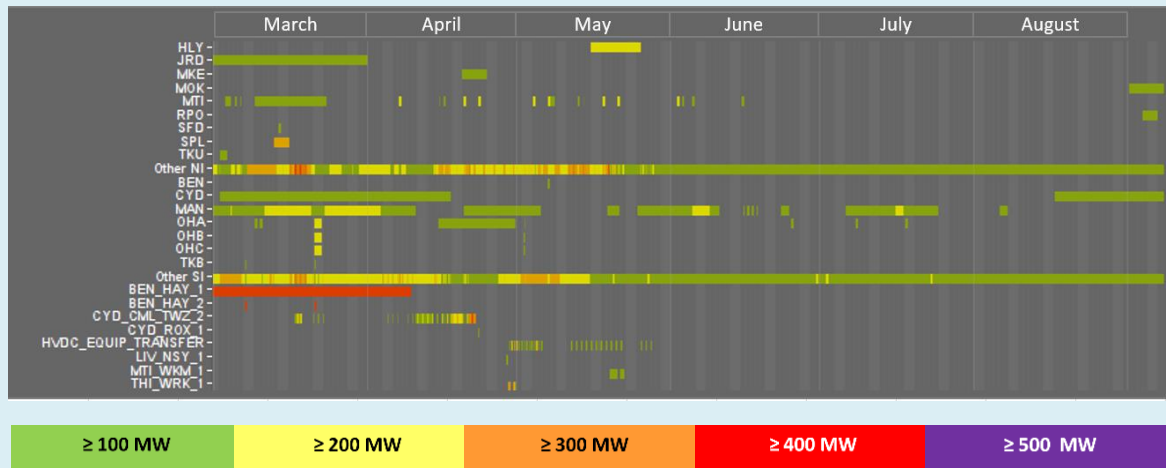


Figure 5: Significant generation and transmission equipment outages.

2. Scenario Analysis

The following section details the NZGB analyses of certain high-profile outages and potential grid situations. Several different scenarios have been used in these analyses. The system operator uses scenarios where it considers there may be additional risks to generation margins that are not reflected in electricity outages already lodged in POCP. They are based on system operator discussions with participants and previous participant behaviour. They are chosen as *possible* scenarios that it is prudent to use to assess system security.

The *Worst Case Winter Scenario* (section 2.1) is modelled by applying the peak 2019 winter load across June, July and August.

The scenarios outlined in sections 2.2 and 2.3 are modelled in NZGB by constraining back selected generators. This can have a varied impact depending on the other inputs into NZGB's calculation including station maximums, reserves and constraints. Nevertheless, indicative MW reduction values of the scenarios used are provided below.

Scenario	Indicative Reduction (MW)
Base Case	0
Low Gas	542
Low Gas with Ahuroa Outage	742

In the analyses, some scenarios use the 20% wind generation availability assumption used in NZGB's standard analyses, and some assume 0%.

2.1 Generation balance for Worst Case Winter Scenario 2020

The Worst Case Winter Scenario shows no forecasted shortfalls under the basecase scenario (figure 3). However, under the sensitivity scenario, where a large NI thermal unit were not to be available, several minor N-1-G shortfalls are anticipated late-July and August.

