VERITEK

Major Change Gas Audit

For

First Gas

Prepared by Tara Gannon – Veritek Ltd

Date of Audit: September – December 2021

Date Audit Report Complete: 10 January 2022

Executive Summary

From 15 November 2021, First Gas intends to implement their new First Gas metering validation system, which will replace IMV (a SQL database with an Access front end and supporting excel spreadsheets) which is currently used for validation, conversion, correction, and provision of gas gate metering information. The system will be comprised of four applications:

- EnergySys the metering validation core system,
- Zaptic the metering field data collection system,
- Power BI the business analytics platform, which also displays metering validation dashboards, and
- Ninetex Promapp which maps the end-to-end metering validation process.

The metering validation system will be used to meet First Gas' obligation under the Gas Downstream Reconciliation Rules 2008 to provide validated daily metered quantities and gas composition information. It is intended that the new system will reduce the time taken to process information, and increase standardisation of operating processes. OATIS processes will not change.

This is considered a major 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.

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.

The audit considered whether the major change was likely to have a detrimental impact on compliance by:

- reviewing project, process, and testing documentation and a sample of results including for parallel runs between IMV (the existing validation system) and EnergySys,
- conducting process walkthroughs in the test system, and

- interviewing operations staff and project team members.

User acceptance testing was conducted for the daily and monthly processes carried out by First Gas. By 1 October 2021 all P1 (critical) non-Zaptic defects had been resolved. Nine P2 (high/major) non-Zaptic defects which require work arounds which are unacceptable to the business are present, and are intended to be resolved by 8 October 2021. Five of these defects are currently undergoing retesting.

73 P3 (minor) non-Zaptic defects relating to functionality or non-critical data which require acceptable workarounds, and 22 P4 (low) non-Zaptic defects relating to minor or cosmetic issues are present. Four P3 issues and one P4 issue are currently being re-tested. They are intended to be resolved prior to going live on 15 November 2021.

Zaptic user acceptance testing will continue until 8 October 2021. There are still some Zaptic related defects which are in the process of being resolved and tested. These primarily relate to display and usablility, such as updating the text for validation messages on number fields, changing instructional text on forms, and naming conventions. Zaptic issues relating to data validation at the time vendor exit testing was completed have been resolved by the vendor during the user acceptance testing period, and are ready for user re-testing.

Defects are closely managed and monitored daily using Azure, and First Gas has confirmed that they will not go live until all P1 and P2 issues are resolved. P3 and P4 issues are minor, and tested workarounds will be used in the unlikely event that they are not all resolved prior to going live. I have seen evidence that defects are recorded, prioritised, resolved, retested, and closed, and I expect that the remaining defects will be resolved according to these robust processes.

I found that the metering data validation processes were well designed, and help to minimise the risk of late, incomplete, inaccurate, or misleading data being provided once the remaining defects are resolved. The summary of report findings in the table below shows that First Gas' control environment is effective for all areas assessed and the major change is unlikely to have a detrimental impact on compliance, provided that the P2 issues are resolved as planned.

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	By 1 October 2021 all P1 (critical) defects had been resolved. Nine P2 (high/major) non-Zaptic defects which require work arounds which are unacceptable to the business to continue testing are present, and are intended to be resolved by 8 October 2021. 73 P3 (minor) non-Zaptic defects relating to functionality or non-critical data which require acceptable workaround, and 22 P4 (low) non-Zaptic defects relating to minor or cosmetic issues are present. Four P3 and one P4 issues are currently being re-tested. They are intended to be resolved prior to going live on 15 November 2021. There are still some Zaptic related defects which are in the process of being resolved and tested. Defects are closely managed and monitored daily using Azure, and First Gas has confirmed that they will not go live until all P1 and P2 issues are resolved. P3 and P4 issues are minor, and workarounds will be put in the unlikely event that they are not all resolved prior to going live. I have seen evidence that defects are recorded, prioritised, resolved, retested, and closed, and I expect that the remaining defects will be resolved according to these processes.

