Performance against the quality standards

Attachment to the Annual Compliance Statement

For the reporting year ended 31 March 2016

Contents

1. Introduction

We have breached the SAIDI[1] limit for the year ended 31 March 2016. Accordingly, we have written this report, *Performance against the quality standards,* to provide the Commerce Commission with the relevant information it needs to inform its investigation of our performance against the quality standards.

The report is broken into nine sections.

- Section 2—provides a high level summary of our annual performance against the annual limits.
- Section 3—provides a high level summary of our monthly performance against our monthly targets and the monthly limits.
- Section 4— provides high level discussion around the four major event days (MEDs) that we experienced during the assessment period.
- Section 5— provides detailed analysis on our SAIDI performance for our unplanned and interruptions; including the steps we are taking, or are going to take, to reduce interruptions.
- Section 6—discuss the steps that we take to reduce the impact of planned interruptions on consumers.
- Section 7—is an overview of how we are thinking outside the box to provide consumers with a safe and reliable supply of electricity
- Section 8—provides our high-level thinking around enhancing reliability.
- Section 9—our closing comments and contact details at Alpine Energy to direct questions about this report, or any information held within.

2. Summary of our performance

In this section we provide a summary of our annual performance against the Limits set by the Commerce Commission in its Default Price-Quality Path (DPP) Determination[2] for this assessment period (1 April 2015 to 31 March 2016) and the two extant periods (i.e. 1 April 2013 to 31 March 2014, and 1 April 2014 to 31 March 2015).

[1] System average interruption duration index (SAIDI), is the sum of the duration of the interruptions divided by the number of consumers impacted.

[2] Commerce Commission, Electricity Distribution Services Default Price-Quality Path Determination 2015, consolidating all amendments as of 9 July 2015, [2015] NZCC 18, 9 July 2015.

2.1 Our year end performance

Table 1 below shows that for the year ending 31 March 2016 we exceeded the SAIDI limit and complied with the SAIFI[3] limit.

Table 1: Summary of our performance for the year ended 31 March 2016

Quality Standard	Performance	Limit	Variance	Exceeded?
SAIDI	155.29	154.16	+1.13	Yes
SAIFI	1.18	1.51	-0.33	No

2.2 Our performance in prior periods

Table 2 below shows that for the year ending 31 March 2015 we complied with both the SAIDI and SAIFI limits.

Table 2: Summary of our performance for the years ended 31 March 2015

Quality Standard	Performance	Limit	Variance	Exceeded?
SAIDI	140.28	164.22	-23.94	No
SAIFI	1.16	1.69	-0.53	No

Table 3 below shows that for the year ending 31 March 2014 we exceeded both the SAIDI and SAIFI limits.

Table 3: Summary of our performance for the years ended 31 March 2014

Quality Standard	Performance	Limit	Variance	Exceeded?
SAIDI	274.77	164.22	+110.55	Yes
SAIFI	2.00	1.69	+0.31	Yes

2.3 Our interpretation of the two out of three year rule

Because we exceeded the SAIDI limit in the year ended 31 March 2014 and 2016 we have 'breached' the quality standards.

It is our understanding that exceeding the limits does not in its self amount to a breach of the DPP. The DPP Determination applies the 'two out of three' rule to performance against the quality standard. The two out of three rules means that an Electricity Distribution Business (EDB) must exceed the SAIDI and/or SAIFI limit at two out of three years to be considered to have breached the quality standard.

[3] System average interruption frequency index, is the total number of interruptions divided by the total number of consumer impacted.

Because we exceeded the SAIDI threshold in 2014 and have again exceeded the SAIDI threshold in 2016 we have exceeded the quality standards at two out of three years and accordingly have breached the DPP.

3. Our performance against target

In this section we provide a summary of our actual monthly performance against our monthly target and limit for SAIDI and SAIFI and for planned and unplanned interruptions.

Because we came within the SAIFI limits during the assessment period we have limited our discussion on our SAIFI performance to the high level summary in this section.

However, because we exceeded the SAIDI limit for this assessment period we provide more analysis about our:

- unplanned SAIDI performance in section 5—*Unplanned interruptions* at page 10
- planned SAIDI performance in section 6—*Planned interruptions* at page 28.

3.1 How we set our targets

We set our monthly targets based on the annual target set by the commission under its quality incentive scheme. The SAIDI target under the DPP Determination is 132.81 SAIDI minutes. To set the annual planned and unplanned targets we allocate the annual target between planned/unplanned interruptions using a 70/30 split as shown at Table 4 below.

Table 4: Annual targets for planned/unplanned

Quality Standard	Annual Target	Unplanned	Planned
SAIDI	132.81	92.97	39.84
SAIFI	1.2973	0.9081	0.3892

To set the monthly target for planned interruptions we spread the total planned target equally across each month. For example, our planned SAIDI minutes target per month is 3.32 minutes (i.e., 39.84/12 = 3.32).

We use an even split across months. While planned interruptions can be attributed to work that has been planned well in advance, sometimes years, the confirmation of work and consumer notification happens with no more than 12 weeks in advance. This means that it is very difficult to set a meaningful monthly targets. Accordingly, the month-on-month planned target remains constant for each month.

To set the target for unplanned interruptions we take the total unplanned target and spread it across the months based on the 10-year average for each month.

For example, of the total unplanned interruptions that have occurred over the last 10-years approximately 2.35% unplanned interruptions occurred in April. Therefore of the total

target of 92.97 SAIDI minutes 2.35% is allocated to the month of April. Making Aprils' target 2.18 SAIDI minutes (i.e., 132.81 x 70% x 2.35% = 2.18).

3.2 Our SAIDI performance against monthly targets

Our unplanned annual target for the assessment period was 92.97 SAIDI minutes. We exceeded our annual target by 21.52 SAIDI minutes and exceeded our monthly SAIDI targets at eight out of twelve months.

Our unplanned annual limit for the assessment period was 107.91 SAIDI minutes. We exceeded our annual SAIDI limits by 6.59 SAIDI minutes and exceeded our monthly SAIDI limits at seven out of twelve months.

Our performance this assessment period was impacted by adverse weather, at 77% of the unplanned interruptions, which is largely outside of our control. We discuss the adverse weather events experienced during this assessment period in our section *Adverse weather* at page 11 of this report.

Table 5 below shows our normalised SAIDI performance per month for Category C–unplanned interruptions[4] against our SAIDI target and limit.

