ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

MASTERTON DISTRICT COUNCIL AND MERCURY NZ LIMITED

Prepared by: Tara Gannon

Date audit commenced: 10 February 2020

Date audit report completed: 26 February 2020

Audit report due date: 1 March 2020

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EXECUTIVE SUMMARY

This audit of the **Masterton District Council (MDC)** DUML database and processes was conducted at the request of **Mercury NZ Limited (Mercury)** 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 scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information.

The DUML ICPs for MDC switched from Contact Energy to Mercury effective from 01/10/19.

A RAMM database is held by MDC. Alf Downs completes repairs, maintenance, upgrades, new installations, and removals and updates the database using Pocket RAMM. Lights in new subdivisions are installed by the developer's electrician and are entered into the database by MDC.

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233. MDC provides a monthly report from the database to Mercury, which is used to determine wattages. On hours are derived using data logger information.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	99.3	Wattage from survey is lower than the database wattage by 0.7%
R_L	96.7	With a 95% level of confidence it can be concluded that the error could be between -0.1% and -3.3%
R_H	99.9	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The best available estimate indicates that the database is accurate within ± 5 %.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% and 3.3% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 1 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 5 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 4,800 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 600 and 21,600 kWh p.a. lower than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant. Mercury completes revision submissions where corrections are required and confirmed that no corrections have occurred since the

ICPs switched to them on 01/10/2019. Mercury has not yet updated their processes to be consistent with the Authority's memo.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of eight indicates that the next audit be completed in 18 months. The ICPs switched to Mercury recently, and they intend to resolve the issues identified. Given the minor nature of the discrepancies, I agree with this recommendation.

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	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh per annum. Festive lights are not excluded from submission information when they are not connected, resulting estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.	Strong	Medium	2	Identified
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B (b)	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815	Strong	Medium	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh per annum. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs.				
Volume information accuracy	3.2	15.2 and 15.37B (c)	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh per annum. Festive lights are not excluded from submission information when they are not connected, resulting estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs.	Strong	Medium	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.				
Future Risk Rating						8	

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	Recommendation
		Nil

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

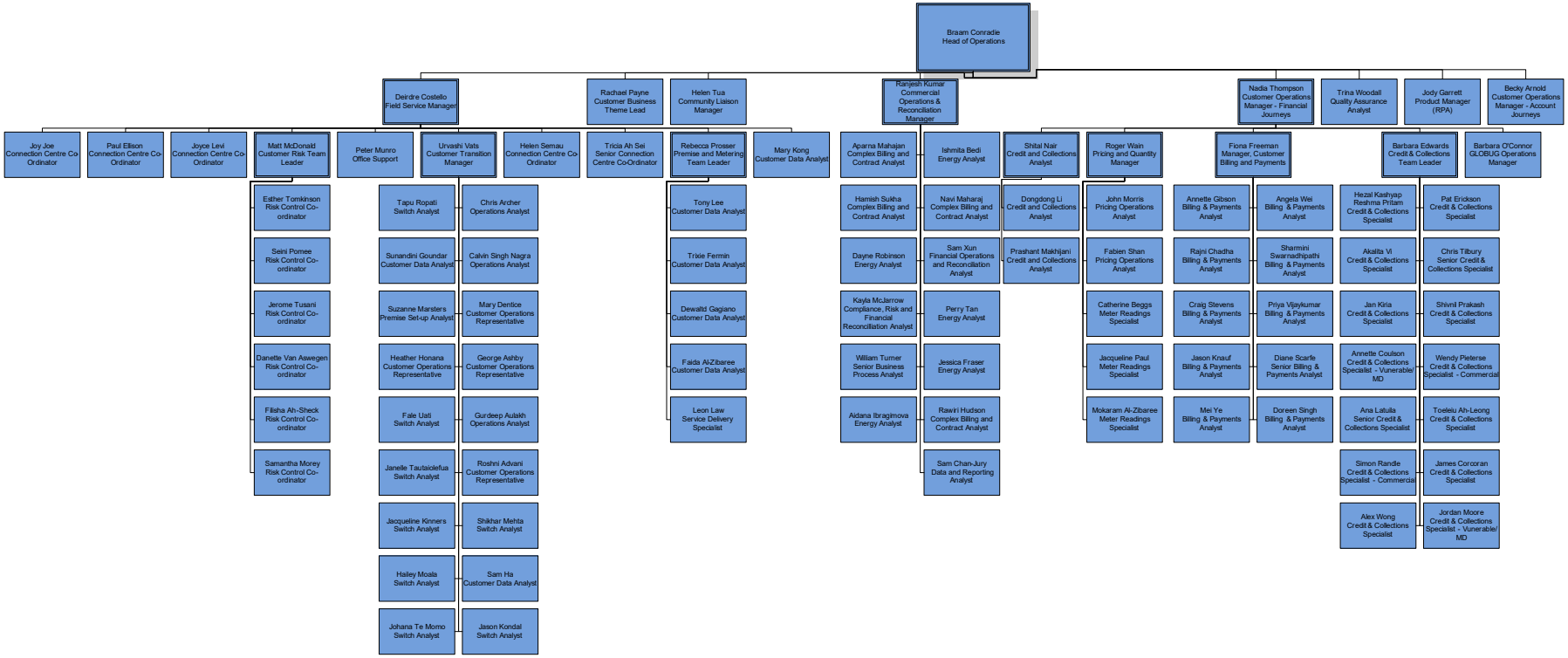
Current code exemptions were reviewed on the Electricity Authority website.

