

VERITEK



Gas Downstream Reconciliation Performance Audit Final Report

For

Genesis Energy Limited



Prepared by

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Executive Summary

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

The purpose of this audit is to assess the systems, processes and performance of Genesis Energy (Genesis) in terms of compliance with these rules. The scope of the audit includes three retailer codes; GENG (Genesis non TOU), GEOL (Energy Online non TOU) and GEND (Genesis TOU).

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

The summary of report findings in the table below shows that Genesis's control environment is "effective" for eight of the areas evaluated, "adequate" for five areas and "not adequate" for four areas.

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

- Some altitude discrepancies have led to the provision of incorrect consumption information to the allocation agent.
- Altitude adjustment is not occurring for GEND ICPs.
- Genesis recently updated their temperature data and they are using data from the MetService which contains air temperature at 200cm above ground and not ground temperature at 30cm below ground. We compared this data with data obtained from NIWA's National Climate Database for nine areas for a winter month and a summer month and in two cases in winter and three cases in summer, the temperature factor differences will result in conversion errors greater than 1.1% as allowed by NZS 5259:2015.
- Consumption information was not submitted for some ICPs shown as disconnected where consumption is recorded.
- The initial submission accuracy did not meet the 10% requirement for some gas gates for the period May 2014 to April 2015.
- GEOL's HE processes are not compliant for some scenarios. The calculation includes a shape file value for the day of the meter read, but meter readings are deemed to have been obtained at 2400 on any given day so the calculation should use a shape value starting the next day.

Summary of Report Findings

Issue	Section	Control Rating (Refer to Appendix 1 for definitions)	Compliance Rating	Comments
ICP set up information	2.1	Not adequate	Not compliant	<p>Time delays exist with the registry update systems and processes.</p> <p>Consumption information is incorrect for two ICPs where the altitude figures are incorrect.</p> <p>Altitude adjustment is not occurring for GEND.</p>
Metering set up information	2.2	Effective	Compliant	<p>Validation processes are in place and robust to ensure meter pressures are correct.</p>
Billing factors	2.3	Not adequate	Not compliant	<p>Genesis recently updated their temperature data and they are using data from the MetService which contains air temperature at 200cm above ground and not ground temperature at 30cm below ground. We compared this data with data obtained from NIWA's National Climate Database for nine areas for a winter month and a summer month and in two cases in winter and three cases in summer, the temperature factor differences will result in conversion errors greater than 1.1% as allowed by NZS 5259:2015.</p> <p>We recommend GENG applies Joule-Thomson adjustment.</p>
Archiving of reading data	3.1	Effective	Compliant	<p>Robust controls are in place for the security of meter reading data.</p>

Meter interrogation requirements	3.2	Adequate	Compliant	Periodic validation occurs to ensure allocation groups are correct. We recommend this is conducted monthly.
Meter reading targets	3.3	Effective	Compliant	Meter reading attainment processes are robust.
Non TOU validation	3.4	Effective	Compliant	Validation processes are robust.
Non TOU error correction	3.5	Adequate	Not compliant	Consumption information was not submitted for some ICPs shown as disconnected where consumption is recorded.
TOU validation	3.6	Effective	Compliant	Robust processes are in place for TOU validation.
Energy consumption calculation	4	Not adequate	Not compliant	Altitude adjustment is not occurring for GEND ICPs and some GEOL ICPs have an altitude factor of 1. Air temperature is used instead of ground temperature, leading to inaccuracies.
TOU estimation and correction	5.1	Effective	Compliant	Genesis's processes achieve compliance with the requirement to provide its "best estimate of consumption information".