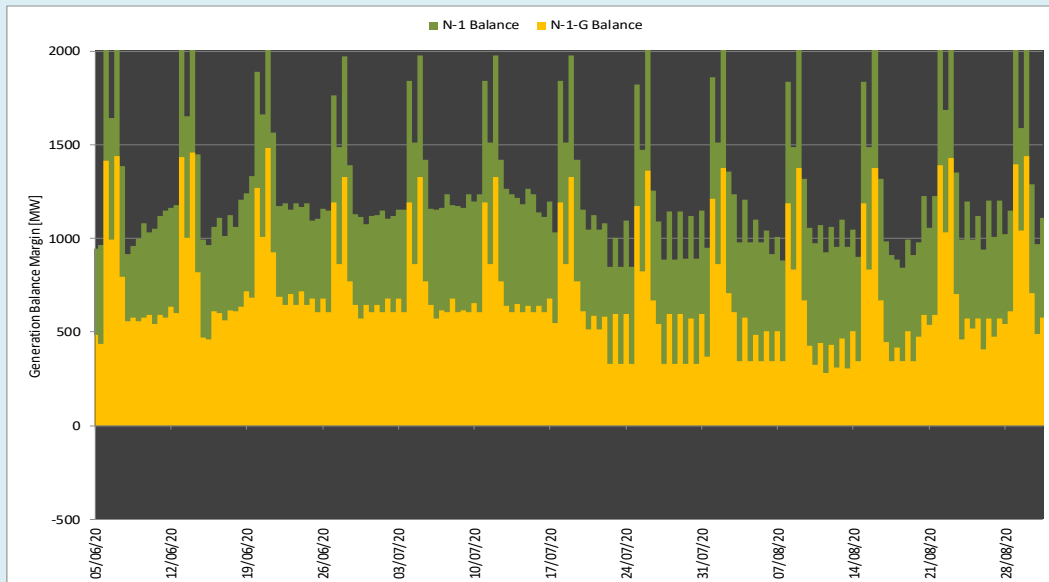


Figure 3: Generation balance base study results (winter months only)

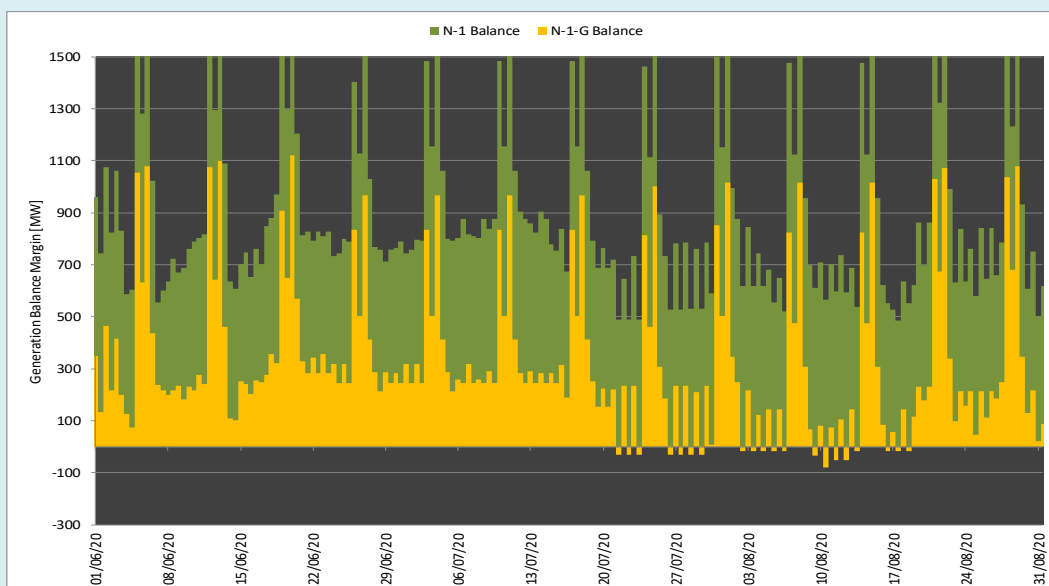


Figure 4: Generation balance sensitivity study results (winter months only)

2.2 Low Gas Scenario Comparison

A planned or unplanned outage of major gas production, storage facilities or pipelines; due to its potential impact on thermal generators, can impact national generation balance. For this reason, the N-1 and N-1-G generation balances for the next six months have been plotted in figures 6 and 7 against low gas scenarios with both 20% and 0% wind availability.

Figure 6 shows that there are no issues for an N-1 generation balance. However, as figure 7 shows, for the N-1-G balance, the low gas scenario presents risks from early April through to August.

