ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

CHRISTCHURCH CITY COUNCIL AND CONTACT ENERGY LIMITED

Prepared by: Tara Gannon

Date audit commenced: 4 February 2020

Date audit report completed: 25 February 2020

Audit report due date: 1 March 2020

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EXECUTIVE SUMMARY

This audit of the **Christchurch City Council (CCC) DUML database** and processes was conducted at the request of **Contact Energy Limited (Contact)**, 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.

Electricity is supplied in the CCC region by Orion and Mainpower. Orion and Mainpower both manage databases of unmetered load information on behalf of CCC, who is Contact's customer. 43,957 unmetered items of load (99.72%) are connected to Orion's network, and 124 unmetered items of load (0.28%) are connected to Mainpower's network in Kainga.

Orion

Orion's fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database.

A field audit was conducted of a statistical sample of 546 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	100.8	Wattage from survey is higher than the database wattage by 0.8%
R_L	99.2	With a 95% level of confidence it can be concluded that the error could be between -0.8% and +3.4%
R_H	103.4	

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 ± 5.0%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.8% lower and 3.4% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 33 kW lower and 149 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 157,400 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 142,100 kWh p.a. lower and 635,400 kWh p.a. higher than the database indicates.

Mainpower

Mainpower's fault, maintenance, new connection and upgrade work is completed by Mainpower or Mainpower's approved contractors. Paperwork is provided to the Mainpower records team confirming that work is complete, and Mainpower uses this information to update the database.

A field audit was conducted of all 124 items of load recorded in the database. I found that the field wattage was 92.4% of the database wattage, and non-compliance is recorded because the error is more than ± 5.0%.

Submission processes

Contact reconciles the Orion and Mainpower DUML load using the HHR profile in accordance with exemption 177. Wattages are derived from the monthly database extracts provided by Orion and Mainpower, and on and off times are derived from a data logger.

Orion has some unmetered smart lights connected on its LV network, which are available 24 hours, and are turned on and off by a light sensor. Orion's smart light ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0 are recorded with "inactive reconciled elsewhere" status, and the volumes are submitted against the corresponding DUML ICP for the NSP. The DUML lights are controlled, and the on and off hours are recorded by the data logger. Because of the different control methods, the smart lights are unlikely to have the same on hours as the DUML ICPs.

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 Orion monthly report is provided with supporting information which includes the daily unmetered kW and number of connections for each ICP. Contact applies the kW value for the last day of the month when calculating submission volumes.

The Mainpower monthly report is provided as a snapshot and is non-compliant.

Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Conclusion

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. This is a significant improvement from a future risk rating of 31 in the previous audit, largely because database accuracy for the Orion audit sample had increased. I agree that a maximum audit period of 18 months is appropriate following this audit.

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	**Orion** 288 lamps have incorrect total wattages, resulting in estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours. 41.852 kW relating to smart lights connected to "reconciled elsewhere" status ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0, are reconciled under the DUML ICP for the same NSP. The on hours for these ICPs may differ to the logger hours, because they are controlled by daylight sensors. Submissions are calculated based on a snapshot at the end of the month. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours). There was a 271 W or 73.84 kWh difference between the database information and submission information for January 2020. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently. 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) of Schedule 15.3	**Mainpower** Five L20 lamps situated on Pine Ave are not included in the database, resulting in estimated under submission of 100W or 427.10 kWh p.a. based on 4,271 burn hours.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B (b)	**Orion** 288 lamps have incorrect total wattages, resulting in estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours.	Moderate	Low	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
			Some addresses and GPS coordinates do not reflect the physical location of the item of load, particularly where the light is installed beyond the customer's boundary. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours). Some street addresses do not reflect the street that the light is located on. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently.				
Volume information accuracy	3.2	15.2 and 15.37B (c)	**Orion** 288 lamps have incorrect total wattages, resulting in estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours. 41.852 kW relating to smart lights connected to "reconciled elsewhere" status ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0, are reconciled under the DUML ICP for the same NSP. The on hours for these ICPs may differ to the logger hours, because they are controlled by daylight sensors. Submissions are calculated based on a snapshot at the end of the month. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours). There was a 271 W or 73.84 kWh difference between the database information and submission information for January 2020. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently.	Moderate	Low	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

