Electricity Ashburton Limited, trading as EA Networks

Default Price-Quality Path

Annual Compliance Statement

1 April 2020 – 31 March 2021 Assessment Period

25 August 2021

Contents

1. Introduction

Electricity Ashburton Limited, trading as EA Networks (EA Networks) is subject to price-quality regulation under Part 4 of the Commerce Act 1986. The Commerce Commission has set a Default Price-Quality Path (DPP) which applies to EA Networks from 1 April 2020.

This annual compliance statement is published in accordance with clause 11.4 of the Electricity Distribution Services Default Price-Quality Path Determination 2020 [2019] NZCC 21 (2020 DPP Determination), and applies to the first assessment period, commencing 1 April 2020 and ending 31 March 2021.

2. Date prepared

This statement was prepared on 25 August 2021.

3. Wash-up amount

3.1 Statement of compliance

For the purposes of calculating the wash-up amount under clause 8.6 of the 2020 DPP Determination, 'actual revenue from prices' includes a discount of $3.47M that does not meet the requirement of limb (c) of clause 3.1.1(11) of the Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26 (as amended). This discount was included in prices in order to return to consumers revenue incorrectly recovered from consumers in the 2021 assessment period.

Additional information concerning the $3.47M discount is given in appendix B of this disclosure.

EA Networks has otherwise complied with the requirements of the 2020 DPP Determination in respect of the wash-up amount calculation.

3.2 Wash-up amount calculation

Table 1

Wash-up amount RY21		
Term	Description	Value ($000)
Actual allowable revenue (AAR)	*Sum of actual net allowable revenue, actual pass-through and recoverable costs, pass-through balance and revenue wash-up draw down amount*	43,387
Actual revenue (AR)	*Sum of actual revenue from prices plus other regulated income*	43,595
Revenue foregone (RV)	*Actual net allowable revenue x (revenue reduction percentage - 20%) when revenue reduction percentage is greater than 20%, otherwise nil*	-
Wash-up amount	*AAR - AR - RV*	**(208)**

Further information supporting actual allowable revenue is included in Section 3.2.1.

Further information supporting actual revenue is included in Section 3.2.2.

Further information supporting revenue foregone is included in Section 3.3.3.

3.2.1 Actual allowable revenue

Table 2 below shows the actual allowable revenue for the assessment period consistent with Schedule 1.6 of the 2020 DPP Determination.

Table 2

Actual allowable revenue RY21		
Term	Description	Value ($000)
Actual net allowable revenue (ANAR)	*Amount specified as forecast net allowable revenue for the first assessment period*	33,259
Actual pass-through costs	*Sum of all pass-through costs that were incurred or approved by the Commission in the assessment period*	422
Actual recoverable costs	*Sum of all recoverable costs that were incurred or approved by the Commission in the assessment period*	10,554
Pass-through balance	*The amount calculated for the assessment period ending 31 March 2020 under clause 8.6 of the 2015 DPP Determination*	813
Total actual allowable revenue (AAR)	*Actual net allowable revenue + actual pass-through costs and actual recoverable costs – (pass-through balance x (1 +* 67th percentile estimate of post-tax WACC))	**43,387**

Further information supporting actual pass-through costs, actual recoverable costs and the pass-through balance is included in Appendix A.

3.2.2 Actual revenue

Table 3 below shows actual revenue for the assessment period consistent with clause 4.2 of the 2020 DPP Determination.

Table 3

Actual revenue RY21		
Term	Description	Value ($000)
Actual revenue from prices[1]	*Actual prices between 1 April 2020 and 31 March 2021 multiplied by actual quantities for the assessment period*	44,084
Other regulated income	*Other income associated with supply of electricity distribution services*	(489)
Total actual revenue (AR)	*Sum of actual revenue from prices plus other regulated income*	**43,595**

Further information supporting actual revenue from prices is included in Appendix B.

3.2.3 Revenue foregone

Table 4 below shows the revenue foregone consistent with clause 4.2 of the 2020 DPP Determination.

Table 4

Revenue foregone RY21		
Term	Description	Value ($000)
Actual net allowable revenue (ANAR)	*Amount specified as forecast net allowable revenue for the first assessment period*	33,259
Revenue reduction percentage (RRP)	*1 - (actual revenue from prices / forecast revenue from prices)*	6.58%
Revenue foregone (RV)	*Actual net allowable revenue x (RRP- 20%) when RRP is greater than 20%, otherwise nil*	**-**

[1] See section 3.1 above.

4. Quality standards

4.1 Statement of compliance with planned interruptions quality standards

EA Networks is subject to a planned accumulated SAIDI limit and a planned accumulated SAIFI limit which are assessed for the DPP regulatory period as stated in clause 9.2 of the 2020 DPP Determination.

Table 5 and Table 6 below show the planned accumulated SAIDI and SAIFI limits for [name of EDB] for the DPP regulatory period and the planned SAIDI and SAIFI assessed values for the first assessment period.

Table 5

Planned interruptions quality standard - SAIDI	
Sum of planned SAIDI assessed values ≤ Planned accumulated SAIDI limit	
Planned accumulated SAIDI limit	1,376.08
Planned SAIDI assessed value for the first assessment period	100.12
Compliance result	**Compliant**

Table 6

Planned interruptions quality standard - SAIFI	
Sum of planned SAIFI assessed values ≤ Planned accumulated SAIFI limit	
Planned accumulated SAIFI limit	4.8939
Planned SAIFI assessed value for the first assessment period	0.3162
Compliance result	**Compliant**

Further information supporting planned SAIDI and SAIFI assessed values is included in Section 4.1.1.

4.1.1 Planned SAIDI and SAIFI assessed values

Table 7 and Table 8 below show EA network's planned SAIDI and SAIFI assessed values for the assessment period.

Table 7

Planned SAIDI assessed value RY21		
Term	Description	Value
Class B non-notified interruptions		100.12
Class B notified interruptions falling outside window		0.00
$SAIDI_B$	*Sum of Class B non-notified interruptions*	100.12
Class B notified interruptions falling inside window		0.00
Class B intended interruptions cancelled without notice		0.00
Class B intended interruptions cancelled with notice		0.00
$SAIDI_N$	*Sum of Class B notified interruptions*	0.00
Planned SAIDI assessed value	$SAIDI_B + (SAIDI_N/2)$	100.12

Table 8

Planned SAIFI assessed value RY21		
Term	Description	Value
Planned SAIFI assessed value	*Sum of Class B interruptions commencing within the assessment period*	0.3162

4.2 Statement of compliance with unplanned interruptions quality standards

As demonstrated in Table 9 and Table 10 below, and consistent with clause 9.7 of the 2020 DPP Determination, EA Networks has complied with the unplanned interruptions quality standard.