Audit commentary

Mercury has been granted exemption No. 233. This allows them to provide half-hour ("HHR") submission information instead of non half-hour ("NHH") submission information for distributed unmetered load ("DUML"). This exemption expires on 31 October 2023.

1.2. Structure of Organisation

Mercury provided their current organisational structure:



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
Warwick Potts	Roading Projects Engineer	Masterton District Council
Kayla McJarrow	Compliance, Risk & Financial Reconciliation Analyst	Mercury Energy

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". The specific module used for DUML is called RAMM Contractor.

RAMM Software Limited backs up the database and assists with disaster recovery as part of their hosting service. Nightly backups are performed. As a minimum daily backups are retained for the previous five working days, weekly backups are retained for the previous four weeks, and monthly backups are retained for the previous six months.

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)
0020901000WR99A	MSTN DISTRICT COUNCIL (RURAL)	MST0331	HHR	100	3758
0020902000WRB7A	MASTERTON DISTRICT COUNCIL	MST0331	HHR	2638	151964
Blank	No light fitted			1	0
Solar	Pole control is photocell, solar powered			1	0
Total				2740	155722

The items of load with blank or solar recorded as the ICP number are compliant. The light with a blank ICP was a partial duplicate of another record and has since been removed from the database, and the light with solar recorded is solar powered and is not part of the distributed unmetered load.

22 items of load (736W) connected to 0020902000WRB7A are indicated to be metered. This is discussed further in **section 3.1**.

1.7. Authorisation Received

All information was provided directly by Mercury or MDC.

