ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

For

OPOTIKI DISTRICT COUNCIL
AND GENESIS ENERGY

Prepared by: Steve Woods

Date audit commenced: 1 April 2020

Date audit report completed: 1 May 2020

Audit report due date: 17 April 2020

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EXECUTIVE SUMMARY

This audit of the Opotiki District Council (**ODC**) DUML database and processes was conducted at the request of Genesis Energy Limited (**Genesis**) 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 largely conducted in accordance with the audit guidelines for DUML audits version 1.1. A field audit was not undertaken due to the restrictions imposed by the Covid-19 lockdown; therefore, LED upgrade records were checked against the database for six streets where upgrades occurred within the last two years.

Genesis reconciles this DUML load using the NST profile. Genesis has been using the registry figures to calculate the unmetered load as no database extracts were being provided. ODC have provided a database extract in April 2020 to the auditor and is expected to provide these each month to Genesis going forward. I have assessed compliance by checking the submission for February 2020 against the database figures, which indicate an estimated annual over submission of 15,090 kWh.

Examination of the database found the following accuracy issues:

- 39 LED lights have make/model as "LED" but make and model information is also required,
- 45 70 watt SON lights have 18 watts for ballast instead of 13, and
- eight 150 watt SON lights have 14 watts for ballast instead of 18.

ODC are utilising the Telensa central management system (CMS). Each light has a photocell which controls its on and off times based on pre-set light levels. Each light also has a "Telecell" which includes a meter and the metered quantities along with the exact on/off times are sent back to the CMS. The accuracy of the metering chip in the Telecell is reportedly ± 1.0%. I checked a report commissioned by Elexon in the UK in 2012, which stated that their testing confirmed the accuracy of the Telecell meters was within 1.0%. I've inserted an extract from the report to Elexon below.

2 Measuring Equipment

The equipment used for power measurement was sourced from Telensa Ltd (www.telensa.com). The Telensa PLANet equipment is specifically designed for the control and monitoring of street lighting. In the Telensa system, a control node or "Telecell" is attached to each lamp, replacing the Photoelectric control Unit (PECU) normally used to control the lamp switching. The Telecell contains a radio transceiver, a switching relay and a metering section calibrated to a +/-1% accuracy, equivalent to the metering equipment standard BS EN50470 class B. The Telecell power is not included in the load metering.

Upon installation, each Telecell establishes a radio link to a central base station to download a dusk/dawn switching control program which is controlled by a central photocell on the base station. More importantly for this project, every Telecell returns daily power measurement data to the base station, which in turn is stored on a remote central server.

2.1 Calibration

As a key part of manufacturing testing, the meter section in each Telensa Telecell is individually calibrated to 1% accuracy at the power levels typically used in street lighting. After calibration, the calibration is then verified by the test system. All the Telecell manufacturing test equipment is yearly calibrated by an external laboratory, traceable to national standards.

For a separate quality assurance check after the manufacturing test and verification, a 10% sample of the Telecells used in this research were connected to a 250W load for 6 hours and the Telecell meter readings compared to those of a class B accuracy regular power meter connected in the circuit. No failures were found in this process.

I also corresponded with Telensa directly and they supplied other information supporting this level of accuracy, including test results from Georgia Power in the USA, which confirmed accuracy to within +/1 0.4%.

Given the accuracy of the Telecell meters, it appears Genesis can use the output of the CMS to accurately determine consumption. On/off times are different per light, but the reporting provided will enable the determination of an average on time and an average off time for the profile. A sample report is shown below.

Telensa
making brighter cities

PLANet Report - ODC

Switch ON/OFF time for ODC-46 in March 2020

Asset ID	Unit No	Street	Event date	Event time	Event	Meter reading (watt hour)	Telecell ID
ODC-46	17	ARAKOTIPU BLVD	1/03/2020	8:04:44 PM	on - full on	128605	3725977
ODC-46	17	ARAKOTIPU BLVD	1/03/2020	6:37:08 AM	off	128605	3725977
ODC-46	17	ARAKOTIPU BLVD	2/03/2020	8:04:42 PM	on - full on	128821	3725977
ODC-46	17	ARAKOTIPU BLVD	2/03/2020	6:42:20 AM	off	128821	3725977
ODC-46	17	ARAKOTIPU BLVD	3/03/2020	8:03:30 PM	on - full on	129037	3725977
ODC-46	17	ARAKOTIPU BLVD	3/03/2020	6:41:30 AM	off	129037	3725977
ODC-46	17	ARAKOTIPU BLVD	4/03/2020	8:48:36 PM	on - full on	129255	3725977
ODC-46	17	ARAKOTIPU BLVD	4/03/2020	6:45:06 AM	off	129255	3725977