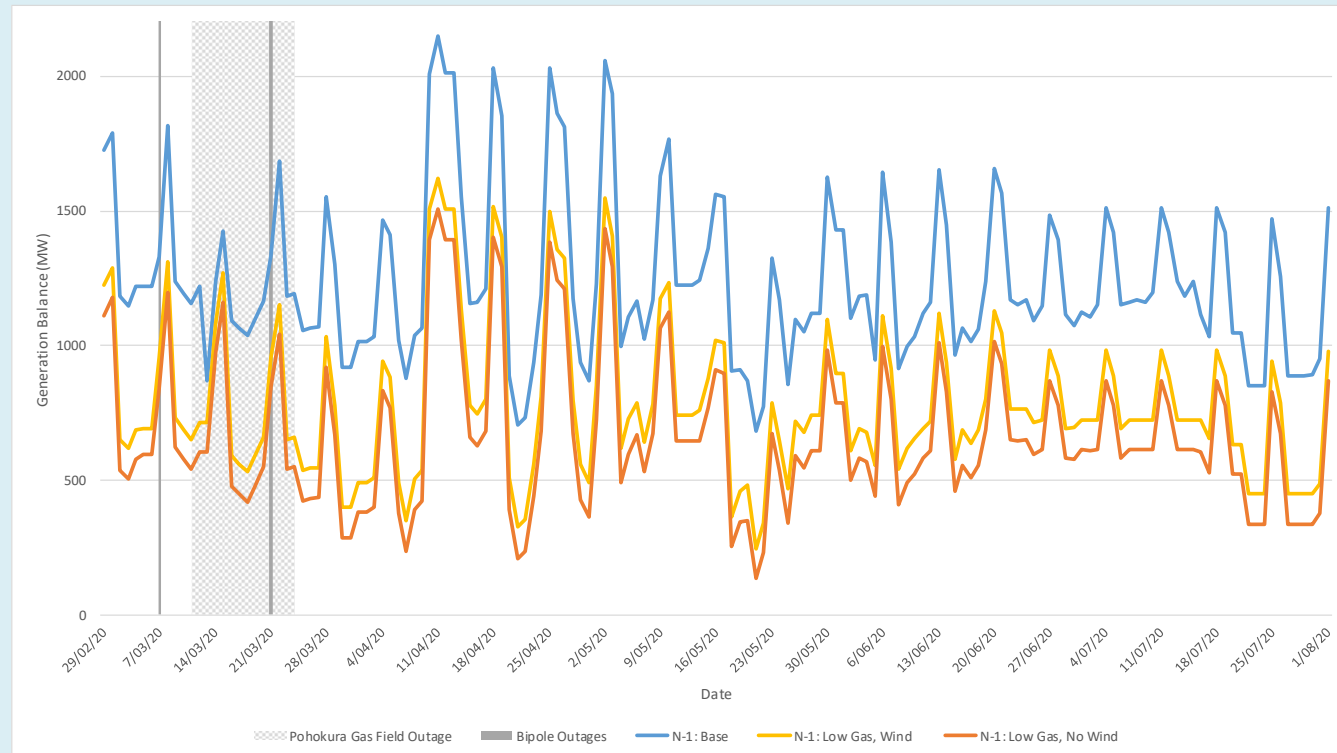


Figure 6: New Zealand Generation Balance – Low Gas Comparison – N-1.