Table 9

Unplanned interruptions quality standard RY21 - SAIDI		
Unplanned SAIDI assessed value ≤ Unplanned SAIDI limit		
Unplanned SAIDI limit		91.98
Unplanned SAIDI assessed value	*Sum of normalised SAIDI values for Class C interruptions commencing within the assessment period*	75.07
Compliance result		**Compliant**

Table 10

Unplanned interruptions quality standard RY21 - SAIFI		
Unplanned SAIFI assessed value ≤ Unplanned SAIFI limit		
Unplanned SAIFI limit		1.2826
Unplanned SAIFI assessed value	*Sum of normalised SAIFI values for Class C interruptions commencing within the assessment period*	0.8856
Compliance result		**Compliant**

Information about policies, procedures and calculations for measuring planned and unplanned interruptions during the assessment period is in Appendix C.

4.2.1 Major events

Table 11 and Table 12 below show the SAIDI and SAIFI values attributed to major events which occurred during the assessment period.

Further information about major events is included in Appendix D.

Table 11

Unplanned SAIDI major events RY21			
Start	End	Pre-normalised unplanned SAIDI	Normalised unplanned SAIDI
None noted			

Table 12

Unplanned SAIFI major events RY21			
Start	End	Pre-normalised unplanned SAIFI	Normalised unplanned SAIFI
18-01-2021:11:30 am	20-01-2021:10.30 am	0.2600	0.0042

4.3 Statement of compliance with extreme event standard

As demonstrated in Table 13 below, and consistent with clause 9.9 of the 2020 DPP Determination EA Networks has complied with the extreme event standard.

Table 13

Extreme event standard RY21	
Unplanned SAIDI value ≤ 120 minutes, and customer interruption minutes ≤ six million during any 24-hour period, excluding unplanned interruptions from major external factors	
Number of extreme events	Compliance result
-	Compliant

4.4 Quality Incentive Adjustment

Table 14 below shows EA Networks' quality incentive adjustment for the assessment period.

Table 14

Quality Incentive Adjustment RY21		
Term	Description	Value ($000)
SAIDI planned adjustment	*($SAIDI_{planned, target}$ - $SAIDI_{planned, assessed}$) x 0.5 x IR*	(23)
SAIDI unplanned adjustment	*($SAIDI_{unplanned, target}$ - $SAIDI_{unplanned, assessed}$) x IR*	(18)
Total adjustment	*SAIDI planned adjustment + SAIDI unplanned adjustment*	(41)
Revenue at risk	*0.02 * ANAR*	665.18
Total penalty/reward		(41)
67th percentile estimate of post-tax WACC		4.23%
Quality incentive adjustment		**(45)**

Table 15 below shows EA Network's quality incentive adjustment inputs consistent with Schedule 4 of the 2020 DPP Determination.

Table 15

Quality Incentive Adjustment Inputs RY21					
Term	Units	Value	Term	Units	Value
SAIDI planned interruption cap	minutes	275.22	SAIDI unplanned interruption cap	minutes	91.98
SAIDI planned interruption collar	minutes	-	SAIDI unplanned interruption collar	minutes	-
SAIDI planned interruption target	minutes	91.74	SAIDI unplanned interruption target	minutes	71.65
Planned SAIDI assessed value	minutes	100.12	Unplanned SAIDI assessed value	minutes	75.07
Incentive rate		5,394			
Actual net allowable revenue (ANAR)	$000	33,259			
SAIDI planned interruption target	minutes	92	SAIDI unplanned interruption target	minutes	72
Minimum of the planned SAIDI cap and assessed value	minutes	100	Minimum of the unplanned SAIDI cap and assessed value	minutes	75
Planned SAIDI subject to incentive	minutes	(8)	Unplanned SAIDI subject to incentive	minutes	(3)
Adjustment (IR x 0.5)	$	2,697	Adjustment (IR)	$	5,394
SAIDI planned adjustment	$000	(23)	SAIDI planned adjustment	$000	(18)

5. Transactions

EA Networks has not entered into any agreements with another EDB or Transpower for an amalgamation, merger, major transaction or transfer in the assessment period.

6. Director's certification

A Director's certificate in the form set out in Schedule 7 of the 2020 DPP Determination is included as Appendix E.

7. Assurance report

An assurance report meeting the requirements of Schedule 8 of the 2020 DPP Determination is included in Appendix F.

Appendix A – Pass-through and recoverable costs

Pass-through costs

Table 16

Actual and forecast pass-through costs RY21				
Actual pass-through costs	Actual ($000)	Forecast ($000)	Forecast variance ($000)	Explanation for variances
Rates on system fixed assets	199	207	(8)	A rates increase was allowed for, using the Ashburton District Council 10-year plan to forecast the value of the increase. The actual increase was lower than what the 10-year forecast stated.
Commerce Act levies	102	119	(17)	The forecast was based on actual Commerce Commission cost plus an inflation adjustment. The actual FY21 invoices are lower due to no additional work required by the Commerce Commission for implementation of DPP3. DPP3 was implemented 1 April 2021.
Electricity Authority levies	110	72	38	The forecast was based on actual costs from 1 April 2019 to 31 October 2020, normalised for a whole year. Actual levies from 1 November to 31 March tend to be higher than other months of the year. The higher levies were not considered in the forecast.
Utilities Disputes levies	11	12	(1)	
Total actual pass-through costs	**422**	**410**	**12**	**Overall, the variance is 3% of total actual pass-through costs**

Recoverable costs

Table 17

Actual and forecast recoverable costs RY21				
Actual recoverable costs	Actual ($000)	Forecast ($000)	Forecast variance ($000)	Explanation for variances
IRIS incentive adjustment	(2,506)	(2,506)	-	
Transmission charges	6,557	6,557	-	
New investment contract charges	6,312	6,341	(29)	Transpower advised EA Networks what the required new investment payments will be for the 2020-21 year. EA Networks used this number plus an allowance to make a one-off additional payment to calculate the forecast. The difference between the actual and forecast is a rounding issue associated with the additional payment.
System operator services charges	-	-	-	
Avoided transmission charges	-	-	-	
Distributed generation allowance	-	-	-	
Claw-back	-	-	-	
Catastrophic event allowance	-	-	-	
Extended reserves allowance	-	-	-	
Quality incentive adjustment	148	131	17	The forecast incorrectly calculated the time value of money adjustment.
Capex wash-up adjustment	-	-	-	
Reconsideration event allowance	-	-	-	
Quality standard variation engineers fee	-	-	-	
Urgent project allowance	-	-	-	
Fire and Emergency NZ levies	43	28	15	EA Networks increased the value of items insured after the forecast was completed.
Innovation project allowance	-	-	-	
Total actual recoverable costs	**10,554**	**10,551**	**3**	**Total actual cost is in line with forecasted recoverable costs**

Pass-through balance

Table 18

Pass-through balance RY21		
Term	Description	Value ($000)
Pass-through balance	*Pass-through balance for the assessment period ending 31 March 2020*	813
67th percentile estimate of post-tax WACC		4.23%
Pass-through balance	*Pass-through balance x (1 + 67th percentile post-tax WACC)*	**847**

Appendix B – Prices and quantities

Table 19 shows the actual prices and quantities for actual revenue from prices for the first assessment period.

