VERITEK

Gas Downstream Reconciliation Performance Audit Final Report

For

Mercury NZ Limited

Prepared by Steve Woods – Veritek Ltd

Date of Audit: 10/11/20 - 11/11/20

Date Audit Report Complete: 22/03/21

Executive Summary

This Performance Audit was conducted at the request of the Gas Industry Company (GIC) in accordance with Rule 65 of the Gas (Downstream Reconciliation) Rules 2008 effective from 14 September 2015.

The purpose of this audit is to assess the systems, processes and performance of Mercury NZ Limited (Mercury) in terms of compliance with these rules.

The audit was conducted in accordance with terms of reference prepared by the GIC, and in accordance with the "Guideline note for rules 65 to 75: the commissioning and carrying out of performance audits and event audits, V3.0" which was published by GIC in June 2013.

The summary of report findings in the table below shows that Mercury's control environment is "effective" for 14 of the areas evaluated, "adequate" for two and not adequate for one.

14 of the 17 areas evaluated were found to be compliant. Six breach allegations are made in relation to the remaining areas. They are summarised as follows:

- The registry was populated late for four new connections resulting in submission information not being provided for the initial and interim allocation. The final allocation did not have submission information for one ICP for the period June 2018 to November 2019,
- ICP 1002063469QT236 has an altitude of 400m in the registry but the actual altitude is 40m; the altitude factor is therefore too low by 4.1% and the annualised consumption is approximately 85 GJ, which means submission has been too low by 3.5 GJ,
- incorrect temperature data for three gas gates for January, two gas gates for February and one gas gate for December,
- incorrect temperature conversion factors were used for 16 ICPs because Joule Thomson adjustment was not applied,
- 218 ICPs are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015, and
- the initial submission accuracy did not meet the required accuracy percentage for three gas gates for April and June 2019.

Summary of Report Findings

Issue	Section	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Transmission methodology and audit trails	1.5	Effective	Compliant	Reports were appropriately retained and had not been modified after submission. Audit trails were available.
ICP set up information	2.1	Adequate	Not compliant	The registry was populated late for four new connections resulting in submission information not being provided for the initial or interim allocations and for one ICP submission information was not provided for the final allocation for a 6-month period. ICP 1002063469QT236 has an altitude of 400m in the registry but the actual altitude is 40m. The altitude factor is therefore too low by 4.1%. The annualised consumption is approximately 85 GJ, which means submission has been too low by 3.5 GJ.
Metering set up information	2.2	Effective	Compliant	Mercury has robust validation processes for the identification of meter pressure discrepancies and changes.

Issue	Section	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Billing factors	2.3	Not adequate	Not compliant	Incorrect temperature data for three gas gates for January, two gas gates for February and one gas gate for December. Incorrect temperature conversion factors were used for 16 ICPs because Joule Thomson adjustment was not applied. Some billing classes had incorrect gas types assigned. There are 218 ICPs that are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015.
Archiving of reading data	3.1	Effective	Compliant	Robust controls are in place for the archiving and security of meter reading data.
Meter interrogation requirements	3.2	Effective	Compliant	Consumption reporting is monitored monthly and compliance is achieved.
Meter reading targets	3.3	Effective	Compliant	Mercury uses best endeavours to obtain meter readings at least once every 12 months.
Non TOU validation	3.4	Effective	Compliant	A robust validation process is in place before and after invoicing.
Non TOU error correction	3.5	Effective	Compliant	The error identification and correction processes are robust.
TOU validation	3.6			Not applicable to the scope of this audit.

Issue	Section	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Energy consumption calculation	4	Effective	Compliant	The conversion process was proved from end to end using a spreadsheet-based calculation tool.
TOU estimation and correction	5.1			Not applicable to the scope of this audit.
Provision of retailer consumption information	5.2	Adequate	Compliant	The process for preparing consumption information files is compliant; however, some gas conversion and pressure correction issues exist. This has resulted in incorrect consumption information being submitted to the allocation agent.
Initial submission accuracy	5.3	Effective	Not compliant	Although compliance has not been achieved, the process is robust. Forward estimates are profiled to improve the accuracy of initial submissions.
Forward estimates	5.4	Effective	Compliant	Mercury's forward estimate process includes a "factoring" process, which involves the use of historic profile shapes.
Historic estimates	5.5	Effective	Compliant	Compliance is confirmed for all scenarios tested.
Proportion of HE	5.6	Effective	Compliant	Reporting has been provided as required.
Billed vs consumption comparison	5.7	Effective	Compliant	On a long-term basis, Mercury's billed information is slightly lower than consumption information. Although these figures cannot be directly compared, they provide a useful indicator to ensure that under reporting of consumption information is not occurring.

Issue	Section	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Gas Trading Notifications	5.8	Effective	Compliant	Processes are in place to ensure that trading notifications are issued where required.

Persons Involved in This Audit

Auditor:

Steve Woods
Veritek Limited

Mercury personnel assisting in this audit were.

Name	Title
Ranjesh Kumar	Commercial Operations and Reconciliation Manager
Kayla McJarrow	Compliance, Risk & Financial Reconciliation Analyst
Fabien Shan	Pricing Operations Analyst
Jerome Tushani	Risk Control Coordinator
Mokaram Al-Zibaree	Meter Readings Specialist
Jacquie Paul	Meter Readings Specialist
Leon Law	Service Delivery Spedialist
Rebecca Prosser	Premise and Metering Team Leader
Ishmita Bedi	Energy Analyst
Evelise Favari	Energy Analyst

Service providers assisting with processes within the audit scope:

Company	Processes
Wells Instrument and Electrical	Meter reading

Contents

1. Pre-Audit and Operational Infrastructure Information

1.1 Scope of Audit

This Performance Audit was conducted at the request of the Gas Industry Company (GIC) in accordance with Rule 65 of the Gas (Downstream Reconciliation) Rules 2008 effective from 14 September 2015. Rule 65 is inserted below:

65. Industry body to commission performance audits

65.1 The industry body must arrange at regular intervals performance audits of the allocation agent and allocation participants.

