ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

SOUTH WAIKATO DISTRICT COUNCIL AND MERIDIAN ENERGY

Prepared by: Steve Woods

Date audit commenced: 18 November 2019

Date audit report completed: 25 November 2019

Audit report due date: 30-Nov-19

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This audit of the South Waikato District Council Unmetered Streetlights (**SWDC**) DUML database and processes was conducted at the request of Meridian Energy Limited (**Meridian**), 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, which became effective on 1 June 2017.

Odyssey Energy (2009) Limited (Odyssey) manages the installation, maintenance and database management of all SWDC lighting connections.

SWDC are in the process of installing a CMS system and metering this DUML load. This is expected to be complete by the end of 2020.

The main issues identified are as follows:

- In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates.
- Submission is based on a snapshot and does not consider historic adjustments
- Incorrect ballasts resulting in under submission of 1,725 kWh per annum
- Many of the lamp descriptions require additional detail.

The database contains a small number of ballast discrepancies. These are discussed in the report.

The audit found four non-compliance issues and makes no recommendations. The future risk rating of eight indicates that the next audit be completed in 18 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 9,400 kWh lower than the DUML database indicates. Submission is based on a snapshot and does not consider historic adjustments Incorrect ballasts resulting in under submission of 1,725 kWh per annum	Moderate	Low	2	Identified
All load recorded in database	2.5	11(2A) of Schedule 15.3	Three additional items of load found in the field audit.	Moderate	Low	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Database accuracy	3.1	15.2 and 15.37B(b)	In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates. 184 items of load have incorrect ballast figures, resulting in under submission of 1,725 kWh per annum location details are inaccurate for four items of load. 1,655 LED items of load have insufficient detail in the description to confirm the accuracy of the wattage	Moderate	Low	2	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates. Submission is based on a snapshot and does not consider historic adjustments Incorrect ballasts resulting in under submission of 1,725 kWh per annum	Moderate	Low	2	Identified
Future Risk Rating						8	

Future risk rating	1-3	4-6	7-8	9-17	18-26	27+
Indicative audit frequency	36 months	24 months	18 months	12 months	6 months	3 months

RECOMMENDATIONS

Subject	Section	Description	Action
		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

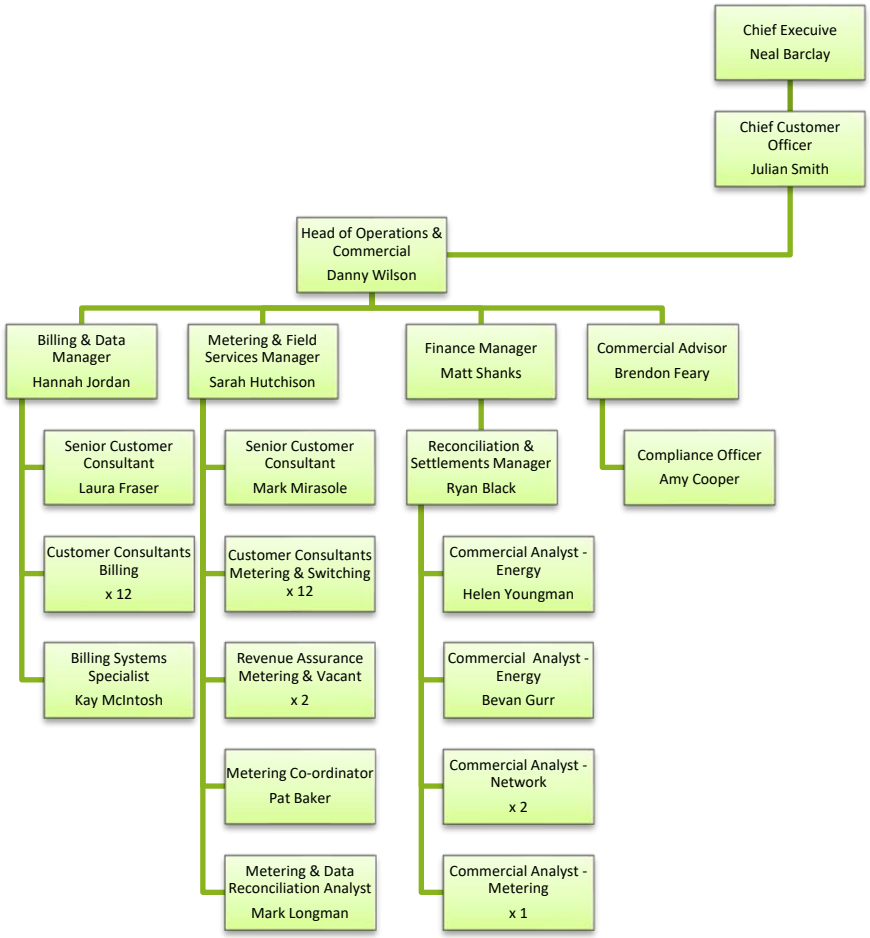
Section 11 of the Electricity Industry Act provides for the Electricity Authority to exempt any participant from compliance with all or any of the clauses.