Provision of retailer consumption information	5.2	Adequate	Not compliant	<p>The process for preparing consumption information files is compliant; however, there are some issues which have led to the submission of incorrect consumption information to the allocation agent. The specific issues are as follows:</p> <ul style="list-style-type: none"> • Over recording of consumption due to incorrect altitude information • Incorrect consumption information due to the use of incorrect temperature factors • Consumption information is not submitted for disconnected ICPs with consumption recorded.
Initial submission accuracy	5.3	Effective	Not compliant	<p>Genesis uses historic seasonal adjustment daily shape values, which are then “scaled” depending on temperature relevant to historic temperature. Although compliance has not been achieved, the process is robust.</p>
Historic estimates	5.4	Adequate	Not compliant	<p>Compliance was achieved for all of the GENG scenarios provided during the audit, but GEOL’s HE processes are not compliant for some scenarios. The calculation includes a shape file value for the day of the meter read, but meter readings are deemed to have been obtained at 2400 on any given day so the calculation should use a shape value starting the next day. The GEOL processes are considered inadequate, however when considering the GENG and GEOL codes together we have concluded that controls designed to ensure compliance are not consistently applied, and are not fully effective, therefore we have applied a control rating of “adequate”.</p>
Proportion of HE	5.5	Adequate	Not compliant	<p>The proportion of HE is calculated incorrectly for GEOL.</p>

Forward estimates	5.6	Effective	Compliant	Genesis uses historic seasonal adjustment daily shape values, which are then "scaled" depending on temperature relevant to historic temperature.
Billed vs consumption comparison	5.7	Not adequate	Not compliant	Incorrect quantities billed totals in GAS070 files for GEOL, GENG and GEND.

Persons Involved in This Audit

Auditors

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Veritek Limited

Julie Langford
Langford Consulting

Genesis personnel assisting in this audit were:

Name	Title
Craig Young	Reconciliation Leader
Marcel Green	Senior Data Reconciliation Analyst
Shweta Arora	Reconciliation Services Analyst

Service providers assisting with processes within the audit scope:

Company	Processes
Wells Instrument & Electrical Services Ltd	Gathering and storing raw meter data and TOU downloads
Vector Limited	TOU downloads
PowerCo	TOU downloads

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1. Pre-Audit and Operational Infrastructure Information

1.1 Scope of Audit

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

65. Industry body to commission performance audits

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

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

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

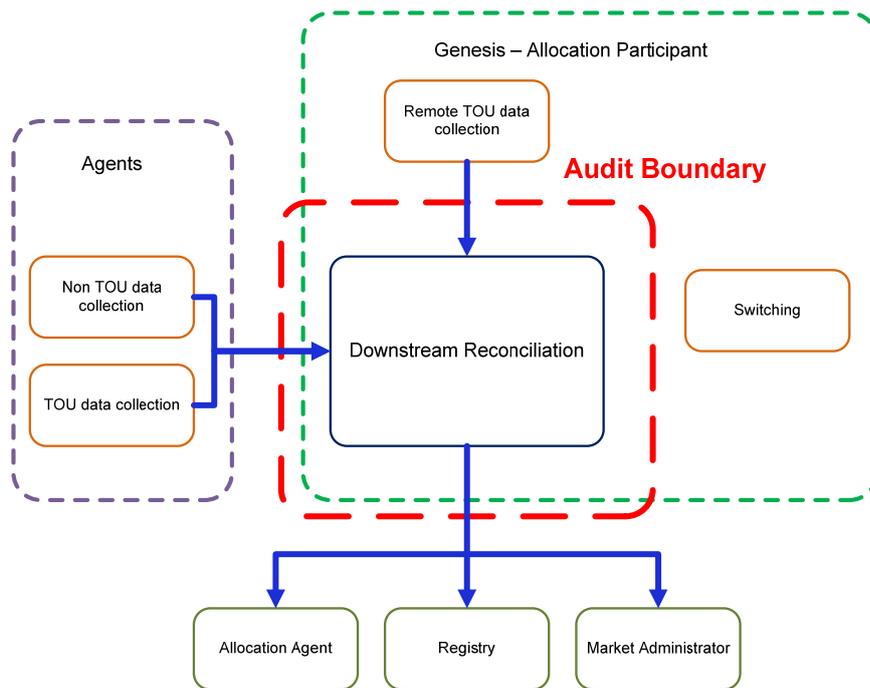
65.2.2 The systems and processes of the allocation agent or that allocation participant that have been put in place to enable compliance with these rules.