65.2 The purpose of a performance audit under this rule is to assess in relation to the allocation agent or an allocation participant, as the case may be, -

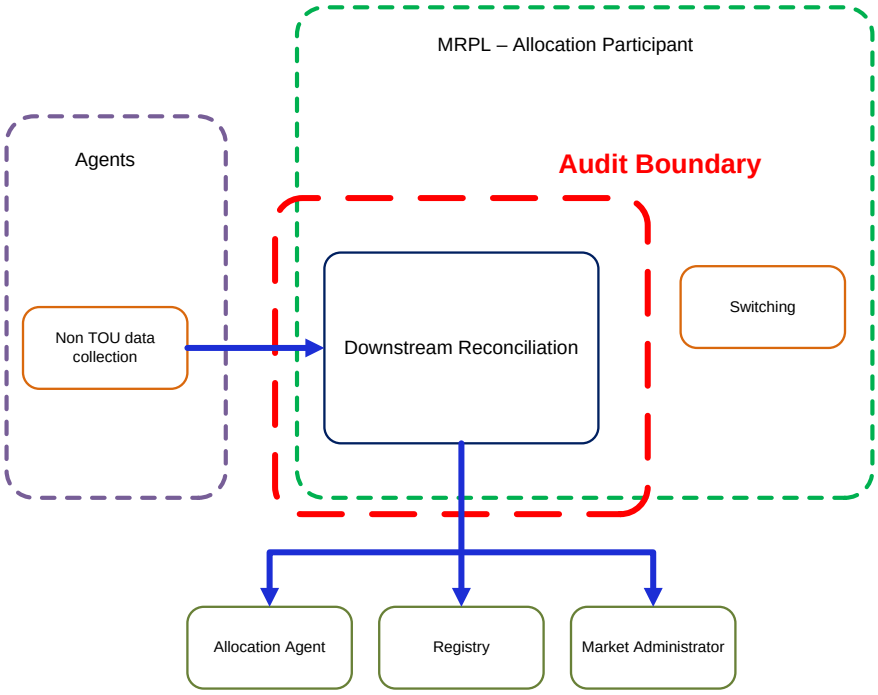
65.2.1 The performance of the allocation agent or that allocation participant in terms of compliance with these rules; and

65.2.2 The systems and processes of the allocation agent or that allocation participant that have been put in place to enable compliance with these rules.

The audit was conducted in accordance with terms of reference prepared by the GIC, and in accordance with the "Guideline note for rules 65 to 75 and 80: the commissioning and carrying out of performance audits and event audits, V3.0" which was published by GIC in June 2013.

The audit was carried out on 10-11 November 2020 at Mercury's offices in Auckland.

The scope of the audit includes "downstream reconciliation" only, as shown in the diagram below. Switching, metering ownership and data collection functions are not within the audit scope. Mercury only has allocation group 4 and 6 ICPs; they do not have any TOU processes or systems.



1.2 Audit Approach

As mentioned in **section 1.1**, the purpose of this audit is to assess the performance of Mercury in terms of compliance with the rules, and the systems and processes that have been put in place to enable compliance with the rules.

This audit has examined the effectiveness of the controls Mercury has in place to achieve compliance, and where it has been considered appropriate sampling has been undertaken to determine compliance.

Where sampling has occurred, this has been conducted using the Auditing Standard 506 (AS-506) which was published by the Institute of Chartered Accountants of New Zealand. I have used my professional judgement to determine the audit method and to select sample sizes, with an objective of ensuring that the results are statistically significant.[1]

Where calculations are performed by Mercury's systems, the algorithm has been checked by using one or two examples as a "sample". Multiple examples are not required because they will not introduce any different variables.

Where compliance is reliant on manual processes, manual data entry for example, the sample size has been increased to a magnitude that, in my judgement, ensures the result has statistical significance.

Where errors have been found or processes found not to be compliant the materiality of the error or non-conformance has been evaluated.

1.3 General Compliance

1.3.1 Summary of Previous Audit

Mercury provided a copy of their previous audit conducted in 2017 by Veritek Ltd. Five breach allegations were made. The resolution of these matters is summarised in the table below.

Breach Allegation	Rule	Section in this report	Resolution
The registry was populated late for seven new connections resulting in submission information not being provided for the initial allocation and for one ICP submission information was not provided for the interim allocation.	28.3	2.1.1	Still existing
1184 ICPs are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015.	26.2.1, 26.3 and 28.2	2.3.2	Still existing

[1] In statistics, a result is considered statistically significant if it is unlikely to have occurred by chance. (Wikipedia)

Best endeavours were not used to get meter readings at least once in a 12-month period.	26.4.3	3.3	Cleared
15 ICPs did not have pressure corrections applied from the correct date, which resulted in some pressure factors outside the threshold allowed by NZS 5259:2015.	26.2.1, 26.3 and 28.2	3.5	Cleared
Historic estimate is not calculated correctly for the switch in month, where an ICP has switched back to Mercury after being supplied by another retailer.	26.2.1 and 26.3	5.5	Cleared

1.3.2 Breach Allegations

Mercury has 21alleged breaches recorded by the Market Administrator since July 2017. These are summarised as follows:

Nature of Breach	Rule	Quantity	Section in this Report
Initial vs final allocation variances	37.2	17	5.3
1184 ICPs are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015.	26.2.1, 26.3 and 28.2	1	2.3.2
Best endeavours were not used to get meter readings at least once in a 12-month period.	26.4.3	1	3.3
15 ICPs did not have pressure corrections applied from the correct date, which resulted in some pressure factors outside the threshold allowed by NZS 5259:2015.	26.2.1, 26.3 and 28.2	1	3.5
Historic estimate is not calculated correctly for the switch in month, where an ICP has switched back to Mercury after being supplied by another retailer.	26.2.1 and 26.3	1	5.5

As noted in the Summary of Report Findings, this audit has found six areas of non-conformance. The following breach allegations are made in relation to these matters.