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

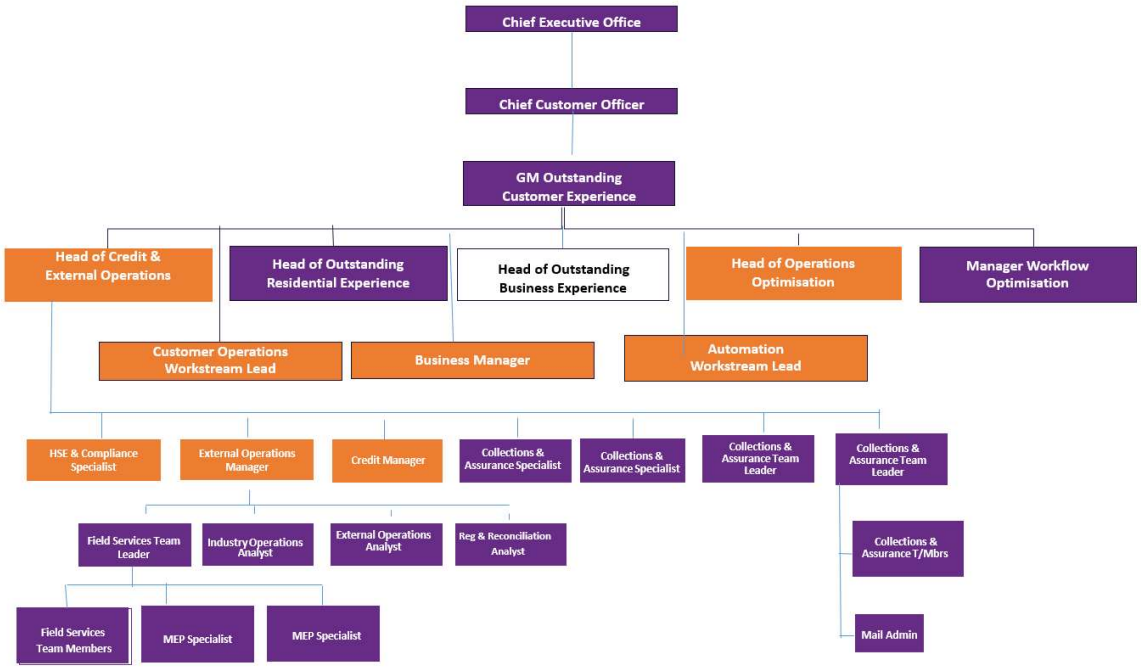
Audit commentary

There is one exemption in place relevant to the scope of this audit:

Exemption No. 177: Exemption to clause 8(g) of schedule 15.3 of the Electricity Industry Participation Code 2010 ("Code") in respect of providing half-hour ("HHR") submission information instead of non half-hour ("NHH") submission information for distributed unmetered load ("DUML"). This exemption expires at the close of 31 October 2023.

1.2. Structure of Organisation

Contact Energy provided a copy of their 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
Penny Lawrence	Operations Services	Orion
Neil O'Loughlin	Maintenance Manager	Mainpower
Joel Hung	Commercial Analyst	Mainpower
Sam Baker	Auto CAD/GIS Technician	Mainpower
Allie Jones	External Operations	Contact Energy

1.4. Hardware and Software

Orion

Orion use a purpose built Oracle Streetlighting/DUML database for the management of the DUML information. Backup and restoration procedures are in place, and access to the Orion network (including the database) is restricted using logins and passwords.

Mainpower

Mainpower use an Access based Mainpower Streetlight Database for the management of the DUML information. Backup and restoration procedures are in place, and access to the Mainpower network (including the database) is restricted using logins and passwords.

1.5. Breaches or Breach Allegations

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

1.6. ICP Data

Orion

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0007102593RN8D3	Orion_CCC GXP street light ICP	BRY0661	HHR	15,050	1,519,947.1
0007102594RN519	Orion_CCC GXP street light ICP	ISL0331	HHR	3,613	357,134.9

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0007102595RN95C	Orion_CCC GXP street light ICP	ISL0661	HHR	25,294	2,543,017.9
Total				43,957	4,420,099.9

Orion has some unmetered smart lights connected on its LV network, which are available 24 hours, and are turned on and off by a light sensor. Orion's smart light ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0 are recorded with "inactive reconciled elsewhere" status, and the volumes are submitted against the corresponding DUML ICP for the NSP as discussed in **sections 2.1** and **3.2**.

Mainpower

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0000366681MPA69	Mainpower - KAI0111 Riverlea Estate Dr	KAI0111	HHR	20	400
0000366751MPE2F	Mainpower - KAI0111 Street Lights	KAI0111	HHR	104	6,876
Total				124	7,276

1.7. Authorisation Received

All information was provided directly by Contact, Orion or Mainpower.

1.8. Scope of Audit

This audit of the CCC DUML database and processes was conducted at the request of Contact 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.

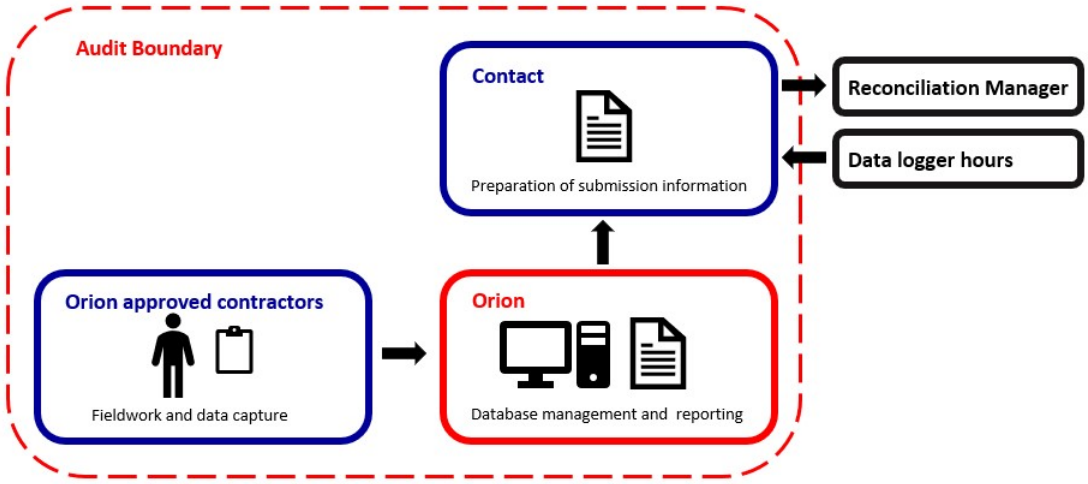
Electricity is supplied in the CCC region by Orion and Mainpower. Orion and Mainpower both manage databases of unmetered load information on behalf of CCC, who is Contact's customer. 43,957 unmetered items of load (99.72%) are connected to Orion's network, and 124 unmetered items of load (0.28%) are connected to Mainpower's network in Kainga.

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 diagrams below show the audit boundaries for clarity.