Given the accuracy of the Telecell meters, it appears Genesis can use the output of the CMS to accurately determine consumption. On/off times are different per light, but the reporting provided will enable the determination of an average on time and an average off time.

I compared the metered consumption from the CMS for one 19 watt LED for a 10 day period against a calculation based on the rated wattage (19 watts) * hours (based on CMS on/off times). The metered consumption was 6.72% higher than the calculated consumption. This may bring into question the accuracy of the rated wattage.

A complicating factor is that approx. 75% of lights are connected to the CMS and are controlled by photocell but the other 25% are still controlled by ripple relays.

This audit found four non-compliances. The future risk rating of 16 indicates that the next audit be completed in six months. 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	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 15,090 kWh. Average burn times of 11.9 hours per day are not accurate per month.	Weak	Medium	6	Investigating
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	39 LED lights have make/model as "LED". Make and model information is also required. 45 70 watt SON lights have 18 watts for ballast instead of 13. Eight 150 watt SON lights have 14 watts for ballast instead of 18.	Moderate	Low	2	Identified
Database accuracy	3.1	15.2 and 15.37B(b)	39 LED lights have make/model as "LED". Make and model information is also required. 45 70 watt SON lights have 18 watts for ballast instead of 13. Eight 150 watt SON lights have 14 watts for ballast instead of 18.	Moderate	Low	2	Identified

Subject	Section	Clause	Non-Compliance	Controls	Audit Risk Rating	Breach Risk Rating	Remedial Action
Volume information accuracy	3.2	15.2 and 15.37B(c)	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 15,090 kWh. Average burn times of 11.9 hours per day are not accurate per month.	Weak	Medium	6	Investigating
Future Risk Rating						16	

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

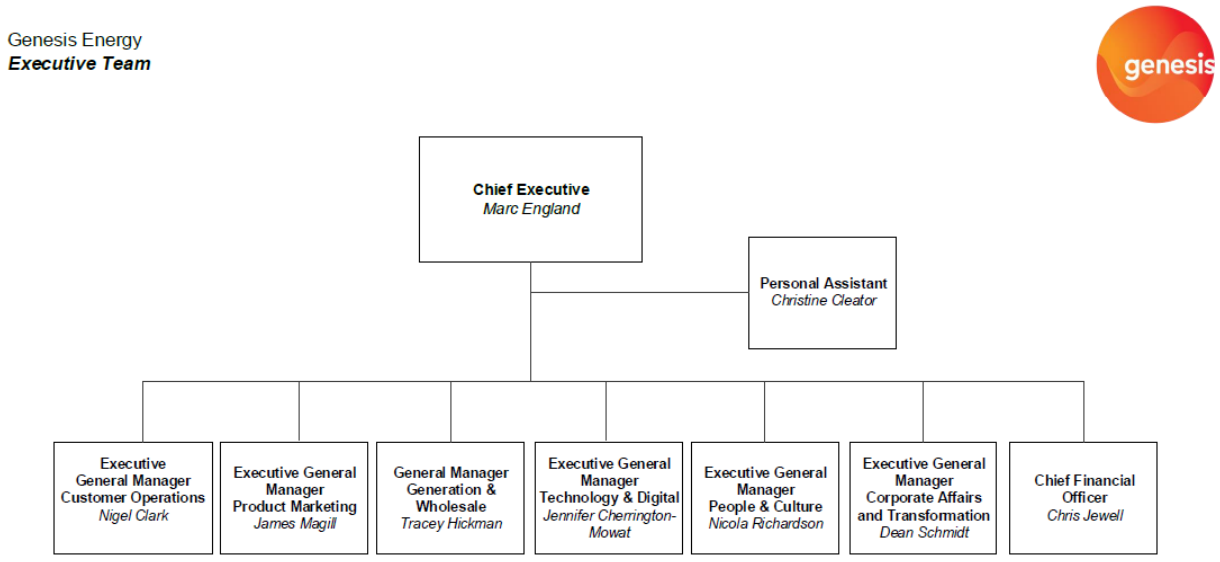
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