Breach Allegation	Rules	Section in this report
The registry was populated late for four new connections resulting in submission information not being provided for the initial and interim allocation. The final allocation did not have submission information for one ICP for the period June 2018 to November 2019.	28.3	2.1.1
ICP 1002063469QT236 has an altitude of 400m in the registry but the actual altitude is 40m. The altitude factor is therefore too low by 4.1%. The annualised consumption is approximately 85 GJ, which means submission has been too low by 3.5 GJ.	26.2	2.1.2
Incorrect temperature data for three gas gates for January, two gas gates for February and one gas gate for December.	26.5.4	2.3.1
Incorrect temperature conversion factors for 16 ICPs because Joule Thomson adjustment was not applied.	26.5.4	2.3.1
218 ICPs are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015.	26.2.1, 26.3 and 28.2	2.3.2
The initial submission accuracy did not meet the required accuracy percentage for three gas gates for April and June 2019.	37.2	5.3

1.4 Provision of Information to the Auditor (Rule 69)

In conducting this audit, the auditor may request any information from Mercury, the allocation agent and any allocation participant.

Information was provided by Mercury in a timely manner in accordance with this rule.

Information was requested from metering equipment owners and was provided within the requested timeframe or a subsequent agreed timeframe by all parties. I consider that all parties have complied with the requirements of this rule.

1.5 Transmission Methodology and Audit Trails (Rule 28.4.1)

The audit trail was evaluated for all data gathering, validation and processing functions. This rule requires that "The consumption information supplied to the allocation agent in accordance with rules 29 to 40 is transferred in such a manner that it cannot be altered without leaving a detailed audit trail".

A sample of GAS040 (initial, interim, and final), GAS070, and GAS080 reports submitted on the Allocation Portal were checked against the original reports on Mercury's network. This check confirmed whether the original files were still available, and if they had been edited after the submission date and time. Compliance is confirmed.

1.6 Draft Audit Report Comments

A draft audit report was provided to the industry body (GIC), the allocation agent, and allocation participants that I considered had an interest in the report. In accordance with rule 70.3 of the 2015 Amendment Version of the Gas (Downstream Reconciliation) Rules 2008, those parties were given an opportunity to comment on the draft audit report and indicate whether they would like their comments attached as an appendix to the final audit report. The following responses were received.

Party	Response	Comments provided	Attached as appendix
Mercury Energy	Yes	Yes	Included in each relevant section.

The comments received were considered in accordance with rule 71.1, prior to preparing the final audit report. No changes were made to the report.

2. Set-up and Maintenance of Information in Systems (Rule 28.2)

Every retailer must ensure the conversion of measured volume to volume at standard conditions and the conversion of volume at standard conditions to energy complies with NZS 5259:2015, for metering equipment installed at each consumer installation, for which the retailer is the responsible retailer.

Compliance with this rule has been examined in relation to the set-up of ICP, metering and billing information. I have also considered the Gas (Downstream Reconciliation) Rules 2008 Billing factors guideline note v1.0 (Billing Factors Guideline) published by GIC on 30/11/2015 when examining the set up and maintenance of information.

2.1 ICP Set Up Information

2.1.1 New Connections Process

The process was examined for the connection and activation of new ICPs.

New connections are managed via the networks' portals. Progress notifications are automatically generated, and the relevant details are loaded into SAP.

One of the main issues with the new connections process is that the physical connection is made at the property when the ICP is still at the "ready" status. At this point the consumer has not always registered with a retailer, even though gas is being consumed. Because networks will create ICPs based on a request from the customer, the retailer is not always included in the communication process.

When an ICP is established in SAP for a proposed new connection a "proposed connection date" field is populated. Monitoring is in place to identify those ICPs where this date has passed without the receipt of a livening notification. There is also monitoring of situations where a livening notification has been provided but a meter docket has not been received. Customer identification and registration is managed by outbound calling to "register" the customer at the time the ICP is first established for the proposed new connection.

The "Maintenance Breach History Report (RET breaches)" report was examined for the period August 2019 to September 2020. This report contained 146 ICPs where the initial registry update was later than two business days, out of a total of 940 new connections. I checked the records for six ICPs where the registry update was more than 10 business days. In all six cases, Mercury updated the registry as soon as they were notified by the distributor or meter owner. Late field notification was the cause of the late updates in all cases.

I checked the "RSREADY" report to identify ICPs at Ready, where Mercury is the proposed retailer to ensure they were loaded into SAP. The report contained 290 records. I checked the records for 82 ICPs where the creation date was prior to 01/01/2020. The findings are as follows:

- 12 ICPs are not recorded in SAP,

- 17 ICPs have had the new connection cancelled,
- 33 ICPs are recorded as "on hold",
- 16 ICPs are in progress, and
- four ICPs were not changed to ACTC in the registry despite notification being received from the field or from the meter owner having populated the registry; non-conformance is recorded below, and the details are shown in the following table.

ICP	Creation date	Connection date	Registry input date	GJ since connection date	Comments
1001295913NG57B	9/05/2018	12/06/2018	10/11/2020	78.90	Initial, interim and final allocation missed for the period June 2018 to November 2019.
1002035223QT2B0	12/06/2017	14/07/2020	11/11/2020	17.38	Initial and interim allocation missed.
1002072527QT34D	24/10/2019	16/11/2019	11/11/2020	21.31	Initial and interim allocation missed.
1002073372QT1AC	8/11/2019	3/06/2020	11/11/2020	15.47	Initial and interim allocation missed.