Issue	Section	Rule	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
Identification, remedy, and reduction of UFG	2.2	26.3	Effective	Compliant	
Audit trails	2.3	27A.1	Effective	Compliant	
Retention and availability of information	2.4	27A.2	Effective	Compliant	
Provision of daily injection information	2.5	41	Effective	Compliant	
Identification and reporting of material errors	3.1	44.1	Effective	Compliant	
Correction of suspected material errors	3.2	Schedule 1A	Effective	Compliant	
Correction of actual material errors	3.3	Schedule 1A	Effective	Compliant	

Persons Involved in This Audit

Auditor:

Tara Gannon
Veritek Limited

Personnel assisting in this audit were:

Name	Title	Company
Mary Horn	Senior Project Manager	First Gas Group
Liam Heslop	Technical Consultant	Spark Digital
Tony Parrott	Business Analyst/QA	First Gas Group
Shaun O'Brien	Senior System Controller, Transmission Operations	First Gas Group
Harshitha Paruchuri	Senior BI & Configuration Lead	Elite Systems Ltd

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1. Audit Information

1.1 Scope of Audit

This major 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.

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 remotely in September and October 2021.

1.2 Audit Approach

As mentioned in **section 1.1**, the purpose of this major 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.

1.3 Compliance

One breach of rules 44.1 and 41.4 (2021-044) was alleged by EMS between 2018 and 2021. The alleged breach was for not providing injection volumes for 30 gas gates by 12pm on business day four for 30 April 2021, due to SCADA data collection issues. Once First Gas supplied complete data the allocation was re-run by 5.30pm on the next business day after the allocation results were provided under rule 44.3. The outcome of breach 2021-044 is yet to be determined.

As noted in the Summary of Report Findings, this audit has found no areas of non-compliance.

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.

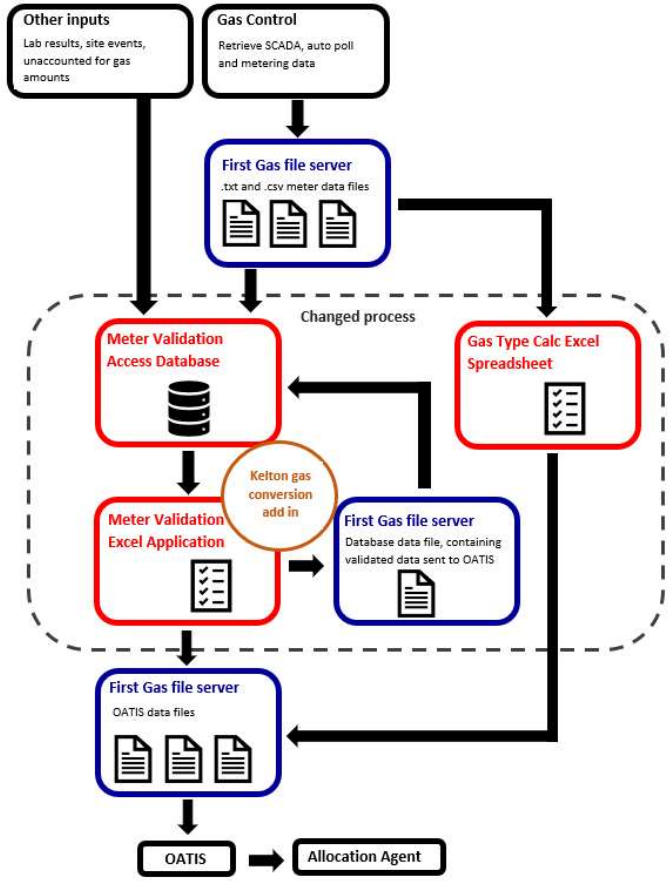
Party	Response	Comments provided	Attached as appendix
First Gas	Yes	Yes	Yes

