ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

NELSON CITY COUNCIL AND TRUSTPOWER LIMITED

Prepared by: Tara Gannon

Date audit commenced: 18 January 2018

Date audit report completed: 11 February 2019

Audit report due date: 1 March 2019

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EXECUTIVE SUMMARY

This audit of the **Nelson City Council (NCC)** DUML database and processes was conducted at the request of **Trustpower Limited (Trustpower)** in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

The RAMM database used for submission is managed by NCC. New connection, fault, and maintenance work is completed by **Powertech Nelson New Zealand Limited (Powertech)**. Powertech record changes to the database on paper, which are then entered into a spreadsheet and updated in RAMM by Powertech's Electrical Contracts Manager.

Powertech provide Trustpower a monthly report of changes to the RAMM database, and a full report from the RAMM database on request.

Because the NCC database does not contain ballast wattages, Trustpower maintains its own records of lamp and ballast wattages for each ICP which is used for submission. The monthly information provided by Powertech is used to keep this up to date. I found some discrepancies between RAMM and the Trustpower data, and recommend that a full reconciliation is carried out to ensure that submission is accurate.

The field audit found the accuracy of the lamp make, model and lamp wattage information in the RAMM database was high, and the majority of the discrepancies were caused by incomplete database information:

- One lamp was recorded in the database but was not present in the field.
- Four lamps had a different lamp make, model and wattage to what was recorded in the database due to recent upgrades.
- The other discrepancies all related to missing ballast wattages in the database (64 lamps) and missing model and lamp wattage information (three lamps).

Powertech has been provided a list of the missing and incomplete database information found during this audit, which they intend to check and update. Powertech has also been provided the EA's standardised wattage table and intends to update ballast wattages using this.

NCC's LED upgrade is almost complete, with approximately 70 lamps still to be upgraded. The lamps will be centralised management system (CMS) ready, but NCC have no immediate plans to implement a CMS or use dimming.

Six non-compliances were identified, and one recommendation was raised. The future risk rating of 28 indicates that the next audit be completed in three months. The risk rating has increased largely due to an increase in differences identified between the RAMM data and Trustpower's submission data, and I have recommended a reconciliation between RAMM and Trustpower's data be completed.

The matters raised are detailed below:

AUDIT SUMMARY

NON-COMPLIANCES

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Deriving submission information	2.1	11(1) of Schedule 15.3	The database used to prepare submissions contains some inaccurate information.	Weak	High	9	Identified
ICP identifier and items of load	2.2	11(2)(a) and (aa) of Schedule 15.3	20 items of load do not have an ICP number recorded in RAMM.	Moderate	Low	2	Identified
Location of each item of load	2.3	11(2)(b) of Schedule 15.3	Three of the items of load do not have sufficient address information recorded in RAMM to allow them to be readily located.	Moderate	Low	2	Identified
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	16 items of load have unknown or blank lamp model, and zero wattage in RAMM. No items of load have ballast wattages recorded in RAMM.	Weak	Low	3	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	The database contains some inaccurate data.	Weak	Low	3	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database used to prepare submissions contains some inaccurate information.	Weak	High	9	Identified
Future Risk Rating						28	

Future risk rating	0	1-4	5-8	9-15	16-18	19+
Indicative audit frequency	36 months	24 months	18 months	12 months	6 months	3 months

RECOMMENDATIONS

Subject	Section	Description	Recommendation
Database reconciliation	2.1	Database reconciliation	Reconcile the full RAMM database to Trustpower's file periodically to ensure that all lamps are recorded.

ISSUES

Subject	Section	Description	Issue
		Nil	

1. ADMINISTRATIVE

1.1. Exemptions from Obligations to Comply with Code

Code reference

Section 11 of Electricity Industry Act 2010.

Code related audit information

Section 11 of the Electricity Industry Act provides for the Electricity Authority to exempt any participant from compliance with all or any of the clauses.

Audit observation

The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

Audit commentary

There are no exemptions in place relevant to the scope of this audit.

1.2. Structure of Organisation

Trustpower provided a copy of their organisational structure as at December 2018:

1.3. Persons involved in this audit

Auditor:

Tara Gannon

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Robbie Diederen	Reconciliation Analyst	Trustpower
Barry Harkerss	Commercial Account Manager	Trustpower
Roy Price	Electrical Contracts Manager	Powertech Nelson New Zealand Limited

1.4. Hardware and Software

The SQL database used for the management of DUML is remotely hosted by RAMM Software Ltd. The database is commonly known as "RAMM" which stands for "Roading Asset and Maintenance Management".

Database back-up is in accordance with standard industry procedures. Access to the database is secure by way of password protection.

1.5. Breaches or Breach Allegations

There are no breach allegations relevant to the scope of this audit.

1.6. ICP Data

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0000090001NTBEF	NCC STREETLIGHTING STOKE	STK0331	STL	2,470	158,217
0000200190CTC63	NELSON STREETLIGHTS	STK0331	STL	2,897	159,496
			Total	5,387	319,125

1.7. Authorisation Received

All information was provided directly by Trustpower and Powertech.