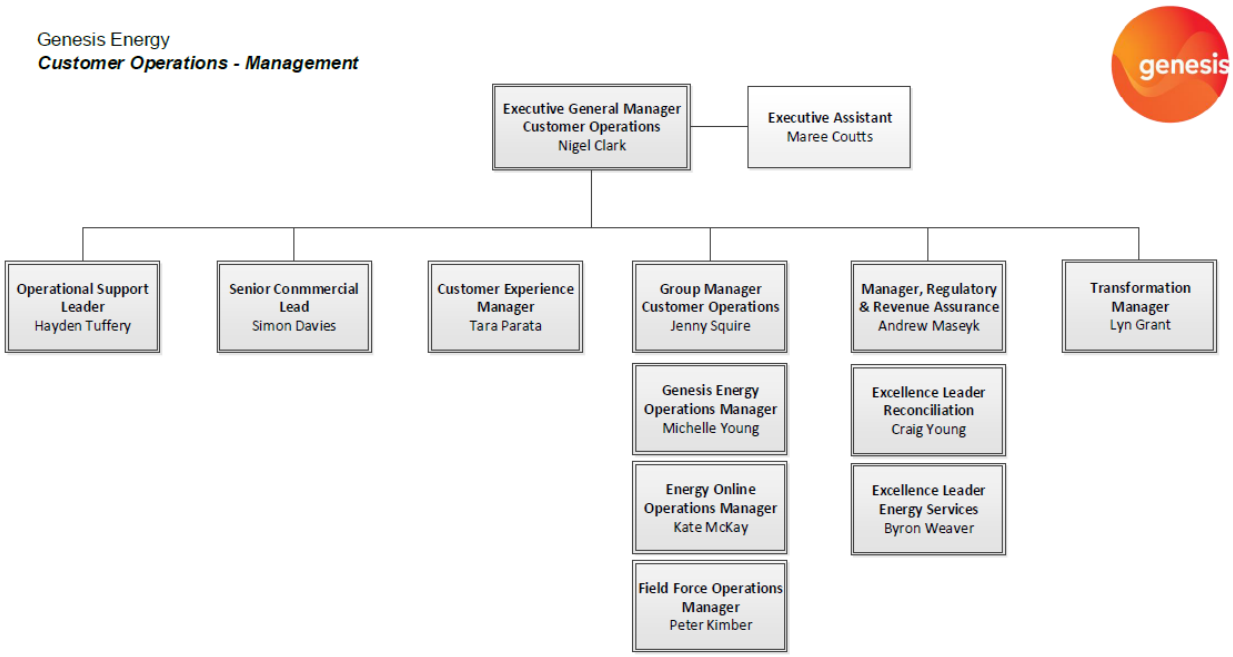
Audit commentary

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

1.2. Structure of Organisation

Genesis provided the relevant organisational structure:





1.3. Persons involved in this audit

Auditor:

Steve Woods

Veritek Limited

Electricity Authority Approved Auditor

Other personnel assisting in this audit were:

Name	Title	Company
Craig Young	Excellence Leader - Reconciliation	Genesis Energy
Grace Hawken	Technical Specialist - Reconciliations Team	Genesis Energy
Janan Nirainjanan	Project Manager	Opotiki DC

1.4. Hardware and Software

The SQL database used for the management of DUML is remotely hosted by RAMM Software Ltd. The database is commonly known as “RAMM” which stands for “Roading Asset and Maintenance Management”. The specific module used for DUML is called RAMM Contractor.

The database is backed-up in accordance with standard industry procedures. Access to the database is secure by way of password protection.

Systems used by the trader to calculate submissions are assessed as part of their reconciliation participant audits.

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)
1000023038BPAFE	OPOTIKI DISTRICT COUNCIL (Te Kaha)	WAI0501	NST	10	405
1000023040BPDB7	OPOTIKI DISTRICT COUNCIL Rural	WAI0111	NST	149	3,688
1000023041BP1F2	OPOTIKI DISTRICT COUNCIL Urban	WAI0111	NST	239	9,414
Total				398	14,054

1.7. Authorisation Received

All information was provided directly by Genesis and ODC.