Audit commentary

Meridian confirms that there are no exemptions in place relevant to the scope of this audit.

1.2. Structure of Organisation

Meridian provided the relevant organisational structure:



1.3. Persons involved in this audit

Auditor:

Rebecca Elliot

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
David Raven	Street light Consultant	Odyssey

1.4. Hardware and Software

Section 1.8 Section 1.2 shows that 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.

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)
1000499769PCCB7	SOUTH WAIKATO STREETLIGHTS, STREETLIGHTS, WAIKATO 2392	HIN0331	DST	892	72,053
1000571665PC2BC	South Waikato District Council Streetlights	KIN0331	DST	1,671	98,667
0000036463HR791	STREETLIGHTING, STATE HIGHWAY 1, ATIAMURI, BAY OF PLENTY	ROT0111	DST	17	3,732

1.7. Authorisation Received

All information was provided directly by Meridian or Odyssey.

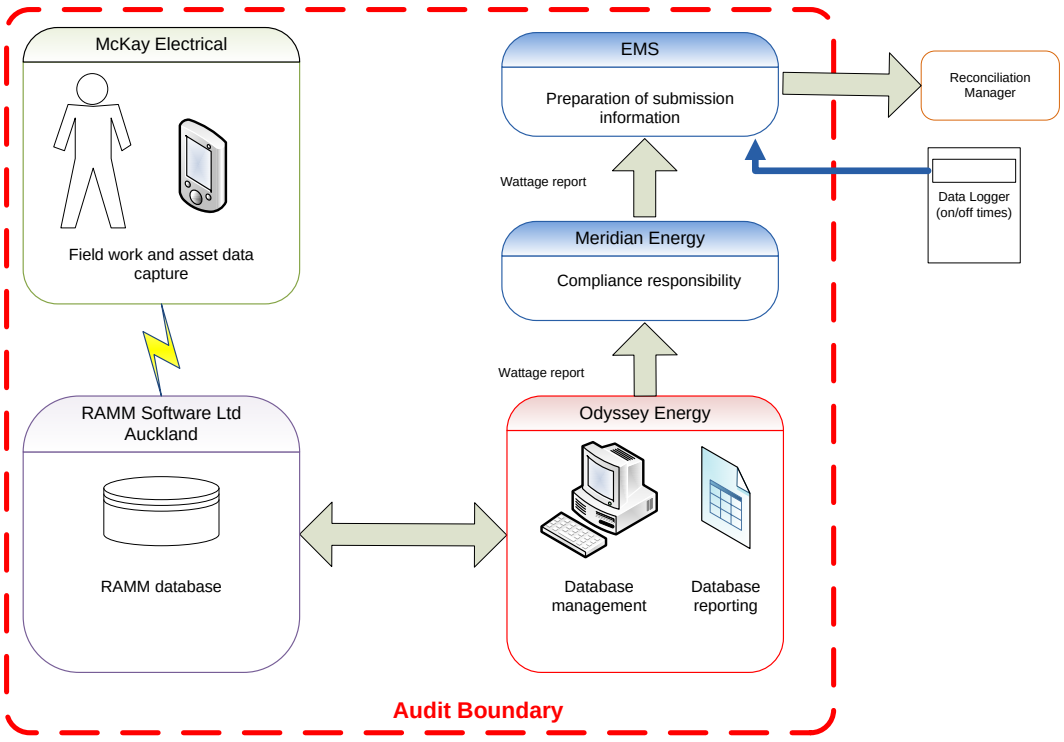
1.8. Scope of Audit

This audit of the South Waikato District Council Unmetered Streetlights (**SWDC**) DUML database and processes was conducted at the request of Meridian Energy Limited (**Meridian**), 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, which became effective on 1 June 2017.

The database is remotely hosted by RAMM Software Ltd and is managed by Odyssey, on behalf of SWDC, who is Meridian's customer. McKay Electrical, who is a contractor to Odyssey, and is engaged by SWDC, conducts the fieldwork and asset data capture. Reporting is provided to Meridian on a monthly basis by Odyssey.

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 field audit was undertaken of a statistical sample of 274 items of load.

1.9. Summary of previous audit

Meridian provided a copy of the last audit report undertaken by Rebecca Elliot of Veritek Limited in March 2018. The table below shows the issues raised.

