ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

KAIKOURA DISTRICT COUNCIL
AND MERIDIAN ENERGY

Prepared by: Rebecca Elliot

Date audit commenced: 25 September 2019

Date audit report completed: 25 November 2019

Audit report due date: 01 December 2019

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EXECUTIVE SUMMARY

This audit of the Kaikoura District Council (**KDC**) 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.

Kaikoura DC is located on the Mainpower network. Mainpower is engaged as the streetlighting maintenance contractor and they also maintain a database, which is used by Meridian Energy to calculate submission information. Mainpower provides reporting to Meridian Energy on a monthly basis.

No changes have occurred to systems and processes during the audit period and they remain generally robust and secure.

Four non-compliances were found relating to minor discrepancies in the database.

There were minor discrepancies in the ballast values being applied to 19 items of permanent load indicating an estimated over submission of 602 kWh per annum.

A field audit was conducted of a statistical sample of 142 items of load. The "database auditing tool" was used to analyse the results. The analysis confirmed that the database potential error is less than 5.0%.

A recommendation is made that naming conventions and spelling of roads are reviewed to remove duplicate entries for roads.

The future risk rating of eight indicates that the next audit be completed in 18 months. I have considered this in conjunction with Meridian's comments and 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	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot.	Moderate	Low	2	Identified
All load recorded in database	2.5	11(2A) and (d) of Schedule 15.3	Two additional lights found in the field.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602 kWh per annum.	Moderate	Low	2	Identified
Volume information accuracy	3.2	15.2 and 15.37B(c)	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602.211 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot.	Moderate	Low	2	Identified
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
Location of each item of load	2.3	Review and correct the naming conventions and spelling of roads to remove duplicate entries for roads.

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

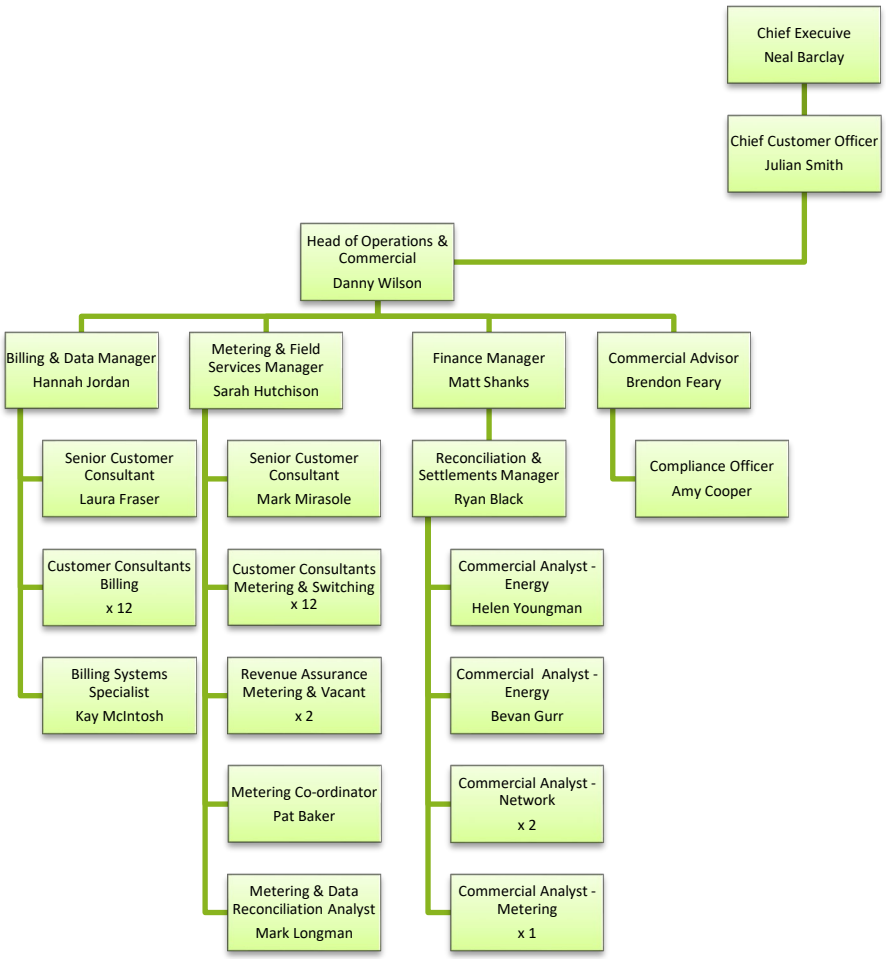
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