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

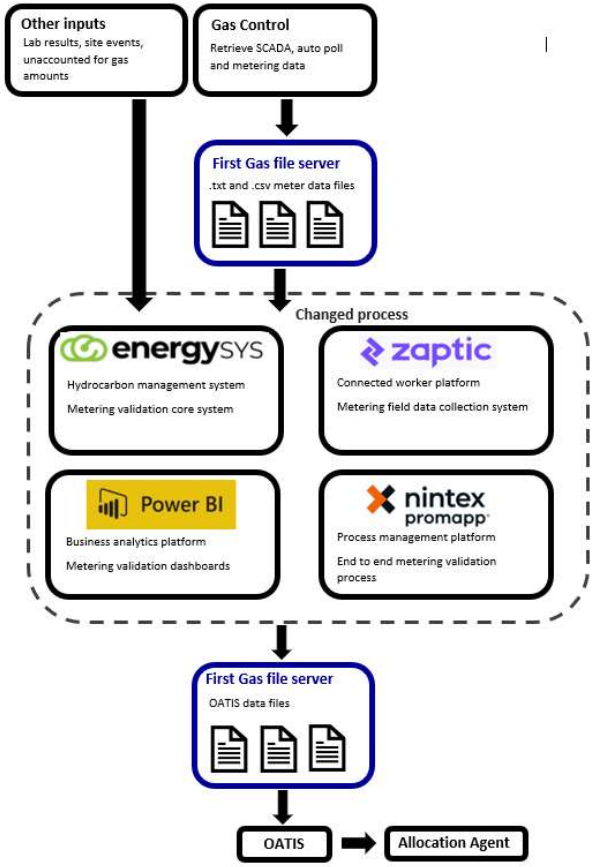
2. Overview

The diagram below provides a high-level overview of the major changes to First Gas' systems. The Access databases, spreadsheets and Kelton gas conversion add in will be replaced with EnergySys, Zaptic, Power BI, and Nintex Promapp. There will be a common user interface to the applications.

Current systems



New systems



Vendor testing was completed in August 2021 using data supplied by First Gas, and user acceptance testing was completed by First Gas in September and October 2021. Testing and defects were managed via Azure DevOps.

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 by:

- reviewing project, process, and testing documentation and a sample of results including for parallel runs between IMV and EnergySys,
- conducting process walkthroughs in the test system, and
- interviewing staff and project team members.

User acceptance testing was conducted for the daily and monthly processes carried out by First Gas. By 1 October 2021 all P1 (critical) defects had been resolved. Nine P2 (high/major) non-Zaptic defects which require work arounds which are unacceptable to the business are present, and are intended to be resolved by 8 October 2021.

Defect	Title	Priority[2]	Severity[3]	Status	Comment
9943	EM-012.1 – Monthly File Failed (Unmetered Gas gates)	2	3	Active	The system timeout must be increased to allow files with a large number of rows to be processed. This is an environmental rather than system functionality issue.
9946	Meter Index Readings are not being imported into EnergySys for	2	3	Active	A mapping issue exists between Zaptic and EnergySys for the affected meters, which is in the process of being resolved. A manual

[2] **Priority 1** - Complete system failure, critical issue, defect affects critical functionality or data. Testing has stopped and cannot continue, no workaround exists, business is highly impacted.

Priority 2 - Major issue. Testing has been impacted in one or many areas currently using work arounds to continue testing, work arounds are not acceptable to the business and must be resolved before progressing.

Priority 3 - Minor issue affecting functionality or non-critical data, it requires a work around that's acceptable to the business.

Priority 4 - Cosmetic / Trivial issue – no workaround is required, no impact to productivity of efficiency.

[3] **Severity 1** – A critical incident with a high impact.

Severity 2 - A major incident with a significant impact.

Severity 3 – A minor incident with a low impact.

Defect	Title	Priority[2]	Severity[3]	Status	Comment
	Read Type 01 – Spot Reads				workaround allows the process to be run in the meantime.
9920	E-021.1 – Manage as found test results differ from production spreadsheet	2	3	Active	The results for the correction differed from the expected values. The defect has been resolved, and processes are being updated to prevent recurrence of the issue which was partially caused by missing data and partially caused by part of the correction process being run twice during testing.
9610	Worklist useability needs updating to cover Manual & Automated processes in single format	2	3	Active	Elite Systems has updated the attributes on the worklist as requested to improve usability. Requires vendor testing and then user testing.
9814	Minutes Validation Check – needs to not change Opening 00:00 Hour	2	3	Active	The opening hour should not be updated for gas type B. The defect is intended to be resolved by 8 October 2021.
9911	E-020.1 – Need an EnergySys control process to re-run a meter using Raw Data	2	3	Active	The issue has been corrected, and Elite Systems have confirmed the processes that require re-testing by users.
9765	Need to review initial setup of operation use data prior to testing results	2	3	Ready for re-test	The issue relating to display of daily task information has been resolved and is ready for re-testing.
9969	E-021.3c As found corrector correction – Doesn't find the Corrector Install record	2	3	Ready for re-test	The issue was caused by an incorrect filter in EnergySys. It has been corrected and is ready for re-testing.
9973	E-012.5 – Corrector Exchange Process caused blank cells	2	2	Ready for user acceptance testing	The issue was caused by an incorrect parameters being entered for the correction in EnergySys. It has been corrected and is ready for re-testing.