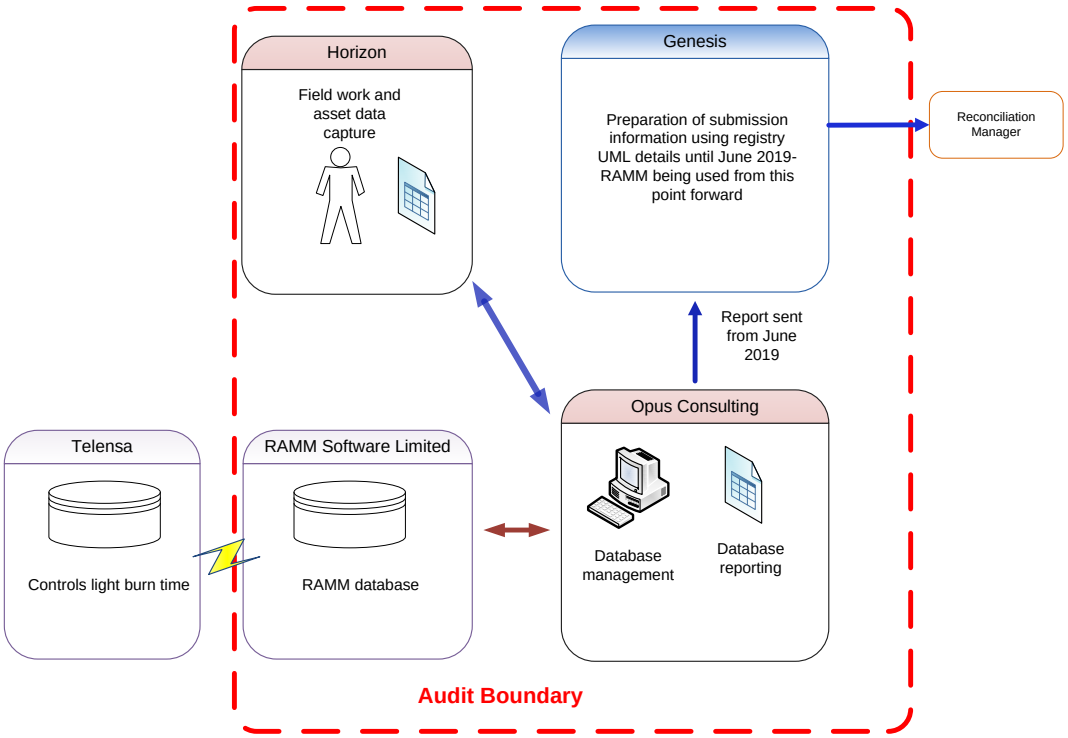
1.8. Scope of Audit

This audit of the Opotiki District Council (**ODC**) DUML database and processes was conducted at the request of Genesis Energy Limited (**Genesis**) 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 largely conducted in accordance with the audit guidelines for DUML audits version 1.1. A field audit was not undertaken due to the restrictions imposed by the Covid-19 lockdown; therefore, LED upgrade records were checked against the database for six streets where upgrades occurred within the last two years.

Horizon is engaged by ODC to conduct the fieldwork and Opus is engaged to manage the database. ODC are utilising the same central management system as Whakatane DC. This is called Telensa. It controls the light burn times and has replaced the network relays previously used therefore the fixed burn hours used to calculate submission will not be representative of the actual burn hours. I checked the output of this system against the NSP profile hours and the fixed hours of 11.9 used by Genesis.