1.8. Scope of Audit

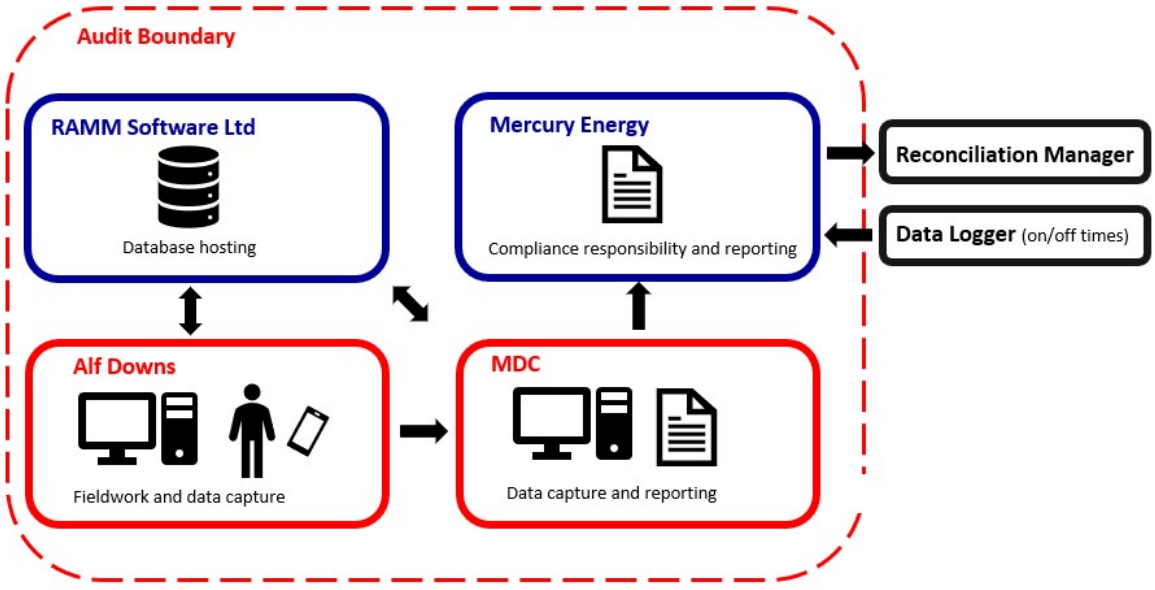
This audit of the MDC DUML database and processes was conducted at the request of Mercury in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied. The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

The DUML ICPs for MDC switched from Contact Energy to Mercury effective from 01/10/19.

A RAMM database is held by MDC. Alf Downs completes repairs, maintenance, upgrades, new installations, and removals, and updates the database from the field using Pocket RAMM. Lights in new subdivisions are installed by the developer's electrician and are entered into the database by MDC.

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233. MDC provides a monthly report from the database to Mercury, which is used to determine wattages. On hours are derived using data logger 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 boundaries for clarity.



The field audit was undertaken of a statistical sample of 268 items of load on 10 February 2020.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Tara Gannon of Veritek Limited in September 2017. The summary table below shows the statuses of the non-compliances raised in the previous audit. Further comment is made in the relevant sections of this report.

Subject	Section	Clause	Non-compliance	Status
Profiles	2.1	11(1) of Schedule 15.3	An incorrect profile is recorded on the registry for ICP 0020903000WRADA.	Still existing
Wattages	2.4	11(2)(c) & (d) of Schedule 15.3	Six lamps have incorrect lamp wattage, and 305 lamps have incorrect gear wattage.	Still existing
Database accuracy	3.1	Clause 15.2 & 15.37(b)	Six lamps have incorrect lamp wattage, and 305 lamps have incorrect gear wattage.	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

Mercury 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.

Audit outcome

Compliant

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 and the application of profiles was checked. The database was checked for accuracy.

Audit commentary

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233.

- Wattages are derived from an extract provided each month by MDC, and the best available estimate indicates that the database is accurate within ± 5 % as discussed in **section 3.1**.
- On and off times are derived from a data logger.

I reviewed the submission information for November 2019 and confirmed that it the calculation methodology was correct, and that wattages were based on the database extract totals and on hours were based on data logger information.

The database extract total included some lights which were recorded against 0020902000WRB7A but should have been excluded from submissions.

1. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh p.a. based on 4,271 burn hours.
2. Festive lights are recorded against the ICP which they are attached to, and must be deducted from the total wattage for the ICP when they are not connected, rather than being added to the total wattage when they are connected. To date, Mercury has not excluded the festive lights connected to 0020902000WRB7A when they are disconnected, resulting in estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information.	Under submission of 1,815 kWh
196 lamps have incorrect total wattages.	Over submission of 2,618 kWh
22 items of load connected to 0020902000WRB7A are indicated to be metered, but are included in submission data.	Over submission of 3,143 kWh

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant. 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. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

The RAMM database records an installation date, which is used to record the date of livening. There is no separate livening date.