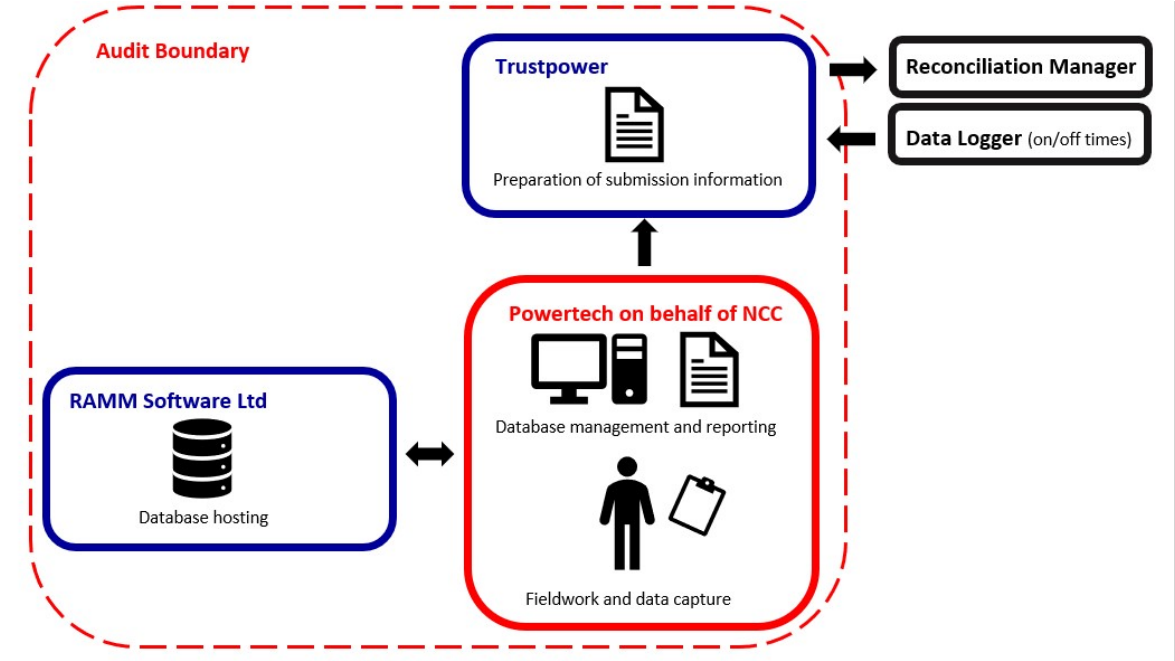
1.8. Scope of Audit

The RAMM database used for submission is managed by NCC. New connection, fault, and maintenance work is completed by Powertech Nelson New Zealand Limited (Powertech). Powertech record changes to the database on paper, which are then entered into a spreadsheet and updated in RAMM by Powertech's Electrical Contracts Manager.

Powertech provide Trustpower a monthly report of changes to the RAMM database, and a full report from the RAMM database on request.

Because the NCC database does not contain ballast wattages, Trustpower maintains its own records of lamp and ballast wattages for each ICP which are used for submission. The monthly information provided by Powertech is used to keep this up to date.

The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information based on the database reporting. The diagram below shows the audit boundary for clarity.



The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

A field audit of a statistical sample of 246 items of load recorded in the database was undertaken on 18, 20 and 22 January 2019. The total population was divided into three strata:

- NZTA
- Other (including pedestrian crossings, parks, amenities, facilities, shared paths, walkways, accessways and private facilities); and
- Roading.

1.9. Summary of previous audit

The previous audit was completed in May 2018 by Tara Gannon of Veritek Limited. Five non-compliances were identified, and one recommendation was made. The statuses of the non-compliances and recommendation are described below.

Subject	Section	Clause	Non-compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	The database used to prepare submissions contains some inaccurate information.	Still existing
ICP identifier and items of load	2.2	11(2)(a) and (aa) of Schedule 15.3	Three items of load do not have an ICP number recorded.	Still existing
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	Nine items of load have unknown or blank lamp model, and zero wattage. No items of load have gear wattages recorded.	Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	The database used to prepare submissions contains some inaccurate information.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database used to prepare submissions contains some inaccurate information.	Still existing

Subject	Section	Clause	Non-compliance	Status
Database accuracy	3.1	15.2 and 15.37B(b)	Check the wattages for Italo 1 and Italo 2 lights and update the database if necessary.	Implemented

1.10. Distributed unmetered load audits (Clause 16A.26 and 17.295F)

Code reference

Clause 16A.26 and 17.295F

Code related audit information

Retailers must ensure that DUML database audits are completed:

1. *by 1 June 2018 (for DUML that existed prior to 1 June 2017)*
2. *within three months of submission to the reconciliation manager (for new DUML)*
3. *within the timeframe specified by the Authority for DUML that has been audited since 1 June 2017.*

Audit observation

Trustpower have requested Veritek to undertake this streetlight audit.

Audit commentary

This audit report confirms that the requirement to conduct an audit has been met for this database within the required timeframe. Compliance is confirmed.

2. DUML DATABASE REQUIREMENTS

2.1. Deriving submission information (Clause 11(1) of Schedule 15.3)

Code reference

Clause 11(1) of Schedule 15.3

Code related audit information

The retailer must ensure the:

- *DUML database is up to date*
- *methodology for deriving submission information complies with Schedule 15.5.*

Audit observation

The process for calculation of consumption was examined.

Audit commentary

Trustpower reconciles the DUML load for 0000090001NTBEF and 0000200190CTC63 using the STL profile. The on and off times are derived from data logger information. The profile and submission flags are correctly recorded on the registry.

Because the RAMM data does not contain ballast wattages, Trustpower maintains their own database of NCC lamps with ballast wattages added, which is used as an input to the submission calculation. Database changes are provided by NCC each month, and Trustpower adjusts their database accordingly and maintains a record of any changes.

