ELECTRICITY INDUSTRY PARTICIPATION CODE
DISTRIBUTED UNMETERED LOAD AUDIT REPORT

VERITEK

For

TIMARU DISTRICT COUNCIL
AND GENESIS ENERGY LIMITED

Prepared by: Tara Gannon

Date audit commenced: 11 November 2019

Date audit report completed: 3 December 2019

Audit report due date: 1 December 2019

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EXECUTIVE SUMMARY

This audit of the **Timaru District Council (TDC)** 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 conducted in accordance with the audit guidelines for DUML audits version 1.1. The scope of the audit encompasses the collection, security and accuracy of the data, including the preparation of submission information.

The TDC ICPs switched from Contact to Genesis effective from 01/10/19.

Streetlight load is determined by wattages held within TDC's RAMM database. New connection, fault, maintenance, and upgrade work is completed by NetCon. All streetlight work is initiated by TDC, and RAMM's work management processes are used to dispatch and manage field work. Once NetCon have completed the work, TDC is notified through the RAMM work management process. TDC then verifies that the work has been completed and updates RAMM. TDC provides monthly reports from RAMM to Genesis.

Festive lighting is recorded in the database, and connection and disconnection dates are recorded and provided to Genesis.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	101.0	Wattage from survey is higher than the database wattage by 1.0%
R_L	100.0	With a 95% level of confidence it can be concluded that the error could be between 0.0% and 7.0%
R_H	107.0	

The variability of the sample results was impacted by a discrepancy affecting three lights on Redruth Street, Timaru. Although the wattage differences were small, the percentage difference between the survey and database for this street significantly affected the precision findings in relation to R_H.

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.0% and 7.0% higher than the wattage recorded in the DUML database, and the best available estimate is not precise enough to conclude that the database is accurate within ± 5.0%.

- In absolute terms the installed capacity is estimated to be 5 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 kW to 35 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 22,200 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 0 and 150,400 kWh p.a. higher than the database indicates.

Genesis reconciles this DUML load using the SST profile, and on and off times are derived from Astronomical Society night hours.

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

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

The current monthly report is provided as a snapshot and is non-compliant, and Genesis completes revision submissions where corrections are required. Genesis is working to develop event based calculations, which will enable accurate volume calculations where lamps change part way through a month.

The future risk rating of seven indicates that the next audit be completed in 18 months. Given the minor nature of the discrepancies identified, 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	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis.	Moderate	Low	2	Identified
All load recorded in database	2.5	11(2A) of Schedule 15.3	For the sample of lights checked, there was one less light in the database than was present in the street. The missing light was added to the database during the audit.	Strong	Low	1	Cleared
Database accuracy	3.1		The database is not confirmed as accurate with a 95% level of confidence. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis.	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)	The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis.	Moderate	Low	2	Identified
Future Risk Rating						7	