Table 5: Monthly SAIDI performance against target for Category C—unplanned interruptions

SAIDI C—Unplanned (Normalised in SAIDI minutes)								
Month	Target	Actual	Target vs Actual Variance		Limit	Limit Vs Actual Variance-		MED
April	2.18	11.77	+9.59	+439%	2.54	+9.24	+455%	1 MED
May	3.51	3.91	+0.40	+11%	4.08	-0.16	-1%	
June	34.52	27.69	-6.82	-20%	40.07	-12.37	-1068%	2 MEDs
July	3.88	7.95	+4.07	+105%	4.50	+3.45	+16%	
August	2.99	2.89	-0.10	-3%	3.47	-0.58	-2%	
September	19.54	6.23	-13.32	-68%	22.68	-16.46	-52%	
October	4.88	23.60	+18.71	+383%	5.67	+17.93	+137%	1 MED
November	9.28	7.01	-2.27	-24%	10.77	-3.76	-7%	
December	2.89	4.22	+1.33	+46%	3.35	+0.87	+1%	
January	3.19	7.18	+3.99	+125%	3.71	+3.47	+5%	
February	2.98	8.02	+5.04	+169%	3.46	+4.56	+6%	
March	3.11	4.01	+0.90	+29%	3.61	+0.40	+1%	
Total	**92.97**	**114.49**	**+21.52**	**+23%**	**107.91**	**+6.59**	**+7%**	

[4] Unplanned interruptions means any interruption to the supply of electricity where less than 24 hours' notice was given, either to the public or to all electricity consumers affected by the interruption. It is our internal policy to give no less than 48 hours' notice for planned interruptions and preferably 10 working days.

Our planned annual target for the assessment period was 39.84 SAIDI minutes. We exceeded our annual target by 0.95 SAIDI minutes and exceeded our monthly SAIDI targets at seven out of twelve months.

Our planned annual limit for the assessment period was 46.20 SAIDI minutes. We came within our annual SAIDI limits by 5.44 SAIDI minutes and exceeded our monthly SAIDI limits at five out of twelve months.

We exceeded our planned SAIDI target by deciding to bring forward planned work from future assessment periods when our contractor NETcon had additional resource available. We discuss our planned SAIDI in section *6—Planned interruptions* at page 28.

Table 6 below shows our normalised SAIDI performance per month for Category B–planned interruptions against the SAIDI target and the limit.

Table 6: Monthly SAIDI performance against target for Category B—planned interruptions

Month	SAIDI B—Planned (Normalised in SAIDI minutes)						
	Target	Actual	Target Vs Actual Variance		Limit	Limit Vs Actual Variance	
April	3.32	2.03	-1.29	-39%	3.85	-1.82	-1%
May	3.32	5.05	+1.73	+52%	3.85	+1.19	+31%
June	3.32	0.64	-2.68	-81%	3.85	-3.21	-12%
July	3.32	4.04	+0.72	+22%	3.85	+0.19	+2%
August	3.32	3.37	+0.05	+1%	3.85	-0.49	-17%
September	3.32	4.12	+0.80	+24%	3.85	+0.26	+4%
October	3.32	3.31	-0.01	-0%	3.85	-0.54	-2%
November	3.32	5.23	+1.91	+58%	3.85	+1.38	+20%
December	3.32	4.72	+1.40	+42%	3.85	+0.87	+21%
January	3.32	1.86	-1.46	-44%	3.85	-1.99	-28%
February	3.32	3.68	+0.36	+11%	3.85	-0.17	-2%
March	3.32	2.74	-0.58	-17%	3.85	-1.11	-28%
Total	**39.84**	**40.79**	**+0.95**	**+2%**	**46.20**	**-5.44**	**-14%**

3.3 Our SAIFI performance against targets

Our unplanned annual target for the assessment period was 0.9080 SAIFI interruptions. We came within our annual target by 0.1019 SAIFI interruptions and exceeded our monthly SAIFI targets at seven out of twelve months.

Our unplanned annual limit for the assessment period was 1.0549 SAIFI interruptions. We came within our annual SAIFI limits by 0.2486 SAIFI interruptions and exceeded our monthly SAIDI limits at five out of twelve months.

We performed within the target and limit for the frequency of unplanned interruptions during the assessment period. This means that the number of unplanned interruptions that

our consumers experienced during the assessment period were within the target and limit allowable under the quality standards.

Table 7 below shows our normalised SAIFI performance per month for Category C–unplanned interruptions against the SAIFI target and the limit.

Table 7: Monthly SAIFI performance against target for Category C—unplanned interruptions

Month	SAIFI C—Unplanned (Normalised in No. of interruptions)						
	Target	Actual	Target Vs Actual Variance		Limit	Limit Vs Actual Variance	
April	0.0213	0.0907	+0.0693	+325%	0.0248	+0.0659	+421%
May	0.0343	0.0426	+0.0083	+24%	0.0398	+0.0027	+2%
June	0.3372	0.1798	-0.1574	-47%	0.3917	-0.2120	-2412%
July	0.0379	0.0388	+0.0009	+2%	0.0440	-0.0052	-3%
August	0.0292	0.0147	-0.0145	-50%	0.0340	-0.0192	-7%
September	0.1909	0.0289	-0.1620	-85%	0.2218	-0.1928	-92%
October	0.0477	0.2089	+0.1611	+338%	0.0554	+0.1534	+163%
November	0.0906	0.0388	-0.0519	-57%	0.1053	-0.0665	-19%
December	0.0282	0.0219	-0.0063	-22%	0.0328	-0.0108	-2%
January	0.0312	0.0353	+0.0042	+13%	0.0362	-0.0009	0%
February	0.0291	0.0686	+0.0395	+136%	0.0338	+0.0348	+7%
March	0.0304	0.0373	+0.0069	+23%	0.0353	+0.0020	+0%
Total	**0.9080**	**0.8063**	**-0.1019**	**-11%**	**1.0549**	**-0.2486**	**-27%**

Our planned annual target for the assessment period was 0.3892 SAIFI interruptions. We came within our annual target by 0.1095 SAIFI interruptions and exceeded our monthly SAIFI targets at only one month—May.

Our planned annual limit for the assessment period was 0.4521 SAIFI interruptions. We came within our annual SAIFI limits by 0.1723 SAIFI interruptions and exceeded our monthly SAIDI limits at only one month—May.

We performed within the target and limit for the frequency of planned interruptions during the assessment period. This means that the number of planned interruptions that our consumers experienced during the assessment period was within the target and limit allowable under the quality standards.

The focus of this report is our breach of the SAIDI limits given that we have performed within the annual targets and limits for both unplanned and planned SAIFI. We do not include any further analysis in this report on our SAIFI performance.

Table 11 below shows our normalised SAIFI performance per month for Category B–planned interruptions against the SAIFI target and the limit.

Table 8: Monthly SAIFI performance against target for Category B—planned interruptions

Month	SAIDI B—Planned (Normalised in No. of interruptions)						
	Target	Actual	Target Vs Actual Variance		Limit	Limit Vs Actual Variance	
April	0.0324	0.0156	-0.0168	-52%	0.0377	-0.0220	-1%
May	0.0324	0.0549	+0.0225	+69%	0.0377	+0.0172	+41%
June	0.0324	0.0042	-0.0283	-87%	0.0377	-0.0335	-19%
July	0.0324	0.0197	-0.0127	-39%	0.0377	-0.0180	-46%
August	0.0324	0.0171	-0.0153	-47%	0.0377	-0.0205	-140%
September	0.0324	0.0191	-0.0133	-41%	0.0377	-0.0185	-64%
October	0.0324	0.0293	-0.0031	-10%	0.0377	-0.0083	-4%
November	0.0324	0.0289	-0.0035	-11%	0.0377	-0.0087	-23%
December	0.0324	0.0245	-0.0079	-24%	0.0377	-0.0131	-60%
January	0.0324	0.0092	-0.0233	-72%	0.0377	-0.0285	-81%
February	0.0324	0.0315	-0.0009	-3%	0.0377	-0.0062	-9%
March	0.0324	0.0255	-0.0069	-21%	0.0377	-0.0122	-33%
Total	**0.3892**	**0.2797**	**-0.1095**	**-28%**	**0.4521**	**-0.1723**	**-44%**

4. We experienced four MED's

Our SAIDI boundary value is 9.175 SAIDI minutes and our SAIFI boundary value is 0.072 interruptions. In accordance with the DPP Determination any interruption that exceeds the boundary value is deemed to be a MED. When a MED occurs the actual minute's lost and/or the number of interruptions is replaced with the boundary value; normalising performance. Table 9 below details the four MEDs during the assessment period.

