VERITEK

Material Change Gas Audit

For

First Gas

Prepared by Tara Gannon – Veritek Ltd

Date of Audit: 16/05/17 – 18/05/17

Date Audit Report Complete: 04/08/17

Executive Summary

Up to 3 January 2017, Vector acted as an agent to First Gas, and were responsible for validation, conversion, correction and provision of gas gate metering information. Validation and conversion processes were completed using the Flow2E system.

From 4 January 2017, the agent agreement with Vector ended. First Gas began to complete validation, conversion, correction and provision of gas gate metering information using their own Microsoft Access and Excel based system. This is considered a material change under rule 65.4 of the Gas (Downstream Reconciliation) Rules 2008.

65.4 If the allocation agent or an allocation participant intends to make a change to any of its systems, processes or procedures that could reasonably be considered to be likely to have a major impact on the allocation agent's or allocation participant's compliance with these rules, it must, at least 90 days before the change is to take place, advise the industry body [GIC] of the proposed change.

This audit was conducted at the request of the Gas Industry Company (GIC) under rules 65.5 to 65.6 of the Gas (Downstream Reconciliation) Rules 2008. This review considers First Gas' processes to meet their obligations under the rules.

65.5 Upon notification of a proposed change under rule 65.4, the industry body [GIC] must arrange a performance audit of the allocation agent or allocation participant to be completed at least 30 days before the change is to take effect.

65.6 The purpose of a performance audit arranged under rule 65.5 shall be limited in scope to an audit of the impact of the proposed change on the allocation agent or allocation participant's systems, processes and procedures.

Due to time constraints, it was not possible to complete the audit 30 days before the change came into effect. The GIC agreed to allow a time extension.

The scope of the audit is restricted to assessing compliance with clauses 26.2, 26.3, 27A.1, 27A.2, 41, 44.1 and schedule 1A of the Gas (Downstream Reconciliation) Rules 2008. Data originating from Vector, and actions taken by First Gas to correct data originating from Vector, are specifically excluded from the scope of this audit.

The summary of report findings in the table below shows that First Gas' control environment is effective for six of the areas evaluated, and adequate for the other two areas.

I found that the metering data validation processes were well designed, and help to minimise the risk of incomplete, inaccurate or misleading data being provided. First Gas was already aware of some enhancements that can be made to improve and increase security of processes relating to the validation of gas composition data. Some other minor recommendations to improve processes have been made.

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

- Estimated daily data is provided for two allocated gas gates, Matangi and Pauatahanui 2.
- Some validated injection data was provided late for two initial allocations.
- Notification and correction of errors does not occur immediately, because it takes time to investigate and calculate the correction. In particular, there are delays in processing meter test results, and in investigating issues where input is required from other parties.

Late data, and delays in notification and correction of errors, appear to be related to resourcing.

Summary of Report Findings

Issue	Section	Rule	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Completeness, accuracy and timeliness of information	2.1	26.2	Effective	Compliant	There are controls in place to minimise the risk of inaccurate, incomplete or misleading data being provided.
Identification, remedy and reduction of UFG	2.2	26.3	Effective	Compliant	Processes are in place to identify and resolve excess UFG attributable to data provided by First Gas.
Audit trails	2.3	27A.1	Effective	Compliant	Audit trails and controls to prevent accidental or unauthorised modification of data within the Meter Validation Excel Database and Meter Validation Excel Application are strong. First Gas is aware that the Gas Type Calc Spreadsheet is not as well protected as the other systems, and intends to improve this.
Retention and availability of information	2.4	27A.2	Effective	Compliant	I saw evidence that First Gas is and intends to continue to comply with data retention and provision requirements.
Provision of daily injection information	2.5	41	Adequate	Not compliant	Matangi and Pauatahanui 2 are both allocated gas gates, which require daily metered energy quantities under the rules. Estimated daily data, based on monthly actual readings is provided. Validated injection data was provided late for two initial allocations. In both cases the reasons for late validation were well documented, and action has been taken to prevent recurrence.

Issue	Section	Rule	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Identification and reporting of material errors	3.1	44.1	Adequate	Not compliant	First Gas is currently working with the Allocation Agent to confirm under which circumstances notices are required. At present notices are normally only published where data has been corrected due to an error, or remains unvalidated at month end. Notification of errors does not occur immediately, because it takes time to investigate and calculate the correction. There are delays in processing meter test results, and in investigating issues where input is required from other parties.
Correction of suspected material errors	3.2	Schedule 1A	Effective	Compliant	Based on the sample of corrections reviewed, First Gas used the best information available to them at the time to process corrections.
Correction of actual material errors	3.3	Schedule 1A	Effective	Compliant	Based on the sample of corrections reviewed, First Gas used the best information available to them at the time to process corrections.

Persons Involved in This Audit

Auditor:

Tara Gannon
Veritek Limited

First Gas personnel assisting in this audit were:

Name	Title
Andrew Loft	Pipeline Nominations Manager
Danielle Lowe	Transmission Analyst/Scheduler
Eduardo Villatore	Commercial Advisor - Transmission
Shaun O'Brien	Transmission Analyst/Scheduler

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1. Audit Information

1.1 Scope of Audit

This material change audit was conducted at the request of the Gas Industry Company (GIC) under rules 65.5 to 65.6 of the Gas (Downstream Reconciliation) Rules 2008. This review considers First Gas' compliance with the rules, for systems and processes which have changed.

Data originating from Vector, and actions taken by First Gas to correct data originating from Vector, are specifically excluded from the scope of this audit. The audit focusses on First Gas data and processes only.

The scope of the audit is limited to the following Gas (Downstream Reconciliation) Rules 2008:

26.2 *Every allocation participant must provide the information required under these rules in a manner that is:*

26.2.1 *Accurate and complete; and*

26.2.2 *Not misleading or likely to mislead; and*

26.2.3 *Timely.*

26.3 *Where an allocation participant is or becomes aware of a cause of UFG at a gas gate, it must use reasonable endeavours to remedy the cause of UFG or reduce the UFG occurring at the gas gate.*

27A *Requirements for information provided by the transmission system owner*

Every transmission system owner must ensure that:

27A.1 *Any information supplied to the allocation agent for each allocation in accordance with rule 41 or rule 44 is transferred and stored in such a manner that it cannot be altered without leaving a detailed audit trail; and*

27A.2 *A copy of all information about daily metered energy quantities injected at each gas gate is kept for a minimum period of 30 months and is made available to the allocation agent, industry body or an auditor on request.*

41 *Provision of daily injection information*

41.1 *Every transmission system owner must provide to the allocation agent by 1200 hours on the 4th business day of the month that immediately follows a consumption period the daily metered energy quantities injected at each allocated gas gate connected to its transmission system for that consumption period.*