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

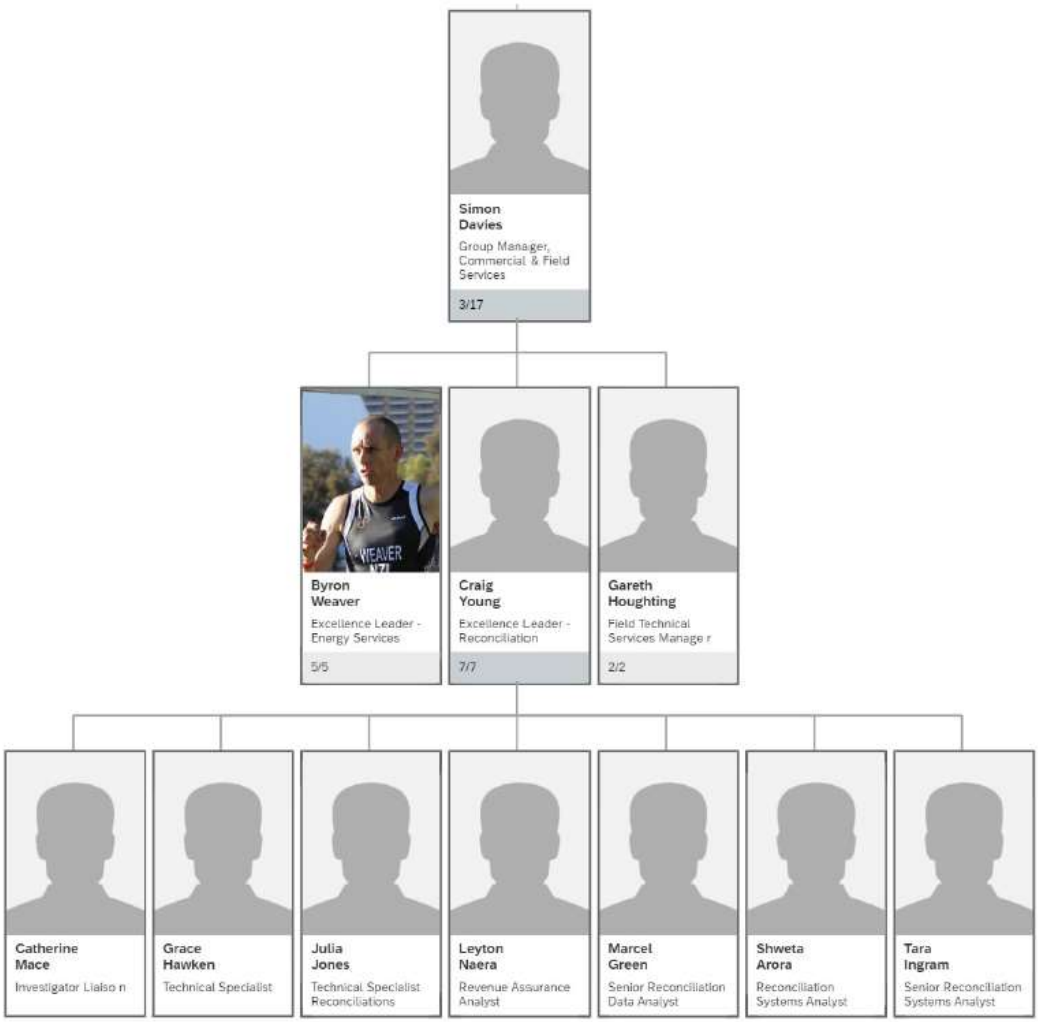
The Electricity Authority's website was reviewed to identify any exemptions relevant to the scope of this audit.

Audit commentary

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

1.2. Structure of Organisation

Genesis provided 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
Anthony Bacon	Road Engineering Technician	Timaru District Council
Grace Hawken	Technical Specialist - Reconciliation Team	Genesis Energy

1.4. Hardware and Software

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

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

Access to the database is secure by way of password protection.

1.5. Breaches or Breach Allegations

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

1.6. ICP Data

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0000000001ALAE7	All TIM0111 Streets	TIM0111	SST	3,941	419,644
0000000006AL72D	All TMK0331 Streets	TMK0331	SST	1,060	82,916
Total				**5,001**	**502,560**

Festive lights (connected from November to January):

ICP Number	Description	NSP	Profile	Number of items of load	Database wattage (watts)
0000000001ALAE7	All TIM0111 Streets	TIM0111	SST	36	3295.3
0000000006AL72D	All TMK0331 Streets	TMK0331	SST	4	300.3
Total				**40**	**3,595.6**

1.7. Authorisation Received

All information was provided directly by Genesis or TDC.