To check the accuracy of Trustpower's database I:

- Checked the ballast wattages applied in their December 2018 file against the published standardised wattage table, and manufacturer's specifications where available. All ballasts were recorded correctly, except four ADC Metal Halide 400W, which were expected to have 38W ballast, and had 42W ballast. The total difference is 16W or 68 kWh (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).
- Compared the lamp counts and nominal (lamp) wattages in the December 2018 file to all unmetered load connected to the two ICPs as at the end of December 2018 in the RAMM database. The Trustpower summary is aggregated by lamp types, which differ from the make and model fields listed in RAMM. To match the data I considered all RAMM make and model fields and the lamp wattage, and Trustpower's lamp type and model fields. The following differences were identified:

Item	0000200190CTC63		0000090001NTBEF	
	Trustpower	RAMM	Trustpower	RAMM
Lamp Count	2,378	2,456	2,805	2,895
Total lamp wattage	145,476W	158,216W	148,559W	141,646W
Total lamp and ballast	156,687W	170,105W (est ballast added)	158,222W	170,064 (est ballast added)

Item	0000200190CTC63	0000090001NTBEF
Lamp differences	Seven lamps were recorded as LED 45W by Trustpower and LED 46W by Powertech. One RGB 20LED lantern (70W) was excluded from Trustpower's list.	The following lamp types were not recorded in Trustpower's data: LED 150W SON-E-150 LED 48W LED 52W SON-E-100 SON-E-70

Item	Trustpower	RAMM	Difference
Total lamp wattage	294,035W	299,862W	5,827W or 24,887 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).
Total lamp and ballast (est ballast added for RAMM)	314,909W	340,170W	25,261W or 107,890 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).

I recommend that a full reconciliation between the RAMM database and Trustpower file should be carried out periodically to ensure that all lamps are captured:

Description	Recommendation	Audited party comment	Remedial action
Database reconciliation	Reconcile the full RAMM database to Trustpower's file periodically to ensure that all lamps are recorded.	Can report from RAMM when requested	Investigating

I recalculated the submissions for October and November 2018 for ICPs 0000090001NTBEF and 0000200190CTC63 using Trustpower's database summary and data logger information. I confirmed that the calculation method was correct.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Missing lamp models and wattages for 16 lamps in the RAMM database	6,560 kWh per annum of under submission if the database were used directly for reconciliation

Issue	Estimated volume information impact (annual kWh)
Missing ballast wattages in the RAMM database	94,945 kWh per annum of under submission if the database were used directly for reconciliation
Potential under submission due to database inaccuracy identified during the field audit	113,800 kWh per annum of under submission if the database were used directly for reconciliation
Incorrect ballast wattages in Trustpower's database used for submission	68 kWh per annum of over submission
Differences between Trustpower's database used for submission and the RAMM database, based on the difference in nominal lamp wattage	24,887 kWh per annum of under submission based on the lamp wattages only 107,890 kWh per annum of under submission based on estimated ballast wattages

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: unknown To: 31-Dec-18	The database used to prepare submissions contains some inaccurate information. • Missing lamp models and wattages for 16 lamps in the RAMM database resulting in 6,560 kWh per annum of under submission if it were used directly for reconciliation. • Incorrect ballast wattages in Trustpower's file used for submission resulting in 68 kWh per annum of over submission. • Missing ballast wattages in the RAMM database resulting in a potential 94,945 kWh per annum if used for submission. • The database accuracy is assessed to be 108.3% indicating potential under submission of 113,800 kWh per annum if it were used for submission. The majority of the database inaccuracies identified in the field audit (67/72) related to missing ballast wattages which are populated in Trustpower's file and do not impact on submission, therefore the actual impact to the market is far less volume indicated above. • Differences between Trustpower's database used for submission and the RAMM database based on the difference in nominal lamp wattage are 24,887 kWh per annum of under submission, and based on the estimated ballast wattages are 107,890 kWh per annum. Potential impact: High Actual impact: Unknown Audit history: Once Controls: Weak Breach risk rating: 9

Audit risk rating	Rationale for audit risk rating
High	The controls are rated as weak, due to the differences in lamp wattages and counts between the Trustpower file used to calculate submissions and the Powertech data. The impact is assessed to be high based on the kWh above, but the impact of the missing ballast wattages in the database is greatly reduced, because Trustpower adds on the missing ballast wattages prior to submission.

Actions taken to resolve the issue	Completion date	Remedial action status
Ballast information sourced from DUML tables to be populated in next 20 working day	30/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure any new ballasts added have correct wattage recorded	30/03/19	

2.2. ICP identifier and items of load (Clause 11(2)(a) and (aa) of Schedule 15.3)

Code reference

Clause 11(2)(a) and (aa) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *each ICP identifier for which the retailer is responsible for the DUML*
- *the items of load associated with the ICP identifier.*

Audit observation

The database was checked to confirm an ICP is recorded for each item of load.

Audit commentary

5,367 (99.6%) out of 5,387 items of load have an ICP number recorded in the database. 20 items of load do not have an ICP number recorded, and are recorded as non-compliance below.