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



1.9. Summary of previous audit

NON-COMPLIANCES

Subject	Section	Clause	Non-Compliance	Status
Distributed unmetered load audits	1.10	17.295F of part 17	Audit not completed within 12 months of Part 16A coming into effect.	Cleared
Deriving submission information	2.1	11(1) of Schedule 15.3	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 149,160 kWh. Telensa system used to control lighting without an approved profile. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. 76 items of load with no wattage recorded resulting in a small amount of under submission. Light changes being recorded without the actual date of installation being known.	Still existing to a smaller extent

Subject	Section	Clause	Non-Compliance	Status
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	65 items of load with no lamp description, wattage and ballast recorded. 11 items of load with no lamp wattage or ballast recorded.	Still existing to a smaller extent
All load recorded in database	2.5	11(2A) and (d) of Schedule 15.3	One additional light found in the field.	Cleared
Database accuracy	3.1	15.2 and 15.37B(b)	65 items of load with no lamp description, wattage and ballast recorded. 11 items of load with no lamp wattage or ballast recorded.	Still existing to a smaller extent
Volume information accuracy	3.2	15.2 and 15.37B(c)	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 149,160 kWh. Telensa system used to control lighting without an approved profile. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. 76 items of load with no wattage recorded resulting in a small amount of under submission. Light changes being recorded without the actual date of installation being known.	Still existing to a smaller extent

RECOMMENDATIONS

Subject	Section	Recommendation	
Deriving submission information	2.1	Liaise with ODC and the Electricity Authority to get a profile in place to enable the Telensa data to be used to calculate submission.	Cleared
Database accuracy	3.1	Liaise with ODC and Horizon to ensure new streetlights are reconciled from the point of electrical connection.	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

Genesis 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

Genesis reconciles this DUML load using the NST profile. Genesis has been using the registry figures to calculate the unmetered load as no database extracts were being provided on a regular basis. The registry figures are based on a report from October 2019. ODC have provided a database extract in April 2020 and is expected to provide these each month going forward. I have assessed compliance by checking the submission for February 2020 against the database figures.

The table below contains the results.

ICPs	kWh value submitted	Calculated kWh value from database	Differences
1000023042BPD32	580	140	440
1000023060BP0E2	1,830	1,273	557
1000023047BP07D	3,450	3,249	201
Total month kWh difference			1,199

Annualised this will result in an estimated annual over submission of 15,090 kWh. Genesis intends to use a further database extract provided in April 2020 to carry out revisions for the last 14 months. The estimated over submission is recorded as non-compliance below.

ODC have installed a central management system called Telensa. It controls the light on/off times for approx. 75% of lights. The remaining 25% are still controlled by ripple relays, therefore the fixed burn hours of 11.9 used to calculate submission will not be representative of the actual burn hours. This is recorded as non-compliance.

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.

Genesis is currently using a database output dated October 2019, which is outdated because changes have been made since then.

The database accuracy is discussed in **section 3.1**. It is not relevant to this section because the most recent database is not used.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-Jun-19 To: 09-Apr-20	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 15,090 kWh. Average burn times of 11.9 hours per day are not accurate per month. Potential impact: Medium Actual impact: Medium Audit history: Once Controls: Weak Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as weak because submission information is not calculated from an up to date data source and the burn hours used to calculate submission are fixed but are variable in the field. The impact is assessed to be medium based on over submission of 15,090 kWh per annum.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has requested monthly asset data to be provided and will follow up with the council each month to ensure its delivery. Genesis has also requested information that pertains to the assets controlled by the Telensa system, as these assets on/off times will be supported by the data held within it, to remove the necessary daily average burn time of 11.9 hours. The remaining 25% of non-LED assets that are currently still on the network replay will require further investigation to ascertain whether the network quantifies its monthly burn times.	01/09/2020	Investigating
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis has made corrections to the registry daily kwh information. Genesis will make the necessary changes to the registry monthly whilst working with the council to rectify database anomalies.	01/04/2020	

2.2. ICP identifier and items of load (Clause 11(2)(a) and (aa) of Schedule 15.3)

Code reference

Clause 11(2)(a) and (aa) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *each ICP identifier for which the retailer is responsible for the DUML*
- *the items of load associated with the ICP identifier.*

Audit observation

The database was checked to confirm the correct ICP was recorded against each item of load.

Audit commentary

Each item of load has an ICP recorded against it.

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

All items of load are locatable by nearest house address and GPS coordinates.