1.8. Scope of Audit

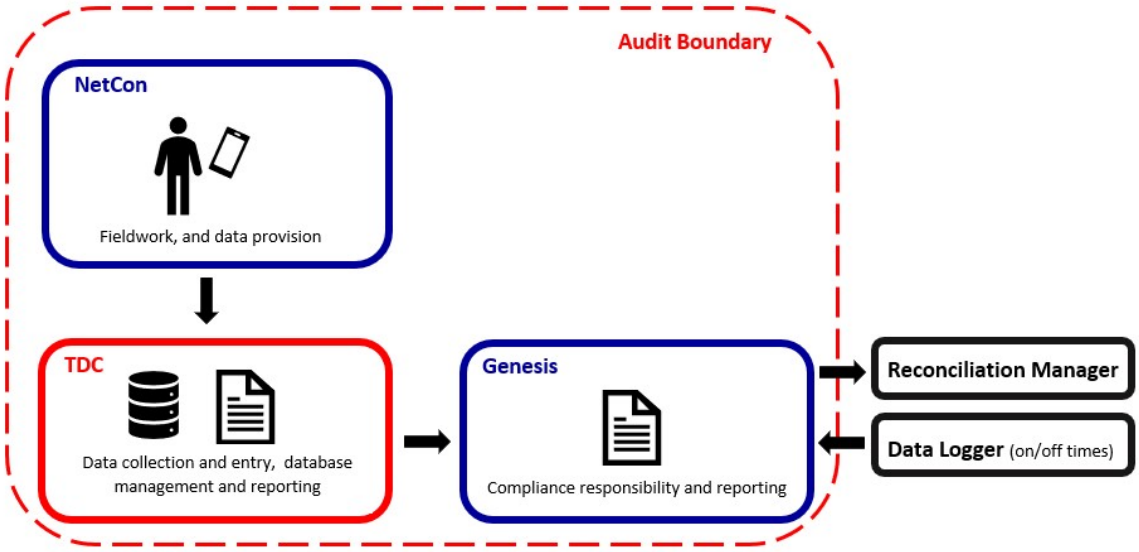
This audit of the TDC DUML database and processes was conducted at the request of Genesis in accordance with clause 15.37B. The purpose of this audit is to verify that the volume information is being calculated accurately, and that profiles have been correctly applied.

The audit was conducted in accordance with the audit guidelines for DUML audits version 1.1.

The TDC ICPs switched from Contact to Genesis effective from 01/10/19.

Streetlight load is determined by wattages held within TDC's RAMM database. New connection, fault, maintenance, and upgrade work is completed by NetCon. All streetlight work is initiated by TDC, and RAMM's work management processes are used to dispatch and manage field work. Once NetCon have completed the work, TDC is notified through the RAMM work management process. TDC then verifies that the work has been completed and updates RAMM. TDC provides monthly reports from RAMM to Genesis.

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



The field audit was undertaken of a statistical sample of 286 items of load on 11-12 November 2019.

1.9. Summary of previous audit

The previous audit of this database was undertaken by Steve Woods of Veritek Limited in May 2018. The summary table below shows the statuses of the non-compliances and recommendations 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	The methodology for deriving submission information is incorrect, Festive Lights are incorrectly subtracted from the database total each month. Estimated under submission of 43,116 kWh per annum. Inaccurate information in the database • 7 items of load without an ICP, under submission of 2,358 kWh pa • 2 lamp type and wattage errors, over submission of 324 kWh pa	Cleared Some inaccurate information is still existing

Subject	Section	Clause	Non-compliance	Status
			• 1 lamp type field audit errors identified, over submission of 205 kWh pa	
ICP identified and items of load	2.2	11(2)(a) and (aa) of Schedule 15.3	There are seven items of load that do not have an ICP identifier recorded against them in the database. Resulting in estimated under submission of 2,358 kWh per annum.	Cleared
Description and capacity of load	2.4	11(2)(c) and (d) of Schedule 15.3	There are two lamp types with incorrect wattage values in the database. There are 19 lamps affected result in estimated over submission of 324 kWh per annum.	Cleared
All load recorded in the database	2.5	11(2A) of Schedule 15.3	The field audit included the majority of the lamps identified (12 of the 15) with one of the incorrect lamp type wattage value in the database. The field data was 99.9% of the database data for the sample checked, resulting in estimated over submission of 205 kWh per annum.	Still existing
Database accuracy	3.1	Clause 15.2 and 15.37B(b)	The only database inaccuracies found stem from the two incorrect lamp type wattage values identified in the database, 19 lamps in total, estimated over submission of 324 kWh per annum. The field data was 99.9% of the database data for the sample checked, resulting in estimated over submission of 205 kWh per annum.	Still existing
Volume Information accuracy	3.2	15.2 and 15.37B(c)	The DUML database is largely accurate but the submission calculation is incorrectly reducing the total by Festive Lights which are not included in the database total to start with. Resulting in an estimated under submission of 43,116 kWh per annum.	Cleared

Subject	Section	Description	Recommendation	Status
All load recorded in the database	2.5	I was unable to distinguish the one 30w LED from the 25 x 27w LEDs in Gleniti Road	A site visit to confirm lamp type and wattage at above GPS location on Gleniti Road.	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 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

The ICPs switched to Genesis effective from 01/10/19.