73 P3 (minor) non-Zaptic defects relating to functionality or non-critical data which require acceptable workarounds, and 22 P4 (low) non-Zaptic defects relating to minor or cosmetic issues are present. Four P3 and one P4 issues are currently being re-tested. They are intended to be resolved prior to going live on 15 November 2021.

Zaptic user acceptance testing will continue until 8 October 2021. There are still some Zaptic related defects which are in the process of being resolved and tested. These primarily relate to display and usablility, such as updating the text on validation messages on number fields, changing instructional text on forms, and naming conventions. Zaptic issues relating to data validation at the time vendor exit testing was completed have been resolved during the user acceptance testing period, and are ready for user re-testing.

Defects are closely managed and monitored daily using Azure, and First Gas has confirmed that they will not go live until all P1 and P2 issues are resolved. P3 and P4 issues are minor, and workarounds will be put in the unlikely event that they are not all resolved prior to going live. I have seen evidence that defects are recorded, prioritised, resolved, retested, and closed, and I expect that the remaining defects will be resolved according to these processes as planned.

Data import

Data retrieval processes will not change, but files will be imported into EnergySys rather than the Meter Validation Access Database and Gas Type Calc Excel Spreadsheet.

There are monitoring and corrective controls over the data import process. EnergySys produces email notifications if daily exports of meter data do not exist or are empty, and Power BI notifications are produced if data is missing. There are documented procedures in place to use these notifications to determine how much data is missing and whether the issue should be resolved through a bulk re-import of data, or retrieving the missing Autopoll or SCADA data. Missing data service requests are raised in Maximo where data is missing for more than two days.

Missing data is estimated following the daily meter data import. Estimates are replaced with actual data when it becomes available. As part of the import process, EnergySys imports data to a temporary table and identifies any instances where existing hour or minute data is present for the meter. There is a procedure to compare the data to the existing value, and import and retain the value with the best data quality flag. Unnecessary data is then deleted from temporary table, the remaining data is imported into EnergySys and then the temporary data is cleared ready for the next import. Estimates are discussed further under 4. Corrections.

Processes are in place to ensure that estimated data is validated on OATIS. Retrievable data is updated and republished once correct values are available and estimates are approved for irretrievable data.

Gas type information

Gas type information is used to calculate compressibility where First Gas converts data to energy, and is published on OATIS and used by retailers to calculate energy values.

EnergySys checks for missing and poor quality 10-minute data, which is then substituted with data from another similar location with accurate data, adjusted for the time offset between the locations. The validation process includes substitution of data for gas types R, J and F depending on whether certain conditions are met, and updates of time offsets so that data from different meters can be compared. Power BI produces a series of charts which are used to validate the data for each composition value, and check any anomalies.

The validation results are reviewed and if necessary a correction is processed, and initial or revised data is published as necessary. I walked through the process and found it is operating as expected.

First Gas provided user acceptance test results for their parallel runs of IMV and EnergySys for 1 September 2021 to 14 September 2021. I found that the differences had been reviewed by First Gas and were explainable, with defects found on earlier days quickly resolved. The differences were largely caused by

- estimates being calculated for missing data in EnergySys,
- corrections and changes to gas types processed in production not always being processed in the user testing environment,
- minor rounding differences which were within maximum permissible errors set out in NZS 5259:2015, and
- Bug #9761 which estimated data for as gate because it had more than six rows of estimated data and was resolved during user acceptance testing and did not cause any differences for later parallel runs.

Gas conversion accuracy

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.

Currently, the Kelton FloCalc Excel add in is used for gas conversion, and uses AGA 8 to calculate the compressibility factor. EnergySys will also use AGA 8, and the conversion process is designed to meet the requirements of NZS 5259:2015, the GIC's Gas Billing Factors guideline, and AGA 8.