- Alf Downs records the date that the data is loaded for all new connections, changes, and removals they complete. This means that where Alf Downs has completed the new connection or change, the date is likely to be accurate.
- MDC enters the data of vesting for new connections within subdivisions, which may not reflect the date of livening.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-Nov-19 To: 30-Nov-19	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh per annum. Festive lights are not excluded from submission information when they are not connected, resulting estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: High Actual impact: Unknown Audit history: Once Controls: Strong Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Medium	The controls over the database are rated as strong, because the database was found to be accurate within ±5%. The submission process is working as expected, but some incorrect inputs resulted in some inaccurate submission data. The audit risk rating is medium based on kWh variances.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 2020	

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 the correct ICP was recorded against each item of load.

Audit commentary

All connected unmetered items of load have an ICP recorded against them. Two items of load are powered by solar or do not have a light fitted, and validly do not have an ICP number recorded in the database.

ICP Number	Description	Pole ID	Model	Number of items of load	Database wattage (watts)
Blank	No light fitted	2684	Not fitted	1	0
Solar	Pole control is photocell, solar powered	1532	20 LED 525mA	1	0

22 items of load connected to 0020902000WRB7A are indicated to be metered. This is recorded as non-compliance in **sections 2.1** and **3.1**.

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 fields for the road name, displacement, pole ID and number, and GPS coordinates.

2,210 items of load have GPS coordinates, and the other 530 items of load have sufficient street address, displacement and pole number information to enable them to be located.

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 light type and wattage capacity;
- wattage capacities include any ballast or gear wattage; and
- each item of load has a light type, light wattage, and gear wattage recorded.

Audit commentary

The database contains light model, light wattage, gear model and gear wattage. These fields were checked for all records, and a small number of exceptions were identified.

Four items of load had no lamp model, and a zero lamp wattage recorded. Two of these also had a zero gear wattage recorded. I confirmed that the record for Pole ID 2630 was a partial duplicate of another record on Hope St, and was removed from the database by January 2020. The correct lamp model, lamp wattage and gear wattages were confirmed for the other three lamps. The missing information resulted in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours.

Pole ID	Road Name	Model	Lamp Wattage	Gear Wattage	Correct model	Correct Lamp Wattage	Correct Gear Wattage	Difference
289	CHAPEL STREET (SH2)		0	11	125 MV	125	11	125W
290	CHAPEL STREET (SH2)		0	11	125 MV	125	11	125W
2711	KURIPUNI STREET		0	0	160 MV	160	15	175W
2630	HOPE STREET		0	0	Removed	-	-	-
							Total	425W

Seven 160W MV lights had their gear wattage recorded as zero. These were checked and confirmed to be "self-ballasted" and the zero gear wattage was correct.

The accuracy of the recorded wattages is discussed in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.4 With: Clause 11(2)(c) and (d) of Schedule 15.3 From: 01-Dec-19 To: 10-Feb-2020	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information. Potential impact: Low Actual impact: Low Audit history: Once Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as moderate, as they are sufficient to mitigate the risk most of the time and only a small number of exceptions were identified. The impact is assessed to be low. The missing information resulted in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with MDC to ensure a complete and updated database is maintained.	June 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with MDC to ensure a complete and updated database is maintained.	June 2020	

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 268 items of load on 10 February 2020. The sample was selected from three strata, as follows:

1. NZTA
2. Other; and
3. Urban roading.

Audit commentary

The field audit discrepancies are detailed in the table below:

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
Other					
PERRY STREET	3	3	-	1	One L60,5A 51W light[1] (pole ID 1578) was recorded in the database as Itron Zero 0C6 STA 55W.
Urban roading					
FLEET STREET	7	6	-1	-	The database recorded one 70W SON-E at pole ID 758 (17-19 Fleet Street) which was not present on the street. The light was removed when the pole was upgraded by Powerco, but should have been replaced. A new LED will be installed at this location and the database will be updated.
KING STREET	4	4	-	2	Two L60,5A 51W lights (pole IDs 1117 and 2546) were recorded in the database as Itron Zero 0C6 STA 55W.

[1] Specifications provided by the manufacturer confirmed that the rated LED wattage for the lights labelled L60,5A is 51W.