Wattages are derived from reports provided by TDC. The field survey found that the best available estimate of field wattage is not precise enough to conclude that the database is accurate within ±5.0% as recorded in **section 3.1**. The variability of the sample results was impacted by a discrepancy affecting three lights on Redruth Street. Although the wattage differences were small, the percentage difference between the survey and database for this street significantly affected the precision findings in relation to R_H. On and off times are derived from Astronomical Society night hours.

Genesis reconciles this DUML load using the SST profile. The on/off times are based on "Profile night hours", which leads to inaccurate consumption information. "Profile night hours" are the SST profile hours, which are sunset and sunrise hours published by NIWA rounded to the nearest half hour. The SST profile rules do not allow these on/off times to be used to calculate consumption information. The SST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. The reason for this is that if the "on" time is 18.20 and the off time is 07.13, the "Profile night hours" will have values from 18.00 to 07.30. The on/off times used may vary from the actual on/off times by up to 29 minutes at each end of the period.

Festive light information is provided with connection and disconnection dates, and they are included in submission data when connected. The previous audit recorded that Contact Energy had incorrectly subtracted the festive lights from the submission totals when disconnected, when they should have been added when connected. This issue was resolved by Contact Energy, prior to the ICPs being switched to Genesis.

Sources of inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
Five lights had incorrect gear wattages recorded, which were corrected prior to the November 2019 database extract being provided to Genesis.	Under submission of 26 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 as a snapshot and this practice 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. Genesis completes revision submissions where corrections are required, and is working to develop event based calculations, which will enable accurate volume calculations where lamps change part way through a month.

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

Change dates are automatically generated by RAMM when records change but cannot be selected by the user. Changes are generally entered by TDC as soon as they receive notification via RAMM work management process that the field work is complete. Where a light type has changed, TDC updates the installation date to match the date that the change was completed.

Festive lights are recorded in RAMM and managed in the same way as other lights. On and off dates are recorded in the monthly reports to Genesis.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 2.1 With: Clause 11(1) of Schedule 15.3 From: 01-Sep-19 To: 31-Oct-19	Incorrect use of SST profile. The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis. Potential impact: Medium Actual impact: Low Audit history: Once Controls: Moderate Breach risk rating: 2

Audit risk rating	Rationale for audit risk rating
Low	The controls over the database are rated as moderate, because: • the accuracy assessment was skewed by a very small number of exceptions where a large wattage percentage difference was present, and very few data accuracy issues were identified overall; • the database update processes will ensure that in most cases the change date reflects the date that the change is made; and • a very small number of lights had incorrect gear wattages and were corrected. The impact is expected to be low based on the kWh variances identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis are correcting how burn hours are derived requesting the appropriate logger from EMS. Genesis will be working with Timaru DC with the exception management.	01/03/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis to continue revising monthly reporting from TDC, adopting the use of the logger in the region	01/12/2020	

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

Code reference

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

Code related audit information

The DUML database must contain:

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

Audit observation

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

Audit commentary

All items of load have an ICP recorded against them. The accuracy of ICP identifiers was checked in **section 3.1**.

Audit outcome

Compliant

2.3. Location of each item of load (Clause 11(2)(b) of Schedule 15.3)

Code reference

Clause 11(2)(b) of Schedule 15.3

Code related audit information

The DUML database must contain the location of each DUML item.

Audit observation

The database was checked to confirm the location is recorded for all items of load.

Audit commentary

The database contains fields for the road name, displacement, pole ID, and GPS coordinates.