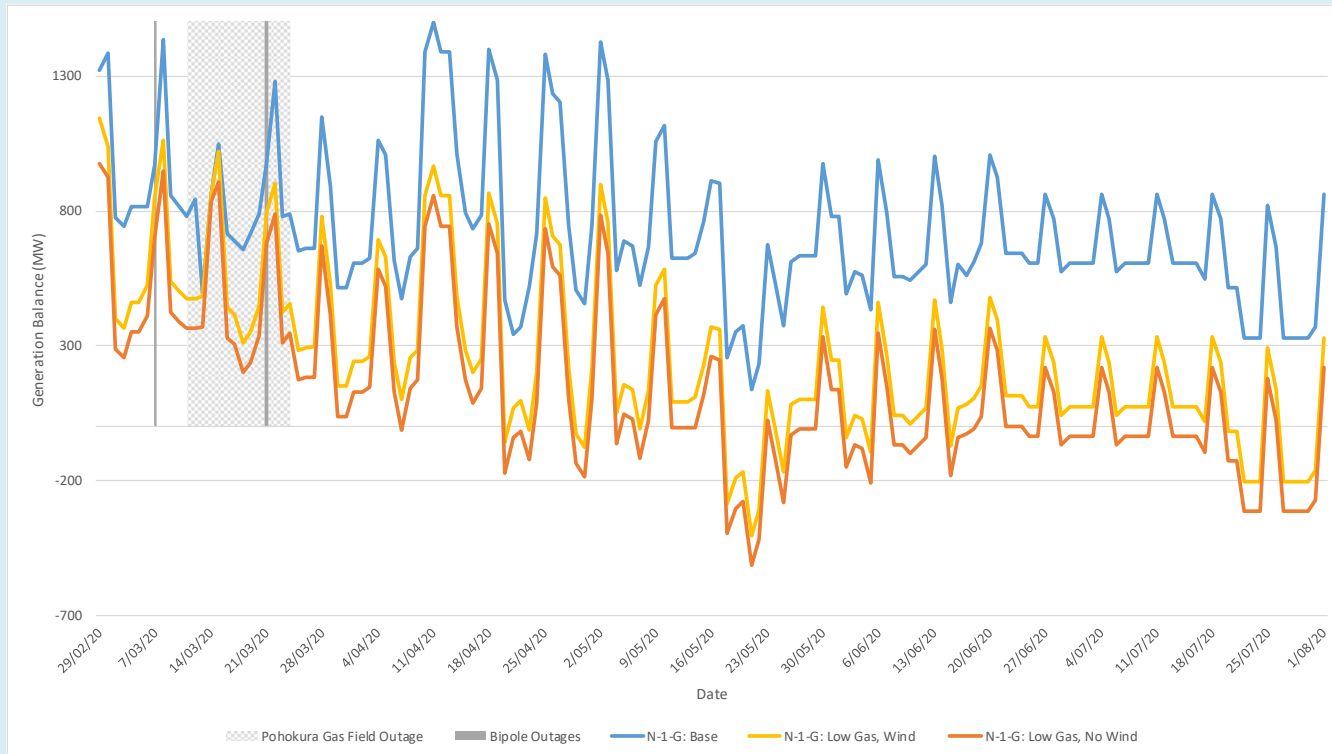


Figure 7: New Zealand Generation Balance – Low Gas Comparison – N-1-G.

2.2 HVDC 2020 Outages

HVDC outages have commenced and are due to be completed on the 9th of April 2020. There are also the following gas outages or risks of outage notified during this time:

- An outage of the Pohokura gas production plant (11-24 Mar)
- Inspections of the Pohokura gas infrastructure which may lead to outages.
- Minor reductions in gas deliverability at Kupe, Maui, Pohokura and Kapuni

In addition to the HVDC single pole outages, further HVDC Bipole outages are scheduled for the 7th and 21st of March. Also scheduled are electrode outages concurrent with an HVDC single pole outage resulting in reduced HVDC transfer capability. Our modelling includes the reduced transfer limits.

An analysis of generation balance during the HVDC outages is summarised below in Table 3.

The reduced gas scenario outlined in the *Scenario Analysis – Assumptions* section has been considered with both 20% and 0% wind availability applied. During the Pohokura gas outage scheduled for the 11th until 24th March 2020, a reduced gas scenario is considered more likely. Inspections of Pohokura gas infrastructure across the period of the HVDC outages may result in additional unplanned gas outages.

There are no anticipated Generation Balance (N-1) shortfalls. However, there is one anticipated Generation Balance (N-1-G) shortfall in the low gas scenarios, on the 7th of April. This is due to several generator outages and increasing loads over the period.