Non-Conformance	Description	Audited party comment
Regarding: Rule 28.3 **Control Rating**: Adequate	The registry was populated late for four new connections resulting in submission information not being provided for the initial and interim allocation. The final allocation did not have submission information for one ICP for the period June 2018 to November 2019.	**Response:** These 4 instances have highlighted the need for more frequent follow up for jobs issued to the field. This has been reviewed and a process implemented. In some cases, results were returned but job status not updated so metering was not setup and registry not updated. The improved process will also capture this. **Comments:** We have implemented better monitoring of jobs in this status and will look at periodically analysing ICPs at "Ready" status.

2.1.2 Altitude Information

It is a distributor's responsibility to populate the registry with correct altitude information to support compliance with NZS 5259:2015, and it is a retailer responsibility to comply with NZS 5259:2015 for the conversion of volume to energy.

NZS 5259:2015, which was published in November 2015, contains the following requirements regarding the way that altitude information should be managed.

1. The maximum permissible error is ± 1.0% where the meter pressure is less than or equal to 100kPa, and ±0.5% where the meter pressure is greater than 100kPa.
2. The following note is also included "Altitude should be determined within 10m where practicable."

Mercury provided a registry list file and a sample of ICPs per distributor was checked against "google earth" data. The sample was selected by firstly looking for obvious outliers and then increasing the sample size through random selection. The "google earth" data is based on the "Shuttle Radar Topography Mission" (SRTM) results and a number of recent studies indicate an accuracy of ± 10m for altitude. An evaluation against this data is considered an appropriate test for "reasonableness".

Altitude figures within approximately 90m of the actual altitude will ensure an accuracy of ± 1.0%. As shown in the table below, all altitude data checked was accurate within 90m.

Point 2 above recommends altitude figures are determined to within 10m where practicable. An evaluation of altitude data on the registry was conducted to check whether this recommendation had been met. As noted above, the margin of error of the "google earth" data appears to be approximately ± 10m, therefore, to allow for this margin, I have checked that the registry data is within 20m of "google earth" data.

As shown in the table below the altitude data on the registry appears to be very accurate.

Distributor	Total ICPs	ICPs checked	Quantity within 20m	Quantity within 90m
UNLG	31,134	20	20	20
NGCD	4,256	20	20	20
POCO	9,127	20	20	20
GNET	1,226	20	20	20
Total	**45,743**	**80**	**80**	**80**

A further evaluation was conducted of ICPs where the altitude figure was zero on the registry. This data appears to be slightly less accurate than when a figure other than zero is populated. The results are shown in the table below. UNLG and GNET do not have any ICPs with zero populated. NGCD has

three and a check of all three found all were within 20m. POCO has 11 ICPs with zero populated. Six were within 20m and all 11 were within 90m.

Distributor	Total ICPs	ICPs with altitude of zero	ICPs checked	Quantity within 20m	Quantity within 90m
UNLG	31,134	0	N/A	N/A	N/A
NGCD	4,256	3	3	3	3
POCO	9,127	11	11	6	11
GNET	1,226	0	N/A	N/A	N/A
Total	**45,743**	**14**	**14**	**9**	**14**

There were no altitude differences where the conversion factors are outside the allowable tolerances.

ICP 1002063469QT236 has an altitude of 400m in the registry but the actual altitude is 40m. The altitude factor is therefore too low by 4.1%. The annualised consumption is approximately 85 GJ, which means submission has been too low by 3.5 GJ.

Non-Conformance	Description	Audited party comment
Regarding: Rule 26.2 **Control Rating**: Adequate	ICP 1002063469QT236 has an altitude of 400m in the registry but the actual altitude is 40m. The altitude factor is therefore too low by 4.1%. The annualised consumption is approximately 85 GJ, which means submission has been too low by 3.5 GJ.	**Response:** We have confirmed the correct altitude to be 38 and this has been updated in the registry and our systems. **Comments:** This has been resolved.

2.2 Metering Set-up Information

Mercury compares their metering fields against registry metering fields on a daily basis. If a discrepancy is identified, Mercury requires a metering docket or some other form of evidence to confirm the meter pressure before they make a change.

Revisions of consumption information only occur if incorrect invoices are reversed and re-billed with the correct meter pressure. I checked nine meter pressure changes and they were all correctly processed. Reverse and rebill occurred for ICPs where invoices had already been sent.

2.3 Billing Factors

2.3.1 Temperature Information

For ICPs where the actual temperature is not measured NZS 5259:2015 states that temperature may be estimated, and four methodologies are provided. These are listed below in order of decreasing preference.

(a) Gas temperature records for the GMS location under flowing conditions. Historic records can be used if similarity is preserved.
(b) Records of actual gas temperature in similar installations at similar locations over corresponding periods.
(c) For compact installations directly connected to short risers and well shaded from direct sunlight, the average ground temperature at 300mm depth. NOTE – Reliable and relevant climatic temperature data may be used as a basis for estimating average 300mm ground temperatures. This may include published data.
(d) For installations where the inlet pipes are exposed to ambient air conditions the temperature may be estimated from the mean temperature obtained at reliable and relevant weather recording stations. The installation should be shielded from direct sunlight.

Mercury has chosen option (c) and uses a read-to-read daily average temperature in their calculations.

Temperature data has been refreshed since the last audit. I compared Mercury's temperature data for all gas gates for a 12-month period against the data published by Gas Industry Company, and I found some examples where the differences in temperatures will result in conversion factors having errors greater than 1.1%, as shown in the table below.