GPS coordinates are populated for all items except two lights in Timaru. The locations of both lights can be mapped using pole location information in RAMM.

Pole ID	Road Name	Displacement	Pole Purpose
5173	REDRUTH STREET	387m	Streetlighting
5155	ROXBURGH ST	128m	Community Lighting

No inaccurate locations were identified.

Audit outcome

Compliant

2.4. Description and capacity of load (Clause 11(2)(c) and (d) of Schedule 15.3)

Code reference

Clause 11(2)(c) and (d) of Schedule 15.3

Code related audit information

The DUML database must contain:

- *a description of load type for each item of load and any assumptions regarding the capacity*
- *the capacity of each item in watts.*

Audit observation

The database was checked to confirm that:

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

Audit commentary

The database contains gear model, light model, light wattage, and gear wattage.

All items of load have a gear model, light model, light wattage, and gear wattage recorded, and no items have invalid zero lamp or gear wattages.

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

The field audit was undertaken of a statistical sample of 286 items of load on 11-12 November 2019. The sample was selected from four strata, as follows:

1. 0000000001ALAE7 road names A to K
2. 0000000001ALAE7 road names L to SH1 - (F)
3. 0000000001ALAE7 road names SH1 - (G) to Z
4. 0000000006AL72D

Audit commentary

The field audit discrepancies are detailed in the table below:

Street	Database count	Field count	Light count difference	Wattage recorded incorrectly	Comments
Redruth St	7	8	1	2	One 70W HPS was recorded as a 27W LED. Two 70W HPS on the way to the Crow's Nest were missing from the database. TDC corrected the database during the audit.
Grand Total	**285**	**286**	**1**	**2**	

One light was not recorded in the database, which is recorded as non-compliance below. The additional light was on TDC owned land but was connected to the streetlight circuit. TDC intends to review other TDC owned sites to confirm that all lights connected to the streetlight circuit are accounted for in the database.

The 2018 audit found one 30w LED could not be distinguished from the 25 x 27w LEDs in Gleniti Road and recommended a site visit to confirm the wattage. The site visit was completed, and the wattage was confirmed to be correct.

Wattage differences are recorded as non-compliance in **section 3.1**.

Audit outcome

Compliant

Non-compliance	Description
Audit Ref: 2.5 With: Clause 11(2A) of Schedule 15.3 From: 01-Sep-19 To: 31-Oct-19	For the sample of lights checked, there was one less light in the database than was present in the street. The missing light was added to the database during the audit. Potential impact: Medium Actual impact: Low Audit history: None Controls: Strong Breach risk rating: 1
Audit risk rating	**Rationale for audit risk rating**
Low	Controls are rated as strong, the small number of exceptions indicated that controls are sufficient to ensure that all lamps are recorded in the database most of the time. The impact is low, because only one missing lamp was identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis will be working with Timaru DC with the exception management.	01/12/2020	Cleared
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis to continue revising monthly reporting from TDC	01/12/2020	

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

Code reference

Clause 11(3) of Schedule 15.3

Code related audit information

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

Audit observation

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

Audit commentary

The RAMM database functionality achieves compliance with the code.

The change management process and the compliance of the database reporting provided to Genesis is detailed in **sections 3.1** and **3.2**.

Audit outcome

Compliant

2.7. Audit trail (Clause 11(4) of Schedule 15.3)

Code reference

Clause 11(4) of Schedule 15.3

Code related audit information

The DUML database must incorporate an audit trail of all additions and changes that identify:

- *the before and after values for changes*
- *the date and time of the change or addition*
- *the person who made the addition or change to the database.*

Audit observation

The database was checked for audit trails.

Audit commentary

The database has a complete audit trail.

Audit outcome

Compliant

3. ACCURACY OF DUML DATABASE

3.1. Database accuracy (Clause 15.2 and 15.37B(b))

Code reference

Clause 15.2 and 15.37B(b)

Code related audit information

Audit must verify that the information recorded in the retailer's DUML database is complete and accurate.