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
PERRY STREET CBD	3	3	-	2	Two L60,5A 51W lights (pole IDs 1561 and 1569) were recorded in the database as Itron Zero 0C6 STA 55W.
Grand Total	**267**	**266**	**1**	**5**	

The field audit did not find any items of load missing from the database, so compliance is recorded in this section. Other light count and wattage differences identified during the field audit are 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

The database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Mercury 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

The database has a complete audit trail.

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

Mercury's submissions are based on a monthly extract from the RAMM database. A database extract was provided in December 2019 and I assessed the accuracy of this by using the DUML Statistical Sampling Guideline. The table below shows the survey plan.

Plan Item	Comments
Area of interest	Masterton DC streetlights
Strata	The database contains 2740 items of load in the MDC region. The management process is the same for all lights. I created three strata: 1. NZTA 2. Other; and 3. Urban 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 23 sub-units.
Total items of load	268 items of load were checked, making up 8.5% of the database.

Wattages were checked for alignment with the published standardised wattage table produced by the Electricity Authority against the database or in the case of LED lights against the LED light specification.

The change management process and timeliness of database updates was evaluated.

Audit commentary

Field audit findings

A field audit was conducted of a statistical sample of 268 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	99.3	Wattage from survey is lower than the database wattage by 0.7%
R_L	96.7	With a 95% level of confidence it can be concluded that the error could be between -0.1% and -3.3%
R_H	99.9	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The table below shows that Scenario A (detailed below) applies, and the best available estimate indicates that the database is accurate within ± 5 %.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% and 3.3% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 1 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 5 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 4,800 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 600 and 21,600 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 %

Light description and capacity accuracy

As discussed in **section 2.4**, three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information. The missing information resulted in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours.

Lamp and gear wattages for all other lamps were compared to the expected values and the following exceptions were identified:

Model	Database wattage	Correct wattage	Quantity	Total difference	Comment
Italo STA1 4.7-2M/700mA	35W	32W	21	-63W	Corrected Jan 2020.
Itron Zero 0C6 STA	55W	51W	173	+692W	To be corrected. Note five lights with this description checked on King St and Perry St were labelled L60,5A.
Galileo 1 OF6 ASP-6W 4 7-3m	150W	142W	2	-16W	To be corrected.
Total			196	613W	

This could result in an estimated annual over submission of 2,618 kWh.

ICP number accuracy

As discussed in **section 2.2**, all connected unmetered items of load have an ICP recorded against them. Two items of load do not have an ICP recorded and were confirmed not to have a light installed or to be solar powered.

22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in estimated over submission of 736W or 3,143 kWh per annum. This is recorded as non-compliance below, and in **sections 2.1** and **3.2**.

Pole ID	Light Owner	Road Name	Model	Gear Wattage	Model	Lamp Wattage
5	Roading - MDC Urban	AKURA ROAD	Vizulo Mini Martin	0	Vizulo Mini Martin	28
246	NZTA	CHAPEL STREET (SH2)	150W HPS	18	150 SON	150
2670	Roading - MDC Urban	CRAIGMILLER STREET	No gear	0	27W LED	27
2665	Roading - MDC Urban	GIMSON STREET	No gear	0	27W LED	27
2666	Roading - MDC Urban	GIMSON STREET	No gear	0	27W LED	27
2667	Roading - MDC Urban	GIMSON STREET	No gear	0	27W LED	27
2668	Roading - MDC Urban	GIMSON STREET	No gear	0	27W LED	27
2669	Roading - MDC Urban	GIMSON STREET	No gear	0	27W LED	27
2738	Roading - MDC Urban	MIRO STREET		0	27W LED	27
	Roading - MDC Urban	MIRO STREET		0	27W LED	27
2671	Roading - MDC Urban	MITRE WAY		0	27W LED	27
2672	Roading - MDC Urban	MITRE WAY		0	27W LED	27
2673	Roading - MDC Urban	MITRE WAY		0	27W LED	27