41.2 *For each interim allocation and final allocation, every transmission system owner must provide to the allocation agent, by the times and on the days specified in rule 32 and 33 respectively, daily metered energy quantities injected at each allocated gas gate connected to its transmission system for the relevant consumption period.*

41.3 *Transmission system owners are not required to provide daily metered energy quantities under rules 41.1 and 41.2 for unmetered gas gates or oversized metered gas gates.*

41.4 *Transmission system owners must provide the allocation agent and the industry body with access to data on daily metered energy quantities injected at each gas gate.*

44.1 *Where an allocation participant discovers that:*

44.1.1 *consumption information previously provided to the allocation agent under rules 31, 32 or 33; or*

44.1.2 *daily metered energy quantities injected at a gas gate previously provided to the allocation agent under rule 41;*

included a material error, that allocation participant must immediately advise the allocation agent of the nature and extent of the error and provide the corrected consumption information or daily metered energy quantities.

Schedule 1A *Transmission system owners must use the best information available to them at the time of calculating daily metered energy quantities*

Metering error	***Correction criteria***
Suspected Metering Error	*If the transmission system owner suspects, or is made aware of, but cannot confirm before the times specified in rule 41 the existence of a metering error at a gas gate, then it will determine daily metered energy quantities for the relevant period based on one or more of the following:* *(a) quantities derived from metering equipment;* *(b) historical data for a corresponding prior period; and/or* *(c) any other information reasonably available to the transmission system owner.*
Actual Metering Error	*If the transmission system owner discovers, or is made aware of, a metering error at a gas gate, daily metered energy quantities for the relevant period will be calculated based on one or more of the following, as applicable to the nature of the of the metering equipment error:* *(a) the results of testing performed on the metering equipment found to have been in error;* *(b) data from accurate metering equipment operating in series;* *(c) data from accurate metering equipment operating in parallel;* *(d) correction factors from a relevant time period when the conversion device or other metering equipment was functioning properly;* *(e) independent corrections for pressure, temperature, compressibility or other relevant factors;* *(f) gas properties based on relevant historical information;* *(g) gas properties from the most appropriate alternative gas analyser;* *(h) data from metering equipment unaffected by the error;* *(i) data from another party's accurate check metering downstream of the gas gate;* *(j) consumption quantities from consumer installations provided by the allocation agent, including production profiles (with due allowance for UFG if applicable);* *(k) historical data for a corresponding prior period; and/or* *(l) other information reasonably available.*

The audit was conducted in accordance with terms of reference agreed upon by the GIC and Veritek, in consultation with First Gas.

The audit was carried out on 16-18 May at First Gas' office in New Plymouth.

1.2 Audit Approach

As mentioned in Section 1.1, the purpose of this material change audit is to assess compliance with the rules, for systems and processes which have changed.

This audit has examined the effectiveness of the controls First Gas 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 First Gas' 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-compliance has been evaluated.

1.3 Compliance

First Gas has no alleged breaches relating to their activities as transmission services operator recorded by the Market Administrator between 4 January 2017 and 4 May 2017.

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

Breach Allegation	Rule	Section in this report
Matangi and Pauatahanui 2 are both allocated gas gates, which require daily metered energy quantities under the rules. Estimated daily data, based on monthly actual readings is provided.	41.1 and 41.2	3.5
Some validated injection data was provided late for two initial allocations.	41.1 and 41.2	3.5
Notification and correction of errors does not occur immediately, because it takes time to investigate and calculate the correction. There are delays in processing meter test results, and in investigating issues where input is required from other parties.	44.1	4.2

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

1.4 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 response was received.

Party	Response	Comments provided	Attached as appendix
Contact Energy	Yes	Yes	Yes

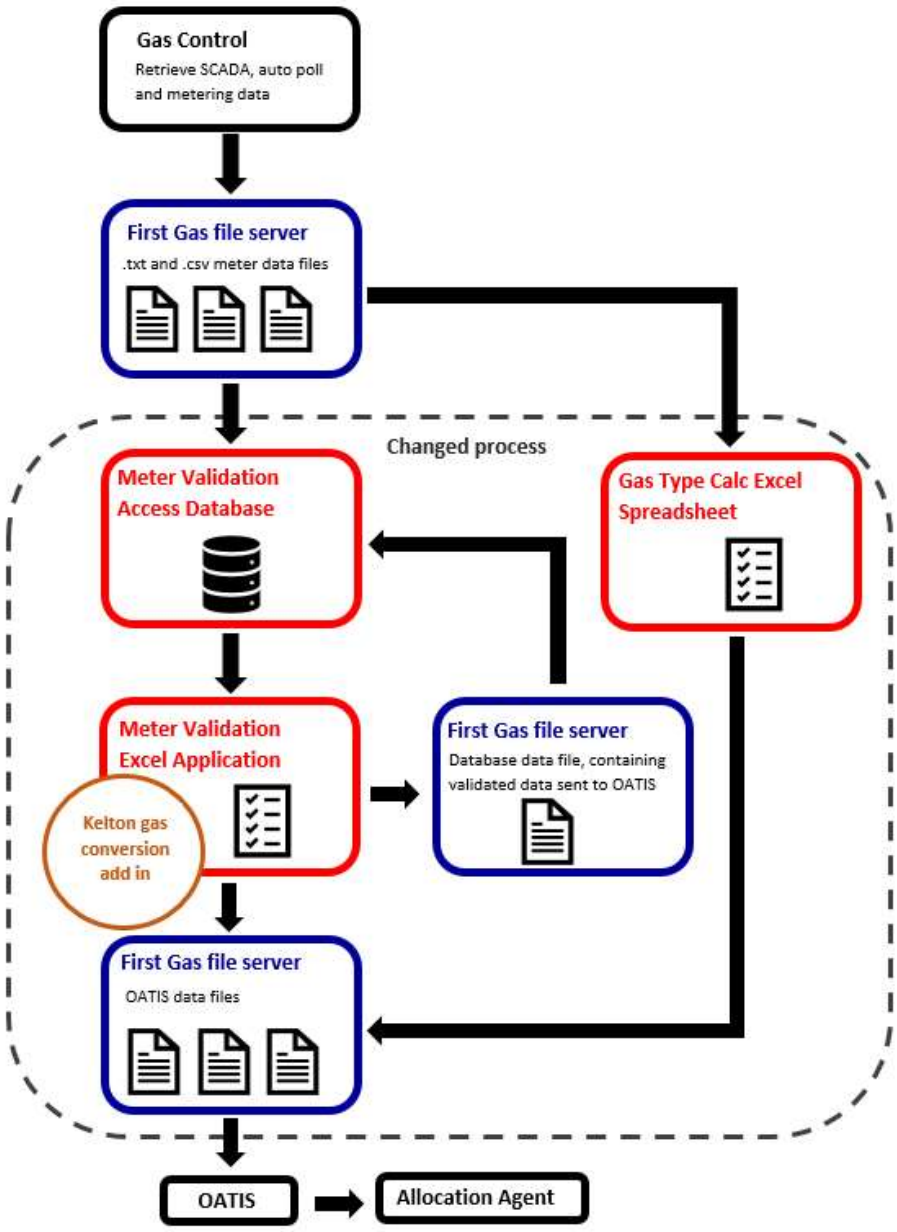
The comments received were considered in accordance with rule 71.1, prior to preparing the final audit report. No changes were made to the report after considering comments. In the appendix, I have recorded the reasons for not making changes after consideration of the comments provided.