Table 19

Actual revenue from prices RY21									
						Discount			
Price Category	Price code	Charaged out by:	Unit	Unit price	Revenue	Unit	Unit price	revenue	Actual revenue ($000)
GS05	less than 5 kVA	$/day	44.042	0.526300	8,460	12674	-0.0518	($657)	8
GS20	20 kVA	$/day	14977.581	0.150000	820,023	5405929	0	0	820
GS50	50 kVA	$/day	1619.29	0.300000	177,312	498857	0	0	177
G100	100 kVA	$/day	688.847	0.600000	150,857	244866	0	0	151
G150	150 kVA	$/day	284.542	0.900000	93,472	86450	0	0	93
GUEN	Uncontrolled Energy	$/kWh	227018390.9	0.085700	19,455,476	219995357.8	-0.0066	($1,451,969)	18,004
GCOP	Controlled Off Peak Energy	$/kWh	31865311.92	0.016200	516,218	30875421	-0.0016	($49,401)	467
G10N	Night Boost 10	$/kWh	775875.294	0.016200	12,569	682746	-0.0016	($1,092)	11
GNEN	Night Rate	$/kWh	4463417.546	0.000000	-	4475097	0	0	-
GEDG	Export kWh	$/kWh	393996.128	0.000000	-	109112	0	0	-
GUDG	Generation Credit	$/kWh	139188.344	0.000000	-	121603	0	0	-
MCRF	Floodlight	$/fitting/day	4.565	0.286300	477	1032	-0.0282	($29)	0
MCRU	Under Verandah	$/fitting/day	10.871	0.252000	1,000	1223	-0.0248	($30)	1
ISCH	Connected kW	$/kW/day	140731.166	0.427500	21,959,339	50045190	-0.0331	($1,656,496)	20,303
ISCF	Irrigation Harmonic Penalty	$/kW/day	884.604	0.527500	170,319	285635	-0.0331	($9,455)	161
ISMR	Irrigation Managed Rebate	$/kW/day	61.741	-0.100000	(2,254)	961	0	0	(2)
IUEN	Uncontrolled Energy	$/kWh	250497667.2	0.000000	-	1360476	0	0	-
ICEN	Uncontrolled Energy	$/kWh	5264980.232	0.000000	-	5201822.25	0	0	-
IDEN	Day Energy	$/kWh	262106.19	0.000000	-	255395	0	0	-
INEN	Night Energy	$/kWh	79707.156	0.000000	-	71796	0	0	-
IEMD	Industrial Supply Energy - kVA	$/kWh	57747014.25	0.000000	-	56751936.93	0	0	-
IEDS	Direct Supply Energy - kVA	$/kWh	2655459.853	0.000000	-	2623605.32	0	0	-
ICMD	Industrial Supply - kVA	$/kVA/day	11091.999	0.387200	1,567,610	3934596	-0.0331	($130,235)	1,437
ICDYMD	Industrial Supply - Day Demand	$/kVA/day	806.055	0.387200	113,918	290681	-0.0331	($9,622)	104
ICDPD	Industrial Supply - Peak Demand	$/kVA/day	2423.644	0.121600	107,571	874018	0	0	108
ICDYAD	Industrial Supply - Anytime Demand	$/kVA/day	0	0.000000	-	293174	0	0	-
ICDAM	Industrial Supply - Anytime Demand	$/kVA/day	2660.499	0.265600	257,919	959433	-0.0331	($31,757)	226
LUCM	ANZCO Seafield Plant	$/day	1	707.052900	258,074	365	-74.666	($27,333)	231
LECM	ANZCO Seafield Plant Energy	$/kWh	34061316.97	0.000000	-	34061316.97	0	0	-
LMCM	ANZCO Seafield Plant MD	$/kVA/day	6067.315	0.123200	273,734	2221670	0	0	274
LUPP	Talleys Seafield Plant	$/day	1	99.159700	36,193	182	-10.5023	($1,911)	34
LEPP	Talleys Seafield Plant Energy	$/kWh	3080424.04	0.000000	-	1699736.84	0	0	-
LMPP	Talleys Seafield Plant MD	$/kVA/day	550.603	0.126700	25,472	112165	0	0	25
LUMH	Mt Hutt	$/day	1	340.370900	124,235	365	-36.0497	($13,158)	111
LEMH	Mt Hutt Energy	$/kWh	2281883.32	0.000000	-	2281883.32	0	0	-
LMMH	Mt Hutt MD	$/kVA/day	1033.784	0.090200	34,035	377331	0	0	34
LUHP	Connected kW	$/kW/day	9600	0.205200	719,021	3504000	-0.0061	($21,374)	696
LEHP	Highbank Pumps Energy	$/kWh	4678453.62	0.000000	-	4678453.62	0	0	-
LMHP	Highbank Pumps MD	$/kVA/day	0	0.000000	-	1433613	0	0	-
LUHB	Highbank	$/day	1	950.432400	345,908	365	-100.6631	($36,742)	310
LEHB	Highbank Energy	$/kWh	120921849.8	0.000000	-	120921849.8	0	0	-
LMHB	Highbank MD	$/kVA/day	0	0.000000	-	7972422	0	0	-
LUMO	Montalto	$/day	1	97.427000	35,561	365	-10.3188	($3,766)	32
LEMO	Montalto Energy	$/kWh	10371603.01	0.000000	-	10371603.01	0	0	-
LMMO	Montalto MD	$/kVA/day	0	0.000000	-	585662	0	0	-
LUCD	Cleardale	$/day	0.915	76.144200	25,430	334	-6.0647	($2,694)	23
LECD	Cleardale Energy	$/kWh	1599481.84	0.000000	-	1599481.84	0	0	-
LMCD	Cleardale MD	$/kVA/day	0	0.000000	-	137677	0	0	-
LULN	Lavington	$/day	1	19.606900	7,157	365	-2.0766	($758)	6
LELN	Lavington Energy	$/kWh	2997306.8	0.000000	-	2997306.8	0	0	-
LMLN	Lavington MD	$/kVA/day	0	0.000000	-	163634	0	0	-
MCSL	Streetlighting	$/fitting/day	3679.6	0.195300	262,298			($26,053)	236
Total actual revenue from prices									44,084

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Non-discretionary in-year discount to customers

EA Networks inadvertently contravened the 2020 DPP Determination by incorrectly calculating forecast allowable revenue (FAR) for the 2021 assessment period.