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

Lamp make, model and lamp wattage are fields in the database. Examination of the database found the following issues:

- 39 LED lights have make/model as "LED" but make and model information is also required,
- 45 70 watt SON lights have 18 watts for ballast instead of 13, and
- eight 150 watt SON lights have 14 watts for ballast instead of 18.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.4 With: Clause 11(2)(c) and (d) of Schedule 15.3 From: 01-Jun-19 To: 09-Apr-20	39 LED lights have make/model as "LED". Make and model information is also required. 45 70 watt SON lights have 18 watts for ballast instead of 13. Eight 150 watt SON lights have 14 watts for ballast instead of 18. 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 as this information is expected to be captured as part of Opus' management of the RAMM database. The impact is assessed to be low as the impact on annual kWh is small.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has requested monthly asset data to be provided and will follow up with the council each month to ensure its delivery. Genesis has reviewed the dataset and has provide a summary of exceptions to be investigated.	01/06/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis has made corrections to the registry daily kwh information. Genesis will make the necessary changes to the registry monthly whilst working with the council to rectify database anomalies.	01/04/2020	

2.5. All load recorded in database (Clause 11(2A) of Schedule 15.3)

Code reference

Clause 11(2A) of Schedule 15.3

Code related audit information

The retailer must ensure that each item of DUML for which it is responsible is recorded in this database.

Audit observation

I checked the LED upgrade schedule for six streets, 68 lights in total. There have not been any new connections in recent years.

Audit commentary

Most of the LED upgrade records did not have the wattage recorded on the advice sheets, but it was known that only 19 watt lights were being installed. In all cases the database was accurately updated.

I confirmed that the findings from the last audit had been updated in the database.

Audit outcome

Compliant

2.6. Tracking of load changes (Clause 11(3) of Schedule 15.3)

Code reference

Clause 11(3) of Schedule 15.3

Code related audit information

The DUML database must track additions and removals in a manner that allows the total load (in kW) to be retrospectively derived for any given day.

Audit observation

The process for tracking of changes in the database was examined.

Audit commentary

The RAMM database functionality achieves compliance with the code.

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

RAMM contains a complete audit trail of all additions and changes with operator ID 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 RAMM database extract provided in April 2020 was checked for accuracy, along with the records for 68 LED upgrades.

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

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

Audit commentary

LED upgrade Findings

I checked the LED upgrade schedule for six streets, 68 lights in total. There have not been any new connections in recent years. Most of the LED upgrade records did not have the wattage recorded, but it was known that only 19 watt lights were being installed. In all cases the database was accurately updated.

I confirmed that the findings from the last audit had been updated in the database.

Wattage and ballast accuracy findings

Lamp make, model and lamp wattage are fields in the database. Examination of the database found the following issues:

- 39 LED lights have make/model as “LED” but make and model information is also required,
- 45 70 watt SON lights have 18 watts for ballast instead of 13, and
- eight 150 watt SON lights have 14 watts for ballast instead of 18.

Change management process findings

Previously we have recorded that any changes that are made during any given month take effect from the beginning of that month. The code requires that the total load can be retrospectively derived for any given day. The compliance of the database reporting provided to Genesis is detailed in **section 3.2**.

Horizon carries out the field work and provides a spreadsheet of changes to Opus to update RAMM. These are reviewed by Opus before they are accepted into the database and then updated in RAMM as soon as possible. Examples of field sheets were provided. I checked a sample of 68 items of load and confirmed that they were installed in RAMM for the correct date. The light install dates are provided in a spreadsheet which is provided along with the field sheets.

ODC are utilising the same central management system as Whakatane DC. This is called Telensa. It controls the light burn times and has replaced the network relays previously used therefore the fixed burn hours used to calculate submission will not be representative of the actual burn hours. ODC have no immediate plans to use dimming but I note that the system is capable.

The Telensa CMS system tracks faults on the network and therefore outage patrols are no longer required. The system also flags if the lamp burn wattage is different to that recorded in the database. This will increase the accuracy of the data in the database. The data from the Telensa system is synchronised with the RAMM database.

The new connection process was discussed. There has been very little new development in the ODC area. There is a new subdivision being planned but this may still be some years away. New streetlight circuits get connected by the network, and they also carry out the field work, therefore the correct electrical connection date should be known. I recommend this process is reviewed in conjunction with ODC and Horizon to ensure that this is the case in practice.

Festive lighting is connected into the metered circuits and is therefore accounted for in the metered supply.