2. Overview

The diagram below provides a high-level overview of the major changes to First Gas' systems and processes. Metering data is still provided by Gas Control, but processes to validate the metering data and prepare files for upload into OATIS have changed.

Up to 3 January 2017, Vector acted as First Gas' agent. Vector validated metering data, converted it to energy, and produced upload files using Flow2E, which were manually uploaded to OATIS.

From 4 January 2017, First Gas has validated metering data, converted it to energy and produced upload files using their Meter Validation Access Database and Meter Validation Excel Application. CV data is processed using the Gas Type Calc Excel Spreadsheet. First Gas manually upload the data to OATIS.



At a high level, the process below is followed to provide metering information

- Receive SCADA, autopoll and meter data
- Validate gas type data
- Validate meter data and convert to energy
- Produce output files
- Upload output files to OATIS

3. Information provided to the allocation agent and industry

3.1 Completeness, accuracy and timeliness of information

Under the Gas (Downstream Reconciliation) Rules 2008

26.2 *Every allocation participant must provide the information required under these rules in a manner that is:*

26.2.1 *Accurate and complete; and*

26.2.2 *Not misleading or likely to mislead; and*

26.2.3 *Timely.*

I reviewed the controls and processes to ensure that information provided under the Gas (Downstream Reconciliation Rules) 2008 is accurate, complete, not misleading or likely to mislead, and timely. The review included tracing a sample of data from the Gas Control source files, through the validation process to the published data on OATIS.

Data import

Gas Control downloads data from the meters, and transfers it to secure folders on the First Gas network. These files are uploaded directly into the Meter Validation Access Database and Gas Type Calc Excel Spreadsheet, and uploaded into the Meter Validation Excel Application via the Access Database.

Missing records are identified through import checks, and data validation checks.

As most of the files are imported overnight, there can occasionally be a timing issue because files were not available at the time of the original import. If a file is missing, the Transmission Analyst will manually check for it on the network, and if found, run the import process manually.

If the file cannot be obtained from the network, the Transmission Analyst will use the GMTalk application to dial up the meter and retrieve the data for import, or ask a SCADA Engineer to retrieve the data for a SCADA meter. Because Gas Control constantly receive and manage SCADA data, they are normally aware of, and working on, any communications issues prior to the First Gas Transmission Analyst identifying missing data.

Most missing data issues are resolved within one day. If data cannot be obtained on a given day, OATIS data will remain unvalidated for the affected sites. Data will only be estimated if it is the end of the month, or a large site. Estimates are discussed with the First Gas commercial team and the Allocation Agent before being created. Estimates are replaced with actual data when it becomes available. Estimates are discussed further under **4. Corrections**.

If issues persist longer than one day, or are expected to, they are referred to the First Gas metering specialist. The issue is also noted in the diary and on the whiteboard, so that all affected staff are aware of the issue.

A sample of data was traced from the source files to each application to check the import process, and no errors were found.

Meter Validation Access Database

A script is scheduled to import the meter data files early each morning. The date range for records to be imported is automatically set, with reference to today's date.

After validation is complete, files from the Meter Validation Excel Application are imported into the Meter Validation Access Database.

Logs show whether the imports have completed successfully.

Meter Validation Excel Application

A script is scheduled to import data from the Meter Validation Access Database, including meter validation parameters such as acceptable pressure and volume ranges and the metering data provided by Gas Control. The date range for records to be imported is automatically set, with reference to today's date. Logs show whether the import has completed successfully, and identify any errors, missing, or skipped records. The Transmission Analyst checks that the number of success records is as expected.

The import process can also be run manually where additional data is imported into the Meter Validation Access Database.

Recommendation – Meter Validation Excel Application Log

Currently some errors appear where sites should be skipped. I recommend updating the system so sites that should be skipped do not appear as errors.

Gas Type Calc Excel Spreadsheet

Data is pulled directly from meter data files provided by Gas Control, and automatically refreshed on opening. The date range for records to be imported is set to yesterday's date, but it is possible for users to manually select a different period. The previous four days of data is imported, and the database retains the last 30 days of data.

Data Validation

Validation of data and gas conversion for each gate meter takes place within the Meter Validation Excel Application. Validation of gas composition data occurs within the Gas Type Calc Excel Spreadsheet. These spreadsheets assist the Transmission Analysts to identity and investigate potential errors or missing data.

First Gas staff use a paper-based checklist, which is worked through each morning. Responsibility for completing the checklist rotates between team members. Check items are ticked on the checklist as they are completed. This ensures that no checks are missed, and if the staff member completing the checks had to suddenly leave the office, another staff member could easily continue the checks.

The Transmission Analyst reviews Gas Control activity logs and 24 hour operation reports alongside the meter and gas composition data checks. These logs and operation reports show all activity that

could affect gas gate meters, from technicians visiting sites, to faults, series proving, and meter changes. If further information is required, the Transmission Analyst may contact the technician involved directly. Any meters not owned by First Gas do not appear on this report, and First Gas is reliant on information being provided by the meter owner.

The Transmission Analysts maintain a month end file of Gas Control activity, to which they add the events for the day they are reviewing and their comments on what was found when they reviewed data for the affected meters. This file is updated daily, and used as part of the end of month checks discussed below.

Any potential issues are forwarded to the meter owner for investigation and action if required. I observed daily checks, and evidence of historic checks, and noted that issues were followed up with the meter owner, or First Gas metering engineer if the meter was owned by First Gas. There are sometimes delays in confirmation and reporting of these suspected errors, this is recorded as non-compliance in section **4.2 Identification and reporting of material errors**.

A whiteboard and diary, visible to all Transmission Analysts, records any known issues relating to gas gates, and I noted good communication and consultation within the team to ensure all staff involved were aware of issues.