Orion

Orion's fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database. A monthly report from the database is provided to Contact, and used to calculate submissions. Contact submits the DUML load as HHR using the HHR profile. On hours are derived using data logger information.

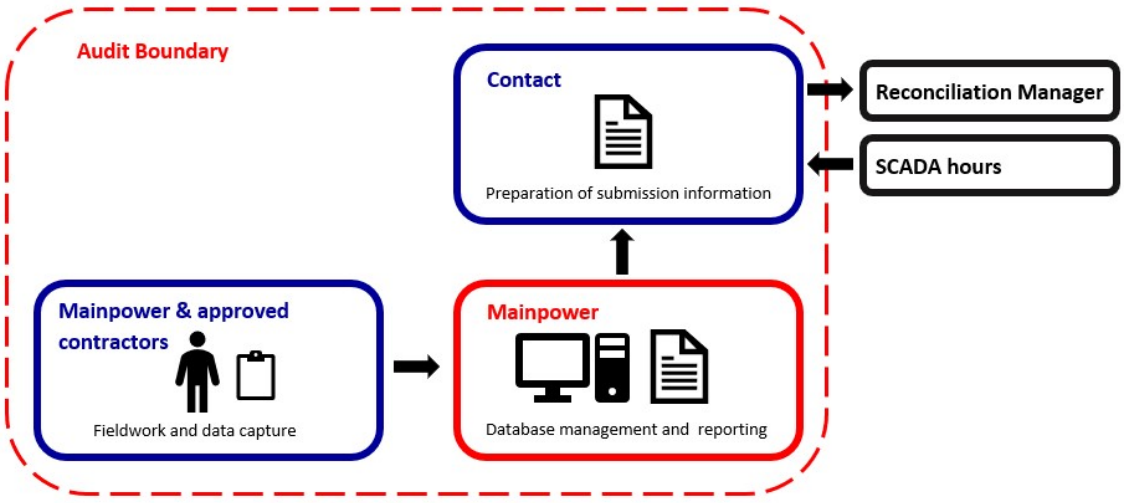
Orion's smart light ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0 are recorded with "inactive reconciled elsewhere" status, and the volumes are submitted against the corresponding DUML ICP for the NSP as discussed in **sections 2.1** and **3.2**.



A field audit was undertaken of a statistical sample of 526 items of load for Orion on 4-5 February 2020.

Mainpower

Mainpower's fault, maintenance, new connection and upgrade work is completed by Mainpower or Mainpower's approved contractors (mainly Connetics). Paperwork is provided to the Mainpower records team confirming that work is complete, and Mainpower uses this information to update the database. A monthly report from the database is provided to Contact, and used to calculate submissions. Contact submits the DUML load as HHR using the HHR profile. On hours are derived using SCADA information.



A field audit was undertaken for all 124 items of load for Mainpower on 3 February 2020.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Tara Gannon of Veritek Limited in May 2019. 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
Deriving submission information	2.1	11(1) of Schedule 15.3	**Orion** The February 2019 kW applied for submission are higher than the database extract values for February 2019 by 40.593 kW or 11,599.57 kWh based on the on hours for the month. The database contains some inaccurate data. **Mainpower** The database contains some inaccurate data.	Still existing
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	**Mainpower** One lamp in the Mainpower database does not have a lamp model, lamp wattage or ballast wattage recorded.	Cleared
All load recorded in database	2.5	11(2A) of Schedule 15.3	**Orion** 13 items of load missing from the database. **Mainpower** Five items of load missing from the database.	Cleared Still existing
Database accuracy	3.1	15.2 and 15.37B(b)	**Orion** The database contains some inaccurate data. **Mainpower** The database contains some inaccurate data.	Still existing
Volume information accuracy	3.2	15.2 and 15.37B(c)	**Orion** The February 2019 kW applied for submission are higher than the database extract values for February 2019 by 40.593 kW or 11,599.57 kWh based on the on hours for the month.	Still existing

Subject	Section	Clause	Non-compliance	Status
			ICPs 0007102594RN519 and 0007102595RN95C had RPS HHR profile recorded instead of HHR. The database contains some inaccurate data. **Mainpower** ICP 0000366751MPE2F had RPS HHR profile recorded instead of HHR. The database contains some inaccurate data.	

Subject	Section	Description	Recommendation	**Status**
Database accuracy	3.1	Street address information	Check and update street addresses to reflect the street that the lights are situated on.	Not implemented

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

Code reference

Clause 16A.26 and 17.295F

Code related audit information

Retailers must ensure that DUML database audits are completed:

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

Audit observation

Contact 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 the Orion and Mainpower databases 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

Orion

Contact reconciles the Orion DUML load using the HHR profile in accordance with exemption 177.

- Wattages are derived from an extract provided by Orion each month. 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 checked the November 2019 submission data for ICPs 0007102593RN8D3, 0007102594RN519 and 0007102595RN95C, and confirmed that the data logger on and off times and kW from the DUML database extract are included in the submission information.

I found that the kW applied for submission differed from the database values due to the inclusion of wattages for smart lights connected to ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0. I confirmed that Contact adds the wattages for each of CCC's smartlight ICPs to the DUML ICP which is connected to the same NSP as follows:

Smartlight ICP	DUML ICP for reconciliation	Smartlight kW (November 2019)
0007182097RN3F9 (BRY0661)	0007102593RN8D3 (BRY0661)	2.039
0007182098RNC27 (ISL0331)	0007102594RN519 (ISL0331)	0.020
0007182100RN8D0 (ISL0661)	0007102595RN95C (ISL0661)	39.793

Orion's smart lights are connected to the LV network, and are available 24 hours. The lights are turned on and off by a light sensor. The DUML lights are controlled, and the on and off hours are recorded by the data logger. Because of the different control methods, the smart lights are unlikely to have the same on hours as the DUML ICPs.