Pole ID	House Address	Model	Lamp Wattage
6947	PARK_WAKEFIELD_WAKEFIELD	12W E27 compact fluro	12
7802	MAITAI TO ROCKS ROAD CYCLEWAY - MAITAI RIVER	Italo 1 2 module 4.7 STW	52
7790	SH 6 HAVEN ROAD (SOUTHBOUND)	Italo 2 5 Module LED 700mA	128
7783	SH 6 HAVEN ROAD (NORTHBOUND)	Italo 2 6 Module LED 700mA	150

Pole ID	House Address	Model	Lamp Wattage
7783	SH 6 HAVEN ROAD (NORTHBOUND)	Italo 2 6 Module LED 700mA	150
7786	SH 6 HAVEN ROAD (NORTHBOUND)	Italo 2 6 Module LED 700mA	150
7786	SH 6 HAVEN ROAD (NORTHBOUND)	Italo 2 6 Module LED 700mA	150
7787	SH 6 HAVEN ROAD (NORTHBOUND) (Centre of Raised Median)	Italo 2 6 Module LED 700mA	150
7791	201 SH 6 HAVEN ROAD (NORTHBOUND) (203 Haven Road)	Italo 2 6 Module LED 700mA	150
7789	SH 6 HAVEN ROAD (SOUTHBOUND)	Italo 2 6Module 700mA STW	148
7788	195 SH 6 HAVEN ROAD (NORTHBOUND) (197 Haven Road)	Italo 2 6Module 700mA STW	148
7774	30 WILL WATCH WAY (WALKWAY) (Queens Road)	L24(AP2)	24
7810	RUSSELL STREET		
7809	HAY STREET		
7808	1 HAY STREET		
7807	1 VICKERMAN STREET		
7806	45 WILDMAN AVENUE (WESTBOUND)		
7805	WILDMAN AVENUE (WESTBOUND)		
7804	WILDMAN AVENUE (EASTBOUND)		
7803	WILDMAN AVENUE (EASTBOUND)		

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.2 With: Clause 11(2)(a) and (aa) of Schedule 15.3 From: unknown To: 31-Dec-18	20 items of load do not have an ICP number recorded in RAMM. Potential impact: Low Actual impact: Low Audit history: None Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are rated as moderate as they are sufficient to ensure that most items of load have an ICP number recorded. The impact is low because only 20 items of load are affected and the wattage is low.

Actions taken to resolve the issue	Completion date	Remedial action status
All ICPs now added	22/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure accuracy of data entry	30/03/19	

2.3. Location of each item of load (Clause 11(2)(b) of Schedule 15.3)

Code reference

Clause 11(2)(b) of Schedule 15.3

Code related audit information

The DUML database must contain the location of each DUML item.

Audit observation

The database was checked to confirm the location is recorded for all items of load.

Audit commentary

5,382 (99.9%) out of 5,387 items of load have GPS coordinates. Road names and house addresses are recorded for all items of load.

Three of the items of load do not have sufficient address information to allow them to be readily located. This is recorded as non-compliance below and in **section 3.1**. Powertech intends to conduct site visits and update the affected addresses.

Pole ID	Road Name	House Address	Easting	Northing
6953	SANCTUARY DRIVE	SANCTUARY DRIVE		

Pole ID	Road Name	House Address	Easting	Northing
6952	SANCTUARY DRIVE	SANCTUARY DRIVE		
6167	PARK_MARSDEN_MAIN ROAD STOKE	PARK_MARSDEN_MAIN ROAD STOKE (Light No 4)		

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.3 With: Clause 11(2)(b) of Schedule 15.3 From: unknown To: 31-Dec-18	Three of the items of load do not have sufficient address information recorded in RAMM to allow them to be readily located. Potential impact: Low Actual impact: Low Audit history: None Controls: Strong Breach risk rating: 1
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are rated as strong they are not sufficient to ensure that most almost all items of load have full address information recorded. The impact is low, because three of the 5,387 items of load are affected.

Actions taken to resolve the issue	Completion date	Remedial action status
Site checks prove these records have no actual asset. Records have been deleted from RAMM	22/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure accuracy of data entry	30/03/19	

2.4. Description and capacity of load (Clause 11(2)(c) and (d) of Schedule 15.3)

Code reference

Clause 11(2)(c) and (d) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *a description of load type for each item of load and any assumptions regarding the capacity*
- *the capacity of each item in watts.*

Audit observation

The database was checked to confirm that it contained a field for lamp type and wattage capacity and included any ballast or gear wattage.

Audit commentary

Lamp make, model and wattage

24 of the 5,387 items of load have blank or unknown model information recorded in the database. These lamps also have blank or zero lamp wattage recorded.

Review of RAMM records confirmed that eight of these lamps were not connected, and the missing lamp details and wattages are valid. Powertech intends to check and update the records for the remaining 16 lamps which are listed below. The total wattage for the affected lamps is unknown, but is estimated to be 1536W[1].

Pole ID	House Address	Make	Model	Lamp Wattage
1502	MOTUEKA STREET (F3 OMAHU WAY)	Philips	Unknown	0
1501	MOTUEKA STREET (OMAHU WAY - 1ST IN ROW)	Philips	Unknown	0
5512	SH 6 QUEEN ELIZABETH II DRIVE (3RD LEFT OFF HAVEN RD)	AEC Illuminazione LED		
5513	SH 6 QUEEN ELIZABETH II DRIVE (3rd LEFT FROM WILDMAN AVE CNR.)	AEC Illuminazione LED		
7777	SH 6 QUEEN ELIZABETH II DRIVE (2 nd LEFT FROM WILDMAN AVE CNR.)	AEC Illuminazione LED		
3011	SH 6 HAVEN ROAD ROUNDABOUT (ROUNDABOUT CENTRE)	AEC Illuminazione LED		
7810	RUSSELL STREET	AEC Illuminazione LED		
7809	HAY STREET	AEC Illuminazione LED		
7808	1 HAY STREET	AEC Illuminazione LED		
7807	1 VICKERMAN STREET	AEC Illuminazione LED		
7806	45 WILDMAN AVENUE (WESTBOUND)	AEC Illuminazione LED		
7805	WILDMAN AVENUE (WESTBOUND)	AEC Illuminazione LED		
7804	WILDMAN AVENUE (EASTBOUND)	AEC Illuminazione LED		

[1] Based on the average wattage for other lamps of that make in the database. The average wattage for all other AEC Illuminazione LED lamps in the database is 95W, and the average for other Philips lamps is 103W.