The calculation of FAR did not include a pass-through balance allowance or IRIS incentive adjustment. The consequence was that EA Networks' forecast revenue from prices (FRFP) exceeded FAR by $3.293 million. Further details of the error are set out in our amended price-setting compliance statement dated 11 February 2021.[2]

To address the error, EA Networks processed a non-discretionary in-year discount of $3.47 million (being the over-charge amount adjusted for the time value of money) to repay the over-recovered revenue to consumers. We have treated this discount as part of our prices for the purposes of the wash-up amount calculations.

The discount is a "qualifying discount" for the purposes of clause 3.1.1(11) of the *Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26 (as amended)*, other than in respect of limb (c), as it was not included in the individual tariffs, fees, or charges (or individual components thereof) used to calculate forecast revenue from prices for the disclosure year. EA Networks has asked the Commerce Commission to exercise its enforcement discretion to take no action in relation to the inclusion of this discount in the calculation of the wash-up amount on the same basis as set out in the Commission's open letter of 24 August 2020 in relation to in-year discounts offered by EDBs during the 2021 assessment period.[3]

[2] EA Networks, Amended Annual Price-Setting Compliance Statement for the first assessment period: https://www.eanetworks.co.nz/assets/PDFs/Disclosures/Regulatory/EA-Networks-Annual-price-setting-Compliance-Statement-2020-2021-Amended.pdf. See also: https://www.eanetworks.co.nz/disclosures/disclosure-2020/ and https://www.eanetworks.co.nz/refund/.

[3] Commence Commission, Open letter to EDBs: 'Treatment of in-year discounts offered by EDBs under DPP3', 24 August 2020.

Table 20 shows the forecast revenue from prices for the first assessment period from the price setting compliance statement.

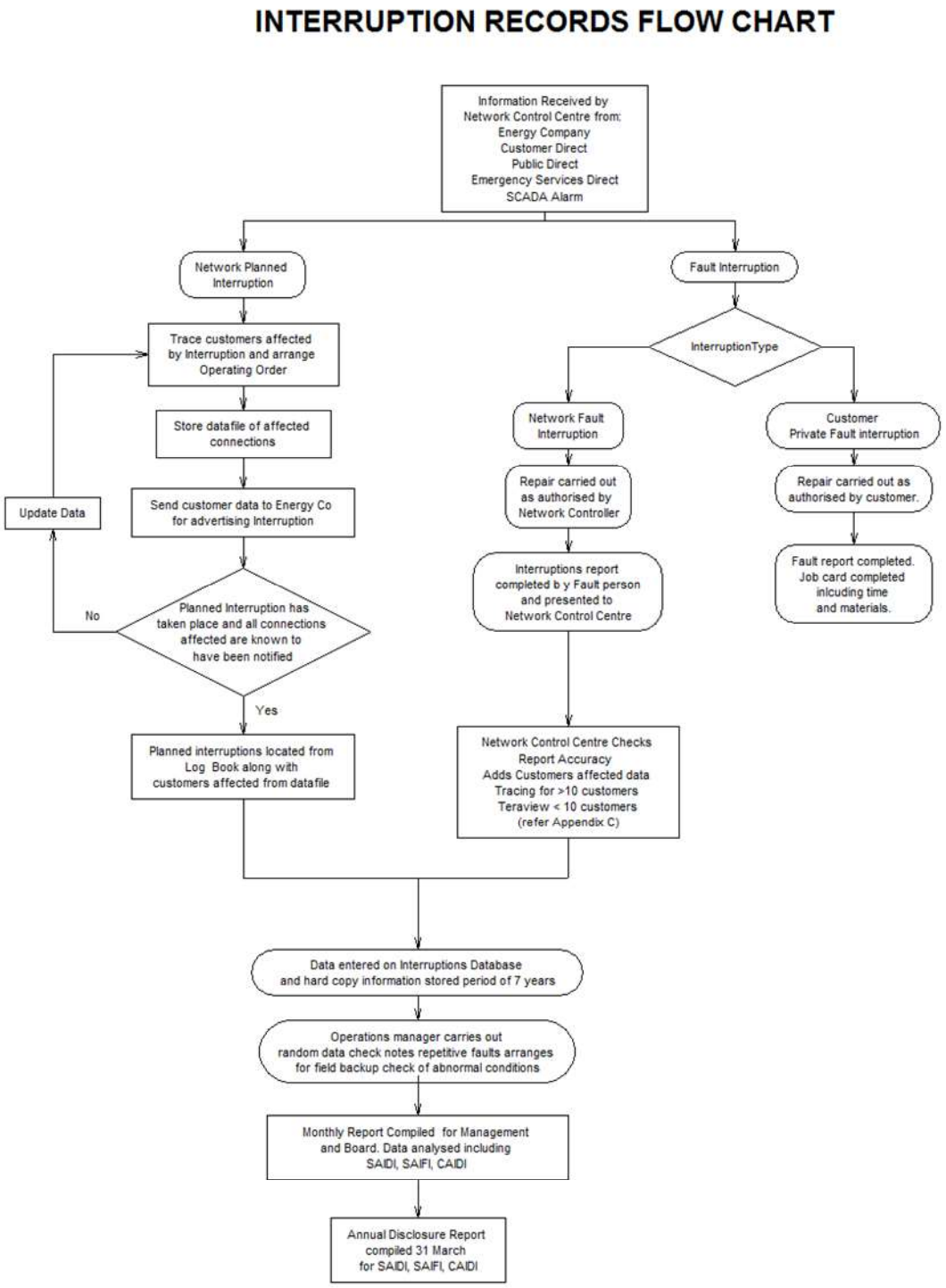
Table 20

Forecast revenue from prices RY21	
Total forecast revenue from prices	46,666

Appendix C – Policies and procedures for measuring planned and unplanned interruptions

1 EA Network's Control Centre is responsible for managing the operation of the electricity network and as such is responsible for recording all interruptions both planned and unplanned. The policies and procedures for carrying out this task are documented in the document labelled "Procedure: Network Interruption Records". During the year EA Networks recorded no 'notified interruptions'.