As discussed in **section 3.1**, festive lights have not been connected at all during the last two years and were correctly excluded from the calculation.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
288 lamps have incorrect total wattages.	Over submission of 1,207 kWh per annum

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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Contact applies the kW value for the last day of the month when calculating submission volumes. Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Orion's database records a "start date" and "created date". The "start date" is entered by the user and reflects the date that the light was installed or changed, and system controls prevent future "start dates" from being entered. The "created date" reflects when the database record was created. Full history of the records that applied from each start date can be viewed in the database.

Mainpower

Contact reconciles the Mainpower DUML load using the HHR profile in accordance with exemption 177.

- Wattages are derived from an extract provided by Mainpower each month. The database is not confirmed as accurate as recorded in **section 3.1**.
- On and off times are derived from SCADA data.

I checked the November 2019 and January 2020 submission data for ICPs 0000366681MPA69 and 0000366751MPE2F, and confirmed that the calculation methodology was correct. For January 2020, I found that there was a small difference between the wattage applied by Contact and the database extract I received from Mainpower on 13/01/20. Mainpower confirmed that there were no database updates between December 2019 and 3 February 2020, and the totals were expected to match.

January 2020					
ICP Number	Description	Database wattage (watts)	Applied wattage (watts)	Difference (watts)	Difference (kWh)
0000366681MPA69	Mainpower - KAI0111 Riverlea Estate	400	400	-	-
0000366751MPE2F	Mainpower - KAI0111 Street Lights	6,876	6,605	271	73.84
Total		7,276	7,005	271	73.84

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Potential over submission due to database inaccuracy identified during the field audit	Over submission of 2,366 kWh p.a.

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. Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Mainpower's database records a "comm date" and "install year". The "comm date" is the installation date, and the "install year" is the year of installation. Mainpower's procedure is to change the "comm date" and "install year" to match the date of the light change when changes occur. I viewed four examples of new installations and changes to existing lamps and found that the "install year" reflected the year in which the latest lamp change occurred (or the installation date if there were no changes), and the "comm date" reflected the date the latest lamp change occurred or the installation date. The correct installation dates were all recorded in Mainpower's GIS.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: unknown To: 05-Feb-20	**Orion** 288 lamps have incorrect total wattages, resulting in estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours. 41.852 kW relating to smart lights connected to "reconciled elsewhere" status ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0, are reconciled under the DUML ICP for the same NSP. The on hours for these ICPs may differ to the logger hours, because they are controlled by daylight sensors. Submissions are calculated based on a snapshot at the end of the month. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours). There was a 271 W or 73.84 kWh difference between the database information and submission information for January 2020. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently. 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: Twice

	Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. The impact is assessed to be low, based on the kWh differences described above. The smart light load is reconciled, but the difference in on hours may have a minor impact on submission. A list of discrepancies has been provided to Orion and Mainpower who are working to investigate and resolve them.

Actions taken to resolve the issue	Completion date	Remedial action status
Contact Energy will work with Orion to ensure their database is accurate Contact Energy is continuing to work on a strategy that will satisfy the rules and regulations without a certified central metering system Contact Energy are to work on a process to be able to submit on any given day Contact Energy will work with Mainpower to ensure their database is accurate. We will work with Mainpower to ensure this database is capable of recording dates accurately and reporting on them	TBA	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Contact Energy will continue to work with all parties to ensure their databases are accurate. We complete quarterly DUML database checks and work with all parties on the results of these	Ongoing	

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 databases were checked to confirm the correct ICP was recorded against each item of load.

Audit commentary

Orion

All Orion items of load have an ICP recorded against them.

Mainpower

All Mainpower items of load have an ICP recorded against them.

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 databases were checked to confirm the location is recorded for all items of load.

Audit commentary

Orion

The database contains fields for the street name, number, and GPS coordinates. GPS coordinates are recorded for all items of load.

Where lighting is installed beyond the customer's property boundary, such as in parks, reserves, and community housing properties, a single GPS and address location which reflects the point of connection to the streetlight circuit is recorded for all lights at that address.

Address accuracy is discussed further in **section 3.1**.

Mainpower

All items of load have street and area recorded. The database contains GPS coordinates for most items of load, and the items without GPS coordinates have a pole or nearest house location recorded.

Address accuracy is discussed further in **section 3.1**.

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

Orion

The database contains a lamp type, which corresponds to a lamp total wattage including ballast wattage. All items of load have a lamp type and total wattage recorded. The accuracy of the recorded wattages is discussed in **section 3.1**.

Mainpower

Mainpower's database contains light type which corresponds to lamp wattage, gear wattage and size (total wattage) information recorded in the SLType table.

All items of load had a light type recorded, and all light types have a size (total wattage) recorded in the SLType table. LED lights do not have a lamp or gear wattage recorded in the SLType table, only the total wattage is recorded.

I confirmed that no light types had an invalid zero or blank total wattage recorded, and all light types which required a gear wattage had a valid lamp and gear wattage recorded. The accuracy of the recorded wattages 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

Orion

A field audit was undertaken of a statistical sample of 546 items of load on 4-5 February 2020. The sample was selected from four strata, as follows:

- 0007102593RN8D3,
- 0007102594RN519,
- 0007102595RN95C street names A to K, and
- 0007102595RN95C street names L to Z.

Mainpower

A field audit included all 124 items of load and was undertaken on 3 February 2020.