The Transmission Analysts are in close communication with First Gas' scheduling, maintenance and planning teams, which helps them to identify and plan for any upcoming events that could impact on gas gate metering or gas composition, such as pigging or maintenance. Weekly management meetings are held.

Processes for corrections, including identification, notification and correction calculations are discussed in section **4 Corrections**.

Meter Validation Excel Application

In accordance with the checklist, large welded points are each reviewed individually regardless of whether the validation system has identified any exceptions. Exceptions identified by the Meter Validation Excel Application are reviewed for small welded points.

Meters for large welded points provide full gas composition information. Each large site is checked individually on the compare sheet of the Meter Validation Excel Application, including:

- Consistency between GJ and corrected volumes
- Consistency and reasonableness of the relationship between corrected volume and pressure
- Reasonableness of temperature and pressure
- Where the gas gate has a series proving meter, this is graphed with the main meter to confirm series proving events
- CV and SG values are graphed against other nearby gas gates expected to have a similar gas composition to check for reasonableness.

If any anomalies are found, the Transmission Analyst will review the detailed data to determine whether there is an error or if correction is required.

Meters for small welded points only provide data on gas volumes, pressure and temperature. Expected ranges for volume, pressure and temperature for each meter are recorded in the Meter Validation Access Database. These ranges are set based on information provided when the meter was installed, or on advice from the metering engineer or meter owner. First Gas was unable to obtain full details of expected volume, pressure and temperature ranges from Vector, and is continuing to refine these in consultation with metering engineers as they build up their history.

An exceptions sheet shows values that fall outside of the expected range for each meter. SCADA tags are checked for each dataset where available to identify bad or missing data. I observed the following validations performed by the Meter Validation Excel Application:

Check	Description	Bad Data	Good (0)	Below Limit (1)	Above Limit (2)	Flatline (3)	Clocked (4)	No Limit (9)
Energy	Check against expected range for meter	✓	✓	✓	✓		✓	✓
CV	Checks for flat line*	✓				✓		
SG	Checks for flat line*	✓				✓		✓
Mass	Check against expected range for meter	✓	✓	✓	✓			✓
Pressure	Check against expected range for meter	✓	✓	✓	✓			✓
Temp	Check against expected range for meter	✓	✓	✓	✓			✓
Corr Vol	Check against expected range for meter	✓	✓	✓	✓			✓

* Validated in gas composition spreadsheet.

In addition to the validations above, the following checks are completed. The prevents export column indicates that the Transmission Analyst will not be able to create OATIS or database export files until the corresponding error has been validated.

Check	Description	Prevents export
SCADA tag exception	Mismatch with expected SCADA tags. SCADA tags are used to identify the correct meter data for the welded point.	✓
Mass Check	Variation in mass based on FC, GC and GT	
Deviation Volume	Variation between deviation calculations based on FC, GC or GT	
Difference CV	Difference min to max CV calculated on FC, GC or GT	
Difference SG	Difference min to max SG calculated on FC, GC or GT	
Null in expected field - CV	Null CV values	
Null in expected field - energy	Null energy values	
Duplicate time data	Identifies duplicate date/times based on count of expected rows	✓
Missing data	Identifies missing date/times based on count of expected rows	✓

Check	Description	Prevents export
QTOT	Checks 24 records for the day are available to calculate QTOT.	✓
Date time	Checks that 24 records are available for the day.	✓

Recommendation – Meter Validation Excel Application duplicate and missing data check
Missing and duplicate data rows are identified by comparing the actual number of data rows to the expected number of data rows. If duplicate and missing data occurred in the same file, the count could be as expected and errors missed. It is recommended that the check for duplicate date and time, and missing data should consider the date and time of the records, rather than only the count.

At the end of the month, the daily checks are worked through again, this time comparing each site to OATIS data for the past 13 months. This is a major undertaking and the gas gates are split between the team, who also compare the data to the month end file of Gas Control activity.

Gas Type Calc Excel Spreadsheet
In accordance with the checklist, gas type data is reviewed each morning. Gas type data is validated in the Gas Type Calc Excel spreadsheet, which validates the gas composition data and creates daily averages from the 10 minute metering data.

The Gas Type Calc Spreadsheet generates the following exceptions:

Check	Low	High	Bad
SG	<0.65	>0.72	SCADA tag reflects bad data
CV	<39.1	>42.5	SCADA tag reflects bad data
N_2			SCADA tag reflects bad data
CO_2			SCADA tag reflects bad data

The spreadsheet contains pivot tables and charts, which are refreshed to review trends and compare gas types expected to have similar compositions. Time offset can be adjusted for the graphs to enable alignment of data where gates are positioned further down the pipeline and a time delay is present such as Oanui and Frankley Road. This is a useful tool for checking the accuracy and consistency of data.

Any bad, missing, high or low data is investigated, and corrections are processed as necessary. Corrections are discussed in section **4. Corrections**.

Gas conversion accuracy
The Kelton FloCalc Excel add in is used for gas conversion, and uses AGA 8 to calculate the compressibility factor.

To ensure calculations were accurate, historic data was processed in First Gas' meter validation systems, and compared to Flow2E data for September, October, November and December 2016.

First Gas identified some discrepancies during the checks, but found the differences were due to meter set up differences, not issues within First Gas' systems.

Large gas meters provide a QTOT and are corrected for all factors. Small gas meters are corrected for pressure and temperature. Altitude and compressibility factors are applied separately.

I tested a sample of gas conversion calculations for both large and small meters, by comparing the meter validation spreadsheet results to my own calculations for both corrected and uncorrected volumes. All calculations were within the permissible errors set out in table 3 of NZS 5259:2015, except where volumes were very low. I found these differences to be acceptable, because the relationship between raw corrected and uncorrected reads is significantly affected by rounding when volumes are low (e.g. corrected read: uncorrected read, 9:2, 4:1, 5:1). This resulted in different inputs to the calculation, which caused some errors over the 1.5% threshold. In all cases I found that the resulting difference in volume was less than +/- 0.1 GJ.

Based on the sample tested, review of spreadsheet calculations and documentation on the Kelton FloCalc add in, I believe the meter validation spreadsheet is compliant with NZS 5259:2015.

Recommendation – Gas gate altitude

During conversion testing I noted that some small welded points where an altitude factor is applied had zero altitude recorded, including Inglewood, Glenbrook, Horotiu and Matangi. I recalculated the altitude factor based on the estimated actual altitude for these gas gates and found no errors outside the acceptable range in table 3 of NZS 5259:2015. I recommend checking and updating the altitudes for any gates with 0m altitude recorded, where an altitude factor is applied. According to NZS 5259:2015 altitude should be determined within 10m where practicable. Reasonable altitudes were recorded for other welded points checked.