Audit commentary

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

1.2. Structure of Organisation

Meridian provided the relevant organisational structure:



1.3. Persons involved in this audit

Auditor:

Rebecca Elliot

Veritek Limited

Electricity Authority Approved Auditor

Brett Piskulic

Veritek Limited

Supporting Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Sarah Barnes	Regulatory Manager	Mainpower
Neil O'Loughlin	Surveyor/ Pricing Co-ordinator	Mainpower
Joel Hung	Commercial Analyst	Mainpower
Amy Cooper	Compliance Officer	Meridian Energy
Helen Youngman	Energy Data Analyst	Meridian Energy

1.4. Hardware and Software

Mainpower maintains an Access database for the management of DUML information.

The database is backed-up 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)
0000366411MPF89	Kaikoura District Council – Streetlighting	CUL0661	DST	398	39,339
Total				398	39,339

1.7. Authorisation Received

All information was provided directly by Meridian and Mainpower.

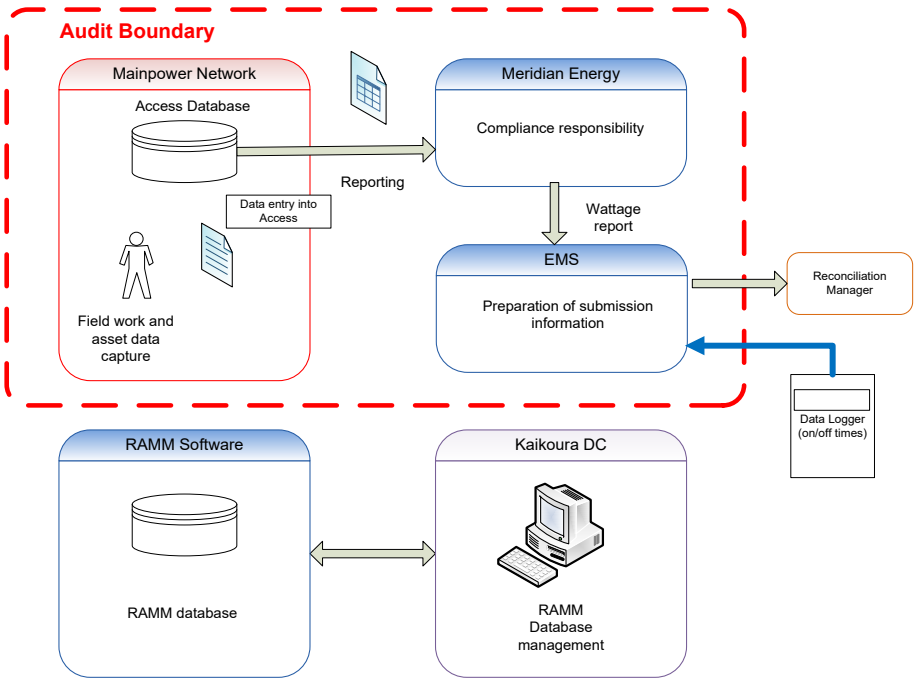
1.8. Scope of Audit

This audit of the Kaikoura District Council (KDC) 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.

Kaikoura DC is located on the Mainpower network. Mainpower is engaged as the streetlighting maintenance contractor and they also maintain a database, which is used by Meridian Energy to calculate submission information. Mainpower provides reporting to Meridian Energy on a monthly basis.

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



The field audit was undertaken of a statistical sample of 142 items of load on 16th and 17th October 2019.

1.9. Summary of previous audit

The previous audit was completed in October 2017 by Steve Woods of Veritek Limited. That audit found four non-compliances and made no recommendations. The current status of that audit's findings is detailed below:

Table of Non-Compliance

Subject	Section	Clause	Non-compliance	Status
Location	2.3	11(2)(b) of Schedule 15.3	16 lamps with an incorrect street address.	Cleared
Wattages	2.4	11(2)(c) & (d) of Schedule 15.3	One lamp has the incorrect wattage.	Cleared
Recording of all load	2.5	11(2A) of Schedule 15.3	Not all load is correctly recorded in the database.	Cleared
Database accuracy	3.1	Clause 15.2 & 15.37(b)	Accuracy ratio is 100.46% indicating under submission of 773 kWh per annum.	Cleared

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.

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.