Audit observation

Genesis' submissions are based on a monthly extract from the RAMM database. A RAMM database extract was provided in October 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	Timaru District Council streetlights
Strata	The database contains the TDC items of load for both DUML ICPs in the Timaru region. The processes for the management of all TDC items of load are the same, but I decided to place the items of load into four strata: 1. 0000000001ALAE7 road names A to K 2. 0000000001ALAE7 road names L to SH1 - (F) 3. 0000000001ALAE7 road names SH1 - (G) to Z 4. 0000000006AL72D
Area units	I created a pivot table of the roads and I used a random number generator in a spreadsheet to select a total of 27 sub-units.
Total items of load	286 items of load were checked, making up 5% of the total database wattage.

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

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

Audit commentary

Field audit findings

A field audit was conducted of a statistical sample of 285 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	101.0	Wattage from survey is higher than the database wattage by 1.0%
R_L	100.0	

Result	Percentage	Comments
R_H	107.0	With a 95% level of confidence it can be concluded that the error could be between 0.0% and 7.0%

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.0% and 7.0% higher than the wattage recorded in the DUML database.

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 C (detailed below) applies, and the best available estimate is not precise enough to conclude that the database is accurate within ±5.0%. The variability of the sample results was impacted by a discrepancy affecting three lights on Redruth Street. Although the wattage differences were small, the percentage difference between the survey and database for this street significantly affected the precision findings in relation to R_H. The point of estimate of R is within the accuracy threshold, and TDC corrected the database records during the audit.

- In absolute terms the installed capacity is estimated to be 5 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 kW to 35 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 22,200 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 0 and 150,400 kWh p.a. higher than the database indicates.

Scenario	Description
A - **Good accuracy, good precision**	This scenario applies if: (a) R_H is less than 1.05; and (b) R_L is greater than 0.95 The conclusion from this scenario is that: (a) the best available estimate indicates that the database is accurate within +/- 5 %; and (b) this is the best outcome.
B - **Poor accuracy, demonstrated with statistical significance**	This scenario applies if: (a) the point estimate of R is less than 0.95 or greater than 1.05 (b) as a result, either R_L is less than 0.95 or R_H is greater than 1.05. There is evidence to support this finding. In statistical terms, the inaccuracy is statistically significant at the 95% level
C - **Poor precision**	This scenario applies if: (a) the point estimate of R is between 0.95 and 1.05 (b) R_L is less than 0.95 and/or R_H is greater than 1.05

Scenario	Description
	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 items of load have a gear model, light model, light wattage and gear wattage recorded, and no items have invalid zero lamp or gear wattages.

Lamp and gear wattages were compared to the expected values, and I found five items of load have gear wattages not matching the expected values. The total difference was 6 W or 26 kWh per annum (based on 4,271 burn hours). All the exceptions were corrected prior to TDC issuing their November 2019 database extract to Genesis.

Model	Gear wattage	Count of lights	Expected gear wattage	Gear wattage difference	Comment
High Pressure Sodium 100W	18	4	14	-16	Corrected
High Pressure Sodium 250W	18	1	28	+10	Corrected
Total		**5**		**+6**	

ICP number accuracy

As discussed in **section 2.2**, all items of load have an ICP number recorded. I checked the database for roads where lights were connected to more than one ICP, and no issues were identified.

Change management process findings

Streetlight load is determined by wattages held within TDC's RAMM database. New connection, fault, maintenance, and upgrade work is completed by NetCon. All streetlight work is initiated by TDC, and RAMM's work management processes are used to dispatch and manage field work. Once NetCon have completed the work, TDC is notified through the RAMM work management process. TDC then verifies that the work has been completed and updates RAMM. TDC provides monthly reports from RAMM to Genesis.

New subdivisions require a proposed plan to be provided (which includes approved lights) and an "as built" plan once the development is complete. NetCon advises TDC once new lights are ready, and TDC then verifies that the work has been completed and updates RAMM effective from the day of livening.

The current monthly report is provided as a snapshot and this practice 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.