Audit commentary

Orion

The field audit discrepancies are detailed in the table below:

Light model	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
0007102593RN8D3					
Damien Place	8	8	-	8	7 x L22 + 1 x L36 were recorded in the database as 5 x 19.9W LED + 2 x 22.1W LED + 1 x 29W LED.
Dolamore Pl by Helanca St	1	1	-	1	One L25 was recorded in the database as 110W HPS.
Gresford St	6	6	-	1	1 x 70W HPS at the corner of Hills Rd and Gresford St was recorded as 29W LED in the database.
Jellicoe St	9	9	-	9	3 x 22W LED + 6 x 36W LED were recorded in the database as 4 x 19.9W LED + 2 x 22.1W LED + 3 x 29W LED.
London St	50	50	-	3	2 x 150W MH were recorded in the database as 1 x 2*20FF and 1 x 2*30FF. 1 x L36 was recorded in the database as 29W LED.
0007102595RN95C street names A to K					
Deepdale St	8	8	-	1	1 x L25 was recorded in the database as 29W LED.
Deepdale St by Teesdale	1	1	-	1	1 x L20 was recorded in the database as 24W LED.
Guildford St	14	14	-	12	12 x L24 were recorded in the database as 18W LEDs. All lights on Guildford St were labelled L24.
0007102595RN95C street names L to Z					
Lancewood Dr	17	17	-	1	1 x L36 was recorded in the database as 2*30W FF (SL005837).
Grand Total	**546**	**545**	**-1**	**37**	

The field audit did not find any items of load missing from the database, so compliance is recorded in this section for Orion. Other light count and wattage differences identified during the field audit are recorded as non-compliance in **section 3.1**.

Mainpower

The field audit discrepancies are detailed in the table below:

Light model	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
GILLESPIES RD	2	2	-	1	1 x L36 (site 2453) was recorded as TERRALED 29W in the database.
KAINGA RD	51	51	-	12	3 x L20 and 9 x L36 were recorded in the database as 1 x Mercury Vapour 125 Watt, 3 x Roadgrace BRP711 LED30 26W, 2 x Sodium High Pressure 70 Watt, 4 x TERRALED 23W and 2 x TERRALED 36W.
MAIN NORTH RD	18	18	-	3	3 x NXT 72M west and south of Link Rd are recorded as Sodium High Pressure 250 Watt in the database.
PINE AVE	3	8	5	2	2 x L36 are recorded in the database as 1 x TERRALED 29W and 1 x Sodium High Pressure 110 Watt. 5 x L20 lamps situated on Pine Ave are not included in the database.
Grand Total	**124**	**129**	**5**	**18**	

The field audit found five items of load were missing from the database, which are recorded as non-compliance below. Other light count and wattage differences identified during the field audit are 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: unknown To: 03-Feb-20	**Mainpower** Five L20 lamps situated on Pine Ave are not included in the database, resulting in estimated under submission of 100W or 427.10 kWh p.a. based on 4,271 burn hours. 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 most items of load are included in the database. The impact is assessed to be low based on an estimated under submission of 427.10 kWh p.a.

Actions taken to resolve the issue	Completion date	Remedial action status
Contact will work with our customers to ensure their database is accurate.	Ongoing	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Contact Energy will continue to work with all parties to ensure their databases are accurate. We complete quarterly DUML database checks and work with all parties on the results of these	Ongoing	

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 for both databases.

The change management process and the compliance of the database reporting provided to Contact 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 databases were checked for audit trails.

Audit commentary

Orion

Orion demonstrated a complete audit trail of all additions and changes to the database information. The user who processed the change is stored in the back end of the database.

Mainpower

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

Orion

Contact's submissions are based on a monthly extract from the Orion 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	CCC streetlights connected to the Orion network within the CCC geographical boundary.
Strata	The database contains 43,957 items of load. The processes for the management of all CCC items of load is the same. The database was divided into four strata: • 0007102593RN8D3, • 0007102594RN519, • 0007102595RN95C street names A to K, and • 0007102595RN95C street names L to Z.
Area units	I created a pivot table of the roads in each database and used a random number generator to select a total of 32 sub-units across the four strata.
Total items of load	546 items of load were checked.

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.

Mainpower

Contact's submissions are based on a monthly extract from the Mainpower 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	CCC streetlights connected to the Mainpower network in Kaiapoi
Strata	The database contains 124 items of load in Christchurch City Council area. All 124 items of load were checked.
Area units	Not applicable, all 124 items of load were checked.

Plan Item	Comments
Total items of load	All 124 items of load were checked.

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

Orion

Field audit findings

A field audit was conducted of a statistical sample of 546 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	100.8	Wattage from survey is higher than the database wattage by 0.8%
R_L	99.2	With a 95% level of confidence it can be concluded that the error could be between -0.8% and +3.4%
R_H	103.4	

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 ± 5.0%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.8% lower and 3.4% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 33 kW lower and 149 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 157,400 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 142,100 kWh p.a. lower and 635,400 kWh p.a. higher than the database indicates.

Compliance is confirmed.

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**, all lights have a lamp and gear wattage recorded.

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
M05FF (Mini FF 5)	5W	4.5W	153	-76.5W	Cleared, now updated
26W LED (Orangetek TERRALED 24 LED)	26W	24W	127	-254W	Cleared, now updated
LED24 (24W 24V LED FLOOD LIGHT)	90W	24W	1	-66W	Cleared, now removed
EM48	56W	65W	4	+36W	To be updated
106W LED (ADLT Cree LEDway 60 LED)	106W	132W	3	+78W	To be updated
		Total	288	-282.5W	

This could result in an estimated annual over submission of 1,207 kWh.

ICP number accuracy

As discussed in **section 2.2**, all lights have a GXP and corresponding ICP recorded. The ICP and corresponding GXP number are assigned based on information provided during the connection process.