No private lights have been identified.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Jun-18 To: 31-May-19	39 LED lights have make/model as "LED". Make and model information is also required. 45 70 watt SON lights have 18 watts for ballast instead of 13. Eight 150 watt SON lights have 14 watts for ballast instead of 18. 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. The accuracy of dates has improved, and it only needs the ballast information and make/model to be updated to achieve compliance. The impact is assessed to be low as the volume of lights with errors is small.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has requested monthly asset data to be provided and will follow up with the council each month to ensure its delivery. Genesis has reviewed the dataset and has provide a summary of exceptions to be investigated.	01/06/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	

Genesis has made corrections to the registry daily kwh information. Genesis will make the necessary changes to the registry monthly whilst working with the council to rectify database anomalies.	01/04/2020	

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

Code reference

Clause 15.2 and 15.37B(c)

Code related audit information

The audit must verify that:

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

Audit observation

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

- checking the registry to confirm that all ICPs have the correct profile and submission flag, and
- checking the database extract combined with the burn hours against the submitted figure to confirm accuracy.

Audit commentary

Genesis reconciles this DUML load using the NST profile. Genesis has been using the registry figures to calculate the unmetered load as no database extracts were being provided. ODC have provided a database extract in April 2020 and is expected to provide these each month going forward. I have assessed compliance by checking the submission for February 2020 against the database figures.

The table below contains the results.

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ODC have installed a central management system called Telensa. It controls the light on/off times for approx. 75% of lights. The remaining 25% are still controlled by ripple relays, therefore the fixed burn

hours of 11.9 used to calculate submission will not be representative of the actual burn hours. This is recorded as non-compliance.

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.

Genesis is currently using a database output dated October 2019, which is outdated because changes have been made since then.

The database accuracy is discussed in **section 3.1**. It is not relevant to this section because the most recent database is not used.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Jun-19 To: 09-Apr-20	Variance found between RAMM database extract and the kWh figure submitted by Genesis resulting in an estimated annual over submission 15,090 kWh. Average burn times of 11.9 hours per day are not accurate per month. Potential impact: Medium Actual impact: Medium Audit history: Once Controls: Weak Breach risk rating: 6
Audit risk rating	**Rationale for audit risk rating**
Medium	The controls are rated as weak because submission information is not calculated from an up to date data source and the burn hours used to calculate submission are fixed but are variable in the field. The impact is assessed to be medium based on over submission of 15,090 kWh per annum

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis has requested monthly asset data to be provided and will follow up with the council each month to ensure its delivery. Genesis has also requested information that pertains to the assets controlled by the Telensa system, as these assets on/off times will be supported by the data held within it, to remove the necessary daily average burn time of 11.9 hours. The remaining 25% of non-LED assets that are currently still on the network replay will require further investigation to ascertain whether the network quantifies its monthly burn times.	01/09/2020	Investigating
Preventative actions taken to ensure no further issues will occur	**Completion date**	

Genesis has made corrections to the registry daily kwh information. Genesis will make the necessary changes to the registry monthly whilst working with the council to rectify database anomalies.	01/04/2020	

CONCLUSION

The audit was largely conducted in accordance with the audit guidelines for DUML audits version 1.1. A field audit was not undertaken due to the restrictions imposed by the Covid-19 lockdown; therefore, LED upgrade records were checked against the database for six streets where upgrades occurred within the last two years.

Genesis reconciles this DUML load using the NST profile. Genesis has been using the registry figures to calculate the unmetered load as no database extracts were being provided. ODC have provided a database extract in April 2020 and is expected to provide these each month going forward. I have assessed compliance by checking the submission for February 2020 against the database figures, which indicate an estimated annual over submission of 15,090 kWh.

Examination of the database found the following accuracy issues:

- 39 LED lights have make/model as “LED” but make and model information is also required,
- 45 70 watt SON lights have 18 watts for ballast instead of 13, and
- eight 150 watt SON lights have 14 watts for ballast instead of 18.

ODC are utilising the Telensa central management system (CMS). Each light has a photocell which controls its on and off times based on pre-set light levels. Each light also has a “Telecell” which includes a meter and the metered quantities along with the exact on/off times are sent back to the CMS. The accuracy of the metering chip in the Telecell is reportedly ± 1.0%. I checked a report commissioned by Elexon in the UK in 2012, which stated that their testing confirmed the accuracy of the Telecell meters was within 1.0%. I’ve inserted an extract from the report to Elexon below.