Once data is received and missing periods are estimated the First Gas data conversion for EnergySys module runs the gas conversion process and compresses the data. There are documented procedures to re-run the process and resolve errors if they occur. The converted data is then imported back into EnergySys from the conversion module.

Monitoring is conducted to ensure that the script is successful, including a check that the script has completed and alerts generated by EnergySys and Power BI. There are processes in place to resolve any issues that occur.

Comprehensive testing of the conversion process was undertaken as part of the project, including testing of over 23,500 points of data to compare the EnergySys results to the Kelton FloCalc Excel add in results and concluded that the results were identical and within permissible errors.

First Gas provided user acceptance test results for their parallel runs of IMV and EnergySys for 1 September 2021 to 10 September 2021. I found that the differences had been reviewed by First Gas and were explainable, with defects found on earlier days quickly resolved. The differences were largely caused by:

- estimates being calculated for missing data in EnergySys,
- corrections and changes to gas types processed in production not always being processed in the user testing environment,
- minor rounding differences which were within maximum permissible errors set out in NZS 5259:2015, and
- meter set up differences.

I tested a sample of gas conversion calculations for both large and small meters, by comparing the EnergySys results to my own calculations. All calculations were within the permissible errors set out in table 3 of NZS 5259:2015. Based on the sample tested, First Gas comparisons between the existing Kelton FloCalc add in results and EnergySys, and system documentation, I believe that the EnergySys conversion calculations are compliant with NZS 5259:2015, the GIC's Gas Billing Factors guideline, and AGA 8.

The previous audit recorded some small welded points where an altitude factor is applied which had zero altitude recorded, including Inglewood, Glenbrook, Horotiu and Matangi. I rechecked the applied altitudes for the affected gates and found they had been corrected. The remaining gates with zero altitudes are valid and match the Google Earth altitude for the area within ± 10m, apart from Te Awamutu Cogen and Te Awamutu North which have zeros but are expected to be around 50-60m. First Gas is investigating to determine the correct altitude, which will be updated if required.

Recommendation – Te Awamutu altitude
Confirm the altitude for Te Awamutu Cogen and Te Awamutu North and process corrections as necessary.

Daily data validation

Data validation occurs within EnergySys as part of the daily tasks. The daily task list prioritises the tasks, states the date range the tasks are to be completed for and whether the task has been completed and reviewed. Any tasks which were not able to be completed the previous day are prioritised for review and completion. Items can be manually added to the worklist, such as issues relating to previous days which should be re-checked.

Acceptable ranges for each attribute measured for the meter (e.g. CTOT, volume, temperature, pressure, flow computer specific gravity) for each hour are set within the Business Configuration Meter Tag Mapping in EnergySys. Ranges are set for high demand, low demand, and offline periods, which are date ranged within the configuration manager. Different values are applied for business days and non-business days. The parameters are provided initially by gas control and can be adjusted as necessary over time.

EnergySys checks for missing and poor quality data. Data is estimated according to the method set out in the Business Configuration and is based on the same hour last week, the same hour on the previous day, or a default value for the hour.

Once data is complete, it is validated and any meter time periods that fall outside the acceptable high and low limits are reported as exceptions. Each is individually reviewed and the status of the exception is updated to reviewed once complete. Graphs are reviewed to check any periods of concern.

The EnergySys dashboard is also reviewed, and any items of concern are investigated and corrective action is taken as required. The Energy Sys dashboard includes any items received from Zaptic that require investigation. Users record whether the exception is genuine, has been reviewed, and any comments.

Events that may affect meter accuracy which are not notified to EnergySys via the Zaptic App are reviewed daily including:

- emails in the transmission scheduler inbox and nominations inbox to identify events from yesterday which could affect data being processed today,
- the Gas Operations Daily Report from the Gas Controller and Gas Control Log for the day(s) being reviewed, to check for any "abnormal situations" listed in the production station and metering sections; staff check any issues which could impact meter data such as faults, power outages, reduced flow rates, shut downs, series proves, calibrations, or upgrade projects, and
- correspondence relating to any meters not owned by First Gas.

Any potential issues are noted so that they can be checked when validating the metering data graphs, and potential corrections required are noted so that they can be checked and processed as necessary.

Once the daily tasks are complete the user moves on to the monthly task list, and begins working through the monthly validation tasks.