Table of Non-Compliance

Subject	Section	Clause	Non-compliance	Status
Deriving submission information	2.1	11(1) of Schedule 15.3	The database accuracy is assessed to be 99.6% indicating an estimated minor over submission of 450 kWh per annum.	Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	The database accuracy is assessed to be 99.6% indicating an estimated minor over submission of 450 kWh per annum.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	The database accuracy is assessed to be 99.6% indicating an estimated minor over submission of 450 kWh per annum.	Still existing

Table of Recommendations

Subject	Section	Clause	Recommendation for Improvement	Status
			Nil	

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

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

Audit commentary

Meridian reconciles this DUML load using the DST profile. The total volume submitted to the Reconciliation Manager is based on a monthly database report derived from RAMM and the "burn time" which is sourced from data loggers installed on the Counties and Powerco networks. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

The capacities supplied to EMS for September 2019 were checked and confirmed to be the same as the database

There are a small number of inaccurate ballasts being applied within the database used to calculate submissions. This is recorded as non-compliance and discussed in **sections 3.1** and **3.2**.

Submission is based on a snapshot of the database at the end of the month and does not consider historic adjustments or the fact that lights can be livened before they are entered into the database.

As recorded in Section 3.1, In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-May-18 To: 18-Nov-19	In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates. Submission is based on a snapshot and does not consider historic adjustments Incorrect ballasts resulting in under submission of 1,725 kWh per annum. Potential impact: Low Actual impact: Low Audit history: Three times previously Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls are rated as moderate, because they are sufficient to ensure that wattage information is correctly recorded most of the time. The impact is assessed to be low, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
We will pass inaccuracies identified to the council to update the database in the short term.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
As reported, this DUML is to be metered by the end of 2020.	31 Dec 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

The RAMM database contains the relevant ICP identifiers for all items of load.

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 the nearest street address, pole numbers 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.

Four items of load had incorrect GPS coordinates, which made them difficult to locate. The details are shown below.

The four items of load in the picture are located either side of the pedestrian crossing but the coordinates plot them in a different location.

All items of load had the location recorded. Non-compliance is recorded in Section 3.1 for incorrect location information.

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 and that each item of load had a value recorded in these fields.

Audit commentary

The database contains two records for wattage, firstly the lamp wattage and secondly the gear wattage, which represents ballast losses. The gear wattage is recorded in the database which meets the requirements of this clause. I found no blank records. The accuracy of the description and wattages recorded is discussed in **section 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 274 items of load.

Audit commentary

The field audit findings are detailed in the table below:

Street	Database count	Field count	Light count differences	Wattage recorded incorrectly	Comments
ARAWA CRES	20	21	+1	-	1 x additional LED
BRIDGE ST (NORTH) CENTRAL	12	13	+1	2	1 x additional 70W HPS 2 x 70W HPS recorded as 68W LED
ROSE ST	6	7	+1	-	1 x additional LED
SWANSTON ST	10	9	-1	1	1 x 150W HPS not found 1 x 50W LED recorded as 100W MH

Three additional items of load were found in the field. This is recorded as non-compliance below. The database accuracy is discussed and recorded as non-compliance in **section 3.1**.

Audit outcome

Non-compliant

Non-compliance	Description		
Audit Ref: 2.5 With: Clause 11(2A) of Schedule 15.3 From: 01-May-18 To: 18-Nov-19	Three additional items of load found in the field audit 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, because they are sufficient to ensure that lamp information is correctly recorded most of the time. The impact is assessed to be low as only three additional items of load were found in the field audit.		
Actions taken to resolve the issue		**Completion date**	**Remedial action status**
We will pass inaccuracies identified to the council to update the database in the short term.		31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur		**Completion date**	
As reported, this DUML is to be metered by the end of 2020.		31 Dec 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 RAMM database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Meridian 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 RAMM database has 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	South Waikato area
Strata	The database contains items of load in South Waikato District Council area. The council area covers two different networks of Powerco and a small number of lights on the Unison network. The processes for the management of are the same across the district but I decided to place the items of load into three strata, as follows: 1. Road name A-E 2. Road name F-O 3. Road name P-Z
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 24 sub-units.
Total items of load	274 items of load were checked.

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

Audit commentary

Database accuracy based on the field audit

A field audit was conducted of a statistical sample of 274 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	98.7	Wattage from survey is lower than the database wattage by 1.3%
R_L	93.8	With a 95% level of confidence it can be concluded that the error could be between -6.2% and +1.8%
R_H	101.8	

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 6.2% lower and 1.8% higher 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 2.0 kW lower than the database indicates.

There is a 95% level of confidence that the installed capacity is between 11 kW lower to 3 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 46,200 kWh p.a. lower to 13,400 kWh p.a. higher 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 %

The database was checked and found all ballasts were applied correctly.

Lamp description and capacity accuracy

184 items of load have incorrect ballast figures, resulting in under submission of 1,725 kWh per annum.