2 The procedures are summarised by following flow chart:



Appendix D – SAIDI and SAIFI major events

The tables below show the normalisation of the SAIDI and SAIFI major events that took place during the assessment period, consistent with Schedule 3.2 of the 2020 DPP Determination.

Table 21

Normalisation of unplanned SAIFI major events RY21						
SAIFI unplanned boundary value						**0.0729**
1/48th of the SAIFI unplanned boundary value	Event date: 18-01-2021			Event date: 18-01-2021		
	Half hour commencing	Raw SAIFI value for Class C interruption	Normalised SAIFI value for Class C interruption	Half hour commencing	Raw SAIFI value for Class C interruption	Normalised SAIFI value for Class C interruption
0.0015	11.30 AM					
0.0015	12.00 AM					
0.0015	12.30 AM					
0.0015	01.00AM					
0.0015	01.30AM					
0.0015	02.00 AM					
0.0015	02.30 AM					
0.0015	03.00 AM	0.0002	0.0002			
0.0015	03.30 AM					
0.0015	04.00 AM					
0.0015	04.30 AM					
0.0015	05.00 AM					
0.0015	05.30 AM					
0.0015	06.00 AM					
0.0015	06.30 AM					
0.0015	07.00 AM					
0.0015	07.30 AM					
0.0015	08.00 AM					
0.0015	08.30 AM					
0.0015	09.00 AM					
0.0015	09.30 AM					
0.0015	10.00 AM					
0.0015	10:30 AM					-
0.0015	11:00 AM	0.2540	0.0015			-
0.0015	11.30 AM					
0.0015	12.00 PM					
0.0015	12.30 PM					
0.0015	01.00 PM					
0.0015	01.30 PM					
0.0015	02.00 PM	0.0008	0.0008			
0.0015	02.30 PM					
0.0015	03.00 PM					-
0.0015	03.30 PM					
0.0015	04:00 PM	0.0048	0.0015			-
0.0015	04.30 PM					
0.0015	05.00 PM					
0.0015	05.30 PM					
0.0015	06.00 PM					
0.0015	06.30 PM					
0.0015	07.00 PM					
0.0015	07.30 PM					
0.0015	08.00PM					
0.0015	08.30 PM					
0.0015	09.00 PM					
0.0015	09.30 PM					
0.0015	10.00 PM					
0.0015	10.30 PM	0.0001	0.0001			
Total		0.2600	0.0042		-	-

Title	Loss of Supply, Northtown Zone Substation, 19 January 2021 (event 4020)
Department	Network Division
Author	Brendon Quinn, Network Manager & Peter Lindsay, Planning Engineer
Authorized by	Brendon Quinn, Network Manager
Date	8 April 2021

Summary

A protection maloperation occurred at Northtown zone substation in January 2021. Approximately 5 000 consumers lost supply for about 10 minutes. The cause of the maloperation was an incorrectly set timer in the settings of ZJ92's SEL 311C-1 line distance protection relay. Several factors contributed to this error and a range of preventative solutions are being put in place including: independent set and check, more complete testing, and a standard setting template with almost all values pre-set.

Purpose

This report has been prepared to provide a record of the event and the lessons learned to prevent a recurrence.

Background

Northtown is the zone substation that supplies close to half of Ashburton township (North and West) and the industrial park EA Networks are located in.

The substation supplies approximately 5 000 ICP's (connections) and has a peak loading of around 17 MW. It has two 20 MVA 66/11 kV transformers giving a firm capacity of 20 MVA. It is supplied off EA Networks' 66 kV network via two independent lines, one direct from Elgin (our connection to Transpower) and the other from Elgin via Fairton zone substation. Fairton also has a 66 kV link into the northern 66 kV ring.

Each 66 kV sub-transmission circuit has two modern protection relays providing differential protection with backup distance protection. Similarly, the zone substation transformers have modern protection relays offering differential protection with backup from the sub-transmission distance relays. In addition, the 66 kV bus has bus zone differential protection to isolate any bus faults.

Given the fault levels present and the amount of energy delivered into a fault, for zone substations we have instigated CB Fail protection. This protection is intended to detect the failure of a 66 kV circuit breaker to open when instructed by a protection relay and open other circuit breakers to isolate the failed breaker and hence the fault. CB Fail protection is delayed by 200 ms from the CB trip signal activation to give the normal trip process time to complete.

This level of protection is considered industry best practice.

Northtown is considered to have a high degree of security.

The Event

During high winds on the 19 January 2021, a tree fell on Smithfield Rd brushing the 66 kV line on the opposite side of the road. This caused both a phase-to-phase and a phase-to-earth 66 kV fault. Both the differential and distance protection relays on the Elgin – Northtown circuit correctly detected the fault and issued trip commands to circuit breakers at each end of the line (see attached oscillogram for details). This action should have cleared the fault with no interruption to any customers.

Unfortunately, simultaneously all the remaining 66 kV circuit breakers at Northtown tripped resulting in significant loss of supply.

The SCADA correctly identified what had happened.

Immediately after the fault, controllers were not aware of the tree in Smithfield Rd. There is no outside camera at Northtown and since there was a possibility that the fault could be at or very close to the substation (e.g. a 66 kV circuit breaker failure), a decision was made to have a first responder visit the site to verify there was no issue with the 66 kV bus at Northtown.

Upon verification of no 66 kV bus issues, Northtown was re-livened using the circuit from Fairton.

Full supply was restored within 10 minutes.

Investigation

Immediately the tripping occurred, engineering staff began investigating to discover why the fault was not contained to the Elgin-Northtown 66 kV line.

Enquiry revealed:

1. Originally, Northtown was fed from a single 33 kV line from Transpower's Ashburton substation.
2. As the line to Northtown had no 33 kV alternative and no possibility of back feeding, no protection was configured on the Elgin-Northtown line from the Northtown end.

3. At a later date, Northtown was converted to 66 kV operation and the second line to Fairton added.
4. The Elgin facing breaker at Northtown was SCADA enabled but no protection was configured.
5. During COVID-19 lockdown it was noticed that the protection configuration was missing and a configuration was added.
6. When the protection was configured, CB fail was added to the trip equation but unfortunately the time delay element was not configured (the time delay gives the circuit breaker time to operate before it issues the CB Fail all-of-bus trip).
7. As a result of the missing element, unintended CB Fail trippings were initiated to all of Northtown's 66 kV breakers simultaneous with the intended line protection line trip signal.

The root cause of the outage was a missing time delay in the trip logic. This was caused by protection settings being installed during the Covid-19 lockdown with no independent check. Time and resource pressure contributed to the lack of an independent check.