Data Export

Once approved a gas type text file is produced from EnergySys, it is automatically emailed to an inbox, and then automatically transferred to a power automate process that populates the text file on OATIS. Once complete the user checks that the data has been uploaded to OATIS as expected.

Once the meter data has been validated, HDR and DDR files are exported and emailed to an inbox and then automatically transferred to a power automate process that populates the text file on OATIS. Once complete the user checks that the data has been uploaded to OATIS as expected.

Validation of data on OATIS is listed as a task within EnergySys, and once validation is completed within OATIS itself the task list is updated. The Gas Transfer Agent is also advised that data is validated.

Conclusion

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

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 task list the daily UFG reports are reviewed in Power BI.

EnergySys generates reports of linepack and UFG prior to the information being published on OATIS. The data is available at daily and hourly level, and is reviewed for reasonableness using ±2% as a rule of thumb.

If any pipelines have excessive UFG, the hourly UFG report and line balance report are reviewed in Power BI to identify possible causes and issues to be investigated. Investigation includes reviewing the Gas Control Logs, Zaptic field services information on the meters being investigated, and identify whether any corrections need to be processed to resolve the issues. Often differences relate to sudden changes in compressor pressure which can result in dramatic temporary changes in linepack which affect UFG. Sensor calibration changes can also affect the data. Once review is complete, the worklist information is updated.

Refinements have been made to the compressor data processes to improve the accuracy of calculations. Most compressors have meters without TOU capability and a spot read is provided each month. As part of First Gas' Worksafe reporting, compressor start and stop times are recorded, and data between the spot reads will only be allocated to periods where the compressor is on.

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**.

Monthly review of UFG

At month end, UFG is checked for the month and 12-month period including line balances and hourly UFG.

Reduction and remedy of UFG

Causes of UFG relating to injections gate meters are likely to be found and acted upon through the data validation processes described above.

Conclusion

3.3 Processes are in place to identify and resolve excess UFG attributable to data provided by First Gas. The material change is likely to have a positive impact on compliance in this area.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 EnergySys without modification. Access to the directory on the network is restricted.

EnergySys

I reviewed corrections in EnergySys and confirmed that an audit trail is created and available where data has been entered or corrected, including a calculation log for corrections.

Access to EnergySys is restricted through logins and passwords. Security of the system is managed in accordance with ISO 27001 and ISO 27002.

Files for import into OATIS

Once the data has been validated, files are exported from EnergySys and emailed to an inbox and then automatically transferred to a power automate process that populates the text file on OATIS. Once complete the user checks that the data has been uploaded to OATIS as expected.

Conclusion

There are strong controls to prevent unauthorised modification of data without an audit trail being created.

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

EnergySys has built in redundancy and resilience, and data is replicated between multiple instances spread across geographic areas. In the event of a disaster affecting one of the centres, the system will failover to another centre with minimal interruption.

EnergySys backup arrangements are robust, tested annually, and compliant with ISO 27001. Data is replicated from production to standby every 15 minutes, binary data is copied to secure storage every 15 minutes, and schema backups are recorded daily. Full database backups are recorded weekly, with incremental backups recorded daily. Copies of backups are stored securely at separate locations.

Source metering telemetry data from SCADA and Autopoll is also backed up daily. Yearly backups are retained indefinitely, monthly backups are retained offsite for one year, weekly backups are retained offsite for one month, and daily backups are retained onsite for 14 days.

First Gas understands the requirement to retain data for at least 30 months and intends to do so. Five years of data has been migrated to EnergySys.

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 will continue to be considered on a case by case basis.

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.*

Provision of unvalidated information

Unvalidated operational imbalance information for each welded point is provided by 8am the following day under the Maui Pipeline Operating Code, and unvalidated energy quantities for small welded points with telemetry is provided by 10am.

Daily procedures are in place to check that unvalidated data has been uploaded to OATIS for all required meters, and re-run scripts to add any missing data as necessary.

Provision of validated information

Validated 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. Quantities are allocated by the allocation agent and posted on OATIS.

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.

I reviewed documentation for the process to provide daily injection information to OATIS and ensure that the information provided is complete, accurate and on time.

The previous major change audit recorded that some gate metering data was not validated each business day by 2pm because manual readings were received at the end of the month. These gates all now have TOU metering, and daily data is received and validated.