I compared the street addresses and GXP recorded for all items of load, and found that 120 streets had items of load connected to more than one NSP. For 31 streets, the two NSPs were ISL0331 and ISL0661 and the assignment appeared reasonable. The remaining 89 streets were checked, and I confirmed that there was a 1:1 relationship between the circuit assigned and the GXP, and the affected streets had lights connected to more than one circuit. I also mapped the GPS coordinates for a sample of 2,018 ICPs and confirmed that the locations appeared reasonable for the GXP assigned.

Address location accuracy

As discussed in **section 2.3**, all lights have an address recorded.

Where Orion is aware that lights are installed but CCC has not provided roading information, Orion records the GPS locations of the lights and a placeholder for road name such as "Road 1", "Unknown" or "Unnamed". Once the street details are provided the road names are updated. I confirmed the process by viewing a sample of lights assigned to an unnamed road in the pre-audit database extract and found that the road names had been updated by 5 February 2020.

Where lighting is installed beyond the customer's property boundary, such as in parks, reserves, and community housing properties, a single GPS and address location which reflects the point of connection to the streetlight circuit is recorded for all lights at that address.

Change management process findings

Fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the Streetlighting/DUML database and GIS. For new subdivisions, this paperwork includes "as built" plans.

Upon receipt, paperwork is checked for completeness and accuracy and any issues are followed up with the contractor. The information is sent to the GIS team so that the GIS can be updated, and then returned to the connections team to update the Streetlighting/DUML database from the date the change or new connection was effective. Once data entry is complete, the values loaded are checked against the paperwork provided, and some spot checks in the field are completed. Paperwork is normally promptly provided electronically, and processed within two to three business days of receipt.

All jobs are tracked using job numbers by the connections team as part of the works management process. Late paperwork from contractors, and late updates by the GIS team are followed up. A checklist is followed to ensure that all steps in the process are completed.

Orion's approved contractors have access to a web based version of the Streetlighting/DUML database in the field, and advise Orion's connections team if they notice any discrepancies in the data recorded. Orion's operation team acts on these notifications, and checks and updates the data where necessary.

Orion has some unmetered smart lights connected on its LV network. Smart lights are available 24 hours, and are turned on and off by a light sensor. The smart lights are connected to ICPs 0007102593RN8D3, 0007102594RN519 and 0007102595RN95C, which have a status of inactive - reconciled elsewhere. The load for these ICPs is reconciled under the DUML ICPs as discussed in **sections 2.1** and **3.2**.

An LED upgrade project is underway, and in the long term CCC is considering using a centralised management system to dim streetlights. Lights are upgraded in batches of 600-1,200 at a time. The upgrade data including pole, light, and installation date information is provided in spreadsheet form and

the IT team run scripts to load the information in the database. The IT and connections teams complete testing on the updates to ensure that the records are correct.

Quarterly outage patrols are completed by Orion's contractors as part of the maintenance programme. Outages are also reported by residents within the CCC region and work orders are raised with contractors as required.

Orion's database records a "start date" and "created date". The "start date" is entered by the user and reflects the date that the light was installed or changed, and system controls prevent future "start dates" from being entered. The "created date" reflects when the database record was created. Full history of the records that applied from each start date can be viewed in the database.

Festive lights

Festive lights are recorded in the database with a class of "miscellaneous" and street address which includes "Christmas lights". These lights are listed as not in service in the database when disconnected, and made active when they are connected so that they can be included in submission data. The festive lights have not been connected for the past two years and have been correctly excluded from submission information.

Private lights

New private lights are not accepted, and where private lights are identified Orion arranges for standard or shared unmetered load to be created. In the meantime, private unmetered lights are recorded in the database against the appropriate ICP number and reported to Contact in the monthly extracts. I viewed an example of a private streetlight in the database to confirm this.

Mainpower

Field audit findings

A field audit was conducted of all 124 items of load recorded in the database. I found that the field wattage was 92.4% of the database wattage, and non-compliance is recorded because the error is more than ±5.0%. The estimated over submission is 554W or 2,366 kWh p.a. based on 4,271 burn hours. The variances are detailed in **section 2.5**.

Light description and capacity accuracy

As discussed in **section 2.4**, all lights have a size (total wattage) recorded. All lamps requiring a gear wattage also have the lamp and gear wattage populated. Lamp and gear wattages for all other lamps were compared to the expected values and found to be recorded correctly.

ICP number accuracy

As discussed in **section 2.2**, all lights have an ICP recorded. I compared the street addresses and GXP recorded for all items of load, and found that Pine Avenue had items of load connected to 0000366681MPA69 (Mainpower - KAI0111 Riverlea Estate Dr) and 0000366751MPE2F (Mainpower - KAI0111 Street Lights). Pine Avenue intersects Riverlea Estate Drive, and the assigned ICPs are correct based on the light locations. Both ICPs are connected to the same NSP.

Address location accuracy

As discussed in **section 2.3**, all lights have an address recorded. I found that street names and GPS locations were sometimes inconsistent (e.g. lights on Pikes Track are recorded as Kainga Rd, some lights on Kainga Rd and Riverlea Estate Drive are recorded as Pine Ave), and that street names were sometimes recorded inconsistently (e.g. Cawood St/Cawood Tce, Gillespie St/Gillespies Rd, Ourbridge/Ourbridge St, Riverlea Est Drive/Riverlea Estate Driv/Riverlea Estate Drive).

The previous audit recommended that the street names should be reviewed and corrected, which has not been done. I found that in general the GPS locations appeared correct, and these were relied upon when completing the field audit.