1,655 LED items of load have insufficient detail in the description to confirm the accuracy of the wattage. The only detail available is "wattage" and "LED", for example, "25W LED". There are many factors relevant to checking the accuracy of LED wattage, for example the manufacturer, driver type and number of LEDs.

NZTA lighting

NZTA lighting is included in the database and was checked as part of the field audit.

ICP accuracy

All items of load appear to have the correct ICPs recorded.

Location accuracy

The location details are inaccurate for four items of load, as recorded in Section 2.3.

Change management process findings

The processes were reviewed for ensuring that changes in the field are notified through to Odyssey. McKay Electrical enters all field data via "Pocket RAMM" directly into RAMM Contractor. Monthly "outage patrols" are conducted, and this process is used to check database accuracy. All McKay Electrical invoices are checked by Odyssey to ensure there is a match between database information and invoice information.

Outage patrols will be in place until SWDC's CMS is in place and the streetlights are metered. This consists of a monthly night time patrol of the network and a six-monthly patrol to pick up any other issues that can't be seen during the night patrols.

There have been no new developments since the last audit and going forward all new streetlights will be connected to metered circuits.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-May-18 To: 18-Nov-19	In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates. 184 items of load have incorrect ballast figures, resulting in under submission of 1,725 kWh per annum location details are inaccurate for four items of load. 1,655 LED items of load have insufficient detail in the description to confirm the accuracy of the wattage Potential impact: Low 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 they are sufficient to ensure that lamp information is correctly recorded most of the time. The impact is assessed to be low, based on the kWh differences described above.

Actions taken to resolve the issue	Completion date	Remedial action status
We will pass inaccuracies identified to the council to update the database in the short term.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
As reported, this DUML is to be metered by the end of 2020.	31 Dec 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
- checking the database extract combined with the burn hours against the submitted figure to confirm accuracy.

Audit commentary

Meridian reconciles this DUML load using the DST profile. The total volume submitted to the Reconciliation Manager is based on a monthly database report derived from RAMM and the "burn time" which is sourced from data loggers installed on the Counties and Powerco networks. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure for each ICP and includes this in the relevant AV080 file. This process was audited during Meridian's reconciliation participant audit and EMS' agent audit.

The capacities supplied to EMS for September 2019 were checked and confirmed to be the same as the database

Submission is based on a snapshot of the database at the end of the month and does not consider historic adjustments or the fact that lights can be livened before they are entered into the database.

As recorded in Section 3.1, In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates

Audit outcome

Non-compliant

<table>
<tr><th>Non-compliance</th><th colspan="3">Description</th></tr>
<tr><td>Audit Ref: 3.2
With: Clause 15.2 and 15.37B(c)

From: 01-May-18
To: 18-Nov-19</td><td colspan="3">In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates.
Submission is based on a snapshot and does not consider historic adjustments
Incorrect ballasts resulting in under submission of 1,725 kWh per annum.
Potential impact: Low
Actual impact: Low
Audit history: Three times previously
Controls: Moderate
Breach risk rating: 2</td></tr>
<tr><th>Audit risk rating</th><th colspan="3">Rationale for audit risk rating</th></tr>
<tr><td>Low</td><td colspan="3">The controls are rated as moderate, because they are sufficient to ensure that lamp information is correctly recorded most of the time.
The impact is assessed to be medium, based on the kWh differences described above.</td></tr>
<tr><th colspan="2">Actions taken to resolve the issue</th><th>Completion date</th><th>Remedial action status</th></tr>
<tr><td colspan="2">We will pass inaccuracies identified to the council to update the database in the short term.</td><td>31 Dec 2019</td><td rowspan="3">Identified</td></tr>
<tr><th colspan="2">Preventative actions taken to ensure no further issues will occur</th><th>Completion date</th></tr>
<tr><td colspan="2">As reported, this DUML is to be metered by the end of 2020.</td><td>31 Dec 2020</td></tr>
</table>

CONCLUSION

Odyssey Energy (2009) Limited (Odyssey) manages the installation, maintenance and database management of all SWDC lighting connections.

SWDC are in the process of installing a CMS system and metering this DUML load. This is expected to be complete by the end of 2020.

The main issues identified are as follows:

- In absolute terms, total annual consumption is estimated to be 9,400 kWh lower than the DUML database indicates.
- Submission is based on a snapshot and does not consider historic adjustments
- Incorrect ballasts resulting in under submission of 1,725 kWh per annum
- Many of the lamp descriptions require additional detail.

The database contains a small number of ballast discrepancies. These are discussed in the report.

The audit found four non-compliance issues and makes no recommendations. The future risk rating of eight indicates that the next audit be completed in 18 months. I agree with this recommendation.

PARTICIPANT RESPONSE