Table 9: MEDs experienced during the assessment period

Date	Cause	Actual SAIDI minutes	No. of minutes SAIDI was reduced by	Actual SAIFI interruptions	No. of interruptions SAIFI was reduced by
12 April	Burnt Cross-arm	13.17	4.00	0.090	0.018
18 June	Snow storm	206.61	197.43	0.094	0.022
19 June	Snow storm	28.86	19.68	0.078	0.006
4 October	High winds	18.92	9.74	0.066	NA

Burnt cross arm

A crossarm on the Pleasant Point 33 kV line caught on fire resulting in an interruption of 10.5 SAIDI minutes. The failure was the result of a strain disc failure causing crossarm and pole top to burn. More information about the burnt cross arm can be found in section *Crossarm—33 kV Lines failures* at page 20.

Snow storm

The 2015 snow storm was a one in 50 year storm that resulted in approximately 4,500 consumers, mainly in the Tekapo, Fairlie and upper Geraldine basin, losing supply on Wednesday, 18 June. Supply was restored to most consumers by the evening of Thursday, 19 June. However, approximately 30 consumers were without supply until Wednesday, 24 June. More information about the snow storms can be found in the section *Snow storm in June* at page 11

High winds

We experienced extreme winds between Sunday, 4 and Thursday, 22 October. Most of the interruptions were experienced by consumers on the Sunday and were the result of lines snapping in the high winds. More information about the high winds can be found in the section *Wind storm in October* on page 17.

5. Unplanned interruptions

In this section we provide more information about our unplanned SAIDI performance for the assessment period. We have analysed our performance by interruption cause as per Schedule 10(ii) of the information disclosure requirements[5].

In each subsection we share:

- our actual performance by cause for this assessment period and the two extant periods
- calculate the proportion that each cause contributes to the total SAIDI minutes experienced
- a description of the underlining causes of our performance this assessment period
- any actions that we have taken, or intend to take, to reduce the impact of interruptions by that cause on consumers.

5.1 Analysis of unplanned interruptions

Table 10 below lists the cause of the unplanned interruption at the assessment periods ended 31 March 2014, 2015 and 2016. The interruptions are in descending order from the interruption category that caused the highest number of SAIDI minutes during the 2016 assessment period (Adverse weather at 273.99 SAIDI minutes) to the lowest (Adverse environment at zero SAIDI minutes).

[5] Commerce Commission, *EDB Information Disclosure Requirements Information Templates for Schedule 1-10*, prepared 24 March 2015, S10. Reliability.

Table 10: Unplanned interruption statistics for the years ended 31 March 2014, 2015, and 2016

Interruption Category	2014		2015		2016	
	SAIDI minutes	% of total	SAIDI minutes	% of total	SAIDI minutes	% of total
Adverse weather	695:04	82%	17:09	19%	273:99	77%
Defective equipment	54:34	7%	35:32	39%	42:41	12%
Vegetation	13:62	2%	05:13	6%	09:32	3%
Human error	0:27	0%	00:00	0%	09:31	3%
Wildlife	06:02	1%	02:54	3%	08:10	2%
Third party interference	36:00	5%	11:28	12%	07:54	2%
Unknown	09:53	1%	09:19	10%	06:33	1%
Lightning	06:14	1%	08:00	9%	00:22	0.1%
Adverse environment	3:46	1%	01:43	2%	00:00	0%
Total	**858:40**	**100%**	**91:18**	**100%**	**357:22**	**100%**

Adverse weather

Adverse weather includes all unplanned interruptions where the primary cause is adverse weather, other than interruptions caused directly by lightning, vegetation contact, or adverse environment[6]. Our consumers experienced interruptions of 273.99 SAIDI minutes (or 77% of the total unplanned interruptions) due to adverse weather. By SAIDI minutes this result is higher than 2015, but lower than 2014.

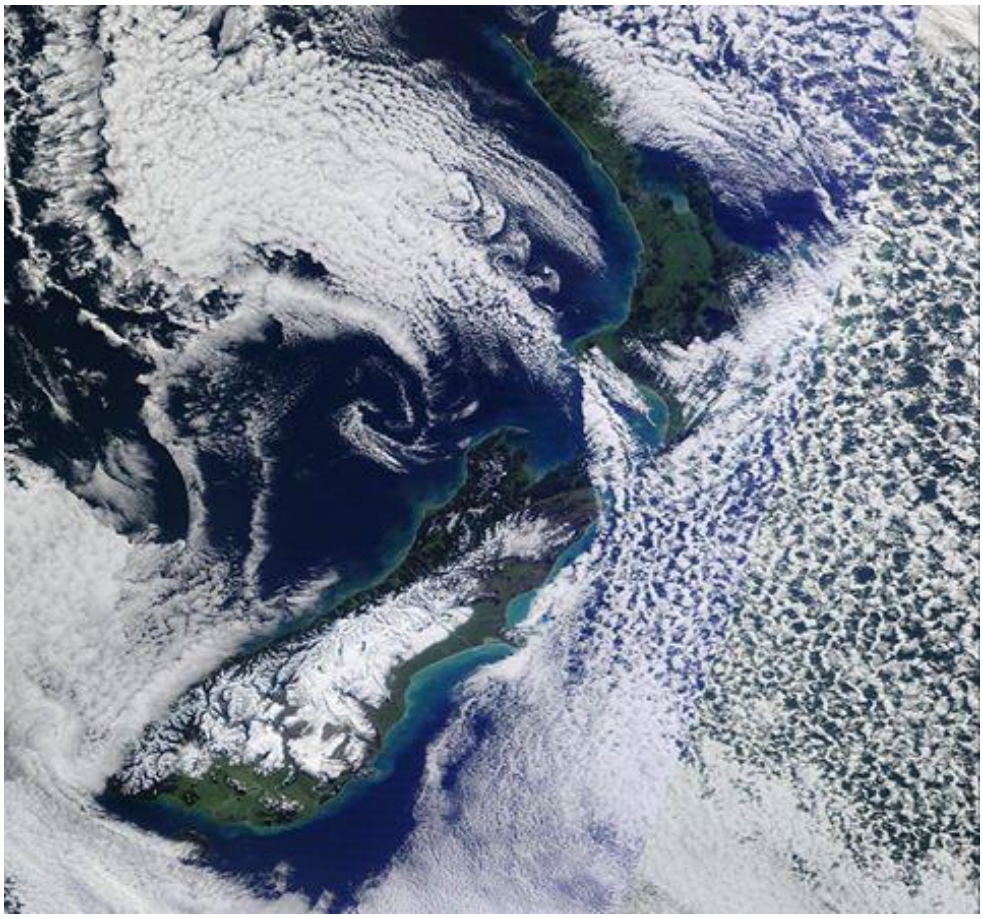
Snow storm in June

The adverse weather event of greatest significance during the assessment period was a snow storm that developed across the South Island on the evening of Wednesday, 18 June. The one in 50 year storm resulted in approximately 4,500 consumers, mainly in the Tekapo, Fairlie and upper Geraldine basin, losing supply. While supply to most consumers was restored by the evening of Thursday, 19 June, approximately 30 consumers were without supply until Wednesday, 24 June.