Remedial Action

Following this incident, all other 66 kV circuit breakers were checked for missing time delays – none were found.

Our initial sub-transmission protection (northern ring) employed distance protection. By the time we developed the southern ring our fibre network was available and differential protection became the primary protection. Differential protection has subsequently been added to the northern ring.

Owing to the changes in protection methodology and different influences over the 20-year life span there are various iterations on the sub-transmission protection configurations. This makes changes to the configuration troublesome.

We have started work developing a new template for sub-transmission protection with the intention of rolling out a standard template, with tweaking only for individual line lengths and other specific electrical characteristics. The logic (such as CB Fail and its timers) will be identical on all identical relays. The intention is that once this new template is fully developed, reviewed, tested, and trialled, it will be applied to all applicable sub-transmission protection relays. It is intended to have the template and individual "tweaks" completed by the end of August 2021.

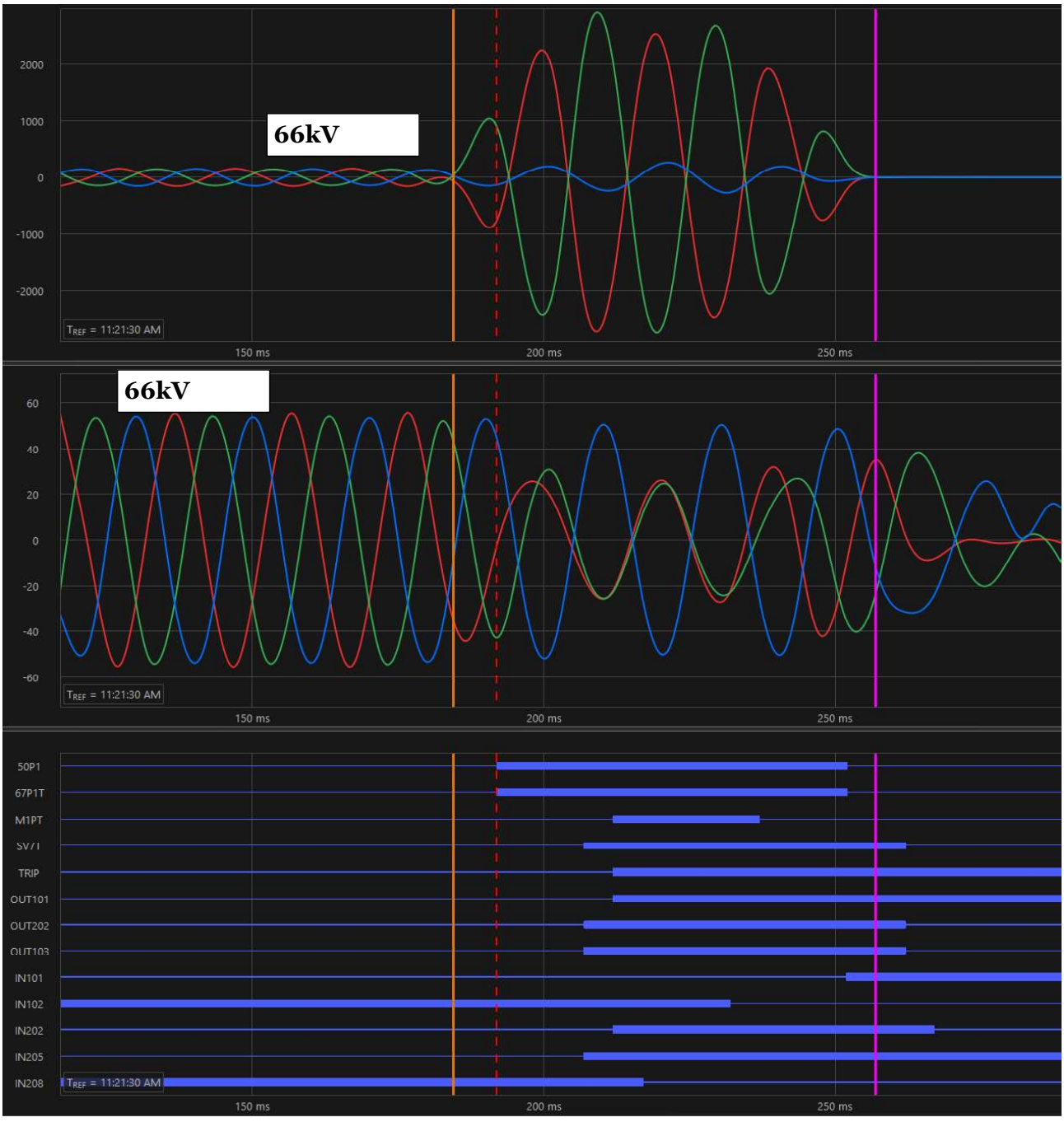
As standardizing the template may require the physical re-wiring of some inputs, this will require full protection testing upon installation. A detailed installation program will be developed once the extent of re-wiring and testing is known.

Appendices

(A) SEL 311C-1 protection relay event record showing operation of the protection relay for circuit-breaker ZJ92.

(B) GE T60 protection relay event record showing operation of the protection relay in response to the erroneous CB Fail signal from ZJ92.

Appendix A – SEL 311C-1 Oscillogram and Relevant Settings



Settings as at 18 January 2021		Current/Correct Settings	
SV7PU = 0.00	SV7DO = 0.00	SV7PU = 10.00	SV7DO = 25.00

Other Settings of Interest
SV7 = LT3 * (IN205 + /M1P + /Z1G + M2PT + Z2GT) * 50L
OUT202 = (SV3T + SV7T) * LT3
TR = M1PT + M2PT + M3PT + Z1GT + Z2GT + Z3GT + 67G4T + 67G2T + 67G3T + SV10T + SV3T + SV7T

SV7 = timer to delay operation of ZJ92 circuit-breaker fail logic (PU = pick-up, DO = drop-off).

OUT202 = output contact that signals other circuit-breakers to trip on circuit-breaker fail.

TR = trip equation that contains all of the elements that can trip the circuit-breaker ZJ92.

M1PT = distance protection element responding to the line fault on the EGN-NTN 66kV circuit.

The critical item that was incorrect was the value of SV7PU which was set to 0 (0ms) instead of 10 (200ms).

This caused SV7PU to time out instantly (see SV7T on diagram) upon pick-up of the zone 1 phase distance protection (/M1P), and OUT202 operates if SV7T is high. At the same time, ZJ92 TR trip equation also goes high (as it should for operation of 50P1, 67P1T, and M1PT) tripping ZJ92.