Pole ID	Light Owner	Road Name	Model	Gear Wattage	Model	Lamp Wattage
2674	Roading - MDC Urban	MITRE WAY		0	27W LED	27
2675	Roading - MDC Urban	STONELEIGH DRIVE		0	27W LED	27
2676	Roading - MDC Urban	STONELEIGH DRIVE		0	27W LED	27
2685	Roading - MDC Urban	TARANAKI STREET	No gear	0	27W LED	27
2687	Roading - MDC Urban	TARANAKI STREET	No gear	0	27W LED	27
2603	Roading - MDC Urban	TARANAKI STREET		0	27W LED	27
2686	Roading - MDC Urban	TARANAKI STREET		0	27W LED	27
2664	Roading - MDC Urban	WYCLIFFE PLACE	No gear	0	27W LED	27
2731	Roading - MDC Urban	WYCLIFFE PLACE	No gear	0	27W LED	27

Change management process findings

A RAMM database is held by MDC. Alf Downs completes repairs, maintenance, upgrades, new installations, and removals and updates the database using Pocket RAMM. Change dates are automatically generated by RAMM when records change but cannot be selected by the user. Changes are normally entered using Pocket RAMM on the date of the change.

Lights in new subdivisions are installed by the developer's electrician and are entered into the database by MDC. The lights are entered once the subdivision is "vested" in council. The RAMM database records an installation date, which is used to record the date the light is vested in council once this occurs. There is no separate livening date. The street lighting team liaise closely with the planning team to ensure new connections are identified promptly, and developers are advised to provide connection information as soon as possible.

Regular outage patrols have not been completed since July 2019. MDC relies on the public to advise of lights which need to be maintained.

An LED upgrade project is underway. The lights are compatible with a CMS, but MDC does not intend to use a CMS for light management or dimming. Most MDC lights have been upgraded with the exception of some:

- subdivisions with decorative lights where MDC is determining suitable replacements;
- CBD under verandah lights; and
- CBD lights in areas where MDC is planning roading upgrades, and lighting will be considered as part of the wider upgrade process.

NZTA lights have not been upgraded, and it is expected that NZTA will initiate the upgrades in 2-3 years. In the meantime, MDC is responsible for maintaining these lights and replaces them with LEDs if the lights require repair or replacement and it is not possible to replace them with similar lights.

Festive lights

Some festive lights are installed, and are switched on from early December and off from mid-January. Alf Downs manages the connection and disconnection process and provides this information in the database extract.

Festive lights are recorded against the ICP which they are attached to, and must be deducted from the total wattage for the ICP when they are not connected, rather than being added to the total wattage when they are connected. To date, Mercury has not excluded the festive lights connected to 0020902000WRB7A when they are disconnected, resulting in an estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019. This is recorded as non-compliance in **section 2.1**.

Private lights

MDC has taken ownership of all private lights in their database. There were historically a small number of private lights on right of ways. I found two lights which had privately owned poles in the database, and load was recorded and submitted as required.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: unknown To: 10-Feb-20	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh per annum. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs. Potential impact: Low Actual impact: Low Audit history: Once Controls: Strong Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls over the database are rated as strong, because the database was found to be accurate within ±5%. The audit risk rating is medium based on kWh variances.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 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 the ICP has the correct profile and submission flag; and
- checking the database extract combined with the on hours against the submitted figure to confirm accuracy.

Audit commentary

Mercury reconciles this DUML load using the HHR profile, and the correct profiles and submission types are recorded on the registry.

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233.

- Wattages are derived from an extract provided each month by MDC, and the best available estimate indicates that the database is accurate within ± 5 % as discussed in **section 3.1**.
- On and off times are derived from a data logger.

I reviewed the submission information for November 2019 and confirmed that it the calculation methodology was correct, and that wattages were based on the database extract totals and on hours were based on data logger information.

The database extract total included some lights which were recorded against 0020902000WRB7A but these should have been excluded from submissions.

1. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in over submission of 736W or 3,143 kWh p.a. based on 4,271 burn hours.

2. Festive lights are recorded against the ICP which they are attached to and must be deducted from the total wattage for the ICP when they are not connected, rather than being added to the total wattage when they are connected. To date, Mercury has not excluded the festive lights connected to 0020902000WRB7A when they are disconnected, resulting in estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information.	Under submission of 1,815 kWh
196 lamps have incorrect total wattages.	Over submission of 2,618 kWh
22 items of load connected to 0020902000WRB7A are indicated to be metered, but are included in submission data.	Over submission of 3,143 kWh

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant. 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. Mercury completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

The RAMM database records an installation date, which is used to record the date of livening. There is no separate livening date.