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

Change dates are automatically generated by RAMM when records change but cannot be selected by the user. Changes are generally entered by TDC as soon as they receive notification via RAMM work management process that the field work is complete. Where a light type has changed, TDC updates the installation date to match the date that the change was completed.

LED upgrades are underway by region by street and are managed using RAMM's work management processes.

Outage patrols are conducted. Sodium lights in the CBD are patrolled monthly, and P (pedestrian area) category lights are patrolled annually. Reliance is placed on the faults process to identify issues with other lights.

Festive lights

Festive lights are recorded in RAMM and managed in the same way as other lights. On and off dates are recorded in the monthly reports to Genesis.

Private lights

Private lights are recorded in the database with an ICP number and are reported to Genesis. TDC is working to identify the owners of private streetlights and request these to be metered. Once TDC receives confirmation that the lights are metered the pole purpose is updated to "metered" and they are excluded from the database extract sent to Genesis.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.1 With: Clause 15.2 and 15.37B(b) From: 01-Sep-19 To: 31-Oct-19	The database is not confirmed as accurate with a 95% level of confidence. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis. Potential impact: Medium Actual impact: Low Audit history: Once Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls over the database are rated as moderate, because: • the accuracy assessment was skewed by a very small number of exceptions where a large wattage percentage difference was present, and very few data accuracy issues were identified overall; • the database update processes will ensure that in most cases the change date reflects the date that the change is made; and • a very small number of lights had incorrect gear wattages, and they were corrected during the audit. The impact is expected to be low based on the kWh variances identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis will be working with Timaru DC with the exception management including tracking of changes and monthly reporting requirements.	01/03/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis to continue revising monthly reporting from TDC, adopting the use of the logger in the region	01/12/2020	

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

Code reference

Clause 15.2 and 15.37B(c)

Code related audit information

The audit must verify that:

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

Audit observation

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

- checking the registry to confirm that the ICP has the correct profile and submission flag; and
- checking the database extract combined with the on hours against the submitted figure to confirm accuracy.

Audit commentary

The ICPs switched to Genesis effective from 01/10/19.

Wattages are derived from reports provided by TDC. The field survey found that the best available estimate of field wattage is not precise enough to conclude that the database is accurate within ±5.0% as recorded in **section 3.1**. The variability of the sample results was impacted by a discrepancy affecting three lights on Redruth Street. Although the wattage differences were small, the percentage difference between the survey and database for this street significantly affected the precision findings in relation to R_H. On and off times are derived from Astronomical Society night hours.

Genesis reconciles this DUML load using the SST profile. The on/off times are based on "Profile night hours", which leads to inaccurate consumption information. "Profile night hours" are the SST profile hours, which are sunset and sunrise hours published by NIWA rounded to the nearest half hour. The SST profile rules do not allow these on/off times to be used to calculate consumption information. The SST profile on/off times can be used to apportion consumption, but the times are too inaccurate to be used for any other purpose. The reason for this is that if the "on" time is 18.20 and the off time is 07.13, the "Profile night hours" will have values from 18.00 to 07.30. The on/off times used may vary from the actual on/off times by up to 29 minutes at each end of the period.

Festive light information is provided with connection and disconnection dates, and they are included in submission data when connected. The previous audit recorded that Contact Energy had incorrectly subtracted the festive lights from the submission totals when disconnected, when they should have

been added when connected. This issue was resolved by Contact Energy, prior to the ICPs being switched to Genesis.

Sources of inaccuracy are as follows:

Issue	Estimated volume information impact (annual kWh)
Five lights had incorrect gear wattages recorded, which were corrected prior to the November 2019 database extract being provided to Genesis.	Under submission of 26 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 as a snapshot and this practice 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. Genesis completes revision submissions where corrections are required, and is working to develop event based calculations, which will enable accurate volume calculations where lamps change part way through a month.

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

Change dates are automatically generated by RAMM when records change but cannot be selected by the user. Changes are generally entered by TDC as soon as they receive notification via RAMM work management process that the field work is complete. Where a light type has changed, TDC updates the installation date to match the date that the change was completed.

Festive lights are recorded in RAMM and managed in the same way as other lights. On and off dates are recorded in the monthly reports to Genesis.