Data Export

Once the data has been validated, files are exported to the First Gas network for upload into OATIS. I checked a sample of validated data in the validation spreadsheets, and traced it through to the OATIS upload files and OATIS. For the Meter Validation Excel Application, I also verified that the validated data was updated in the Meter Validation Access Database. No issues were noted.

Meter Validation Excel Application

Validated data is exported to create OATIS files which are uploaded into OATIS, and database files which are uploaded into the Meter Validation Database. The process to save the files is automated, so they are filed in the same location with a consistent name format.

There are controls in place to prevent export of data that is incomplete, or has not been validated, and to prevent OATIS exports from being created without the corresponding database files. I observed these safeguards during the audit.

Gas Type Calc Excel Spreadsheet

Daily average CV data is exported from the gas type output table. The process to save the files is automated, so they are filed in the same location with a consistent name format. Controls are in place to ensure that the data export is complete.

Conclusion

There are controls in place to minimise the risk of inaccurate, incomplete or misleading data being provided.

The timeliness of information provided is assessed in section **3.5 Provision of daily injection information**.

3.2 Identification, remedy and reduction of UFG

Under the Gas (Downstream Reconciliation) Rules 2008

26.3 *Where an allocation participant is or becomes aware of a cause of UFG at a gas gate, it must use reasonable endeavours to remedy the cause of UFG or reduce the UFG occurring at the gas gate.*

I reviewed the processes to identify excess UFG, and reduce or remedy it.

Daily identification of excess UFG

As part of the daily checklist activities, Transmission Analysts review the line balance report on OATIS. Any balances outside of the pipeline tolerance are displayed in red in the detailed data, and appear outside the upper or lower limit on the chart.

If a difference is close to +/-3% the Transmission Analysts tend to wait until the following day to see if the issue resolves.

If the difference is more than +/-3% or had been present for more than one day, the Transmission Analyst will review the validation data for the pipeline to investigate possible causes of the issue, such as series prove data not being removed, or missing data. The most frequent cause of imbalances is unvalidated data. On any given day, the analyst who completes the validations is also responsible for checking line balances, so they will be familiar with the data for each site on that day.

The Transmission Analysts can request injection data, which can be used to assist with investigation.

If upon investigation, the Transmission Analyst believes a problem exists, they will consult with the metering engineer and arrange meter tests if required. Corrections are processed as necessary, as discussed in section **4. Corrections**.

Monthly review of UFG

At month end, line balances for the whole month are re-checked. This check includes all the monthly read sites which are looked at individually.

Reduction and remedy of UFG

Causes of UFG relating to gate meters are likely to be found and acted upon through the data validation process. The line balance review is a useful cross check to help to identify errors causing excess UFG.

I saw evidence of action taken to investigate and resolve excess UFG, including meter tests and exchanges. I also noted that ongoing monitoring takes place to ensure that the issue is resolved by the action taken, and further action is taken if necessary.

Conclusion

Processes are in place to identify and resolve excess UFG attributable to data provided by First Gas.

3.3 Audit trails

Under the Gas (Downstream Reconciliation) Rules 2008

27A.1 ***27A.1*** *Any information supplied to the allocation agent for each allocation in accordance with rule 41 or rule 44 is transferred and stored in such a manner that it cannot be altered without leaving a detailed audit trail*

I reviewed audit trails, and processes to ensure that data could not be modified without authorisation.

Files received from Gas Control

The files received from Gas Control are automatically uploaded into the Meter Validation Database and Gas Type Calc Excel Spreadsheet without modification. Access to the directory on the network is restricted.

Meter Validation Access Database

Only the Transmission Analysts and developer have access to the database. I observed that data cannot be modified directly within the database, it is only possible to enter data by importing a file. Data can be replaced, but the original record is retained.

The audit trail records details of when the data was entered, the source and whether it is the current record or a replaced record. Only data flagged as current is imported into the Microsoft Excel validation spreadsheet.

Initially, there had been occasional instances where a system clash would result in two records for the same hour being flagged as current. These would be identified in the Meter Validation Excel Application because there would be too many records for the day. This has now been resolved by ensuring only one user has the database open as a writer at a time, other users may have read only access.

Meter Validation Excel Application

Only the Transmission Analysts and developer have access to the application. I observed that data cannot be modified directly within the spreadsheet, except for fields designated to be used for corrections. Only the developer has the password to unprotect the sheet.

A log records the upload of data into the spreadsheet, and any errors that occurred during upload.

Gas Type Calc Excel Spreadsheet

Only the Transmission Analysts have access to the spreadsheet. The Gas Type Calc Excel Spreadsheet does allow imported data to be edited. I did not find any instances of unauthorised modification to the data during the audit.

Recommendation – Protection of the Gas Type Calc Spreadsheet

First Gas is aware that the controls to protect the Gas Type Calc Spreadsheet are not as strong as the controls of the Meter Validation Access Database and Excel Application. They intend to review and improve the Gas Type Calc Spreadsheet.

Files for import into OATIS and the Meter Validation Database

Files are automatically generated from the Meter Validation Excel Validation Application and Gas Type Calc Excel Spreadsheet using scripts. This ensures that the file content, naming and locations are all consistent.

CV raw file is replaced on the network each day, but full record is retained in OATIS. Access to the directory on the network is restricted.

Conclusion

The Meter Validation Access Database and Meter Validation Excel Application have strong controls to prevent unauthorised modification of data, without an audit trail being created.

The Gas Type Calc Excel Spreadsheet has weaker controls, users can modify the data within the spreadsheet. The raw data remains available in the Meter Validation Access Database and in the files saved on the network. Copies of the daily files submitted to OATIS are overwritten each day, but a full history of all the data provided is available within OATIS.

3.4 Retention and availability of information

Under the Gas (Downstream Reconciliation) Rules 2008

27A.2 *A copy of all information about daily metered energy quantities injected at each gas gate is kept for a minimum period of 30 months and is made available to the allocation agent, industry body or an auditor on request.*

Retention of meter data

The Meter Validation Access Database, Meter Validation Excel Application and Gas Type Calc Excel Spreadsheet are all saved on First Gas' network and backed up nightly.

The files provided by Gas Control, and to OATIS and the Meter Validation Access Database, are stored securely on the network. They are also backed up nightly.

During the audit, I viewed the back up database copies. Plans are in place should the database become lost or corrupted, and data can be restored from the Gas Control files and OATIS where necessary.

The Meter Validation Excel Application imports data from the database.

Only the developer has access to modify the database, access is restricted to entering corrections and filtering how data is viewed for all other staff.

First Gas understands the requirement to retain data for at least 30 months and intends to do so. I sighted data relating to corrections that was many years old and intended to be retained indefinitely.