[6] Commerce Commission, *Electricity Distribution Information Disclosure Determination 2012 consolidated in 2015*, 24 March 2015, page 146.

Photograph 1: South Canterbury on morning of Thursday, 19 June 2015

Photograph 2: South Island from space on Thursday, 19 June 2015



The time that consumers were without supply was greatly reduced from the snow storms of 2014. This reduction in time is, in part, is attributable to the continuous improvements made following prior key learnings.

Our Alliance Agreement with NETcon, our wholly owned subsidiary, reduced the interruption times through better network emergency event operations.

- Supporting effective cooperation between our operations teams and NETcon.
- Establishing single points of contact (POCs) that were tested and proven to be appropriate and efficient.
- Agreement on pre-work to develop work plans, collect drawings, and allocate teams each night ready to enable effective and efficient deployment of NETcon field staff the next morning.
- New Connections and Engineering staff undertaking line patrols freeing up NETcon filed staff to do the repairs.
- Daily planning diary provided transparency to both us and NETcon.

Our recent upgrade of plant and equipment and the enhancement of our systems and process also played a role in reducing the duration of interruptions.

- We deployed multiple standby generators to mobile telecommunications towers enabled the remote sites of our internal communications systems to keep running.
- Use of our mobile generators supported supply to the Fairlie township while repairs were made to re-establish network supply saving approximately 20:42 SAIDI minutes (more detail on our mobile generators and substations can be found at section 6.2–Mobile generation on page 29).
- Issuing of snow boots, snow glasses, gaiters, and food to field staff, ensured staff were correctly equip, fed and hydrated.
- Our new 4x4 Utes proved more competent off-road, most vehicles didn't need chains despite the snowy conditions.
- Helicopter support in line patrolling and deployment of equipment to remote areas.

Photograph 3: Standby generator deployed to telecommunications tower

Photograph 4: One of our new 4x4 Utes

Photograph 5: Central South Island Helicopter that was used for line patrols

Photograph 6: Example of assets damaged by sticky snow on the lines

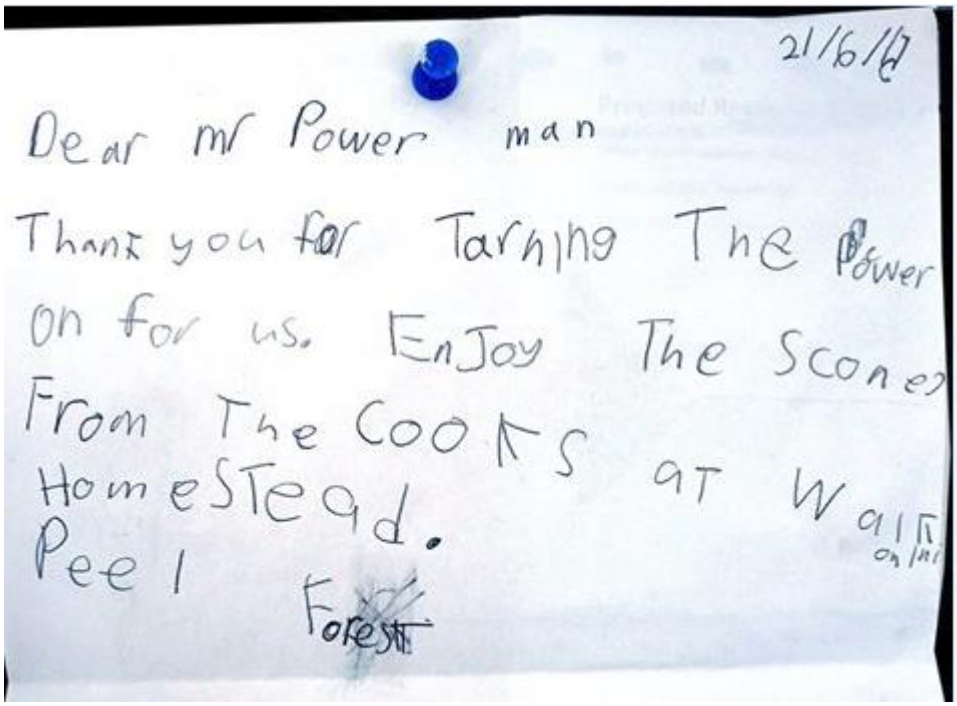
Photograph 7: Example of damage caused to assets

We gained a number of continuous learnings from the 2015 snow event that we will look to implement.

- Improve our communications infrastructure—we will establish:
  - a digital radio telephone to replace the current analogue system, which was at times overwhelmed. A digital radio telephone will give us multiple channels that support separately our Control Room operations and Damage Reporting; and
  - scope the replacement of our legacy PABX system, which is limited to eight lines and accordingly, is not capable of handling high volume calls.
- Develop templates for key roles and responsibilities—as per the Critical Incident Management System (CIMS) methodology used by local councils and Civil Defence–Emergency Management.
- Establish equipment caches—for remote locations, especially Tekapo and Twizel, as part of our advanced preparation for events.
- Confirm consumer interruption and restoration times via smart meters—as smart meters are rolled out we will use the smart meters to determine more accurate interruption and restoration times. In our more remote areas of our network we

still rely on consumers calling an interruption into us and us calling back the consumer to confirm that restoration has been successful.

Photograph 8: Example of a letter from a happy consumer



Wind storm in October

We experienced extreme winds between Sunday, 4 and Thursday, 22 October. Our post event investigation indicated that:

i) a number of the interruptions were the result of lines snapping in the high winds

ii) the interruptions were on lines that had been repaired following damage during similar events at previous assessment periods.

To address these types of interruptions we plan to replace approximately five km of conductor each year, at a cost of approximately $350,000 per year. We will also replace conductor at the same time as we replace hardwood poles that have reached the end of useful life.

Defective equipment

Defective equipment includes all unplanned interruptions resulting from equipment failure, either mechanical or electrical[7]. Our consumers experienced interruptions of 42.41 SAIDI minutes (or 12% of the total unplanned interruptions) due to defective equipment. By SAIDI minutes this result is higher than 2015, but lower than 2014. Table 11 below lists interruptions caused by defective equipment by equipment type.

[7] Supra n6, page 151.