Pole ID	House Address	Make	Model	Lamp Wattage
6968	HAVEN ROAD (ARTERIAL, SOUTHBOUND) (pole 129.(o/s school))	AEC Illuminazione LED		
3010	HAVEN ROAD (ARTERIAL, NORTHBOUND) (QEII ROUNDABOUT -pole 128)	AEC Illuminazione LED		
44	6 RUSSELL STREET	AEC Illuminazione LED		

Accuracy where lamp description and wattage information is populated is discussed in **section 3.1**.

Ballast Wattage

Ballast wattages are not currently populated in the database, which leads to under recording of wattage for all lamps requiring ballast. Fields are available in RAMM to record the ballast wattage, and Powertech intends to populate these for the lamps requiring ballast from the EA's published standardised wattage table.

Based on the make and model information available, there are 1,486 lamps which require ballast wattages. The missing ballast wattage is estimated to be 21,996W based on the EA's published standardised wattage table.

Because the RAMM data does not contain ballast wattages, Trustpower maintains their own database of NCC lamps with ballast wattages added, which is used as an input to the submission calculation. Database changes are provided by NCC each month, and Trustpower adjusts their database accordingly and maintains a record of any changes.

The ballasts applied by Trustpower were reviewed in **sections 2.1** and **3.2** and found to be accurate, except four ADC Metal Halide 400W, which were expected to have 38W ballast, and had a 42W ballast.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.4 With: Clause 11(2)(c) and (d) of Schedule 15.3 From: unknown To: 31-Dec-18	16 items of load have unknown or blank lamp model, and zero wattage in RAMM. No items of load have ballast wattages recorded in RAMM. Potential impact: High Actual impact: Low Audit history: Twice Controls: Weak Breach risk rating: 3

Audit risk rating	Rationale for audit risk rating
Low	The controls are rated as weak as they are not sufficient to ensure that most items of load have make, model, lamp and wattage recorded. The impact is low, because: • Trustpower adjusts the wattages to include the ballast wattage prior to calculating their submissions. • The impact of the 16 items of load with unknown or blank lamp models is estimated to be 1536W.

Actions taken to resolve the issue	Completion date	Remedial action status
System wattages updated for above except two items which are private lights not maintained by Powertech	23/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure all information is recorded at time of entry	30/03/19	

2.5. All load recorded in database (Clause 11(2A) of Schedule 15.3)

Code reference

Clause 11(2A) of Schedule 15.3

Code related audit information

The retailer must ensure that each item of DUML for which it is responsible is recorded in this database.

Audit observation

A field audit of a statistical sample of 246 items of load recorded in the database was undertaken on 18, 20 and 22 January 2019. The total population was divided into three strata:

- NZTA
- Other (including pedestrian crossings, parks, amenities, facilities, shared paths, walkways, accessways and private facilities); and
- Roading.

Audit commentary

The field audit findings are detailed in the table below.

Address	Database Count	Field Count	Count differences	Wattage differences	Comments
NZTA					
COLLINS STREET	1	1	-	-	
MAITAI TO ROCKS ROAD CYCLEWAY - HAY STREET TO	1	1	-	-	

Address	Database Count	Field Count	Count differences	Wattage differences	Comments
SH 6 HAVEN ROAD ROUNDABOUT	3	3	-	1	Wattage was missing for one Italo 2 6 Module LED 700mA (150W)
SH 6 QUEEN ELIZABETH II DRIVE	8	8	-	2	Wattage was missing for two Italo 2 6 Module LED 700mA (300W)
NZTA					
ANDREW STREET	1	1	-	-	
PARK_ANZAC_HAVEN	21	20	1	19	One BL-CL-110-NW (110W) missing from field. Database is missing 307W ballast
ROTO STREET	2	2	-	-	
WASHINGTON TERRACE	1	1	-	-	
WESTBROOK TERRACE	1	1	-		
Roading					
ALMA STREET	8	8	-	-	
ANDREW STREET	9	9	-	1	Database is missing 13W ballast
AVONBANK PLACE	3	3	-	-	
BAXTER PLACE	3	3	-	3	Database is missing 39W ballast
BLICK TERRACE	3	3	-	-	
CALAMARAS STREET	4	4	-	-	
CAR PARK WAKATU SQUARE 2	8	8	-	8	Database is missing 174W ballast
CAROLINE PLACE	1	1	-	-	
COSTER STREET	17	17	-	-	