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

The validation process will help to ensure that data is complete, accurate and on time.

4. Corrections

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.

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.*
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.*

Corrections occur due to suspected and actual errors, and to make sure that data is handled correctly in situations where the meter has recorded the data accurately but correction is required to calculate

the correct volume such as clocked meters. Potential errors and data corrections are identified during the validation process, and discussed further in **section 3.1**.

To ensure timeliness and consistency of corrections, correction processes have been automated for frequently applied correction types. EnergySys uses information from Zaptic and the validation process to identify meters requiring corrections, and creates corrected information. As part of the daily tasks these drafted corrections are validated by a user. If the correction does not pass this validation, it is possible for a manual correction to be processed, imported into EnergySys and validated instead.

The updated validated data will be transferred to OATIS. Where a correction affects historic data, documented processes confirm how to transfer the correction to OATIS and create correction notices if needed. This notice process is manual and occurs outside of EnergySys.

I reviewed processes, detailed design documents, and walked through the corrections processes, and found that the processes use the best information available:

Incident	Identification method	Correction method
Series proving	When series meter verifications are completed the field technician submits the data to EnergySys using the Zaptic field data capture tool. EnergySys identifies that this is a series prove period and that the series meter verification (series prove) process is required.	EnergySys completes a series meter verification (series prove) process. The results of the automated correction are reviewed and accepted. Alternatively, a manual correction is processed, and revised data is published as necessary.
Clocked meters	EnergySys identifies clocked meters based on the maximum reading recorded against each meter in the meter reference object, and the minimum and maximum readings in the last 24 hours.	If the flow for an hour is less than the previous hour, EnergySys will calculate the new quantity as a clocked meter rather than negative value and set the flag for clocked correction to “true”. EnergySys will validate its calculated value against the minimum and maximum readings for the previous 24 hours. If they do not pass this validation the change will not be processed and they will be marked as a clocked meter not run. Clocked meters appear on the daily worklist and are reviewed. Clocked meters which have been calculated by EnergySys are reviewed, and any meters which are “not run” are manually reviewed and corrected according to a documented procedure.
FC or GC outages or faults	Missing data is identified during the meter data import and validation process.	If it is not possible to retrieve the missing data, EnergySys will create an estimate. The results of the automated estimation are reviewed and accepted or a manual correction is processed. Revised data is published as necessary.

Incident	Identification method	Correction method
Missing metering data	Missing data is identified during the meter data import and validation process.	If it is not possible to retrieve the missing data, EnergySys will create an estimate. The results of the automated estimation are reviewed and accepted or a manual correction is processed. If the meter owner is not First Gas, First Gas consults with the meter owner on the issue and correction before it is approved.
Inconsistent electronic totalised flow data	Potentially inaccurate electronic totalised flow data is identified during the meter date validation process.	EnergySys completes a correct hourly data from spot reads conversion process. The results of the automated correction are reviewed and accepted or a manual correction is processed. Revised data is published as necessary.
Off hour data	Off hours data is identified by EnergySys.	Procedures within EnergySys identify and correct off hour information by making the values estimated at the expected hourly interval time. The results of the automated correction are reviewed and accepted or a manual correction is processed. Revised data is published as necessary.
Manual corrections	Corrections required are identified through the validation process, and are only created where no pre-defined EnergySys calculation is available, or the desired result is not produced by the automated process.	The correction is calculated in manually and the process is required to ensure compliance with the Gas (Downstream Reconciliation) Rules 2008, MPOC, VTC and Transmission System Metering Requirements. The file is imported into EnergySys and the results are reviewed in Power BI. Initial or revised data is published as necessary.
Bypass and meter exchanges	Most of the time meter bypasses occur during meter exchanges, but they may also occur where a corrector or pipework is relocated, or during maintenance. The field technician will enter information on the bypass into the Zaptic field capture app. Bypasses for meter exchanges are identified through the meter and/or corrector exchange process.	EnergySys completes a by-pass correction process which is based on the bypass start and end date and flow rate. The results of the automated correction are reviewed and accepted or a manual correction is processed. Revised data is published if a historical day is affected.
Corrector exchanges	The field technician will enter information on the meter and/or corrector exchange into the Zaptic field capture app.	EnergySys completes a corrector exchange process, which takes into account whether the meter has been bypassed. The results of the automated correction are reviewed and accepted or a manual correction is processed, and revised data is published if a historical day is affected.