Table 11: Defective equipment interruption by equipment type

Defective Equipment	No. of interruptions	No. of consumers impacted	SAIDI minutes lost
Insulator/Disk	17	3511	20.21
Crossarms – 33 kV	2	1335	12.39
Jumper	4	2551	4.61
11kV cable W38 to W9	1	248	1.46
Transformer	4	166	0.62
11kV cable P#10819 to F314	1	194	0.60
11kV cable fault Mt Cook M161 to M128	1	69	0.53
11kV cable fault Stafford St feeder	1	188	0.47
Broken/leaning/burning pole	2	89	0.38
ABS/LB ABS	2	1178	0.26
Broken binder	3	222	0.20
Crossarms	2	131	0.16
Conductor	2	215	0.14
Wire touching eye bolt	1	28	0.11
Wire damage	1	89	0.08
Insulator – 22 kV	1	49	0.05
Emergency isolation – possible shock hazard	1	13	0.03
LV isolator	1	50	0.04
Faulty TX – 22 kV	1	41	0.03
Fuse	1	34	0.02
LA	1	5	0.01
Total	**50**		**42.41**

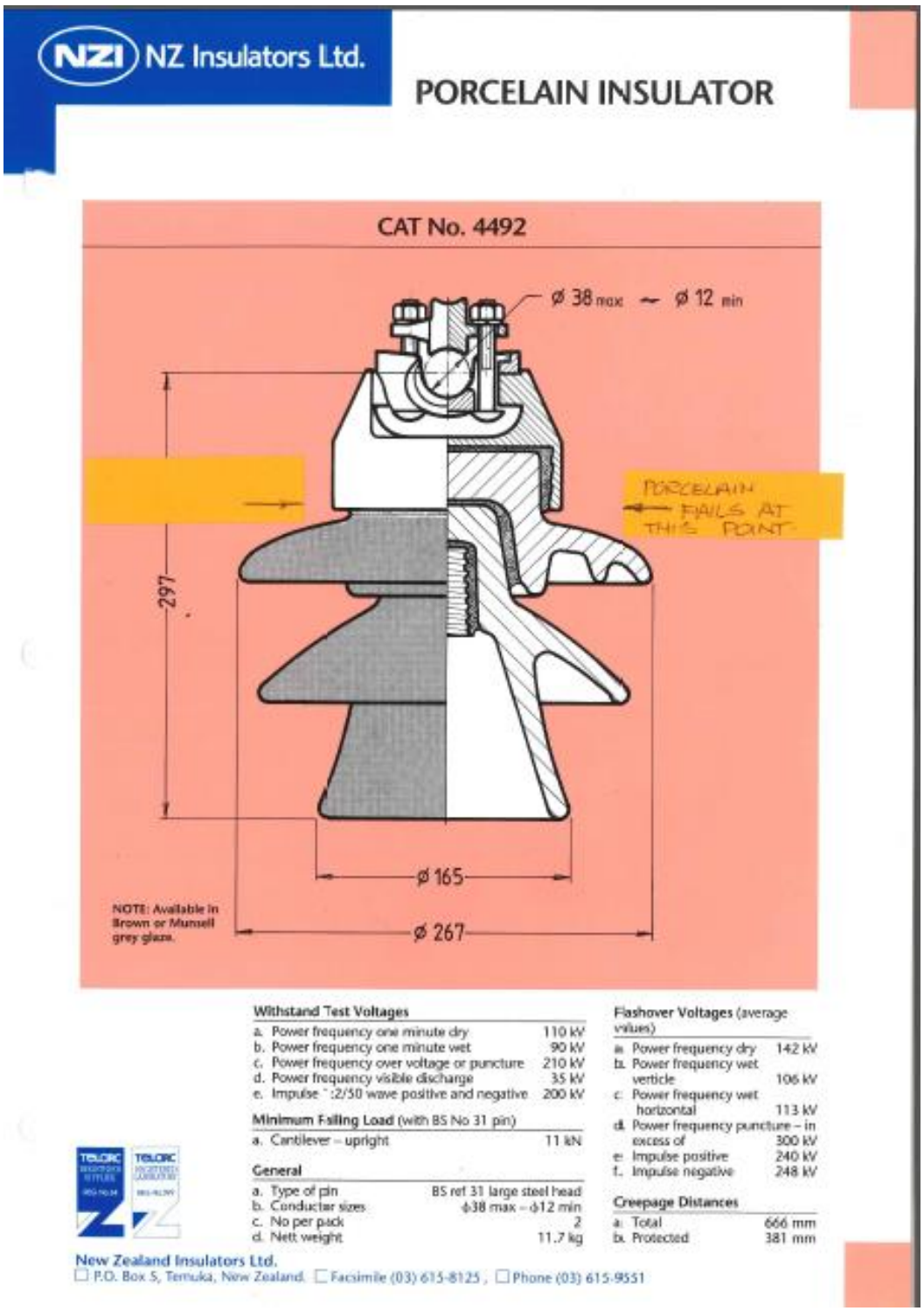
By SAIDI minutes failures of insulator/disk and crossarms – 33kV were the largest contributors to interruptions cause by defective equipment at 48% and 29% respectively.

Insulator disk failure

The most significant insulator/disk failure, by SAIDI minutes, was on the Mount Cook 33 kV line, which contributed 1.5 SAIDI minutes. The failure was the result of a clamp top

insulator failure along the Tasman River crossing section of the line. This is an industry known failure mode of two piece 33 kV insulators as shown at Figure 1 below.

Figure 1: Diagram of porcelain insulator provided by New Zealand Insulators Ltd (NZI)



The Tasman River crossing section is scheduled to have all insulation replaced with superior line post clamp-top insulators this assessment period (i.e., 1 April 2016 to 31 March 2017) at

an estimated cost of $100,000[8]. An example of an insulator that has failed is shown in Photograph 9 below.

Photograph 9: Example of two piece 33 kV clamp top insulator failure

In recent years we have addressed all other lines known to have these type of insulators.

Crossarm—33 kV Lines failures

The most significant crossarm–33 kV failure was on the Pleasant Point 33 kV line, which contributed 10.5 SAIDI minutes. The failure was the result of a strain disc failure causing crossarm and pole top to burn. This is an industry known issue with old porcelain strain discs. It is our standard practice during routine refurbishment to replace all porcelain strain disc insulators with glass. We plan to carryout insulator replacement on this line when our portable generation is next available, likely to be late spring/early summer.

Network component failures

We have experienced a number of component failures in recent years. Some component failures are due to an asset reaching the end of its useful life and some are not. For example, a significant number of new soft wood poles snapped during the 2014 wind and snow

[8] Alpine Energy, *Asset Management Plan 2016-2026*, Table B.1 12 month works plan projects, page 228 and Table C.1 10 year works plan project, page 229.