Gas gate	Jan MEEN	Jan GIC	MEEN factor	GIC factor	% difference
DAN05001	22.17354839	18.9	0.9757095	0.98665	1.11%
KIN02601	22.66870968	19.00	0.9740763	0.98631	1.24%
TKR19701	22.66870968	19.30	0.9740763	0.98530	1.14%
Gas gate	**Feb MEEN**	**Feb GIC**	**MEEN factor**	**GIC factor**	**% difference**
DAN05001	21.91276	19.2	0.97657	0.98563	0.92%
KIN02601	22.91138	19.2	0.97328	0.98563	1.25%
TKR19701	22.91138	19.5	0.97328	0.98462	1.15%
Gas gate	**Dec MEEN**	**Dec GIC**	**MEEN factor**	**GIC factor**	**% difference**

DAN05001	20.45161	17.6	0.98143	0.99106	0.97%
KIN02601	20.67484	17.3	0.98069	0.99208	1.15%
TKR19701	20.67484	17.6	0.98069	0.99106	1.05%

Non-Conformance	Description	Audited party comment
Regarding: Rule 26.5.4 **Control Rating**: Adequate	Incorrect temperature data for three gas gates for January, two gas gates for February and one gas gate for December.	**Response:** We believe our current methodology is adequate and has produced only a few minor discrepancies. We will look at reviewing other methodologies. **Comments:** We plan to review our temperature estimation methodology as well as the inclusion of the Joule Thompson effect before our next upload of temperature data.

Temperature is set at billing class level. Each billing class is assigned to one region. During the previous audit, some ICPs had been assigned to an incorrect billing class, based on their gas gate. In some cases, the billing class error resulted in an incorrect temperature being applied. I re-checked the billing class information and found it had been corrected and is now accurate.

Mercury does not apply the Joule-Thompson effect adjustment. NZS 5259:2015 states that correction for temperature drop due to Joule-Thomson effect of pressure reduction is applicable if temperature methodologies (b), (c) or (d) are used, provided the reduction is made in the same installation and immediately upstream of the GMS. "In other cases, or for large pressure drops or high flow rates the actual temperature drop should be measured. For natural gas, the temperature drop is about 0.5ºC per 100kPa of pressure drop." This indicates that adjustment for the Joule-Thomson effect is desirable.

The Billing Factors Guideline contains the following expectations by GIC:

- Network owners ensure nominal operating pressures are correctly populated in the registry for all ICPs on their networks.
- Once network pressures are correctly populated, retailers ensure that they account for the Joule-Thomson effect by using the network pressure in the registry in their conversions of metered volumes to standard volume, particularly in situations where failure to do so will result in conversion errors greater than those allowed in Table 3 of NZS 5259:2015.

This also reinforces that adjustment for the Joule-Thomson effect is desirable. I recommend that Mercury adjusts for the Joule-Thompson effect.

Recommendation	Audited party comment
Consider adjusting temperature to include the Joule-Thompson effect.	**Response:** We will look into including Joule-Thompson in our gas temperature calculations. **Comments:** We plan to investigate what system changes are required to complete this work and aim to have the Joule-Thompson effect adjustment included in our next upload of temperature data.

I found 16 ICPs with large pressure drops between the network pressure and the meter pressure. The table below shows that the temperature conversion errors are greater than the allowable 1.1%.

ICP	Network pressure	Meter pressure	Temperature factor with JT	Temperature factor without JT	% difference
0000037431QTCE3	700	1.5	0.994718	0.982944	1.18%
0000037441QT9BE	700	1.5	0.994718	0.982944	1.18%
0000037731QTFE0	700	1.5	0.994718	0.982944	1.18%
0000294201QT1CD	700	2.5	0.994718	0.982944	1.18%
0000345981QTE14	700	2.5	0.994718	0.982944	1.18%
0000355431QT14F	700	3	0.994718	0.982944	1.18%
0000401521QT219	700	3	0.994718	0.982944	1.18%
0000901391QT00F	700	14	0.994718	0.982944	1.18%
0001000363NGE5F	700	1.5	0.994718	0.982944	1.18%
0001733031QT5D0	950	2	0.999029	0.982944	1.61%
0001835111QTA3B	950	2	0.999029	0.982944	1.61%
0004202165NGA1D	950	1.5	0.999029	0.982944	1.61%
0004219388NG2FA	950	1.5	0.999029	0.982944	1.61%
0004219464NG45C	950	1.5	0.999029	0.982944	1.61%
0004222001NG42E	950	1.5	0.999029	0.982944	1.61%
0004224606NGA22	950	1.5	0.999029	0.982944	1.61%

Non-Conformance	Description	Audited party comment
Regarding: Rule 26.5.4 **Control Rating**: Adequate	Incorrect temperature conversion factors for 16 ICPs because Joule-Thomson adjustment was not applied.	**Response:** We will look into including Joule-Thompson in our gas temperature calculations. **Comments:** We plan to investigate what system changes are required to complete this work and aim to have the Joule-Thompson effect adjustment included in our next upload of temperature data.

2.3.2 Calorific Values

Gas calorific value (CV) data is sourced from the Open Access Transmission Information System (OATIS) and is loaded into SAP each business day. Specific Gravity (S.G.), carbon dioxide (CO_2), and Nitrogen (N_2) data is not loaded in SAP.

CV data for the previous day is normally available in OATIS by late morning each business day.

Responsibilities for loading the CV data are clear, and there is adequate cover if any staff who normally process CV data are unavailable. If the data is not loaded by 2.00pm, an automated email is sent to the whole billing and operations team for follow up. System controls prevent invoices being generated where CV data does not cover the entire billing period. Staff are also aware that reads cannot be invoiced until the following business day.

The daily download and import process was observed. There is no manual manipulation of the raw data file, and the import is checked to ensure that it completed successfully.

Like temperature, CV is set at billing class level. Each billing class is assigned to one region. I found two key issues with this:

- Some billing classes had incorrect gas types assigned:
    - the Rotorua and Taupo billing classes were both assigned gas type R, but should have gas type B, and
    - the Taranaki billing class was assigned gas type E, but Taranaki gas gates could have gas type E, M, N, O or P.

I reviewed the impact that incorrect assignment of CV would have on the gas conversion process, by comparing the CV applied to the CV which should have been applied for ICPs connected to the gas gate. Any difference greater than ±0.5% is considered material. All of the differences identified are greater than ±0.5% and are therefore considered material.