OUT202 is connected to the Northtown substation 66 kV bus zone trip and causes all other 66 kV circuit-breakers attached to that busbar to also trip – hence the total loss of supply at Northtown.

The horizontal scale on the diagram shows how long 200 ms is and had SV7PU been set at 200 ms the fault would have been cleared by ZJ92 long before SV7 pickup delay had expired.

Appendix B – T60 Event Record

Jan 19 2021 11:22:16.223648	Cont On (CI37)	CI37 = Input 66kV Bus Zone Trip (energised by either 66 kV bus differential relay for a 66 kV bus fault or any 66 kV circuit-breaker fail signal). CI37 was livened by OUT202 from the SEL 311C-1.
Jan 19 2021 11:22:16.224129	PHASE UV1 PKP A	UV1 = Undervoltage picks up because fault causes voltage depression.
Jan 19 2021 11:22:16.226623	Trip T1 On (VO1)	VO1 = Internal variable to trip T1 which responds to CI37 and other protection elements.
Jan 19 2021 11:22:16.226623	Open ZC32 On (VO3)	VO3 = Internal variable to command ZC32 to open triggered by VO1.

Jan 19 2021 11:22:16.226623	Open ZZ01 On (VO10)	VO10 = Internal variable to command ZZ01 to open triggered by VO1.
Jan 19 2021 11:22:16.226623	Open ZO12 On (VO17)	VO17 = Internal variable to command ZO12 to open triggered by VO1.
Jan 19 2021 11:22:16.226623	OSCILLOGRAPHY TRIG'D	Recording of fault data triggered.
Jan 19 2021 11:22:16.226623	Open ZC32 On (CO1)	CO1 = Trip output to ZC32 driven by V03.
Jan 19 2021 11:22:16.226623	Open ZZ01 On (CO3)	CO3 = Trip output to ZZ01 driven by V010.
Jan 19 2021 11:22:16.226623	Open ZO12 On (CO5)	CO12 = Trip output to ZO12 driven by V017.
Jan 19 2021 11:22:16.239106	ZC32 TC Fail PKP (DE1)	CO1 shorts out trip coil fail voltage sensor.
Jan 19 2021 11:22:16.239106	ZZ01 TC Fail PKP (DE2)	CO3 shorts out trip coil fail voltage sensor.
Jan 19 2021 11:22:16.239106	ZO12 TC Fail PKP (DE3)	CO5 shorts out trip coil fail voltage sensor.
Jan 19 2021 11:22:16.253659	ZC32 Closed Off (CI9)	CI9 = ZC32 is no longer closed.
Jan 19 2021 11:22:16.264102	PHASE UV1 DPO A	UV1 phase undervoltage drops off.
Jan 19 2021 11:22:16.264665	ZZ01 Closed Off (CI13)	CI13 = ZZ01 is no longer closed.
Jan 19 2021 11:22:16.266165	ZO12 Closed Off (CI17)	CI17 = ZO12 is no longer closed.
Jan 19 2021 11:22:16.270669	ZZ01 Opened On (CI14)	CI14 = ZZ01 is open.
Jan 19 2021 11:22:16.271666	ZC32 Opened On (CI10)	CI10 = ZC32 is open.
Jan 19 2021 11:22:16.272166	ZO12 Opened On (CI18)	CI18 = ZO12 is open.
Jan 19 2021 11:22:16.274088	ZZ01 TCFBlk On (VO14)	VO14 = logic to block trip coil fail when ZZ01 is open.
Jan 19 2021 11:22:16.276596	ZO12 TCFBlk On (VO21)	VO21 = logic to block trip coil fail when ZO12 is open.
Jan 19 2021 11:22:16.278670	Cont Off (CI37)	CI37 bus zone trip resets to off.
Jan 19 2021 11:22:16.279089	ZC32 TC Fail DPO (DE1)	ZC32 trip coil fail is reset after block (CB is open) is applied.

Jan 19 2021 11:22:16.279089	ZZ01 TC Fail DPO (DE2)	ZZ01 trip coil fail is reset after block is applied.
Jan 19 2021 11:22:16.279089	ZO12 TC Fail DPO (DE3)	ZO12 trip coil fail is reset after block is applied.
Jan 19 2021 11:22:16.281594	Trip T1 Off (VO1)	Trip T1 is reset to zero.
Jan 19 2021 11:22:16.289081	PHASE UV1 PKP A	Loss of supply causes voltage to drop to zero on A phase.
Jan 19 2021 11:22:16.289081	PHASE UV1 PKP C	Loss of supply causes voltage to drop to zero on C phase.
Jan 19 2021 11:22:16.294076	PHASE UV1 PKP B	Loss of supply causes voltage to drop to zero on B phase.
Jan 19 2021 11:22:16.783587	Open ZC32 Off (VO3)	Logic resets VO3 as VO1 has reset to zero.
Jan 19 2021 11:22:16.783587	Open ZZ01 Off (VO10)	Logic resets VO10 as VO1 has reset to zero.
Jan 19 2021 11:22:16.783587	Open ZO12 Off (VO17)	Logic resets VO17 as VO1 has reset to zero.
Jan 19 2021 11:22:16.783587	Open ZC32 Off (CO1)	CO1 opens as V03 drives it.
Jan 19 2021 11:22:16.783587	Open ZZ01 Off (CO3)	CO3 opens as V010 drives it.
Jan 19 2021 11:22:16.783587	Open ZO12 Off (CO5)	CO5 opens as V017 drives it.
Jan 19 2021 11:22:17.293362	PHASE UV1 OP A	Timer on undervoltage expires and sets alarm.
Jan 19 2021 11:22:17.293362	PHASE UV1 OP C	Timer on undervoltage expires and sets alarm.
Jan 19 2021 11:22:17.298360	PHASE UV1 OP B	Timer on undervoltage expires and sets alarm.

The key here is to show that no power frequency fault occurred and T1 was tripped by responding to the CB Fail output on ZJ92 SEL 311C-1 closing.

