ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

NZTA OTAGO AND TRUSTPOWER

Prepared by: Steve Woods

Date audit commenced: 28 August 2019

Date audit report completed: 9 September 2019

Audit report due date: 15 September 2019

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EXECUTIVE SUMMARY

This audit of the NZTA Otago (NZTA) Aurora network 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 database is managed by Aurora and the data is held in their GIS system. Delta is the field contractor for maintenance but not the LED replacement. McKay Electrical have been engaged by NZTA to undertake an LED rollout but as they have no relationship with Aurora, they have not been regularly providing Aurora with these changes.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	95.0	Wattage from survey is low than the database wattage by 5%
R_L	80.3	With a 95% level of confidence it can be concluded that the error could be between -19.7% and +0.1%
R_H	100.1	

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% higher and 19.7% lower than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

In absolute terms the installed capacity is estimated to be 6.0 kW lower than the database indicates.

There is a 95% level of confidence that the installed capacity is between 0 kW to 23 kW lower than the database.

In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 400 kWh p.a. higher to 99,000 kWh p.a. lower than the database indicates.

Most of the database accuracy issues are incorrect wattages. The remedial action may be to conduct a complete field audit of all items of load.

The future risk rating of 16 indicates that the next audit be completed in 12 months. I agree with this recommendation.

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	In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum	Moderate	Medium	4	Identified
All load recorded in the database	2.5	11(2A) and (d) of Schedule 15.3	1 additional item of load found in the field sample	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	The database is inaccurate. In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates. 22 items of load with incomplete lamp descriptions. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot	Moderate	Medium	4	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Volume information accuracy	3.2	15.2 and 15.37B(c)	In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum.	Moderate	Medium	4	Identified
Future Risk Rating						14	

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	Clause	Recommendation
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.	Provide additional details in the "Device type" field for LED lights

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.

1.3. Persons involved in this audit

Auditor:

Steve Woods

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Robbie Diederen	Reconciliation Analyst	Trustpower
Tammy Adams	Data Architect	Aurora

1.4. Hardware and Software

The GIS database used for the management of DUML is managed by Aurora.

The 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)
0000027638CECB5	Central Otago State Highways FKN0331	FKN0331	STL	309	66,571
0000486694CE943	Central Otago State Highways CYD0331	CYD0331	STL	224	35,538
0000486695CE506	Central Otago State Highways CML0331	CML0331	STL	85	15,532
TOTAL				618	117,641