Change management process findings

Mainpower's fault, maintenance, new connection and upgrade work is completed by Mainpower or Mainpower's approved contractors. Paperwork is provided to the Mainpower records team confirming that work is complete, and Mainpower uses this information to update the database. Mainpower relies on the paperwork to confirm the details to be loaded into the database, field checks are not normally completed.

New connections and new subdivisions are rare. The technician provides a form per light and these are signed at the time of data entry to confirm database population. There is also a check against the design. Information is entered into the database immediately on receipt, without having to wait for other departments to process their information. No new subdivisions were created during the audit period.

Around 75% of lights have been replaced with LEDs, and the remaining 25% are expected to be upgraded. New LED installations allow for use of a centralised management system and dimming.

Outage patrols are not completed for the Kainga lights.

Mainpower's database records a "comm date" and "install year". The "comm date" is the installation date, and the "install year" is the year of installation. Mainpower's procedure is to change the "comm date" and "install year" to match the date of the light change when changes occur. I viewed four examples of new installations and changes to existing lamps and found that the "install year" reflected the year in which the latest lamp change occurred (or the installation date if there were no changes), and the "comm date" reflected the date the latest lamp change occurred or the installation date. The correct installation dates were all recorded in Mainpower's GIS.

Festive lights

There are no festive lights within the CCC area of Mainpower's network.

Private lights

There are no private lights within the CCC area of Mainpower's network.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: unknown To: 05-Feb-20	**Orion** 288 lamps have incorrect total wattages, resulting in an estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours. Some addresses and GPS coordinates do not reflect the physical location of the item of load, particularly where the light is installed beyond the customer's boundary. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours). Some street addresses do not reflect the street that the light is located on. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently. Potential impact: Medium Actual impact: Unknown Audit history: Twice Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. The impact is assessed to be low, based on the kWh differences described above. A list of discrepancies has been provided to Orion and Mainpower who are working to investigate and resolve them.

Actions taken to resolve the issue	Completion date	Remedial action status
Contact Energy will work with Orion to ensure their database is accurate Contact Energy is continuing to work on a strategy that will satisfy the rules and regulations without a certified central metering system Contact Energy are to work on a process to be able to submit on any given day Contact Energy will work with Mainpower to ensure their database is accurate. We will work with Mainpower to ensure this database is capable of recording dates accurately and reporting on them	TBA	Identified

Preventative actions taken to ensure no further issues will occur	Completion date	
Contact Energy will continue to work with all parties to ensure their databases are accurate. We complete quarterly DUML database checks and work with all parties on the results of these	Ongoing	

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

Code reference

Clause 15.2 and 15.37B(c)

Code related audit information

The audit must verify that:

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

Audit observation

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

Orion

Contact reconciles the Orion DUML load using the HHR profile in accordance with exemption 177. The correct profiles and submission types are recorded on the registry.

- Wattages are derived from an extract provided by Orion each month. 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 checked the November 2019 submission data for ICPs 0007102593RN8D3, 0007102594RN519 and 0007102595RN95C, and confirmed that the data logger on and off times and kW from the DUML database extract are included in the submission information.

I found that the kW applied for submission differed from the database values due to the inclusion of wattages for smart lights connected to ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0. I confirmed that Contact adds the wattages for each of CCC's smartlight ICPs to the DUML ICP which is connected to the same NSP as follows:

Smartlight ICP	DUML ICP for reconciliation	Smartlight kW (November 2019)
0007182097RN3F9 (BRY0661)	0007102593RN8D3 (BRY0661)	2.039
0007182098RNC27 (ISL0331)	0007102594RN519 (ISL0331)	0.020
0007182100RN8D0 (ISL0661)	0007102595RN95C (ISL0661)	39.793

Orion's smart lights are connected to the LV network, and are available 24 hours. The lights are turned on and off by a light sensor. The DUML lights are controlled, and the on and off hours are recorded by the data logger. Because of the different control methods, the smart lights are unlikely to have the same on hours as the DUML ICPs.

As discussed in **section 3.1**, festive lights have not been connected at all during the last two years and were correctly excluded from the calculation.

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
288 lamps have incorrect total wattages.	Over submission of 1,207 kWh per annum

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 with supporting information which includes the daily unmetered kW and number of connections for each ICP. Contact applies the kW value for the last day of the month when calculating submission volumes. Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Orion's database records a "start date" and "created date". The "start date" is entered by the user and reflects the date that the light was installed or changed, and system controls prevent future "start dates" from being entered. The "created date" reflects when the database record was created. Full history of the records that applied from each start date can be viewed in the database.

Mainpower

Contact reconciles the Mainpower DUML load using the HHR profile in accordance with exemption 177. the correct profiles and submission types are recorded on the registry.

- Wattages are derived from an extract provided by Mainpower each month. The database is not confirmed as accurate as recorded in **section 3.1**.
- On and off times are derived from SCADA data.

I checked the November 2019 and January 2020 submission data for ICPs 0000366681MPA69 and 0000366751MPE2F, and confirmed that the calculation methodology was correct. For January 2020, I found that there was a small difference between the wattage applied by Contact and the database extract I received from Mainpower on 13/01/20. Mainpower confirmed that there were no database updates between December 2019 and 3 February 2020, and the totals were expected to match.

January 2020					
ICP Number	Description	Database wattage (watts)	Applied wattage (watts)	Difference (watts)	Difference (kWh)
0000366681MPA69	Mainpower - KAI0111 Riverlea Estate	400	400	-	-

January 2020					
ICP Number	Description	Database wattage (watts)	Applied wattage (watts)	Difference (watts)	Difference (kWh)
0000366751MPE2F	Mainpower - KAI0111 Street Lights	6,876	6,605	271	73.84
Total		7,276	7,005	271	73.84

Volume inaccuracy is present as follows:

Issue	Estimated volume information impact (annual kWh)
Potential over submission due to database inaccuracy identified during the field audit	Over submission of 2,366 kWh p.a.