Address	Database Count	Field Count	Count differences	Wattage differences	Comments
CULLEN PLACE	2	2	-	-	
DAELYN DRIVE	22	22	-	-	
DODSON VALLEY ROAD	11	11	-	-	
FORESTS ROAD	10	10	-	-	
FRENCHAY DRIVE	11	11	-	-	
GLOVER PLACE	2	2	-	2	Database is missing 26W ballast
KEBAL PLACE	2	2	-	2	Database is missing 13W ballast Database has an S70 (83W) incorrectly recorded as SON-E-100 (100W)
KONINI STREET	12	12	-	1	Database has an L24 (24W) recorded as SON-I-70 (70W)
KOROMIKO AVENUE	3	3	-	-	
LUCY MURCOTT PLACE	3	3	-	3	Database is missing 39W ballast
MARLOWE STREET	11	11	-	1	Database has an L24 (24W) recorded as 525mA 20 LED (35W)
NEW STREET	7	7	-	7	Database is missing 126W ballast
NGAIRE PLACE	2	2	-	1	Database is missing 13W ballast
PINNACLE PLACE	5	5	-	1	Database has an L24 (24W) recorded as HPS-T-70 (70W)
ROSEMARY PLACE	3	3	-	3	Database is missing 39W ballast
ROTO STREET	9	9	-	2	Database is missing 24W ballast

Address	Database Count	Field Count	Count differences	Wattage differences	Comments
RUTH TAYLOR AVENUE	4	4	-	4	Database is missing 52W ballast
SALISBURY ROAD	9	9	-	7	Database is missing 226W ballast
SCOTLAND STREET	2	2	-	-	
WASHINGTON TERRACE	3	3	-	1	Database is missing 11W ballast
WESTBROOK TERRACE	18	18	-	2	Database is missing 24W ballast
Total	**246**	**245**	**1**	**71**	

I found one less lamp in the field than was recorded in the database. This difference is recorded as non-compliance in **section 3.1**.

Audit outcome

Compliant

2.6. Tracking of load changes (Clause 11(3) of Schedule 15.3)

Code reference

Clause 11(3) of Schedule 15.3

Code related audit information

The DUML database must track additions and removals in a manner that allows the total load (in kW) to be retrospectively derived for any given day.

Audit observation

The process for tracking of changes in the database was examined.

Audit commentary

On 20th September 2012 the Authority sent a memo to Retailers and auditors advising that tracking of load changes at a daily level was not required as long as the database contained an audit trail. I have interpreted this to mean that the production of a "snapshot" report is sufficient to achieve compliance. The database tracks additions and removals as required by this clause.

New connection, fault and maintenance work is completed by Powertech. Powertech record changes to the database on paper, which are then entered into a spreadsheet and updated in RAMM by Powertech's Electrical Contracts Manager. The database is usually updated within two business days of work being completed.

For new connections, Powertech receives a request from NCC, arranges connection and loads the streetlight into RAMM including lamp type and wattage information, location, GPS coordinates and the date livened.

For new subdivisions:

- If Powertech is the contractor, the new connection process above is followed.
- If another contractor is used, the developer arranges connection with the network and provides "as built" plans to NCC. NCC passes the details to Powertech, who check the new lamps and update the database.

There can be a delay in NCC being advised of new connections where Powertech is not the contractor. It is estimated that Powertech is the contractor for over half of recent new subdivisions. There have been some recent staff changes at NCC, and Powertech is working with NCC to ensure that they are promptly advised of any new subdivisions.

Private lights continue to be maintained in the database, and charges are invoiced to the consumers by NCC.

Christmas and festive lights are used by NCC. These lights are metered, and excluded from the scope of this audit.

Outage patrols of the whole NCC area are completed monthly. Faults and outages are also reported to NCC, who inform Powertech. When any field work required is completed, the database is updated if necessary.

The LED project is almost completed, with approximately 70 lamps still to be upgraded. Powertech plans to complete an internal audit once the LED upgrade is complete, which will compare RAMM records, GIS records, and paperwork for a sample of lights. Site visits will be undertaken where discrepancies are identified.

Audit outcome

Compliant

2.7. Audit trail (Clause 11(4) of Schedule 15.3)

Code reference

Clause 11(4) of Schedule 15.3

Code related audit information

The DUML database must incorporate an audit trail of all additions and changes that identify:

- *the before and after values for changes*
- *the date and time of the change or addition*
- *the person who made the addition or change to the database*

Audit observation

The database was checked for audit trails.

Audit commentary

The RAMM database has a complete audit trail.

Because the Powertech RAMM data does not contain ballast wattages, Trustpower maintains their own database of NCC lights with ballast wattages added, which is used as an input to the submission calculation. Database changes are provided by NCC each month, and Trustpower adjusts their database accordingly and maintains a record of any changes. The audit trails were sighted during the audit.

Audit outcome

Compliant

3. ACCURACY OF DUML DATABASE

3.1. Database accuracy (Clause 15.2 and 15.37B(b))

Code reference

Clause 15.2 and 15.37B(b)

Code related audit information

Audit must verify that the information recorded in the retailer's DUML database is complete and accurate.

Audit observation

The DUML Statistical Sampling Guideline was used to determine the database accuracy. The table below shows the survey plan.

Plan Item	Comments
Area of interest	NCC street lights in the Nelson region
Strata	The database contains 5,387 items of load in Nelson area. The processes for the management of all NCC items of load is the same. The total population was divided into three strata: • NZTA • Other (including pedestrian crossings, parks, amenities, facilities, shared paths, walkways, accessways and private facilities); and • Roading.
Area units	I created a pivot table of the roads and I used a random number generator in a spreadsheet to select a total of 39 sub-units across the three strata.
Total items of load	256 items of load were checked, making up approximately 5% of the entire database wattage.