Appendix E – Director's certificate

Form of director's certificate for annual compliance statement

We, Paul Jason Munro and Philip John McKendry, being directors of Electricity Ashburton, trading as EA Networks certify that, having made all reasonable enquiry, to the best of my/our knowledge and belief, the attached annual compliance statement of EA Networks and related information, prepared for the purposes of the *Electricity Distribution Services Default Price-Quality Path Determination 2020* has been prepared in accordance with all the relevant requirements expect in the following respect:

- *For the purposes of calculating the wash-up amount under clause 8.6, 'actual revenue from prices' includes a discount of $3.47M that does not meet the requirement of limb (c) of clause 3.1.1(11) of the Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26 (as amended). This discount was included in prices in order to return to consumers revenue incorrectly recovered from consumers in the 2021 assessment period.*

Paul Jason Munro

Philip John McKendry

25 August 2021

Appendix F Independent assurance report

Independent Assurance report

To the Directors of Electricity Ashburton Limited

Assurance report pursuant to the Electricity Distribution Services Default Price-Quality Path Determination 2020

We have completed the reasonable assurance engagement in respect of the compliance of Electricity Ashburton Limited, trading as EA Networks ("the Company") with the Electricity Distribution Services Default Price-Quality Path Determination 2020 ("the Determination") in preparing the Annual Compliance Statement for the assessment period ended 31 March 2021.

Adverse opinion in respect of the wash up amount set out in clause 8.6 of the Determination

Because of the significance of the matter outline in the Basis for opinions including the basis for the adverse opinion in respect of the wash up amount, in our opinion, EA Networks has not complied, in all material respects, with clauses 11.5 and 11.6 of the Determination in preparing the wash-up calculation, as set out in clause 8.6 of the Determination, on pages 4 to 6 and 14 to 19 in the Annual Compliance Statement for the assessment period ended 31 March 2021.

Opinion in respect of the quality standards set out in clause 9 of the Determination and the information used in the preparation of the Annual Compliance Statement

In our opinion, in all material respects:

- the Company has complied with clauses 11.5 and 11.6 of the Determination in preparing the information supporting the quality standards, as set out in clause 9 of the Determination, on pages 7 to 12 and 20 to 28 in the Annual Compliance Statement for the assessment period ended 31 March 2021; and
- as far as appears from an examination, the information used in the preparation of the Annual Compliance Statement has been properly extracted from the Company's accounting and other records, and has been sourced, where appropriate, from its financial and non-financial systems.

Basis for opinions including the basis for the adverse opinion in respect of the wash up mount

As set out on page 18 of the Annual Compliance Statement, the Company incorrectly calculated Forecast Allowable Revenue ("FAR") in the Annual Price-Setting Compliance Statement for the 2020 assessment period. This resulted in the Company's Forecast Revenue From Prices ("FRFP") exceeding the FAR by $3.29 million. To address the matter, the Company declared a non-discretionary in-year discount of $3.47 million (being the over-charge amount adjusted for the time value of money) to repay the consumers in March 2021.

For the purpose of calculating the wash-up amount under clause 8.6 of the Determination, within "actual revenue" on pages 4, 6 and 17, the $3.47 million was treated as a "qualifying discount" for the reasons set out on page 4 and 18. For the discount to be a "qualifying discount" in accordance with clause 3.1.1(11)(c) of the Electricity Distribution Services Input Methodologies Determination 2012, it needs to have been included in the individual tariffs, fees, or charges (or individual components thereof) in determining forecast revenue from prices within the 2021 Annual Price-Setting Compliance Statement prepared in March 2020.

The discount does not meet the requirement of clause 3.1.1(11)(c) of the Electricity Distribution Services Input Methodologies Determination 2012 as it was not included in the determination of forecast revenue from prices. This has the effect of the EA Networks' wash-up amount not being calculated in accordance with clause 8.6 of the Determination and being non-compliant in this regard.

Had the discount not been included, the wash-up amount for the assessment period ended 31 March 2021 would have been calculated to be $3.67 million.

We believe the evidence we have obtained is sufficient and appropriate to provide a basis for our opinions, including our adverse opinion in respect of the wash up amount set out in clause 8.6 of the Determination.

Director's responsibilities

The Directors are responsible on behalf of the Company for compliance with the Determination for the identification of risks that may threaten compliance with the Determination and for such internal controls that would mitigate those risks and monitoring the Company's ongoing compliance.

Our independence and quality control

We have complied with the independence and other ethical requirements of Professional and Ethical Standard 1 *International Code of Ethics for Assurance Practitioners (including International Independence Standards)(New Zealand)* issued by the New Zealand Auditing and Assurance Standards Board, which include independence and other requirements founded on the fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

The firm applies Professional and Ethical Standard 3 (Amended) *Quality Control for Firms that Perform Audits and Reviews of Financial Statement and Other Assurance Engagements* and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards, and applicable legal and regulatory requirements.

We are independent of the Company. Our firm carries out other services for the Company in the areas of annual audit of the Company's financial statements, assignments in the areas of compliance with other regulatory requirements of the Commerce Act 1986 and regulatory advisory services. The provision of these services has not impaired our independence.

Assurance Practitioner's responsibilities

Our responsibility is to express an opinion on whether the Company has complied, in all material respects, with clauses 11.5 and 11.6 of the Determination in the preparation of the Annual Compliance Statement for the assessment period ended 31 March 2021, and whether, as far as appears from an examination, the information used in the preparation of the Annual Compliance Statement has been properly extracted, in all material respects, from the accounting and other records, sourced from the Company's financial and non-financial systems and to report our opinion to you.

SAE 3100 (Revised) requires that we plan and perform our procedures to obtain reasonable assurance about whether the Company has complied, in all material respects, with clauses 11.5 and 11.6 of the Determination, in preparing the Annual Compliance Statement for the assessment period ended 31 March 2021.

In relation to the wash-up amount set out in clause 8.6 of the Determination, our procedures included recalculation of the wash-up amount in accordance with schedule 1.6 of the Determination and assessing it against the amounts and disclosures contained on pages 4 to 6 and 14 to 19 of the Annual Compliance Statement.

In relation to the quality standards set out in clause 9 of the Determination, our procedures included examination, on a test basis, of evidence relevant to the values and disclosures contained on pages 7 to 12 and 20 to 28 of the Annual Compliance Statement.

An assurance engagement to report on the Company's compliance with the Determination involves performing procedures to obtain evidence about the compliance activity and controls implemented. The procedures selected depend on our judgement, including the identification and assessment of risks of material non-compliance.

Inherent limitations

Because of the inherent limitations of an assurance engagement, together with the internal control structure, it is possible that fraud, error or non-compliance may occur and not be detected. A reasonable assurance engagement throughout the specified period does not provide assurance on whether compliance with the Determination will continue in the future.

Use of report

This report has been prepared for the Directors in accordance with clause 11.5 (e) of the Determination and is provided solely to assist you in establishing that compliance requirements have been met. Our report should not be used for any other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility for any reliance on this report to anyone other than the Directors of the Company, or for any purpose other than that for which it was prepared.

The engagement partner on the assurance engagement resulting in this independent auditor's report is Elizabeth Adriana (Adri) Smit.

Chartered Accountants
26 August 2021

Christchurch, New Zealand