Bill Class and Gate	Count of ICPs	Gas Type Applied	Correct Gas Type	Applied Avg CV*	Correct Avg CV*	% Difference
Incorrect gas type assigned to billing class						
GR04 (Rotorua)	129	R	B	39.73645122	39.42759756	-0.78%
GR13 (Taranaki - Eltham)	1	E	N	38.5927561	39.76684146	2.95%
GR13 (Taranaki - Hawera)	4	E	P	38.5927561	39.85473171	3.17%
GR13 (Taranaki - Inglewood)	5	E	U	38.5927561	37.52963415	-2.83%
GR13 (Taranaki - Kaponga)	0	E	N	38.5927561	39.76684146	2.95%
GR13 (Taranaki - Manaia)	1	E	P	38.5927561	39.85473171	3.17%
GR13 (Taranaki - Oakura)	6	E	M	38.5927561	39.12132927	1.35%
GR13 (Taranaki - Okato)	0	E	M	38.5927561	39.12132927	1.35%
GR13 (Taranaki - Opunake)	2	E	M	38.5927561	39.12132927	1.35%
GR13 (Taranaki - Patea)	1	E	O	38.5927561	39.87665854	3.22%
GR13 (Taranaki - Pungarehu No 1)	1	E	M	38.5927561	39.12132927	1.35%
GR13 (Taranaki - Pungarehu No 2)	0	E	M	38.5927561	39.12132927	1.35%
GR13 (Taranaki - Stratford)	7	E	N	38.5927561	39.76684146	2.95%
GR13 (Taranaki - Waverley)	1	E	O	38.5927561	39.87665854	3.22%
GR05 (Taupo)	60	R	B	39.73645122	39.42759756	-0.78%
Total	**218**					
Total material or likely to be material	**218**					

*80 days average between 12/03/20 to 01/06//20

A non-conformance for applying incorrect CV values is raised below. Because CV is applied for each read period, it is not possible to confirm every instance of non-conformance. Comparing average CV over a 3-month period gives a reasonable indication of how likely an ICP is to be affected by a material error.

Non-Conformance	Description	Audited party comment
Regarding: 26.2.1, 26.3 and 28.2 **Control Rating**: Adequate	218 ICPs are likely to have had incorrect CV values applied, which were outside the threshold allowed by NZS 5259:2015.	**Response:** We have corrected the gas type for Rotorua and Taupo which accounts for 189 of the 218 ICPs identified here. For the remaining 29 ICPs, system restrictions prevent us from assigning different gas types under one billing class. **Comments:** As above.

3. Meter Reading and Validation

3.1 Archiving of Register Reading Data (Rule 28.4.2)

Retailers are required to keep register reading data for a period of 30 months. Data was examined during the audit and it is confirmed that Mercury securely archives data for a period in excess of 30 months.

3.2 Retailer to Ensure Certain Metering Interrogation Requirements are Met (Rule 29)

This rule requires that for consumer installations where the actual or expected consumption is greater than 10TJ, a TOU meter will be installed and the installation will be assigned to allocation group 1 or 2. For consumer installations where the actual or expected consumption is between 250GJ and 10TJ a non-TOU meter will be installed and the installation will be assigned to allocation group 4.

Mercury only has allocation group 6 and 4 ICPs. Mercury monitors consumption reporting monthly to identify ICPs with potentially incorrect allocation groups, and if it is determined the consumption is likely to remain at the reported level the allocation group is changed. The most recent report was examined, which confirmed the allocation groups and meter reading frequency were changed as soon as practicable.

3.3 Meter Reading Requirements (Rules 29.4.3, 29.5 & 40.2)

All consumer installations with non-TOU meters must have register readings recorded at least once every 12 months unless exceptional circumstances prevent such an interrogation despite the best endeavours of the retailer.

Mercury provided a copy of some GAS080 reports for June to August 2020, along with a list of 287 ICPs not read within the last 12 months. The records in SAP were checked for 20 installations and I found that exceptional circumstances were present for them all. Mercury has a robust process to conduct outbound communication where two meter readings have been missed. Vacant ICPs are still included in the reading schedule.

The 90% threshold was met for the three months I checked; the table below shows the level of attainment.

Target	Reading Percentage June 2020	Reading Percentage July 2020	Reading Percentage August 2020
Rolling 4 months (target 90%)	94.91%	95.53%	97.01%
12 months (target 100%)	99.35%	99.33%	99.32%

Mercury achieved compliance with rule 40.2, which is the requirement to report the number and percentage of validated register readings obtained in accordance with rules 29.4.3 and 29.5.

3.4 Non TOU Validation

Meter reading validation occurs at multiple levels.

At source, the handheld data input devices perform a localised validation, to ensure that the reading is within expected high-low parameters. These parameters are set as a "high/low" limit, based on an agreed setting with Mercury.

Readings that fail this initial validation must be re-entered, and if the second reading is the same, it will be accepted; if it is different (indicating an error with the first reading) then it must be re-entered. Once the same reading has been entered twice consecutively, it will be accepted.

The second level of validation occurs when the data reaches Mercury. A "master data" validation is conducted which ensures that the reading relates to the correct ICP, meter and register. A file "pre check" is also conducted and only files with a date within one month of the current date are accepted. This check also identifies obvious corruption of the data.

A validation is also conducted to ensure readings are within an acceptable range, the validation process contains a graphical tool that enables the current reading to be viewed in relation to historic consumption. The validation logic now caters for seasonality and regional factors. Overall, this validation process is considered very robust.

The next level of validation occurs during the "billing validation" process. This process checks for high dollar amounts in addition to short and long billing periods.

Meter readings are not edited during these processes. If a reading fails validation and an incorrect meter reading is suspected, then a check reading is performed.

3.5 Non TOU Error Correction

The process for error correction was examined to ensure that consumption information for prior consumption periods is included in the revision process and provided to the allocation agent.