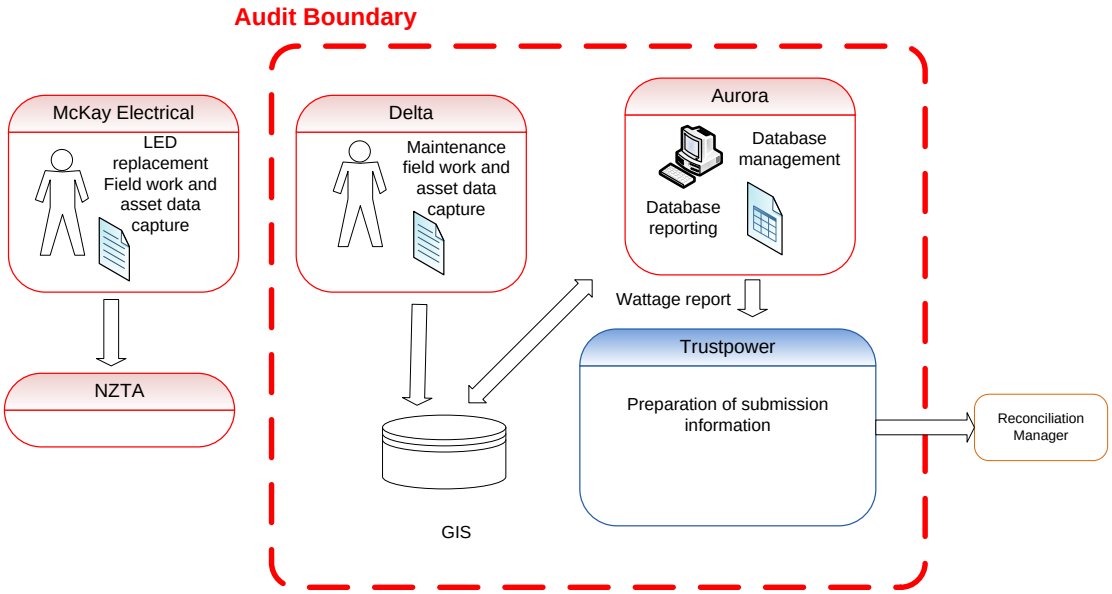
1.7. Authorisation Received

All information was provided directly by Trustpower, Aurora and Delta.

1.8. Scope of Audit

The database is managed by Aurora and the data is held in their GIS system. Reports are received monthly by Trustpower. McKay Electrical have been engaged by NZTA to undertake an LED rollout, but as there is no arrangement in place for the regular provision of updated information.

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 carried out at on August 28, 2019. The field audit was undertaken of 152 lights using the statistical sampling methodology.

1.9. Summary of previous audit

The previous audit was completed in January 2019 by Rebecca Elliot of Veritek Limited. Four non-compliances were identified, and no recommendations were made. The statuses of the non-compliances and recommendations are described below.

Subject	Section	Clause	Non-compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum if these were used for submission. Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum.	Still existing
All load recorded in the database	2.5	11(2A) and (d) of Schedule 15.3	9 additional items of load found in the field sample.	Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	The database accuracy is assessed to be 96.9% indicating an estimated over submission of 16,100 kWh per annum. Eight items of load with incomplete lamp descriptions. Incorrect ballasts applied resulting in an estimated under submission of 1,149 kWh per an annum if these were used for submission.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	Total kW values are calculated outside of the database resulting in an estimated under submission of 1,408.31 kWh of under submission per annum. The database accuracy is assessed to 96.9% indicating an estimated over submission of 16,100 kWh per annum.	Still existing

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 this DUML load using the STL profile. The on and off times are derived from data logger information. Trustpower receives a monthly wattage report.

I recalculated the submissions for July 2019 using the data logger and the database information. I confirmed that the calculation method was correct and accurate.

ICPs	Fittings number from July submission	Fittings number from database extract	Differences	kWh value submitted	Calculated kWh value from database extract	Differences
0000027638CECB5	309	309	0	30,933	30,933	0
0000486694CE943	224	224	0	16,467	16,467	0
0000486695CE506	85	85	0	7,454	7,454	0
Total month kWh difference						0

In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 31-Dec-18 To: 03-Sep-19	In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum. Potential impact: Medium Actual impact: Medium Audit history: Twice Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Will instruct Aurora Energy to check and make the changes to correct the discrepancies found in the audit. There are no immediate plans to update the process of providing a "snapshot" report. However, we have confirmed that there is no active LED replacement programme in place, and therefore changes will be limited to largely maintenance activity and the impact of relying on a snapshot report is expected to be minor overall. We have an internal process whereby light types are compared to the EA standard table and this helps us identify anomalies in things like light ballast. Unknown types are questioned with the contractor/customer, and where necessary are raised with the EA if they require inclusion/update in the standards table.	24th April 20	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
We continue to work with our customer and their contractors to remind them of their responsibilities when maintaining or changing items of load connected to DUML. This includes the timeliness and accuracy of notifications.	24th April 20	

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

All items of load had an ICP recorded as required by this clause.

Audit outcome

Compliant

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

The database contains either the nearest street address and Global Positioning System (GPS) coordinates for each item of load and users in the office and field can view these locations on a mapping system.