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. Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Mainpower's database records a "comm date" and "install year". The "comm date" is the installation date, and the "install year" is the year of installation. Mainpower's procedure is to change the "comm date" and "install year" to match the date of the light change when changes occur. I viewed four examples of new installations and changes to existing lamps and found that the "install year" reflected the year in which the latest lamp change occurred (or the installation date if there were no changes), and the "comm date" reflected the date the latest lamp change occurred or the installation date. The correct installation dates were all recorded in Mainpower's GIS.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c)	**Orion** 288 lamps have incorrect total wattages, resulting in estimated over submission of 282.5W or 1,207 kWh p.a. based on 4,271 burn hours. 41.852 kW relating to smart lights connected to "reconciled elsewhere" status ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0, are reconciled under the DUML ICP for the same NSP. The on hours for these ICPs may differ to the logger hours, because they are controlled by daylight sensors. Submissions are calculated based on a snapshot at the end of the month. **Mainpower** The database accuracy is assessed to be 92.4% indicating estimated over submission of 2,366 kWh per annum (based on 4,271 annual burn hours).

From: unknown To: 05-Feb-20	There was a 271 W or 73.84 kWh difference between the database information and submission information for January 2020. A "comm date" and "installation year" are recorded in the database, but the dates may not be sufficient to determine exactly when a light was installed, and the fields are not always populated consistently. 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: Three times Controls: Moderate Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Low	Controls are rated as moderate. Almost all the field audit differences relate to LED upgrades, where there is sometimes a delay between the light being installed and paperwork being received to update the database. A relatively small number of lights are affected by the wattage differences. The impact is assessed to be low, based on the kWh differences described above. The smart light load is reconciled, but the difference in on hours may have a minor impact on submission. A list of discrepancies has been provided to Orion and Mainpower who are working to investigate and resolve them.

Actions taken to resolve the issue	Completion date	Remedial action status
Contact Energy will work with Orion to ensure their database is accurate Contact Energy is continuing to work on a strategy that will satisfy the rules and regulations without a certified central metering system Contact Energy are to work on a process to be able to submit on any given day Contact Energy will work with Mainpower to ensure their database is accurate. We will work with Mainpower to ensure this database is capable of recording dates accurately and reporting on them	TBA	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Contact Energy will continue to work with all parties to ensure their databases are accurate. We complete quarterly DUML database checks and work with all parties on the results of these	Ongoing	

CONCLUSION

Electricity is supplied in the CCC region by Orion and Mainpower. Orion and Mainpower both manage databases of unmetered load information on behalf of CCC, who is Contact's customer. 43,957 unmetered items of load (99.72%) are connected to Orion's network, and 124 unmetered items of load (0.28%) are connected to Mainpower's network in Kainga.

Orion

Orion's fault, maintenance, new connection and upgrade work is completed by Orion's approved contractors. The contractors provide paperwork to Orion confirming that work is complete, and Orion uses this information to update the database.

A field audit was conducted of a statistical sample of 546 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	100.8	Wattage from survey is higher than the database wattage by 0.8%
R_L	99.2	With a 95% level of confidence it can be concluded that the error could be between -0.8% and +3.4%
R_H	103.4	

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 ± 5.0%.

- The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.8% lower and 3.4% higher than the wattage recorded in the DUML database.
- In absolute terms the installed capacity is estimated to be 37 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 33 kW lower and 149 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 157,400 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 142,100 kWh p.a. lower and 635,400 kWh p.a. higher than the database indicates.

Mainpower

Mainpower's fault, maintenance, new connection and upgrade work is completed by Mainpower or Mainpower's approved contractors. Paperwork is provided to the Mainpower records team confirming that work is complete, and Mainpower uses this information to update the database.

A field audit was conducted of all 124 items of load recorded in the database. I found that the field wattage was 92.4% of the database wattage, and non-compliance is recorded because the error is more than ± 5.0%.

Submission processes

Contact reconciles the Orion and Mainpower DUML load using the HHR profile in accordance with exemption 177. Wattages are derived from the monthly database extracts provided by Orion and Mainpower, and on and off times are derived from a data logger.

Orion has some unmetered smart lights connected on its LV network, which are available 24 hours, and are turned on and off by a light sensor. Orion's smart light ICPs 0007182097RN3F9, 0007182098RNC27 and 0007182100RN8D0 are recorded with "inactive reconciled elsewhere" status, and the volumes are submitted against the corresponding DUML ICP for the NSP. The DUML lights are controlled, and the on and off hours are recorded by the data logger. Because of the different control methods, the smart lights are unlikely to have the same on hours as the DUML ICPs.

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 Orion monthly report is provided with supporting information which includes the daily unmetered kW and number of connections for each ICP. Contact applies the kW value for the last day of the month when calculating submission volumes.

The Mainpower monthly report is provided as a snapshot and is non-compliant.

Contact completes revision submissions where corrections are required, and has not yet updated their processes to be compliant with the Authority's memo.

Conclusion

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. This is a significant improvement from a future risk rating of 31 in the previous audit, largely because database accuracy for the Orion audit sample had increased. I agree that a maximum audit period of 18 months is appropriate following this audit.

PARTICIPANT RESPONSE

This is great progress made by Chirstchurch City Council and Mainpower - we are pleased with their willingness to ensure their data is accurate.

We will continue to work with our customers to ensure that they are supplying and we are submitting accurate data