Availability of information to the allocation agent, GIC and auditors

First Gas staff are aware of their responsibility to provide information requested by the GIC, allocation agent and auditors.

Requests for information are considered on a case by case basis. I did not find any evidence of information requested by the GIC, allocation agent and auditors which had not been provided.

Conclusion

I saw evidence that First Gas is and intends to continue to comply with data retention and provision requirements.

3.5 Provision of daily injection information

Under the Gas (Downstream Reconciliation) Rules 2008

41 *Provision of daily injection information*

41.1 *Every transmission system owner must provide to the allocation agent by 1200 hours on the 4th business day of the month that immediately follows a consumption period the daily metered energy quantities injected at each allocated gas gate connected to its transmission system for that consumption period.*

41.2 *For each interim allocation and final allocation, every transmission system owner must provide to the allocation agent, by the times and on the days specified in rule 32 and 33 respectively, daily metered energy quantities injected at each allocated gas gate connected to its transmission system for the relevant consumption period.*

41.3 *Transmission system owners are not required to provide daily metered energy quantities under rules 41.1 and 41.2 for unmetered gas gates or oversized metered gas gates.*

41.4 *Transmission system owners must provide the allocation agent and the industry body with access to data on daily metered energy quantities injected at each gas gate.*

Injection information is uploaded to OATIS each business day, in accordance with the Vector Transmission Code.

- For large welded points and small welded points with telemetry, validated data should be available by 2pm the following business day.
- For small welded points read manually, data is to be validated by 12pm on the fourth business day of the following month.
- Data is not provided for unmetered or oversized metered gas gates.

The allocation agent and GIC have access to the data once it is posted on OATIS. First Gas posts an OATIS notice for the Allocation Agent once end of month data is available.

Provision of daily injection information

I observed the process to provide daily injection information to OATIS and ensure that the information provided is complete, accurate and on time. The daily checklist includes the provision of information to OATIS, and the Transmission Analysts are aware of the deadline.

Most data is validated each business day by 2pm, except for the following gates:

- Alfriston and Mangaroa have downloads received at the end of the month. Daily consumption is estimated based on these readings. As they are both direct connect gas gates, rather than allocated, this estimated data is acceptable.
- Matangi and Pauatahanui 2 have a manual read provided once per month, which is used to estimate daily consumption. Data is validated by 12pm on the fourth business day. Matangi and Pautahanui 2 are both allocated gas gates, and daily consumption should be provided.
- Waikeria has a download received at the end of the month from a third party, which is checked for reasonableness. I reviewed the file and confirmed the information provided to OATIS matched the source file. Waikeria is a direct connect gas gate, and daily data is not required.

Non-compliance with rules 41.1 and 41.2

Matangi and Pauatahanui 2 are both allocated gas gates, which require daily metered energy quantities under the rules. If it is not practicable or cost effective to provide daily data, I recommend First Gas apply for an exemption for these meters.

I reviewed the OATIS notices advising the allocation agent that validated meter data was available at month end. Where the notification was provided after 12pm on the fourth business day, I checked when the data had been validated to determine whether submission was on time. I found two instances of late validation, and some other cases were data was submitted very close to the deadline. I found that where staff were absent or the original data upload did not complete successfully, it was more likely validation would be late.

Non-compliance with rules 41.1 and 41.2

I found two instances where some validated data was provided late. In both cases the reasons for late validation were well documented, and action has been taken to prevent recurrence.

Once the data is validated it remains unchanged for interim and final allocations unless corrections are made. See **4. Corrections** for review of the corrections process.

Conclusion

I found some late provision of data. First Gas is aware of its obligations and is working to improve the timeliness of validation.

4. Corrections

Corrections occur due to suspected and actual errors, and to make sure that data is handled correctly. Potential errors and data corrections are identified during the validation process, discussed further in section **3.1 Completeness, accuracy and timeliness of information**.

For clarity, I have classified corrections into three groups

- **Routine corrections** where meter data provided by Gas Control must be modified so that it is processed correctly.
- **Correction for suspected material errors**, where it is suspected that the data provided by gas control is inaccurate.
- **Correction for actual material errors**, where it is known that the data provided by Gas Control is inaccurate.

4.1 Routine corrections

Routine corrections are processed where data provided by Gas Control must be modified, to ensure it is treated correctly when converting to energy and creating the upload files. I walked through processes, and where possible reviewed actual examples of routine corrections.

The Meter Validation Excel Application and Gas Type Calc Excel Spreadsheet allow the user to create corrections to data. The corrections are easy to identify and the user is prompted to make notes recording the reason for their correction. The most common corrections are largely automated.

The table below describes how incidents requiring routine correction are identified, and corrected.

Incident	Identification method	Correction method
Series proving	Validation checks identify bypass consumption as an exception, and chart the bypass meter against main meter to identify series proving. Gas Control logs and series prove paperwork provide supporting information.	The Meter Validation Excel Application and Gas Type Calc Excel Spreadsheet both have automated processes to remove series proving data, to prevent double counting of consumption. I observed the correction process for a sample of series proves and found they had been corrected accurately.
Clocked meters	Validation checks will show values outside expected range for affected registers.	The Meter Validation Excel Application and Gas Type Calc Excel Spreadsheet both have automated processes to adjust data for clocked meters. I observed the correction process for a sample of clocked meters and found they had been corrected accurately.

Incident	Identification method	Correction method
FC or GC outages	Identified as missing data.	If missing data cannot be retrieved, average gas composition values for the gas type are applied instead of the values recorded by the GC or FC for First Gas meters. For other meter owners, instructions provided by the meter owner are followed. I observed two examples of this and found they had been corrected accurately.
Missing metering data	Appears as missing data in the event logs and during validation.	If data is retrieved in the normal format it is processed as normal. If data is retrieved in a different format a correction is processed and validated. I observed examples of missing data replacement and found calculations were accurate. If it is not possible to retrieve the missing data, the Transmission Analyst liaises with the Allocation Agent to create an estimate. Refer to section **4.3 Correction of suspected material errors** for further information on estimation.
Missing gas composition data	Appears as missing data in the event logs and for validation.	The Gas Type Calc Excel Spreadsheet follows a decision tree to determine the data to be provided to the gas composition output file, to ensure that the most accurate information available is used to calculate the daily values. The current process is in line with Vector's gas composition data processes. First Gas intends to review and improve this decision tree. I observed the process and noted it was working as expected. In some cases, data must be estimated because actual data is unavailable. This normally affect gas types F and K. I observed the process and noted it was working as expected.