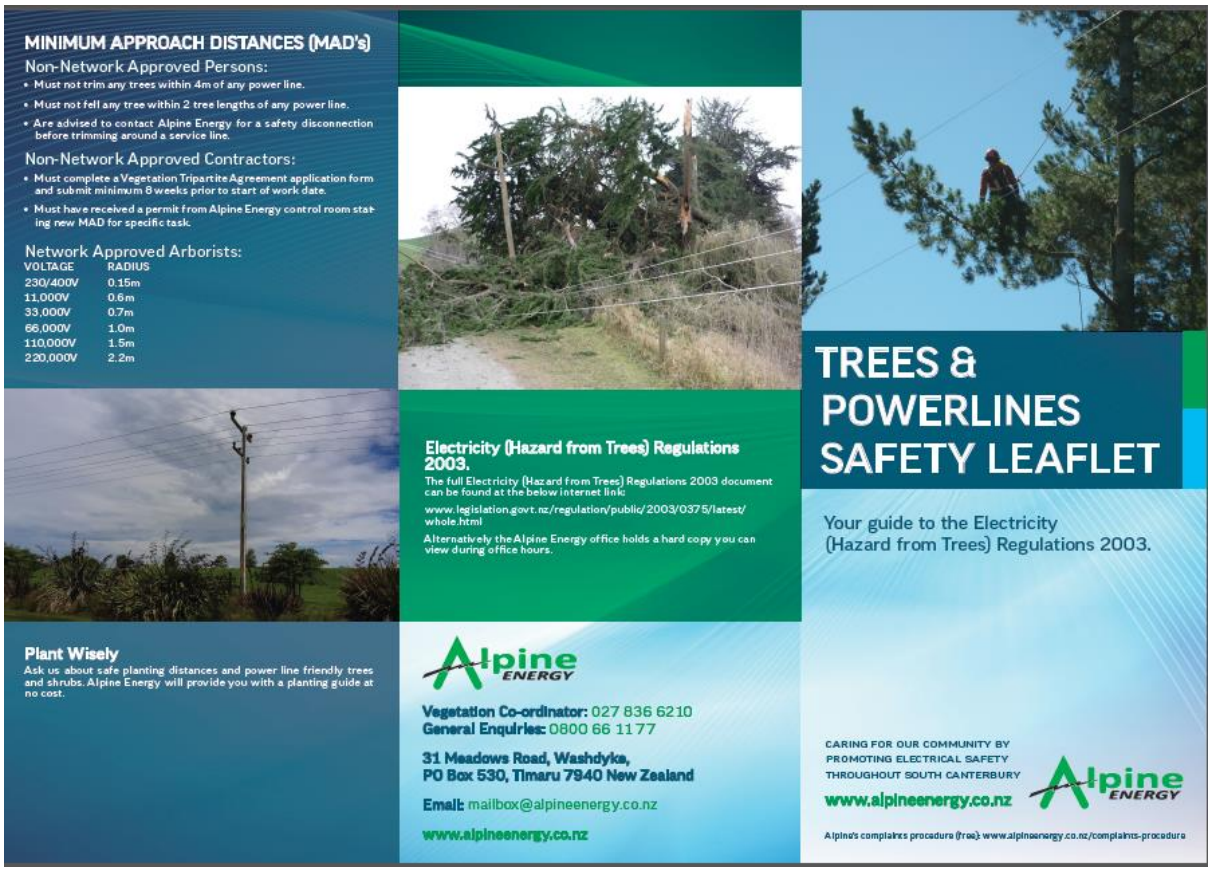
storms whereas issues with some other componentry materialise years after such an event for example, cracked insulators failing.

Vegetation

Vegetation means all unplanned interruptions resulting from vegetation contact, including debris, grass, and tree contact[9]. Our consumers experienced interruptions of 9:32 SAIDI minutes (or 3% of the total unplanned interruptions) due to vegetation. By SAIDI minutes this result is higher than 2015, but lower than 2014.

Vegetation management has been and remains a concern for us due to the number of interruptions and SAIDI minutes attributable to debris flown into our lines. We conduct an active programme of tree cutting to keep trees away from lines and where possible from the routes of new lines and extensions at an average cost of $500,000 per annum[10]. A copy of our Trees and Powerlines Safety Leaflet is shown at Figure 2 below.

Figure 2: Copy of our Trees and Powerlines Safety Leaflet



We employ two full-time vegetation officers to manage and coordinate the programme. The majority of the actual cutting is undertaken by contracted arborists.

[9] Supra n6, page 169.

[10] Supra n8, Table 1.3 AMP forecast expenditure 2016 to 2026 (Constant dollar terms), page 18.

A new vegetation management database has been set up to record and assist with the management of vegetation control work. The database tool allows tree maintenance to be correlated with SAIDI events attributable to 'tree causes', while enabling more accurate budgeting, planning, and management of vegetation control resources.

Electrical (Hazards from Trees) Regulations 2003

Electrical (Hazards from Trees) Regulations 2003 require line owners to advise tree owners of their responsibilities for keeping trees away from lines and to provide advice and notification when growth limit and notice limit zones are breached. We have a dedicated database to administer tree management and notification processes.

We are of the view that the Regulations are inadequate with respect to the defined growth limit zone, as the limit only considers distance from trees in calm weather conditions. The limit set under the Regulations of 1.6 meter clearance of an 11 kV line is of no significance during moderate to high winds or storm conditions. During high wind conditions, branches are broken off trees and blown hundreds of metres by the wind creating a hazard. To counter this hazard, we are approaching owners and offering to cut trees that are within the fall zone.

Our vegetation management is proving successful

As a result of the severe wind storms of 2013, a successful programme of removing trees within falling distance of 33 kV sub-transmission lines was undertaken with the support of the property owners concerned. Vegetation management following the 2014 snow storms on the Albany to Fairlie 33 kV line and associated 11kV lines was effective as there were no tree related damage to those lines in the 2015 snow storm.

Human error

Human error means all unplanned consumer interruptions resulting from contractors or staff, commissioning errors, incorrect protection settings, SCADA problems, switching errors, dig-in, and overhead contact[11]. Interruptions caused by human error were noticeably higher at 9:31 SAIDI minutes (or 3% of the total unplanned interruptions) compared with prior years.

On 19 February a contractor pushed LV wires into 11kV lines. This one incident, at 4.5 SAIDI minutes, contributed materially to the total SAIDI minutes caused by human error during the assessment period. The investigation of the incident found that there were a number of points of failure:

i) the contractor breached ECP 34 by not gaining a close approach consent to work within the minimum approach distance of our conductors

[11] Supra n6, page 156.