Wattages for all items of load were checked against the published standardised wattage tables produced by the Electricity Authority, and the manufacturer's specifications.

Audit commentary

Database accuracy based on the field audit

The database was found to contain some inaccuracies and missing data. The field audit found:

- One less lamp in the field than was recorded in the database
- 64 sodium and metal halide lamps with no ballast wattage recorded in the database
- Three lamps with no lamp or ballast wattage recorded in the database
- Four lamps which had a different model and wattage to what was recorded in the database.

The field data was 108.3% of the database data for the sample checked. The statistical sampling tool reported with 95% confidence the precision of the sample was 8.9%, and the true load in the field will be between 103.3% to 112.2% of the load recorded in the database. The sample is not sufficiently precise

to be able to determine the database accuracy but indicates that the database is likely to be under submitting.

The total wattage recorded in the database for the sample was 15,881W. The total wattage found in the field for the sample checked was 17,227W, a difference of 1,346W. This will result in potential under submission of 113,800 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). The statistical sampling tool reported with 95% confidence the possible impact will be between 45,300 and 152,900 kWh per annum under submission.

Wattage accuracy

The database was checked against the published standardised wattage table, and manufacturer's specifications where available. For 203 lamps, I could not locate specifications or the wattages recorded differed from the manufacturer's specifications available. All 203 wattage discrepancies were reviewed by Powertech. In all cases, Powertech confirmed that the wattage matched the given wattage recorded on the luminaire.

As discussed in **section 2.4**, ballast wattages are not currently populated in the database, which leads to under recording of wattage for all lamps requiring ballast. Based on the make and model information available, there are 1,486 lights which require ballast wattages. The missing ballast wattage is estimated to be 21,996W based on the EA's published standardised wattage table, or approximately or 94,945 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool) if the RAMM database were used directly for submission.

As discussed in **section 2.4**, 16 items of load have blank or unknown model information recorded in the database. These lamps also have blank or zero lamp wattage recorded. The total wattage for the affected lights is unknown, but is estimated to be 1536W[2] or approximately 6,560 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).

ICP accuracy

As discussed in **section 2.2,** 20 items of load do not have an ICP number recorded.

Address accuracy

As discussed in **section 2.3,** three of the items of load do not have sufficient address information to allow them to be readily located.

Audit outcome

Non-compliant

[2] Based on the average wattage for other lamps of that make in the database. The average wattage for all other AEC Illuminazione LED lamps in the database is 95W, and the average for other Philips lamps is 103W.

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: unknown To: 31-Dec-18	The database contains some inaccurate data. The field data is 108.3% of the database data for the sample checked. This will result in potential under submission of 113,800 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool) resulting in a potential 94,945 kWh per annum if used for submission. 16 items of load have unknown or blank lamp model, and zero wattage. The total wattage for the affected lights is unknown, but is estimated to be 1,536W or approximately 6,560 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool). No items of load have ballast wattages recorded in RAMM. The missing ballast wattage is estimated to be 21,996W or approximately 94,945 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool) if used for submission. 20 items of load do not have an ICP number recorded. Three of the items of load do not have sufficient address information to allow them to be readily located. Potential impact: High Actual impact: Low Audit history: Once Controls: Weak Breach risk rating: 3
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are rated as weak, because they are not sufficient to ensure that database wattage is accurate. The impact is assessed to be low: • the majority of the database inaccuracies identified in the field audit (67/72) and database review related to missing ballast wattages which are populated in Trustpower's file and therefore do not impact on submission. • A small number of lamps have missing make, model and wattage information or ICP information.

Actions taken to resolve the issue	Completion date	Remedial action status
Ballast information to be added to RAMM. ICPs missing now added.	22/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure all information is recorded at time of entry	Ongoing	

3.2. Volume information accuracy (Clause 15.2 and 15.37B(c))

Code reference

Clause 15.2 and 15.37B(c)

Code related audit information

The audit must verify that:

- *volume information for the DUML is being calculated accurately*
- *profiles for DUML have been correctly applied.*

Audit observation

Submission data was checked for accuracy, including:

- checking the registry to confirm that all ICPs have the correct profile and submission flag
- checking the database extract combined with the burn hours against the submitted figure to confirm accuracy.

Audit commentary

Trustpower reconciles the DUML load for 0000090001NTBEF and 0000200190CTC63 using the STL profile. The on and off times are derived from data logger information. The profile and submission flags are correctly recorded on the registry.

Because the RAMM data does not contain ballast wattages, Trustpower maintains their own database of NCC lights with ballast wattages added, which is used as an input to the submission calculation. Database changes are provided by NCC each month, and Trustpower adjusts their database accordingly and maintains a record of any changes.