Incident	Identification method	Correction method
Off hour data	Off hour records (not recorded at xx:00) are not identified in the Meter Validation Excel Application, they are found during the OATIS upload process.	Typically, off hour records are within a few minutes of the hour, and are corrected by adjusting the time using the force dates function in the Meter Validation Excel Application. The force dates function replaces the date and time in each row based on the date range selected by the user. Because the date selected is consistent with the data displayed, it is unlikely data would ever be corrected with the wrong date. However, because the process replaces the time on all rows, it is possible that where there are missing or duplicate records time may be replaced with an incorrect value. I checked the use of the force dates function and did not note any issues where an incorrect time was applied.
Estimation of daily data for Mangaroa and Alfriston	Mangaroa and Alfriston appear as missing data each day, and are known to require estimation. As they are direct connect, not allocated gas gates, daily actual metered data does not need to be provided and providing an estimate is acceptable.	Mangaroa and Alfriston are estimated based on the same day last year, and the data remains unvalidated. When a download is received at the end of the month, the data is replaced on OATIS and validated.
Estimation where only manual monthly reads are received	Matangi and Pauatahanui 2 appear as missing data each day. They have a manual read provided once per month, which is used to estimate daily consumption. Data is validated by 12pm on the fourth business day.	At the end of the month when a reading is received, consumption is apportioned flat line based on the number of days in the read period. I reviewed the spreadsheet used to calculate the estimates and noted that instructions provided by the metering engineer had been followed, and that data was entered correctly. An issue was noted with the application of the daily average, as explained below. Non-compliance relating to the provision of estimated data is recorded in section **3.5 Provision of daily injection information.**

Recommendation - Meter Validation Excel Application off hour records validation
Add validation to identify off hour records to the Meter Validation Excel Application. Consider modifying the force dates function to ensure that times will corrected accurately in situations where there could be multiple records with incorrect times.

Recommendation - Matangi and Pauatahanui 2 month end estimation
The Matangi and Pauatahanui 2 estimate calculation treats the reads as if they occurred at the beginning of the day, rather than the end. The average consumption for the read period is spread from the day of the previous read, to the day before the current read. Read timing for transmission reads is not set out within the Gas (Downstream Reconciliation) Rules 2008, but trader reads are expected to be treated as having occurred at 24:00. An issue about not providing daily reads is raised in section **3.1 Completeness, accuracy and timeliness of information**. I suggest discussing estimation for these gates with the GIC to confirm how they should be treated.

Conclusion
Routine corrections appear well controlled, and no issues were noted.

4.2 Identification and reporting of material errors

Under the Gas (Downstream Reconciliation) Rules 2008

44.1 *Where an allocation participant discovers that:*

44.1.1 *consumption information previously provided to the allocation agent under rules 31, 32 or 33; or*

44.1.2 *daily metered energy quantities injected at a gas gate previously provided to the allocation agent under rule 41;*

included a material error, that allocation participant must immediately advise the allocation agent of the nature and extent of the error and provide the corrected consumption information or daily metered energy quantities.

Errors are identified through the validation processes, discussed under **3.1 Completeness, accuracy and timeliness of data.**

Corrected data, and advice on the nature, impact and extent of the error are provided via OATIS. Corrected data is uploaded and validated, and accompanied by a notice containing an explanation. Processes for calculation of corrections are discussed in sections **4.3 Correction of suspected material errors** and **4.4 Correction of actual material errors.**

Identification of errors
I reviewed the validation process to ensure that common errors, or situations that require a correction were identified.

Reporting of errors
Notification is provided in the form of notices on OATIS. If the meter is connected only to the Maui pipeline, a notice is posted on Maui OATIS. If the meter is at an interconnected point or on the former Vector pipeline, the notice is posted on First Gas OATIS only.

First Gas commercial operations is currently working with the Allocation Agent to confirm exactly when notices are required. At present, notices are only posted if there has been a correction to data due to an error. These notifications include the nature and extent of the error and provide corrected

information. Processes to calculate corrections are reviewed under sections **4.2 Correction of suspected material errors** and **4.3 Correction of actual material errors**.

Corrections to data so that it is treated correctly, such as handling of clocked meters and series proving do not normally have notices issued, as data has been corrected prior to initially being posted. A finalised data notice at the end of the month states which data has been left unvalidated.

Non-compliance with rule 44.1
Notification and correction of errors does not occur immediately, because it takes time to investigate and calculate the correction. There are delays in processing meter test results, and in investigating issues where input is required from other parties.

Meter tests need to be processed to determine whether a correction is required, and then if necessary the correction must be processed. There are 18 meter test results waiting for processing. Of these 13 passed, and are unlikely to require correction, and five have failed. The failed tests relate to February, March, April and May 2017.

There are another seven issues currently being investigated that may require corrections, including possible time lag or clock issues, flatlined CV values, and confirmation of series proving. Most are sitting with the First Gas metering engineers for investigation or escalation. Corrections have not been processed as First Gas is unsure whether they are genuine.

Conclusion
There are delays in confirming whether corrections are required, and providing corrections for some errors. The delays are largely due to workload for the First Gas team.

4.3 Correction of suspected material errors

Under the Gas (Downstream Reconciliation) Rules 2008, schedule 1A:

Transmission system owners must use the best information available to them at the time of calculating daily metered energy quantities

Metering error	***Correction criteria***
Suspected Metering Error	*If the transmission system owner suspects, or is made aware of, but cannot confirm before the times specified in rule 41 the existence of a metering error at a gas gate, then it will determine daily metered energy quantities for the relevant period based on one or more of the following:* *(a) quantities derived from metering equipment;* *(b) historical data for a corresponding prior period; and/or* *(c) any other information reasonably available to the transmission system owner.*

As part of the review I traced data from correction calculations through to OATIS and the Meter Validation Access Database. Corrections are independently reviewed by another Transmission Analyst before being submitted to OATIS. This sign off is part of the calculation sheets.

Correction of suspected errors

Suspected errors are identified through the validation process, and subsequent investigation. If a suspected error is believed to be material, First Gas will consult with the Allocation Agent to confirm whether an estimate is required, otherwise the data will be left unvalidated.

I saw evidence of First Gas liaising with the Allocation Agent to confirm whether estimation was required for a sample suspected errors, and reviewed the error correction workings, and the updated data and notices in OATIS. In all cases the corrections were created in accordance with the allocation agent's instructions, and the metering error correction criteria above.

Conclusion

Based on the sample of corrections reviewed, First Gas used the best information available to them at the time to process corrections. First Gas complied with instructions from the Allocation Agent.