Audit commentary

Meridian reconciles this DUML load using the DST profile. The on and off times are derived from a data logger read by EMS. This information is used to create a shape file. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure and includes this in the relevant AV080 file. This process was examined during EMS's audit in June 2019 and I confirm compliance. I also checked the figures for September 2019, and I confirm the submission matches the database.

The database accuracy is discussed in **section 3.1.** The field audit confirmed it to be within the acceptable +/-5% accuracy threshold.

19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602.211 kWh per annum. This is detailed in **section 3.1.**

On 18 June 2019, the Electricity Authority issued a memo confirming that 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 data used is a snapshot and this practice is non-compliant.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-Jun-18 To: 16-Oct-19	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602 kWh per annum. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Potential impact: Low Actual impact: Unknown Audit history: None 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 but there is room for improvement. The impact is assessed to be low due to the impact on submission.

Actions taken to resolve the issue	Completion date	Remedial action status
The ballast discrepancies will be provided to Mainpower to review and correct if necessary.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Existing controls are considered adequate to maintain the accuracy of the database.		

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

Mainpower's database contains a customer number that is linked to the relevant ICP in the customer table in Access.

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 access database contains a unique identifier, which is expected to be the pole number attached to the pole. There is also a field for the nearest street address. The database contains a field for GPS coordinates. Although eight lamps did not have GPS coordinates recorded, there was still sufficient information recorded in the address field to be able to locate the lamps.

Some roads are recorded with differing spelling spellings of the same name, e.g. Whitby PL and Whitby Place, Brighton St and Brighton Street, Westend and West End. I recommend that the naming convention and spelling of roads is reviewed and corrected to remove duplicate entries for roads.

Recommendation	Description	Audited party comment	Remedial action
Regarding: Clause 11(2)(b) of Schedule 15.3	Review and correct the naming conventions and spelling of roads to remove duplicate entries for roads.	We will suggest this to Mainpower as a matter of good practice.	Investigating

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 all items of load were recorded.

Audit commentary

The database contains lamp description information within the SL Type, Fitting Pick, Description and Type fields. There are three fields which record the lamp wattage, ballast wattage and total wattage. These fields were populated for all lamps.

The accuracy of lamp descriptions, wattages and ballasts is recorded 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 142 lights using the statistical sampling methodology.

Audit commentary

The field audit discrepancies found are detailed in the table below.

There were two additional lamps found in the field that were not recorded in the database and one lamp not found in the field that was in the database.

Street	Database count	Field count	Light count differences	Wattage recorded incorrectly	Comments
Whitby Place	5	5	-	1	1x incorrect wattage, 70W HPS found in the field recorded as a 53W LED in the database.
South Bay Parade	10	9	-1	-	1x 43W LED not in field (luminaire not on pole).
Ocean Ridge Boulevard	20	22	+2	-	2x additional 70W HPS found in field.
Total	**142**	**143**	**3**	**1**	

This clause relates to lights in the field that are not recorded in the database. I found two additional lamps in the field that were not recorded in the database. The database accuracy is discussed 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-Jun-18 To: 16-Oct-19	Two additional lights found in the field. 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 due to the volume of additional lights found in the field. The impact is assessed to be low due to the low number of differences found in the field and total estimated kWh difference detailed in **section 3.1**.

Actions taken to resolve the issue	Completion date	Remedial action status
Minor discrepancies identified during the field audit will be provided to Mainpower to update the database.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Existing controls are considered adequate to maintain the accuracy of the database.		

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 Access 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

Mainpower demonstrated 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

A database extract was provided 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	Kaikoura DC region
Strata	The database contains items of load in Kaikoura, excluding NZTA. The area has three distinct sub regions of Kaikoura town, South Bay and the Ocean View subdivision on the way into Kaikoura. The processes for the management of Kaikoura DC items of load are the same, but I decided to place the items of load into three strata, as follows: 1. New Kaikoura town 2. South bay 3. Ocean View subdivision (south of town)
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 19 sub-units (roads).
Total items of load	142 items of load were checked.

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

The process to manage changes made in the field being updated in the database was examined.

Audit commentary

Field Audit Findings

A field audit was conducted of a statistical sample of 142 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	100.3	Wattage from survey is higher than the database wattage by 0.3%
R_L	98.8	With a 95% level of confidence it can be concluded that the error could be between -1.2% and 2.0%
R_H	102.0	

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 A (detailed below) applies.