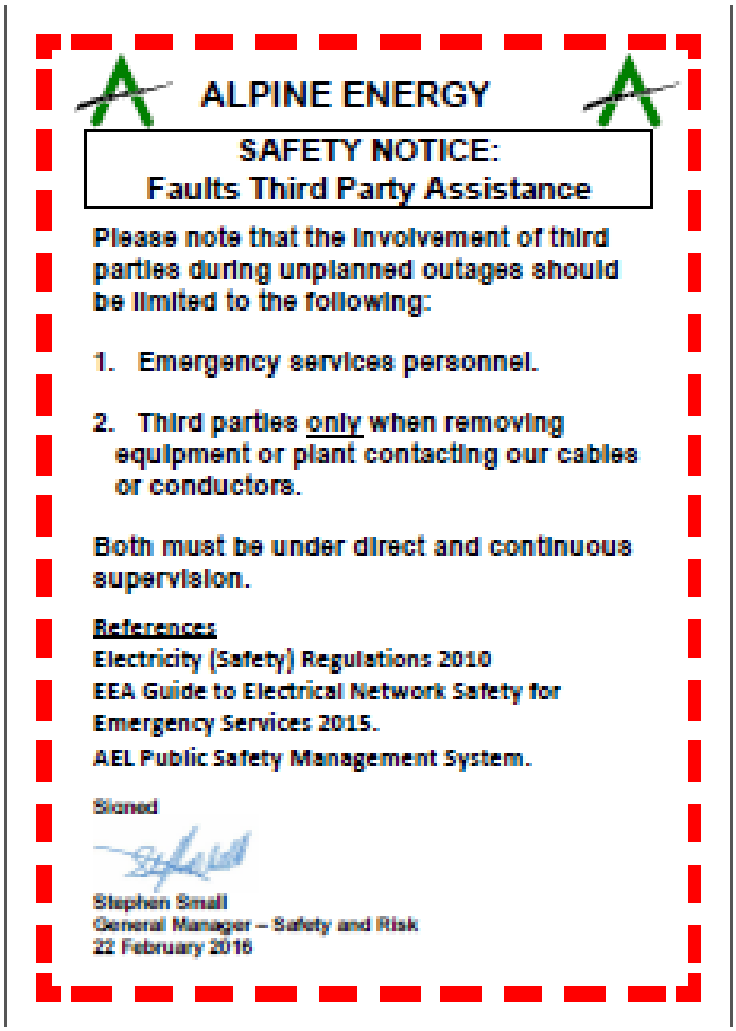
ii) the attending fault man was assisted by the digger crew to pull up the LV the digger crew did not possess the correct competencies to complete that task and clashed the LV conductor with the HV causing a larger interruption

iii) the feeder breaker would not initially close extending the duration of the interruption.

Our corrective actions taken in this incident included:

- reporting the breach of ECP 34 to Worksafe NZ (as per the requirements of our Public Safety Management System)
- disciplining the fault man for using non-competent members of the public to assist
- sending out a Safety Notice to all staff and contractors as shown at Figure 3 below
- checking of maintenance records, for this type of breaker, which did not show abnormality
- bringing forward the next scheduled maintenance for the breaker.

Figure 3: Copy of Safety Notice



ALPINE ENERGY

SAFETY NOTICE:
Faults Third Party Assistance

Please note that the involvement of third parties during unplanned outages should be limited to the following:

1. Emergency services personnel.

2. Third parties only when removing equipment or plant contacting our cables or conductors.

Both must be under direct and continuous supervision.

References:
Electricity (Safety) Regulations 2010
EEA Guide to Electrical Network Safety for Emergency Services 2015.
AEL Public Safety Management System.

Signed

Stephen Small
General Manager – Safety and Risk
22 February 2016

Wildlife

Wildlife means all unplanned consumer interruptions resulting from wildlife contact—includes birds, possums, vermin, cats etc[12]. Our consumers experienced interruptions of 8:10 SAIDI minutes (or 2% of the total unplanned interruptions) due to wildlife. By SAIDI minutes this result is higher than 2015 and 2014.

We had an unusually high number of goose strikes during the assessment period; in particular during January 2016. The newly established council ponds in Washdyke attracted a large number of geese given the unusually dry summer. The location of bird strikes changes depending on what crops farmers plant and where they plant them since this determines the flight paths that the geese follow.

We could mitigate interruptions caused by bird strikes by undergrounding sections of our network where geese, are known to gather. Our investigations into this course of action have concluded that such an action is cost prohibitive. Instead we are looking at the cost and effectiveness of:

- insulating or covering conductors
- fitting 'gadgets' to the overhead lines to deter birds flying in a specific direction.

Third party interference

Third party interference means all unplanned consumer interruptions resulting from external contractors or members of the public, including: Dig-In, Overhead Contact, Vandalism, and Vehicle Damage[13]. Our consumers experienced interruptions of 7:54 SAIDI minutes (or 2% of the total unplanned interruptions) due to third party interference. By SAIDI minutes this result is lower than 2015 and 2014. A breakdown in the causes of third party interference by calendar year is shown at Table 12 below.

We are of the view that we largely do not have control over third party interference of our assets. Our assets are in the public space and it is not costs effective to protect assets such as poles. However, we are of the view that we do have some control to prevent interruptions caused by interference with our overhead lines, underground cables, and insecure assets.

[12] Supra n6, page 169.

[13] Supra n6, page 167.

Table 12: Breakdown of third party interference

Cause	2012	2013	2014	2015
Householder Electric Shock	4	4	0	8
Breach of ECP 34	6	8	2	0
Criminal Acts	4	4	0	0
Car vs Pole	20	27	7	14
Car vs D/Box	2	4	2	3
Miscellaneous Damage	1	2	1	1
Network Caused Property Damage	1	2	1	3
Fire Causing Property Damage	2	2	0	3
Insecure Assets	7	7	0	3
O/H Line Contact - Trees	8	11	3	9
O/H Line Contact - Farm	6	15	9	7
O/H Line Contact - Contracting	9	22	13	5
O/H Line Contact - Other	2	2	0	1
U/G Cable Damage	17	21	4	8
Other	1	5	4	9
Total	**90**	**136**	**46**	**74**

Contact with our lines and cables

The number of interruptions caused by overhead line contact by contractor and underground cable damage has significantly reduced since 2013. We manage the number contacts with our lines and cables through:

- Presentations targeted high exposure groups—certain types of contractors can be exposed to our live conductors, for example tree trimmers near overhead lines or thrust-borers near underground cables. We provide safety presentations and training to these contractors so as to support an understanding of safety when working near live conductors.
- Correspondence to persons who exhibit high risk behaviour—as part of our investigation into public safety incidents involving live line contact, reminder letters are sent to the third party reminding them of the dangers when working near live electricity lines. Included in the letter are references to relevant standards and procedures, and supporting material.

By placing regular safety messages in the media, we communicate to the public the consequences of their actions in relations to electricity and electrical assets. Communication through media helps us to create awareness in the community regarding

potential hazards, and reminds the public to contact us when a hazard is perceived. Our public safety message that we put in print media is shown at Figure 4 below.

Figure 4: An example of our public safety message in print media

Insecure assets

We have halved the number of interruptions caused by interference with our assets through our Lock and Key System (LKS). LKS replaces the city councils keys, which are a skeleton key system for all council assets. Under LKS staff, and authorised contractors, are issued keys under a hierarchal system.

Keys are individually serial numbered and cannot be copied. Each worker is personally responsible for their issued key. Possession of a key does not automatically give the holder of that key any network authority to operate the equipment being secured by that lock. Access continues to be based on an individual's competencies.

To date we have spent $400,000 on LKS and expect to spend another $600,000 over the 2017 assessment period.

Unknown

Unknown means all unplanned interruptions where the cause is not known[14]. Our consumers experienced 6:33 SAIDI minutes (or 1% of the total unplanned interruptions) where the cause was unknown. By SAIDI minutes this result is lower than it has been in prior years.