The allocation process uses billed consumption as an input. If billed consumption has been corrected after an error occurs, the revised consumption will be submitted. I reviewed a sample of corrections, which confirmed this process, and that the revised data flowed through to revisions.

Mercury monitors meter pressure discrepancies between SAP and the registry. When differences are found the change is made in SAP from the correct date. If invoices have already been sent, which can occur if the meter owner backdates a change in the registry, reverse and rebill occurs. I checked nine examples of small and large pressure changes and they were all processed correctly.

Mercury monitors zero consumption and if a meter is found to be faulty, rebilling occurs using estimates based on historic or future consumption. I checked two examples to confirm compliance.

Mercury monitors consumption on vacant or disconnected ICPs and there is a process in place to identity the consumer so they can be billed. If a customer cannot be identified the consumption is billed to "mercury unbilled" to ensure submission occurs. I checked 13 examples which confirmed compliance.

3.6 TOU Validation

Mercury does not supply any TOU customers.

4. Energy Consumption Calculation (Rule 28.2)

To evaluate this calculation a spreadsheet was prepared which converts volume between meter readings to volume at standard conditions and then to energy consumption.

The relevant information for five invoices was entered into the spreadsheet and the resulting energy value was compared to that calculated by SAP. The sample covered corrections and range of gas types, pressure, temperature and altitude values.

This comparison confirmed the accuracy of the SAP calculation and compliance with NZS 5259:2015 for the pressure, altitude, temperature and calorific value, where the correct CV is applied for the gas gate.

As mentioned in **section 2.3.1**, Mercury does not adjust for Joule-Thomson.

Mercury does not adjust for compressibility either. The Standard requires that a compressibility factor be applied whenever the error due to nonapplication of such a factor would give rise to errors in excess of the limits defined in Table 3 of the Standard (±0.2% for metering pressures below 500 kPa and ±0.25% otherwise). The rule of thumb, as recommended in NZS5259, is to correct for compressibility at pressures above 50 kPa. One ICP has a pressure of 70 kPa and I checked whether the 0.2% limit was exceeded by not applying compressibility. The error was 0.181% which is within the limit, however I recommend Mercury conducts a monthly check of all ICPs with pressures above 50kPa to ensure the error does not exceed 0.2%.

Recommendation	Audited party comment
Conduct a periodic check of all ICPs with pressures above 50kPa to ensure the error does not exceed 0.2%.	**Response:** We will look at implementing periodic checks where meter pressure is above 50kPa. **Comments:** As above.

A non-conformance relating to incorrect application of CV is raised in **section 2.3.2 Calorific Values**. Incorrect application of temperature is raised in section **2.3.1 Temperature Information**.

5. Estimation and Submission Information

5.1 TOU Estimation and Correction (Rule 30.3)

Mercury does not supply any TOU customers.

5.2 Provision of Retailer Consumption Information (Rules 30 to 33)

Mercury's compliance with rules 30 to 33 was examined by a "walk through" of their processes and controls to confirm compliance.

A GAS040 file was examined and data for two gas gates was compared to the data in Mercury's system at ICP level; the totals matched, which confirms compliance. This also proves that Mercury's consumption information provided to the allocation agent is calculated at ICP level and then aggregated.

The matter of vacant consumption was also examined. When an ICP is vacant but still active (ACTV on the registry), meter reading still occurs and any volume recorded is converted into validated consumption and is then included in the allocation process, even though this consumption is not billed. A sample of active-vacant ICPs were checked, and I confirmed that consumption is included in the GAS040 report.

I also reviewed a sample of inactive ICPs where consumption was found and confirmed that the consumption is included in the GAS040 report.

The process for preparing submission is compliant, however, some calorific value and temperature issues have resulted in incorrect consumption information being submitted to the allocation agent. These issues are discussed in **sections 2.3.1 Temperature information** and **2.3.2 Calorific Values**.

5.3 Initial Submission Accuracy (Rule 37.2)

I checked final allocations for a one-year period from September 2018 to August 2019. Rule 37.2 requires that the accuracy of consumption information, for allocation groups 3 to 6, for initial allocation must be within a certain percentage of error published by the industry body.

Mercury did not meet this requirement for some gas gates during the 12-month period shown. The results are summarised in the table below.

Month	Total Gas Gates	Number Within 10%	% Compliant	Within ±10% or < 200 GJ	% Compliant or immaterial
Sep-18	73	44	60.3%	73	100.0%
Oct-18	73	44	60.3%	73	100.0%
Nov-18	73	43	58.9%	73	100.0%
Dec-18	73	39	53.4%	73	100.0%
Jan-19	73	36	49.3%	73	100.0%
Feb-19	73	38	52.1%	73	100.0%
Mar-19	73	45	61.6%	73	100.0%
Apr-19	73	41	56.2%	70	95.9%
May-19	73	51	69.9%	73	100.0%
Jun-19	73	45	61.6%	70	95.9%
Jul-19	72	38	52.8%	72	100.0%
Aug-19	71	50	70.4%	71	100.0%

The table below shows the difference between consumption information for initial and final submissions at an aggregated level for all gas gates. The consumption information submitted to the allocation agent for the initial allocation is within 10% of the consumption information submitted for the final allocation for all months reviewed except April and June 2019.