The conclusion from Scenario A is that the variability of the sample results across the strata means that the true wattage (installed in the field) could be between 1.2% lower and 2.0% higher than the wattage recorded in the DUML database. Compliance is recorded because the potential error is less than 5.0%.

In absolute terms the installed capacity is estimated to be equal to the capacity indicated by the database.

There is a 95% level of confidence that the installed capacity is up to 1 kW higher than the database.

In absolute terms, total annual consumption is estimated to be 500 kWh higher than the DUML database indicates.

There is a 95% level of confidence that the annual consumption is between 2,100kWh p.a. lower to 3,300 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 %

Lamp description and capacity accuracy

I checked the wattage being applied in the database and found that 19 lamps had a discrepancy when compared to the standardised wattage table. This is detailed in the table below:

Lamp Type	Database Total Lamp Wattage	EA Standardised Total Wattage	Variance	Database Quantity	Estimated Annual kWh effect on consumption
160w MV	184	175	9	17	653.463
70w MH	77	83	-6	2	-51.252
			Total estimated annual effect on submission		+602.211

The incorrect capacities will be resulting in an estimated over submission of 602 kWh per annum (based on annual burn hours of 4,271 as is detailed in the DUML database auditing tool).

I checked the LED lights against the LED light specification sheets and confirmed them to be correct.

Change management process findings

As changes occur the contractor provides a hard copy form to Mainpower, and this information is then entered into the database.

Outage patrols are conducted by Mainpower and the process is used to identify any incorrect wattage and location issues that may exist. Any discrepancies are recorded on a form and the database is updated.

For new subdivisions, a Mainpower inspector completes a form per light at the time of livening. The database is updated on return of the form.

Mainpower receives requests from the KDC for installation of festive lights. A technician installs the lights and the lights are added to the monthly report for the period of installation.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Jun-18 To: 16-Oct-19	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602 kWh per annum. 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 but there is room for improvement. The impact is assessed to be low due to the impact on submission.

Actions taken to resolve the issue	Completion date	Remedial action status
The ballast discrepancies will be provided to Mainpower to review and correct if necessary.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Existing controls are considered adequate to maintain the accuracy of the database.		

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; and
- 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 on and off times are derived from a data logger read by EMS. This information is used to create a shape file. Meridian supplies EMS with the capacity information and EMS calculates the kWh figure and includes this in the relevant AV080 file. This process was examined during EMS's audit in June 2019 and I confirm compliance. I also checked the figures for September 2019, and I confirm the submission matches the database.

The database accuracy is discussed in **section 3.1.** The field audit confirmed it to be within the acceptable +/-5% accuracy threshold.

19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602.211 kWh per annum. This is detailed in **section 3.1.**

On 18 June 2019, the Electricity Authority issued a memo confirming that 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 data used is a snapshot and this practice is non-compliant.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Jun-18 To: 16-Oct-19	19 items of permanent load have the incorrect ballast applied indicating an estimated over submission of 602.211 kWh per annum. The data used for submission does not track changes at a daily basis and is provided as a snapshot. Potential impact: Low Actual impact: Low Audit history: None 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 but there is room for improvement. The impact is assessed to be low due to the impact on submission.

Actions taken to resolve the issue	Completion date	Remedial action status
The ballast discrepancies will be provided to Mainpower to review and correct if necessary.	31 Dec 2019	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Existing controls are considered adequate to maintain the accuracy of the database.		

CONCLUSION

Kaikoura DC is located on the Mainpower network. Mainpower is engaged as the streetlighting maintenance contractor and they also maintain a database, which is used by Meridian Energy to calculate submission information. Mainpower provides reporting to Meridian Energy on a monthly basis.

No changes have occurred to systems and processes during the audit period and they remain generally robust and secure.

Four non-compliances were found relating to minor discrepancies in the database.

There were minor discrepancies in the ballast values being applied to 19 items of permanent load indicating an estimated over submission of 602.211 kWh per annum.

A field audit was conducted of a statistical sample of 142 items of load. The “database auditing tool” was used to analyse the results. The analysis confirmed that the database potential error is less than 5.0%.

A recommendation is made that naming conventions and spelling of roads are reviewed to remove duplicate entries for roads.

The future risk rating of eight indicates that the next audit be completed in 18 months. I have considered this in conjunction with Meridian’s comments and I agree with this recommendation.

PARTICIPANT RESPONSE

Meridian has reviewed this audit. Their comments are recorded in the body of the report. No further comments were provided.