Audit outcome

Compliant

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

The database contains a field for "Wattage", "Ballast" and "Capacity". The Capacity field is the wattage and ballast added together.

The lamp description is in the 'Device type" field and contains sufficient information for non-LED lights. For example, "150W HP Sodium streetlight" is sufficient to denote this is a High-Pressure Sodium

streetlight with a capacity of 150 watts. LED lights are recorded as "LED" or as "Light Emitting Diode" with the wattage. There are often several different wattages available with same shape of fitting, which makes it difficult to determine if the wattage is correct when the labels are not attached in the field. I recommend a naming convention that has the following fields:

Field	Description
Manufacturer	For example, "Cree"
Model	For example, "Ledway"
Number of LEDS	One make and model of light may have many different variants with different LED quantities. Ledway, for example, have between 20 and 120 LEDs.
Driver	This is the LED power supply and different drivers result in different power outputs.
Wattage	The rated wattage

The recommended format for the field is: *Cree;Ledway;60LED;525mA;100W*

Clause	Recommendation	Audited party comment	Remedial action
11(2)(c) and (d) of Schedule 15.3	Provide additional details in the "Device type" field for LED lights	Will ask NZTA to get this information added to the DB	[auditor comment]

The accuracy of these details are discussed in s**ection 3.1**.

Audit outcome

Compliant

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

The field audit was undertaken of a statistical sample of 152 items of load.

Audit commentary

The field audit was accurate for all but the following items detailed in the table below:

Street	Database count	Field count	Light count differences	Wattage recorded incorrectly	Comments
Weldon Lane	8	8	-	7	7 x 150W HPS recorded as 250W
Kanuka Rise	12	12	-	7	7 x 150W HPS recorded as 250W
Marston Road 1	32	32	-	2	1 x 72W LED recorded as 150W HPS 1 x 99W LED recorded as 150W HPS
Marston Road 2	32	31	2	-	1 x 139W LED missing from field. 1 x additional 139W LED
Leask Street	15	15	-	1	1 x 150W HPS recorded as 135W MV
Grand Total			**2**	**17**	

One additional item of load was found in the field. This is recorded as non-compliance below. The overall database accuracy is detailed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.5 With: Clause 11(2A) and (d) of Schedule 15.3 From: 31-Dec-18 To: 03-Sep-19	1 additional item of load found in the field sample. Potential impact: High Actual impact: Low Audit history: Once Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are rated as moderate because the update process from contractors to Aurora has some room for improvement. The impact is assessed to be low because only one example was found.
Actions taken to resolve the issue	**Completion date** / **Remedial action status**

Will instruct Aurora Energy to check and make the changes	1 May 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Once these changes are made and updated then this should not reoccur	1 May 2020	

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

The GIS database functionality achieves compliance with the code. There is an "installation date" used for the date of changes and the date of livening for new installations.

The change management process and the compliance of the database reporting provided to Trustpower is detailed in **sections 3.1** and **3.2**.

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

A complete audit trail of all additions and changes to the database information.

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	NZTA Otago lights on the Aurora network
Strata	The database contains items of load Otago Aurora network area. The area has two distinct sub groups of urban and rural. The processes for the management of NZTA Aurora Otago items of load are the same, but I decided to place the items of load into three geographical strata, as follows: 1. Alexandra 2. Cromwell 3. Queenstown
Area units	I created a pivot table of the roads in each area and I used a random number generator in a spreadsheet to select a total of 13 sub-units.
Total items of load	152 items of load were checked.

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority.

Audit commentary

A field audit was conducted of a statistical sample of 152 items of load. The "database auditing tool" was used to analyse the results, which are shown in the table below.

Result	Percentage	Comments
The point estimate of R	95.0	Wattage from survey is low than the database wattage by 5%
R_L	80.3	With a 95% level of confidence it can be concluded that the error could be between -19.7% and +0.1%
R_H	100.1	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19 and the table below shows that Scenario C (detailed below) applies.