Incident	Identification method	Correction method
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. Testing paperwork and information will be provided via the Zaptic module and email.	The test results are matched to the meter serial number in EnergySys, with a cross check against the meter ID and site name. The test results are entered into EnergySys if they have not already been received via Zaptic. EnergySys creates a correction based on the results. The results of the automated correction are reviewed and accepted or a manual correction is processed, and revised data is published if a historical day is affected.
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. Notification is also provided by gas technicians.	A correction is calculated manually and imported into EnergySys. The results are reviewed, and revised data is published if a historical day is affected.
Changes to pipeline configuration and piggling	Gas control logs and communication between First Gas scheduling, maintenance, and planning teams.	A correction is calculated manually and imported into EnergySys. The results are reviewed, and revised data is published if a historical day is affected.
Incorrect meter pressure	Pressure faults may be identified through the meter data validation process. The field technician will enter information on a pressure fault into the Zaptic field capture app.	EnergySys completes a pressure correction process which is based the dates affected applied and correct pressure. The results of the automated correction are reviewed and accepted or a manual correction is processed, and revised data is published if a historical day is affected.
Incorrect meter temperature	Temperature faults may be identified through the meter data validation process or the field technician will enter information on a temperature fault into the Zaptic field capture app.	EnergySys completes a temperature correction process which is based the dates affected and a reference meter which is expected to have similar temperature. The results of the automated correction are reviewed and accepted or a manual correction is processed, and revised data is published if a historical day is affected.
Time reset	Time resets occur rarely, and will be handled manually.	A manual correction is created and imported.
Incorrect gas composition data	Identified through gas composition data validation.	Data is substituted with data from another similar location with accurate data, adjusted for the time offset between the meter locations.

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.

There is a documented process for notice creation, which is manual and occurs outside of EnergySys.

First Gas has been working with the Gas Industry Company to clarify when notices are required, and it is agreed that they should be provided if changes occur after D+1. Discussions are ongoing to confirm which types of changes require notices.

Conclusion

Based on the procedures and testing provided, First Gas will use the best information available to them at the time to process corrections.

5. Recommendations

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

Report Section	Recommendation
3.1	Confirm the altitude for Te Awamutu Cogen and Te Awamutu North and process corrections as necessary.

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

FC means flow computer
GIC means Gas Industry Company
GC means gas chromatograph
Industry body means Gas Industry Company
QTOT means the total gas quantity, which is recorded for gas meters where volumes are measured corrected for all factors.

Appendix 3 – First Gas Comments

As of 22 December 2021, the remaining Metering Validation Defects are as follows:

EnergySys Defects	Raised	Closed	In Development	Re-testing
P1 Defects	9	9	0	0
P2 Defects	225	225	0	0
P3 Defects	211	194	9	7
P4 Defects	19	19	0	0
Totals	464	447	9	7

Notes:

- In addition to the formal 5 weeks of User Acceptance Testing, we have ran a further 11 weeks of testing which has focussed on quality (the usability of the system and achievability of our forecasted benefits)
- We have defined a defect as either 1. a missed requirement or unexpected system error or; 2. an enhancement request to improve the system and increase the usability or further help deliver forecasted business benefits
- An estimated 123 of the 464 defects were missed requirements or unexpected system errors (true defects). The remaining 341 are related to enhancements
- The open 16 defects are summarised as follows:
    - 37% related to enhancing our field data collection application (not the core Metering Validation system)
    - 12% related to enhancing our reporting platform (not the core Metering Validation system)
    - 25% related to improving the processing times of the Metering Validation System
    - 26% related to minor issues for which we have agreed work arounds in place

All of the remaining defects are P3 meaning they have no envisaged impact on our compliance.

Our plan is for the vendor to continue to resolve the remaining defects prior to go-live and to pass back to us for re-testing. Our internal project team is now focussed on operational readiness which includes testing and refining our processes/procedures; training the users and ensuring the support contracts are in place for go-live. Should we finish operational readiness tasks prior to go-live we aim to re-test the remaining defects. We may go-live with some P3+ defects open and resolve them in an operational context. We have business support to continue to enhance the systems post go-live.