The scope of the audit includes three retailer codes; GENG (Genesis non TOU), GEOL (Energy Online non TOU) and GEND (Genesis TOU). The GEOL code uses the Orion system and the other two codes use the Gentrack system.

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

The audit was carried out on August 23rd to 25th 2016 at Genesis's offices in Hamilton.

The scope of the audit includes "downstream reconciliation" only, as shown in the diagram below. Switching and registry management functions are included in a separate report.



1.2 Audit Approach

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

This audit has examined the effectiveness of the controls Genesis 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. We have used 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 Genesis’s systems, the algorithm has been checked by using one or two examples as a “sample”. Multiple examples are not required because they will not introduce any different variables.

Where compliance is reliant on manual processes; manual data entry for example, the sample size has been increased to a magnitude that, in our 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 In statistics, a result is considered statistically significant if it is unlikely to have occurred by chance. (Wikipedia)

1.3 General Compliance

1.3.1 Summary of Previous Audit

Genesis provided a copy of their previous audit conducted in 2014 by Veritek Ltd. 12 of the 17 areas evaluated were found to be compliant. Nine breach allegations were made in relation to the remaining areas. The resolution of these matters is summarised in the table below.

Breach Allegation	Rule	Section in this report	Resolution
Some altitude discrepancies have led to the provision of incorrect consumption information to the allocation agent. Consumption information for eight ICPs with altitude figure errors of over 90m will be high by between 1.1% and 10%.	28.2	2.1.2	Still existing for two ICPs.
The use of incorrect meter pressure information has led to the under submission of consumption information to the allocation agent.	26.2.1, & 28.2	2.2, & 5.2	Meter pressure validation and correction is now compliant.
GEOL uses the same temperature for each gas type rather than each gas gate. This approach will achieve compliance for some gas types where the relevant gas gates are all in the same region, but compliance will not be achieved for gas types where the gas gates are in different regions with different temperatures. Variations greater than approx. 3° Celsius will result in conversion errors greater than 1.1% as allowed by NZS 5259:2015.	26.2.1, & 28.2	2.3.1 & 5.2	Temperature data has been revised but it is air temperature not ground temperature and it is still not accurate.
There are 101 allocation group 6 ICPs with consumption between 250GJ and 10TJ, which should be recorded as allocation group 4.	29	3.2	Current reporting indicates compliance.
Consumption information was not submitted for 15 ICPs recorded as disconnected where consumption is recorded.	26.2.1 & 26.3	3.4 & 5.2	Still existing.
Consumption information was not corrected for prior periods for one GENG ICP where the meter was stopped and for 1,961 of 1,978 ICPs where meter pressure corrections were made.	26.2.1 & 26.3	3.5 & 5.2	Revisions are now being conducted correctly.

<p>Estimated TOU consumption information has been provided on a number of occasions up until June 2013. Genesis's processes achieve compliance with the requirement to provide its "best estimate of consumption information"; however, the existence of estimated information is considered a matter of non-compliance. This issue was addressed on a monthly basis until June 2013.</p>	30.3	5.1	This is no longer considered a breach.
<p>Genesis's initial submission accuracy did not meet the 10% requirement for all gas gates for the period August 2012 to July 2013,</p>	37.2	5.3	Still existing.
<p>GEOL's HE processes are not compliant for some scenarios. The calculation includes a shape file value for the day of the meter read, but meter readings are deemed to have been obtained at 2400 on any given day so the calculation should use a shape value starting the next day. The exception to this is when an ICP starts with GEOL or has a status change to ACTC, because the ICP is active with GEOL all day. Total consumption is not effected but the apportionment between months will be slightly incorrect, with more consumption in the current month and less in the next month</p>	35.2	5.5	Still existing.