- Alf Downs records the date that the data is loaded for all new connections, changes, and removals they complete. This means that where Alf Downs has completed the new connection or change, the date is likely to be accurate.
- MDC enters the data of vesting for new connections within subdivisions, which may not reflect the date of livening.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Nov-19 To: 30-Nov-19	Three items of load had missing lamp model and lamp wattage data, and one item of load had missing gear wattage information resulting in under submission of 425W or 1,815 kWh p.a. based on 4,271 burn hours. 196 lamps have incorrect total wattages, resulting in estimated over submission of 613W or 2,618 kWh p.a. based on 4,271 burn hours. 22 items of load connected to 0020902000WRB7A are indicated to be metered, resulting in estimated over submission of 736W or 3,143 kWh per annum. Festive lights are not excluded from submission information when they are not connected, resulting an estimated over submission of 7,398W or 3,405 kWh for the period from 01/10/19 until the lights were connected in mid-December 2019. Vesting dates are recorded as the installation date for new connections, and change dates may not reflect the date of the change if they are not processed in the database at the time that the change occurs. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: High Actual impact: Unknown Audit history: None Controls: Strong Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls over the database are rated as strong, because the database was found to be accurate within ±5%. The submission process is working as expected, but some incorrect inputs resulted in some inaccurate submission data. The audit risk rating is medium based on kWh variances.

Actions taken to resolve the issue	Completion date	Remedial action status
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Mercury will liaise with MDC to ensure a complete and updated database is maintained. We will investigate and action any necessary corrections required from the inclusion of festive and metered lights.	June 2020	

CONCLUSION

The DUML ICPs for MDC switched from Contact Energy to Mercury effective from 01/10/19.

A RAMM database is held by MDC. Alf Downs completes repairs, maintenance, upgrades, new installations, and removals and updates the database using Pocket RAMM. Lights in new subdivisions are installed by the developer's electrician and are entered into the database by MDC.

Mercury reconciles this DUML load using the HHR profile in accordance with exemption 233. MDC provides a monthly report from the database to Mercury, which is used to determine wattages. On hours are derived using data logger information.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	99.3	Wattage from survey is lower than the database wattage by 0.7%
R_L	96.7	With a 95% level of confidence it can be concluded that the error could be between -0.1% and -3.3%
R_H	99.9	

These results were categorised in accordance with the "Distributed Unmetered Load Statistical Sampling Audit Guideline", effective from 01/02/19. The best available estimate indicates that the database is accurate within ± 5 %.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.1% and 3.3% lower than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 1 kW lower than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 and 5 kW lower than the database.
- In absolute terms, total annual consumption is estimated to be 4,800 kWh lower than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 600 and 21,600 kWh p.a. lower than the database indicates.

On 18 June 2019, the Electricity Authority issued a memo clarifying the memo of 2012 that stated that a monthly snapshot was sufficient to calculate submission from, and confirmed the code requirement to calculate the correct monthly load must:

- take into account when each item of load was physically installed or removed; and
- wash up volumes must take into account where historical corrections have been made to the DUML load and volumes.

The current monthly report is provided as a snapshot and is non-compliant. Mercury completes revision submissions where corrections are required and confirmed that no corrections have occurred since the ICPs switched to them on 01/10/2019. Mercury has not yet updated their processes to be consistent with the Authority's memo.

Four non-compliances were identified, and no recommendations were raised. The future risk rating of eight indicates that the next audit be completed in 18 months. The ICPs switched to Mercury recently, and they intend to resolve the issues identified. Given the minor nature of the discrepancies, I agree with this recommendation.

PARTICIPANT RESPONSE

Mercury will liaise with the customer to ensure a complete and updated database is maintained to allow accurate reporting. We will review our processes to ensure anomalies such as metered load and festive lights are identified and submitted correctly.