We advise participants:

- Not to schedule further outages on these dates where there is a risk of shortfall
- Consider options to reschedule outages during tight periods. If you are considering rescheduling, please contact Angela.Houston@transpower.co.nz.

For further information on the HVDC outages is available on the [Transpower website](#).

Further information on gas industry outages is available on the [Gas Industry website](#).

Table 3: Result of the generation balance studies for HVDC 2020 Bipole Outages.

Date	Outages	NI Load	NI Generation Outages	Generation Balance (N-1)	Generation Balance (N-1) reduced gas, wind = 20%	Generation Balance (N-1) reduced gas, wind = 0	Generation Balance (N-1-G)	Generation Balance (N-1-G) reduced gas, wind = 20%	Generation Balance (N-1-G) reduced gas, wind = 0
29/02/2020	Pole 3	3171	279	1727	1225	1113	1322	1146	975
1/03/2020		3106	279	1791	1289	1178	1386	1039	928
2/03/2020		3603	391	1183	651	539	778	401	289
3/03/2020		3603	424	1149	617	505	744	367	255
4/03/2020		3573	383	1220	688	576	815	463	351
5/03/2020		3573	382	1222	690	596	817	463	351
6/03/2020		3573	382	1222	690	596	817	523	411
7/03/2020	Bipole	3171	268	1332	955	843	972	853	705
8/03/2020	Pole 3 + Electrode	3064	268	1817	1312	1200	1439	1062	950
9/03/2020		3547	364	1238	733	621	860	538	426
10/03/2020		3547	408	1194	689	577	816	502	390
11/03/2020	Pole 3 + Electrode + Pohokura	3547	446	1156	651	539	778	476	364
12/03/2020		3550	379	1220	715	603	842	476	364
13/03/2020		3550	729	870	715	603	492	484	372
14/03/2020		3145	765	1239	1084	972	861	861	834
15/03/2020		3058	665	1426	1271	1159	1048	1021	909
16/03/2020		3619	435	1095	590	478	717	442	330
17/03/2020		3619	464	1066	561	449	688	417	305
18/03/2020		3619	493	1037	532	420	659	311	200
19/03/2020		3619	435	1096	591	479	718	351	240
20/03/2020		3619	363	1167	662	550	789	449	338
21/03/2020	Bipole + Pohokura	3160	275	1335	958	847	975	794	682

Table 3: Result of the generation balance studies for HVDC 2020 Bipole Outages.

Date	Outages	NI Load	NI Generation Outages	Generation Balance (N-1)	Generation Balance (N-1) reduced gas, wind = 20%	Generation Balance (N-1) reduced gas, wind = 0	Generation Balance (N-1-G)	Generation Balance (N-1-G) reduced gas, wind = 20%	Generation Balance (N-1-G) reduced gas, wind = 0
22/03/2020	Pole 3 + Pohokura	3215	275	1685	1153	1042	1280	903	792
23/03/2020		3692	301	1184	652	540	779	424	312
24/03/2020		3692	291	1193	661	549	788	459	347
25/03/2020	Pole 3	3814	305	1057	535	423	652	285	173
26/03/2020		3814	295	1067	545	433	662	295	183
27/03/2020		3814	293	1069	547	435	664	297	185
28/03/2020		3333	289	1554	1032	920	1149	782	670
29/03/2020		3587	289	1301	779	667	896	529	417
30/03/2020		3870	384	922	400	288	517	150	38
31/03/2020		3870	384	922	400	288	517	150	38
1/04/2020		3928	234	1014	492	380	609	242	130
2/04/2020		3928	234	1014	492	380	609	242	130
3/04/2020		3928	216	1032	510	398	627	260	148
4/04/2020		3494	216	1466	944	832	1061	694	582
5/04/2020		3587	176	1414	882	770	1009	632	520
6/04/2020		3928	226	1022	490	378	617	240	128
7/04/2020		3928	367	881	349	237	476	99	-13
8/04/2020		3928	211	1037	505	393	632	255	143
9/04/2020		3928	180	1067	535	423	662	285	173