To check the accuracy of Trustpower's database I:

- Checked the ballast wattages applied in their December 2018 file against the published standardised wattage table, and manufacturer's specifications where available. All ballasts were recorded correctly, except four ADC Metal Halide 400W, which were expected to have 38W ballast, and had 42W ballast. The total difference is 16W or 68 kWh (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).
- Compared the lamp counts and nominal (lamp) wattages in the December 2018 file to all unmetered load connected to the two ICPs as at the end of December 2018 in the RAMM database. The Trustpower summary is aggregated by lamp types, which differ from the make and model fields listed in RAMM. To match the data I considered all RAMM make and model fields and the lamp wattage, and Trustpower's lamp type and model fields. The following differences were identified:

Item	0000200190CTC63		0000090001NTBEF	
	Trustpower	RAMM	Trustpower	RAMM
Lamp Count	2,378	2,456	2,805	2,895
Total lamp wattage	145,476W	158,216W	148,559W	141,646W

Item	0000200190CTC63		0000090001NTBEF	
	Trustpower	RAMM	Trustpower	RAMM
Total lamp and ballast	156,687W	170,105W (est ballast added)	158,222W	170,064 (est ballast added)
Lamp differences	Seven lamps were recorded as LED 45W by Trustpower and LED 46W by Powertech. One RGB 20LED lantern (70W) was excluded from Trustpower's list.		The following lamp types were not recorded in Trustpower's data: LED 150W SON-E-150 LED 48W LED 52W SON-E-100 SON-E-70	

Item	Trustpower	RAMM	Difference
Total lamp wattage	294,035W	299,862W	5,827W or 24,887 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).
Total lamp and ballast (est ballast added for RAMM)	314,909W	340,170W	25,261W or 107,890 kWh per annum of under submission (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).

Section 2.1 recommends a full reconciliation between the RAMM database and Trustpower file should be carried out periodically to ensure that all lamps are captured.

I recalculated the submissions for October and November 2018 for ICPs 0000090001NTBEF and 0000200190CTC63 using Trustpower's database summary and data logger information. I confirmed that the calculation method was correct.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Missing lamp models and wattages for 16 lamps in the RAMM database	6,560 kWh per annum of under submission if the database were used directly for reconciliation
Missing ballast wattages in the RAMM database	94,945 kWh per annum of under submission if the database were used directly for reconciliation

Issue	Estimated volume information impact (annual kWh)
Potential under submission due to database inaccuracy identified during the field audit	113,800 kWh per annum of under submission if the database were used directly for reconciliation
Incorrect ballast wattages in Trustpower's database used for submission	68 kWh per annum of over submission
Differences between Trustpower's database used for submission and the RAMM database, based on the difference in nominal lamp wattage	24,887 kWh per annum of under submission based on the lamp wattages only 107,890 kWh per annum of under submission based on estimated ballast wattages

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: unknown To: 31-Dec-18	The database used to prepare submissions contains some inaccurate information. • Missing lamp models and wattages for 16 lamps in the RAMM database resulting in 6,560 kWh per annum of under submission if it were used directly for reconciliation. • Incorrect ballast wattages in Trustpower's file used for submission resulting in 68 kWh per annum of over submission. • Missing ballast wattages in the RAMM database resulting in a potential 94,945 kWh per annum if used for submission. • The database accuracy is assessed to be 108.3% indicating potential under submission of 113,800 kWh per annum if it were used for submission. The majority of the database inaccuracies identified in the field audit (67/72) related to missing ballast wattages which are populated in Trustpower's file and do not impact on submission, therefore the actual impact to the market is far less volume indicated above. • Differences between Trustpower's database used for submission and the RAMM database based on the difference in nominal lamp wattage are 24,887 kWh per annum of under submission, and based on the estimated ballast wattages are 107,890 kWh per annum. Potential impact: High Actual impact: Unknown Audit history: Once Controls: Weak Breach risk rating: 9

Audit risk rating	Rationale for audit risk rating
Low	The controls are rated as weak, due to the differences in lamp wattages and counts between the Trustpower file used to calculate submissions and the Powertech data. The impact is assessed to be high based on the kWh above, but the impact of the missing ballast wattages in the database is greatly reduced, because Trustpower adds on the missing ballast wattages prior to submission.

Actions taken to resolve the issue	Completion date	Remedial action status
Ramm to be updated as per above my added comments.	22/03/19	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Ensure all information is recorded at time of entry.	Ongoing	

CONCLUSION

The RAMM database used for submission is managed by NCC. New connection, fault, and maintenance work is completed by Powertech. Powertech record changes to the database on paper, which are then entered into a spreadsheet and updated in RAMM by Powertech's Electrical Contracts Manager.

Powertech provide Trustpower a monthly report of changes to the RAMM database, and a full report from the RAMM database on request.

Because the NCC database does not contain ballast wattages, Trustpower maintains its own records of lamp and ballast wattages for each ICP which is used for submission. The monthly information provided by Powertech is used to keep this up to date. I found some discrepancies between RAMM and Trustpower data, and recommend that a full reconciliation is carried out to ensure that submission is accurate.

The field audit found the accuracy of the lamp make, model and lamp wattage information in the RAMM database was high, and the majority of the discrepancies were caused by incomplete database information:

- One lamp was recorded in the database but was not present in the field.
- Four lamps had a different lamp make, model and wattage to what was recorded in the database due to recent upgrades.
- The other discrepancies all related to missing ballast wattages in the database (64 lamps) and missing model and lamp wattage information (three lamps).

Powertech has been provided a list of the missing and incomplete database information found during this audit, which they intend to check and update. Powertech has also been provided the EA's standardised wattage table and intends to update ballast wattages using this.

NCC's LED upgrade is almost complete, with approximately 70 lamps still to be upgraded. The lamps will be centralised management system (CMS) ready, but NCC have no immediate plans to implement a CMS or use dimming.

Six non-compliances were identified, and one recommendation was raised. The future risk rating of 28 indicates that the next audit be completed in three months. The risk rating has increased largely due to an increase in differences identified between the RAMM data and Trustpower's submission data, and I have recommended a reconciliation between RAMM and Trustpower's data be completed.

PARTICIPANT RESPONSE

Trustpower have reviewed this report and their comments are contained within its body.