2 Measuring Equipment

The equipment used for power measurement was sourced from Telensa Ltd (www.telensa.com). The Telensa PLANet equipment is specifically designed for the control and monitoring of street lighting. In the Telensa system, a control node or "Telecell" is attached to each lamp, replacing the Photoelectric control Unit (PECU) normally used to control the lamp switching. The Telecell contains a radio transceiver, a switching relay and a metering section calibrated to a +/-1% accuracy, equivalent to the metering equipment standard BS EN50470 class B. The Telecell power is not included in the load metering.

Upon installation, each Telecell establishes a radio link to a central base station to download a dusk/dawn switching control program which is controlled by a central photocell on the base station. More importantly for this project, every Telecell returns daily power measurement data to the base station, which in turn is stored on a remote central server.

2.1 Calibration

As a key part of manufacturing testing, the meter section in each Telensa Telecell is individually calibrated to 1% accuracy at the power levels typically used in street lighting. After calibration, the calibration is then verified by the test system. All the Telecell manufacturing test equipment is yearly calibrated by an external laboratory, traceable to national standards.

For a separate quality assurance check after the manufacturing test and verification, a 10% sample of the Telecells used in this research were connected to a 250W load for 6 hours and the Telecell meter readings compared to those of a class B accuracy regular power meter connected in the circuit. No failures were found in this process.

I also corresponded with Telensa directly and they supplied other information supporting this level of accuracy, including test results from Georgia Power in the USA, which confirmed accuracy to within +/1 0.4%.

Given the accuracy of the Telecell meters, it appears Genesis can use the output of the CMS to accurately determine consumption. On/off times are different per light, but the reporting provided will enable the determination of an average on time and an average off time for the profile. A sample report is shown below.

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PLANet Report - ODC

Switch ON/OFF time for ODC-46 in March 2020

Asset ID	Unit No	Street	Event date	Event time	Event	Meter reading (watt hour)	Telecell ID
ODC-46	17	ARAKOTIPU BLVD	1/03/2020	8:04:44 PM	on - full on	128605	3725977
ODC-46	17	ARAKOTIPU BLVD	1/03/2020	6:37:08 AM	off	128605	3725977
ODC-46	17	ARAKOTIPU BLVD	2/03/2020	8:04:42 PM	on - full on	128821	3725977
ODC-46	17	ARAKOTIPU BLVD	2/03/2020	6:42:20 AM	off	128821	3725977
ODC-46	17	ARAKOTIPU BLVD	3/03/2020	8:03:30 PM	on - full on	129037	3725977
ODC-46	17	ARAKOTIPU BLVD	3/03/2020	6:41:30 AM	off	129037	3725977
ODC-46	17	ARAKOTIPU BLVD	4/03/2020	8:48:36 PM	on - full on	129255	3725977
ODC-46	17	ARAKOTIPU BLVD	4/03/2020	6:45:06 AM	off	129255	3725977

I compared the metered consumption from the CMS for one 19 watt LED for a 10 day period against a calculation based on the rated wattage (19 watts) * hours (based on CMS on/off times). The metered consumption was 6.72% higher than the calculated consumption. This may bring into question the accuracy of the rated wattage.

A complicating factor is that approx. 75% of lights are connected to the CMS and are controlled by photocell but the other 25% are still controlled by ripple relays.

This audit found four non-compliances. The future risk rating of 16 indicates that the next audit be completed in six months. I agree with this recommendation.

PARTICIPANT RESPONSE

Genesis accepts that the average burn time of 11.9 in not a 100% accurate measure of any asset for billing or settlements, however published astronomical society daylight hours is also deemed non-compliant, thus will be requesting the data supporting each asset's actual on/off times to determine an average on/off time for the assets. Although this is again an average, Genesis will be investigating whether the calculation can be developed and aggregated from an asset level.

Genesis has corrected historical registry values to provide an adequate calculation of kW's during these historical periods whilst work is done with the council to provide consistent and validated database information for future reporting.

Genesis will continue working with the networks and councils to influence database accuracies and process improvements.