4.4 Correction of actual material errors and estimation of missing data

Under the Gas (Downstream Reconciliation) Rules 2008, schedule 1A:

Transmission system owners must use the best information available to them at the time of calculating daily metered energy quantities

Metering error	***Correction criteria***
Actual Metering Error	*If the transmission system owner discovers, or is made aware of, a metering error at a gas gate, daily metered energy quantities for the relevant period will be calculated based on one or more of the following, as applicable to the nature of the of the metering equipment error:* *(a) the results of testing performed on the metering equipment found to have been in error;* *(b) data from accurate metering equipment operating in series;* *(c) data from accurate metering equipment operating in parallel;* *(d) correction factors from a relevant time period when the conversion device or other metering equipment was functioning properly;* *(e) independent corrections for pressure, temperature, compressibility or other relevant factors;* *(f) gas properties based on relevant historical information;* *(g) gas properties from the most appropriate alternative gas analyser;* *(h) data from metering equipment unaffected by the error;* *(i) data from another party's accurate check metering downstream of the gas gate;* *(j) consumption quantities from consumer installations provided by the allocation agent, including production profiles (with due allowance for UFG if applicable);* *(k) historical data for a corresponding prior period; and/or* *(l) other information reasonably available.*

As part of the review I traced data from correction calculations through to OATIS and the Meter Validation Access Database. Corrections are independently reviewed by another Transmission Analyst before being submitted to OATIS. This sign off is part of the calculation sheets.

Correction of actual errors

My review found that where actual material errors had been discovered, corrections were calculated using the best information available. The corrections reviewed had all been independently reviewed by another Transmission Analyst.

The Meter Validation Excel Application and Gas Type Calc Excel Spreadsheet allow the user to create corrections to data. For some correction types, other excel templates are used to calculate the correction for entry into the validation spreadsheets and upload into OATIS. Where used, I reviewed the calculations within these sheets.

The process to make corrections is clearly documented within the spreadsheets. The corrections are easy to identify and the user is prompted to make notes recording the reason for their correction.

The table below summarises the types of actual error corrections reviewed.

Incident	Identification method	Correction method
Bypass	Validation checks will show values outside expected range for affected registers. Gas Control logs and bypass paperwork provide supporting information.	Correction calculations were based on information provided on the bypass paperwork.
Meter and/or corrector exchanges	Validation checks will show values outside expected range for affected registers. Gas Control logs and exchange paperwork provide supporting information.	Process meter and/or corrector exchange according to paperwork. These corrections often also involve estimation for a bypass period.
Meter inaccuracy Failed meter and/or corrector tests	Validation checks will show values outside expected range for affected registers or anomalies in trends, identifying the need for a meter and/or corrector test. Gas Control logs and testing paperwork provide supporting information.	Process according to testing and paperwork. If correct data is not available estimate based on the best data available.
Venting and leaks	Gas control logs show any communication regarding potential gas leaks or venting, including members of the public phoning regarding a smell of gas.	Query with First Gas Engineers to determine whether there has been genuine venting or leaks. If necessary the Engineer will determine how much gas should be estimated. There were no examples of venting or leaks to review during the audit period.

Incident	Identification method	Correction method
Changes to pipeline configuration	Gas control logs and communication between First Gas scheduling, maintenance and planning teams.	There were no changes to pipeline configuration during the audit period. Processes would vary depending on the nature of the change and pipelines affected.
Pigging	Gas control logs and communication between First Gas scheduling, maintenance and planning teams	There were no changes to pipeline configuration during the audit period. Processes would vary depending on the nature of the change and pipelines affected.

Conclusion

Based on the sample of corrections reviewed, First Gas used the best information available to them at the time to process corrections. First Gas complied with instructions from the Allocation Agent where applicable.

5. Recommendations

As a result of this material change audit the following recommendations are made in relation to First Gas:

Report Section	Recommendation
3.1	**Meter Validation Excel Application Log** Currently some errors appear where sites should be skipped. I recommend updating the system so sites that should be skipped do not appear as errors.
3.1	**Meter Validation Excel Application duplicate and missing data check** Missing and duplicate data rows are identified by comparing the actual number of data rows to the expected number of data rows. If duplicate and missing data occurred in the same file, the count could be as expected and errors missed. It is recommended that the check for duplicate date and time, and missing data should consider the date and time of the records, rather than only the count.
3.1	**Gas gate altitude** During conversion testing I noted that some small welded points where an altitude factor is applied had zero altitude recorded, including Inglewood, Glenbrook, Horotiu and Matangi. I recalculated the altitude factor based on the estimated actual altitude for these gas gates and found no errors outside the acceptable range in table 3 of NZS 5259:2015. I recommend checking and updating the altitudes for any gates with 0m altitude recorded, where an altitude factor is applied. According to NZS 5259:2015 altitude should be determined within 10m where practicable. Reasonable altitudes were recorded for other welded points checked.
3.3	**Protection of the Gas Type Calc Spreadsheet** First Gas is aware that the controls to protect the Gas Type Calc Spreadsheet are not as strong as the controls of the Meter Validation Access Database and Excel Application. They intend to review and improve the Gas Type Calc Spreadsheet.
4.1	**Meter Validation Excel Application off hour records validation** Add validation to identify off hour records to the Meter Validation Excel Application. Consider modifying the force dates function to ensure that times will corrected accurately in situations where there could be multiple records with incorrect times.
4.1	**Matangi and Pauatahanui 2 month end estimation** The Matangi and Pauatahanui 2 estimate calculation treats the reads as if they occurred at the beginning of the day, rather than the end. The average consumption for the read period is spread from the day of the previous read, to the day before the current read. Read timing for transmission reads is not set out within the Gas (Downstream Reconciliation) Rules 2008, but trader reads are expected to be treated as having occurred at 24:00. An issue about not providing daily reads is raised in section **3.1 Completeness, accuracy and timeliness of information**. I suggest discussing estimation for these gates with the GIC to confirm how they should be treated.

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.

Appendix 2 – Glossary

CV means calorific value
FC means flow computer
GIC means Gas Industry Company
GC means gas chromatograph
GT means gas type
Industry body means Gas Industry Company
SG means specific gravity

Appendix 2 – First Gas Comments

First Gas have reviewed this report, and did not wish to make any comments.

Appendix 3 – Response to Contact Energy Comments

Comment	Response
The audit is silent on reviewing the meter event logs to ensure that there are no issues impacting or about to impact meter integrity such as battery alarms or transducer failures - Are you able to confirm that First Gas do monitor meter event logs on a regular basis? Also the report is silent on the time synchronisation validation requirements under NZS 5259 Appendix B paragraph B4. Are you able to confirm that First Gas do monitor time synchronisation in line with NZS 5259?	Review of meter events and time synchronisation was checked and is compliant. It is not in the terms of reference so is not described in the report.