We make a concerted effort to establish the cause of all unplanned interruptions. However, interruptions are classified as unknown where the cause of the interruption is not evident

[14] Supra n6, page 168.

when the crews go to sight to restore supply. For example, debris blown into the lines and then blown further away from the point of impact makes the cause uncertain and accordingly, unknown.

Lightning

Lightning means all unplanned interruptions where the primary cause is a lightning strike, resulting in insulation breakdown and or flashovers[15]. Our consumers experienced interruptions of 0:22 SAIDI minutes (or 0.1% of the total unplanned interruptions) due to lightning. By SAIDI minutes this assessment period result is markedly lower than it has been in prior years.

There is no correlation between either the capex or opex performance on our network this assessment period and the reduction in interruptions caused by lightning strikes. During the assessment period we did not have the same number of storms, with lightning, as we experienced in other years.

Adverse environment

Adverse environment means all unplanned interruptions where the primary cause is adverse environment, such as slips or seismic events[16]. Our consumers experienced interruptions of zero SAIDI minutes (or 0% of the total unplanned interruptions) due to adverse environment. By SAIDI minutes this result is lower than 2015 and 2014.

We were fortunate not to have any events on our network during this assessment period that led to interruptions caused by adverse environment. Snow and wind typically create high risks in the Mackenzie area of our network. Our design standards ensure appropriate materials that meet the extreme weather conditions are used. For example, the 11 kV switchroom at the Studholme Substation has been elevated to minimise flood risk.

Earthquakes pose a significant risk of network interruption and difficulty in supply restoration. The likelihood of an earthquake on our network has been deemed 'possible'. The possibility of an Alpine Fault event is one in 50 years. The impact of an earthquake event would be moderate, making this a high risk event for our network.

We have built additional room and facilities at our North Street Substation to provide a second base for control room operations and back-up ICT servers in the event of a disaster damaging (earthquake or flood) or destroying the Washdyke offices and depot.

[15] Supra n6, page 157.

[16] Supra n6, page 145.

6. Planned interruptions

In this section we discuss the steps that we take to reduce the impact of planned interruptions on consumers. A planned interruption is any outage where consumers are given less than 24 hours' notice that the interruption will occur. It is our standard practice to give a minimum of four days' notice and usually 10 days' notice that we are planning an outage on any part of our network.

Planned interruptions are necessary for us to repair, maintain, and grow our network. We do however, recognise the inconvenience caused to consumers and costs associated when interruptions occur. Accordingly we employ three practices to reduce the impact that planned outages have on consumers:

i) switching—transfer of electricity flow from one substation and /or feeder to another

ii) mobile generation—to support supply when the network is unavailable

iii) mobile substation—to support supply when a substation is completely or partially unavailable.

Each practice is explained in more detail in the following sections.

6.1 Switching

Our Operation Team plan the switching on our network. When planning an interruption the team drafts switching for the field crews to implement. The switching considers:

- the day that the planned interruption is to occur (i.e., the day of the week)
- the date (i.e., time of the year)
- consumers historic load on that day and date
- the assessed demand during the planned interruption.

The team does all this so as we can assess whether, or not, the load can be switched to other feeders or substations so as the interruption can be mitigated in part or in entirety.

The assets used in switching

In recent years we have automated a large number of our reclosers. The automation of pole mounted reclosers and other network improvements increase the efficiency of switching for planned outages as well as reduce the response time associated with switching for faults.

To support switching we recently upgraded our Master Station software, which includes expansion of our SCADA and software capacity to cater for the increasing number of zone substations, and monitored and controlled points from the communications upgrade

project. Our new SCADA includes a whole network view, thereby supporting efficiencies in the preparation, updating, and operational use of our network switching diagrams.

6.2 Mobile generation

In 2014 to reduce the impact of interruptions on consumers we purchased two 500 kW portable generators and one 190 kW portable generator. Our portable generators can run separately at 400 V, ganged at 400 V, or stepped up to 11 kV, helping maintain service expectations of our consumers. Where switching is not possible or is insufficient to support supply we look to deploy our mobile generation.

Photograph 10: Our 190 kW portable generator

Photograph 11: One of our 500 kW mobile Generators

When necessary we also hire additional generators for larger multi MW projects to support supply to minimise disruption to consumers.

6.3 Mobile sub-station

The high level risk of single transformers at zone substations has been identified in the risk management section of our AMP. Considering the cost of purchasing a spare transformer, at our substations, against the need for managing the planned loss of supply resulted in us building a 33/11 kV mobile substation that can double as an emergency back-up for faults and as a temporary second transformer for avoiding planned outages when maintaining single transformers.

We used our mobile substation during this assessment period to support supply in Tekapo during a Transpower outage and in 2014 to support the supply in Fairlie township during scheduled maintenance of the substation. The use of the mobile substation saved approximately 4:19 SAIDI minutes.

Photograph 12: Our mobile substation

7. Thinking out side of the box

In April 2016 we commissioned BESS our lithium ion battery energy storage system. New Zealand's first grid connected commercial battery storage suitable for network and consumer purposes.

BESS stores up to 143 kWh of energy and provides up to 91 kVA of peak power, with the ability to upgrade peak power to 143 kVA with the addition of a second inverter.

At 143 kWh the BESS can supply up to 20 average sized homes for one hour during peak periods, and over two hours during off peak periods. We are exploring BESS' potential to provide feasible electricity supply for both unplanned and planned interruptions.

Photograph 13: Containerised battery system

We have invested in BESS to embrace the possibilities that future technologies can bring to the delivery of electricity and the sustainability of our community. Our thinking includes how new technologies might provide effective and appropriate redundancy for the consumers.

8. Enhancing reliability

Our consumers have voiced a preference to receive 'about the same' reliability in return for paying' about the same' line charges[17]. There is no mandate to improve reliability simply because it can be improved, but there is a mandate to maintain supply.

There are many factors that can lead to a decline in reliability over time, for example:

- tree regrowth
- declining asset condition, especially in coastal marine areas
- extensions to the network that increase its exposure to trees and weather
- growing consumer numbers that increase lost consumer-minutes (SAIDI) for a fault
- installation of requested asset alterations that increase reliability risk
- increase in frequency and magnitude of extreme weather conditions due to climate change

Our reliability enhancement programme includes the following steps:

- identifying the consumer-minutes lost for each asset by cause
- identifying the scope and likely cost of reducing the lost consumer-minutes
- estimating the likely reduction in lost consumer-minutes if work is implemented
- calculating the cost of each enhancement opportunity per consumer-minute
- prioritising the enhancement opportunities by cost from lowest to highest.

9. Closing Comments

We hope that our report is helpful to the commission in informing its investigation of our breach of the quality standards during this assessment period. We are happy to answer any questions about our performance or discuss any information held in this report further with the commission or interested persons. The main contact for this report is:

Sara Carter
General Manager—Commercial and Regulatory
DDI: 03 687 4306
Email: sara.carter@alpineenergy.co.nz

[17] Supra n8, section 1.6 at page 13 and section 4.7 at page 95 and section 6.6 at page 163.