Month	Initial Submission All Gas Gates (GJ)	Final Submission All Gas Gates (GJ)	Percentage Variation
Sep-18	119,610	120,452	0.7%
Oct-18	95,366	94,503	-0.9%
Nov-18	78,073	76,301	-2.3%
Dec-18	62,005	59,985	-3.4%
Jan-19	55,373	52,152	-6.2%
Feb-19	48,900	46,402	-5.4%
Mar-19	57,646	54,249	-6.3%
Apr-19	68,581	71,975	4.7%
May-19	111,469	108,612	-2.6%

Month	Initial Submission All Gas Gates (GJ)	Final Submission All Gas Gates (GJ)	Percentage Variation
Jun-19	134,741	139,927	3.7%
Jul-19	154,677	145,826	-6.1%
Aug-19	151,754	150,378	-0.9%

Non-Conformance	Description	Audited party comment
Regarding: Rule 37.2 **Control Rating**: Effective	The initial submission accuracy did not meet the required accuracy percentage for three gas gates for April and June 2019.	**Response:** The decrease in accuracy for the months of April and June 2019 was from a combination of back dated switches and the over/under estimation of the profile shape which was used for ICPs that had not yet received an actual meter read. **Comments:** Mercury performs frequent analysis to ensure that the difference between the allocation submissions is minimal. The accuracy percentage is within expected variation taking into consideration the reasons above.

Mercury monitors variances in submissions at total and gas gate level and has the ability to drill down to ICP level. This reporting showed the variances reported relate primarily to the replacement of estimates with actuals. Submissions are also checked against trading notifications to ensure that all gates required are included, and aggregation fields are checked against the registry.

5.4 Forward Estimates (Rules 34 & 36)

Mercury's forward estimates are based on historic daily average consumption, profiled to reflect the season.

The historic daily average consumption is estimated using one of the following methods, in decreasing order of preference:

- 12 months of validated meter reading history, which occurred within the last 24-months,
- at least 2 validated actual meter readings for the meter,
- average consumption for the customer price plan and meter type,
- average consumption for the customer price plan billing group and meter type, or
- consumption for the average customer at the gas gate, profiled to reflect the season.

The profiling process ensures that the over estimation or under estimation of submission information is minimised during "shoulder" months. This is supported by the findings in **section 5.3**, which showed

that for most months reviewed Mercury was consistent with the initial submission accuracy requirements.

5.5 Historic Estimates (Rules 34 & 35)

To assist with determining compliance of the historic estimate processes, Mercury was supplied with a list of scenarios. For each scenario, a manual calculation was performed using the relevant seasonal adjustment shape file, and this was compared to the calculation performed in Mercury's system. This test also proves that the correct shape file is used in each case.

Test	Scenario	Test Expectation	Result
a	ICP becomes Active part way through a month	Consumption is only calculated for the Active portion of the month.	Compliant
b	ICP becomes Inactive part way through a month.	Consumption is only calculated for the Active portion of the month.	Compliant
c	ICP's become Inactive then Active within a month.	Consumption is only calculated for the Active portion of the month.	Compliant
d	ICP switches in part way through a month	Consumption is calculated to include the 1st day of responsibility.	Compliant
e	ICP switches out part way through a month	Consumption is calculated to include the last day of responsibility.	Compliant
f	ICP switches out then back in within a month	Consumption is calculated for each day of responsibility.	Compliant
g	Continuous ICP with a read during the month	Consumption is calculated assuming the readings are valid until the end of the day	Compliant
h	Continuous ICP without a read during the month	Consumption is calculated assuming the readings are valid until the end of the day	Compliant
i	Rollover Reads	Consumption is calculated correctly in the instance of meter rollovers.	Compliant

Compliance is confirmed for all scenarios tested.

5.6 Proportion of Historic Estimates (Rule 40.1)

This rule requires retailers to report to the allocation agent the proportion of historic estimates contained within the consumption information for the previous initial, interim and final allocations.

A GAS040 file was examined and compared to the data in Mercury's system at ICP level; the totals matched, which confirms compliance. This also proves that Mercury's consumption information provided to the allocation agent is calculated at ICP level and then aggregated.

5.7 Billed vs Consumption Comparison (Rule 52)

The content of the GAS070 files was proved by selecting four gas gates and checking the bills in SAP for all ICPs at those gates, against the total in the GAS070 file for February 2014. This confirmed the accuracy of the data.

The table below shows a comparison between quantities billed and consumption information submitted to the allocation agent for a 3-year period. The consumption information is higher than quantities billed by 0.07%. This minor difference can be explained by the fact that the revision and normalisation processes for billed data are different to those for consumption data, the billed data, and the consumption data contains some initial and interim submission information for the most recent months, which will include a higher proportion of estimated data. Although these figures cannot be directly compared, they provide a useful indicator to ensure that under reporting of consumption information is not occurring.

Year ending	Billed	Consumption	Percentage Difference
Jul-20	1,131,346	1,143,622	-1.09%
Jul-19	1,120,919	1,122,757	-0.16%
Jul-18	1,128,621	1,116,953	1.03%
Total	3,380,885	3,383,331	-0.07%

5.8 Gas Trading Notifications (Rule 39)

A retailer must give notice to the Allocation Agent where they commence or cease to supply gas under a supplementary agreement to a transmission services agreement, or amend information required to be provided under the supplementary agreement under rule 39.2.

Mercury does not have any supplementary agreements and is not required to submit any gas trading notifications under this rule. Mercury staff are aware of the gas trading notification requirements.

6. Recommendations

As a result of this performance audit, I recommend the following:

- consider adjusting temperature to include the Joule-Thompson effect, and
- conduct a periodic check of all ICPs with pressures above 50kPa to ensure the error does not exceed 0.2%.

Appendix 1 – Control Rating Definitions

Control Rating	Definition
Control environment is not adequate	Operating controls designed to mitigate key risks are not applied, or are ineffective, or do not exist. Controls designed to ensure compliance are not applied, or are ineffective, or do not exist. Efficiency/effectiveness of many key processes requires improvement.
Control environment is adequate	Operating controls designed to mitigate key risks are not consistently applied or are not fully effective. Controls designed to ensure compliance are not consistently applied or are not fully effective. Efficiency/effectiveness of some key processes requires improvement.
Control environment is effective	Isolated exceptions identified when testing the effectiveness of operating controls to mitigate key risks. Isolated exceptions identified when testing the effectiveness of controls to ensure compliance. Isolated exceptions where efficiency/effectiveness of key processes could be enhanced.