The conclusion from Scenario C is that the variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% higher and 19.7% lower than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

In absolute terms the installed capacity is estimated to be 6.0 kW lower than the database indicates.

There is a 95% level of confidence that the installed capacity is between 0 kW to 23 kW lower than the database.

In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 400 kWh p.a. higher to 99,000 kWh p.a. lower than the database indicates.

Scenario	**Description**
A - **Good accuracy, good precision**	This scenario applies if: (a) R_H is less than 1.05; and (b) R_L is greater than 0.95 The conclusion from this scenario is that: (a) the best available estimate indicates that the database is accurate within +/- 5 %; and (b) this is the best outcome.
B - **Poor accuracy, demonstrated with statistical significance**	This scenario applies if: (a) the point estimate of R is less than 0.95 or greater than 1.05 (b) as a result, either R_L is less than 0.95 or R_H is greater than 1.05. There is evidence to support this finding. In statistical terms, the inaccuracy is statistically significant at the 95% level
C - **Poor precision**	This scenario applies if: (a) the point estimate of R is between 0.95 and 1.05 (b) R_L is less than 0.95 and/or R_H is greater than 1.05 The conclusion from this scenario is that the best available estimate is not precise enough to conclude that the database is accurate within +/- 5 %

Lamp description and capacity accuracy

Wattages for all items of load were checked against the published standardised wattage table produced by the Electricity Authority in the database and found a small number of errors. Eight items of load had an incomplete lamp description as detailed in the tables below:

Lamp descriptions	Lamp Quantity
LED	10
Monument light, or ped cross, no beacons	2
Pedestrian crossing beacon with floodlights	6
Pedestrian crossing beacon without flood lights	4

Incorrect ballasts applied as follows:

Lamp descriptions	Ballast variance	Lamp quantity affected	Wattage variance
100W HP sodium street light	+1	2	+2
125W MV street light	-1	44	-44
135W Sox Sodium street light	-26	6	-156
150W HP sodium streetlight	+7	1	7
160W MV street light	-6	2	-12
250W HP sodium streetlight	+2	2	4
LED Lighting	+10	1	+10
Total			-189

I calculated the impact on submission and this indicates an estimated under submission of 807 kWh per annum (based on annual burn hours of 4,271 as detailed in the DUML database auditing tool).

Address accuracy

There were no issues found with location information.

ICP number and owner accuracy

There were no issues found with ICP information.

Change management process findings

The current monthly report is provided as a snapshot and this practice is non-compliant. The database contains an "install date", but if data entry occurs after the monthly report has been run, the items of load will only appear in the report for the next month and revisions do not occur. When a wattage is changed in the database due to a physical change or a correction, only the record present at the time the report is run is recorded, not the historical information showing dates of changes.

The database is managed by Aurora and the data is held in their GIS system. Any changes made in the field are passed to Aurora to update the database.

NZTA have engaged McKay Electrical to undertake LED replacements. This information is not being provided to Aurora and on a regular basis. In April 2019 a large update was provided for LED upgrades that occurred in November 2018. As mentioned above, the reporting process does not cater for late data entry.

No festive lighting is connected to the Aurora NZTA unmetered streetlight network.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Dec-18 To: 04-Sep-19	The database is inaccurate. In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates. 22 items of load with incomplete lamp descriptions. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: Medium Actual impact: Medium Audit history: Twice Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Will instruct Aurora Energy to check and make the changes to correct the discrepancies found in the audit. There are no immediate plans to update the process of providing a "snapshot" report. However, we have confirmed that there is no active LED replacement programme in place, and therefore changes will be limited to largely maintenance activity and the impact of relying on a snapshot report is expected to be minor overall. We have an internal process whereby light types are compared to the EA standard table and this helps us identify anomalies in things like light ballast. Unknown types are questioned with the contractor/customer, and where necessary are raised with the EA if they require inclusion/update in the standards table.	1 May 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
We continue to work with our customer and their contractors to remind them of their responsibilities when maintaining or changing items of load connected to DUML. This includes the timeliness and accuracy of notifications.	1 May 2020	

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

The submission was checked for accuracy for the month the database extract was supplied. This included:

- 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 this DUML load using the STL profile. The on and off times are derived from data logger information. Trustpower receives a monthly wattage report.