Audit outcome

Non-compliant

Non-compliance	Description
Audit Ref: 3.2 With: Clause 15.2 and 15.37B(c) From: 01-Sep-19 To: 31-Oct-19	Incorrect use of SST profile. The database is not confirmed as accurate with a 95% level of confidence as recorded in **section 3.1**. The monthly database extract provided does not track changes at a daily basis and is provided as a snapshot. Livening dates are not recorded for new connections, and lamp installation dates are replaced where lights change. Five lights had incorrect gear wattages recorded resulting in under submission of 6 W or 26 kWh per annum (based on 4,271 burn hours). The discrepancies were corrected prior to the November 2019 database extract being provided to Genesis. Potential impact: Medium Actual impact: Low Audit history: Three times Controls: Moderate Breach risk rating: 2
Audit risk rating	**Rationale for audit risk rating**
Low	The controls over the database are rated as moderate, because: • the accuracy assessment was skewed by a very small number of exceptions where a large wattage percentage difference was present, and very few data accuracy issues were identified overall; • the database update processes will ensure that in most cases the change date reflects the date that the change is made; and • a very small number of lights had incorrect gear wattages and were corrected. The impact is expected to be low based on the kWh variances identified.

Actions taken to resolve the issue	Completion date	Remedial action status
Genesis are correcting how burn hours are derived requesting the appropriate logger from EMS to meet compliance requirement. Genesis will be working with Timaru DC with the exception management.	01/03/2020	Identified
Preventative actions taken to ensure no further issues will occur	**Completion date**	
Genesis to continue revising monthly reporting from TDC, adopting the use of the logger in the region	01/12/2020	

CONCLUSION

The TDC ICPs switched from Contact to Genesis effective from 01/10/19.

Streetlight load is determined by wattages held within TDC's RAMM database. New connection, fault, maintenance, and upgrade work is completed by NetCon. All streetlight work is initiated by TDC, and RAMM's work management processes are used to dispatch and manage field work. Once NetCon have completed the work, TDC is notified through the RAMM work management process. TDC then verifies that the work has been completed and updates RAMM. TDC provides monthly reports from RAMM to Genesis.

Festive lighting is recorded in the database, and connection and disconnection dates are recorded and provided to Genesis.

Database accuracy is described as follows:

Result	Percentage	Comments
The point estimate of R	101.0	Wattage from survey is higher than the database wattage by 1.0%
R_L	100.0	With a 95% level of confidence it can be concluded that the error could be between 0.0% and 7.0%
R_H	107.0	

The variability of the sample results was impacted by a discrepancy affecting three lights on Redruth Street, Timaru. Although the wattage differences were small, the percentage difference between the survey and database for this street significantly affected the precision findings in relation to R_H.

The variability of the sample results across the strata means that the true wattage (installed in the field) could be between 0.0% and 7.0% higher than the wattage recorded in the DUML database, and the best available estimate is not precise enough to conclude that the database is accurate within ± 5.0%.

- In absolute terms the installed capacity is estimated to be 5 kW higher than the database indicates.
- There is a 95% level of confidence that the installed capacity is between 0 kW to 35 kW higher than the database.
- In absolute terms, total annual consumption is estimated to be 22,200 kWh higher than the DUML database indicates.
- There is a 95% level of confidence that the annual consumption is between 0 and 150,400 kWh p.a. higher than the database indicates.

Genesis reconciles this DUML load using the SST profile, and on and off times are derived from Astronomical Society night hours.

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

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

The current monthly report is provided as a snapshot and is non-compliant, and Genesis completes revision submissions where corrections are required. Genesis is working to develop event based calculations, which will enable accurate volume calculations where lamps change part way through a month.

The future risk rating of seven indicates that the next audit be completed in 18 months. Given the minor nature of the discrepancies identified, I agree with this recommendation.

PARTICIPANT RESPONSE

Genesis and Timaru relationship is very new, Genesis will be working with the council to better its reporting and database management. Genesis will be correcting the use of night hours by requesting logger information from EMS or adopt the acceptable industry average burn hours.