I recalculated the submissions for July 2019 using the data logger and the database information. I confirmed that the calculation method was correct and accurate.

ICPs	Fittings number from July submission	Fittings number from database extract	Differences	kWh value submitted	Calculated kWh value from database extract	Differences
0000027638CECB5	309	309	0	30,933	30,933	0
0000486694CE943	224	224	0	16,467	16,467	0
0000486695CE506	85	85	0	7,454	7,454	0
Total month kWh difference						0

In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 31-Dec-18 To: 03-Sep-19	In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates, as recorded in Section 3.1. Incorrect ballasts applied resulting in an estimated under submission of 807 kWh per an annum. Potential impact: Medium Actual impact: Medium Audit history: Twice Controls: Moderate Breach risk rating: 4
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as moderate as they are will mitigate risk and remove errors most of the time. The impact is assessed to be medium, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
Will instruct Aurora Energy to check and make the changes to correct the discrepancies found in the audit. There are no immediate plans to update the process of providing a "snapshot" report. However, we have confirmed that there is no active LED replacement programme in place, and therefore changes will be limited to largely maintenance activity and the impact of relying on a snapshot report is expected to be minor overall. We have an internal process whereby light types are compared to the EA standard table and this helps us identify anomalies in things like light ballast. Unknown types are questioned with the contractor/customer, and where necessary are raised with the EA if they require inclusion/update in the standards table.	1 May 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
We continue to work with our customer and their contractors to remind them of their responsibilities when maintaining or changing items of load connected to DUML. This includes the timeliness and accuracy of notifications.	1 June 2020	

CONCLUSION

The database is managed by Aurora and the data is held in their GIS system. Delta is the field contractor for maintenance but not the LED replacement. McKay Electrical have been engaged by NZTA to undertake an LED rollout but as they have no relationship with Aurora they have not been regularly providing Aurora with these changes.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	95.0	Wattage from survey is low than the database wattage by 5%
R_L	80.3	With a 95% level of confidence it can be concluded that the error could be between -19.7% and +0.1%
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The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% higher and 19.7% lower than the wattage recorded in the DUML database. Non-compliance is recorded because the potential error is greater than 5.0%.

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There is a 95% level of confidence that the installed capacity is between 0 kW to 23 kW lower than the database.

In absolute terms, total annual consumption is estimated to be 25,200 kWh lower than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 400 kWh p.a. higher to 99,000 kWh p.a. lower than the database indicates.

Most of the database accuracy issues are incorrect wattages. The remedial action may be to conduct a complete field audit of all items of load.

Participant response

The Trustpower Account Manager for NZTA lights in Aurora has had discussions with NZTA Regional Manager to understand the situation with regards to an LED roll-out, and the roll of McKays as field contractor.

From this discussion we have been advised that McKay Electrical appears to do the maintenance work for Lakes District Council (NZTA maintenance in that area only). NZTA do not have any direct agreement or use McKay Electrical, and have not yet planned a LED roll out for their lights in this area.

As LDC falls within the Aurora network boundary, LDC are required to provide fieldwork updates to Aurora – who maintain the NZTA DUML database for the NZTA load on the network.

Aurora also engages Delta as a fieldwork contractor, outside the LDC area, and a process is in place for Delta to advise Aurora of NZTA light changes

Our account manager has encouraged NZTA to instruct LDC that if their contract McKay Electrical performs work on NZTA lights they are to convey the alterations to either LDC or NZTA so Aurora can keep the database up to date.