1.3.2 Breach Allegations

Genesis has 881 alleged breaches recorded by the Market Administrator since August 2014. They are summarised as follows:

Nature of Breach	Rule	Quantity	Section in this Report
Initial vs final allocation variances more than the allowable threshold	37.2	869	5.3
Incorrect altitude factor leading to incorrect consumption information	28.2	1	2.1.2
Use of incorrect meter pressure leading to incorrect consumption information	26.2.1, & 28.2	1	2.2, & 5.2
Use of incorrect temperature information leading to incorrect consumption information	26.2.1, & 28.2	1	2.3.1 & 5.2
Some incorrect allocation groups	29	1	3.2
Consumption information was not submitted for some ICPs recorded as disconnected where consumption is recorded.	26.2.1 & 26.3	1	3.4 & 5.2
Consumption information was not corrected for prior periods for ICPs with meter pressure corrections or where the meter was stopped.	26.2.1 & 26.3	1	3.5 & 5.2
Incorrect HE calculations for GEOL for some scenarios	35.2	1	5.5
Under reporting of consumption for one TOU ICP	26.2	1	5.2
Some incorrect status codes recorded	26.5	1	2.1.1
Consumption information not submitted to the allocation agent for two ICPs until the interim allocation.	26.2	1	5.2

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

Breach Allegation	Rule(s)	Section in this report
<p>Two non TOU altitude discrepancies have led to the provision of incorrect consumption information to the allocation agent.</p> <p>Altitude adjustment is not occurring for any of the TOU ICPs. There are five ICPs where the conversion error is greater than 1.0% which does not achieve compliance with rule 28.2. For the remaining 109 ICPs where the conversion error is within the threshold, there is a breach of rule 26.2.1, which requires information to be accurate and complete. In aggregate terms, over submission has occurred by 0.18%, or approx. 500GJ per month.</p>	28.2	2.1.2, 4 & 5.2
<p>Genesis recently updated their temperature data and they are using data from the MetService which contains air temperature at 200cm above ground and not ground temperature at 30cm below ground. We compared this data with data obtained from NIWA's National Climate Database for nine areas for a winter month and a summer month and in two cases in winter and three cases in summer, the temperature factor differences will result in conversion errors greater than 1.1% as allowed by NZS 5259:2015.</p>	26.2.1, & 28.2	2.3.1 & 5.2
<p>Consumption information was not submitted for some ICPs shown as disconnected where consumption is recorded.</p>	26.2.1 & 26.3	3.4 & 5.2
<p>Genesis's initial submission accuracy did not meet the 10% requirement for some gas gates for the period May 2014 to April 2015.</p>	37.2	5.3
<p>GEOL's HE processes are not compliant for some scenarios. The calculation includes a shape file value for the day of the meter read, but meter readings are deemed to have been obtained at 2400 on any given day so the calculation should use a shape value starting the next day. The exception to this is when an ICP starts with GEOL or has a status change to ACTC, because the ICP is active with GEOL all day. Total consumption is not affected but the apportionment between months will be slightly incorrect, with more consumption in the current month and less in the next month.</p>	35.2	5.5
<p>The proportion of HE is calculating incorrectly for GEOL</p>		
<p>Incorrect quantities billed totals in GAS070 files for GEOL and GEND.</p>	26.2.1	5.7

We have also made breach allegations against some distributors in relation to incorrect altitude figures on the registry. They are shown in the table below.

Breach Allegation	Participant Identifier	Rule(s)	Section in this report
Altitude figures incorrect for two ICPS.	NGCD	26.5.1 & 26.5.4	2.1.2

1.4 Provision of Information to the Auditor (Rule 69)

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

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

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

1.5 Draft Audit Report Comments

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

Party	Response	Comments provided	Attached as appendix
Contact Energy	Yes	Yes	Yes
Metrix	Yes	No	No
Gas Industry Company	Yes	No	No
Genesis	Yes	No	No

The comments received were considered in accordance with rule 71.1, prior to preparing the final audit report. The following table records the changes that were made to the report after considering comments. In the appendix, we have recorded the reasons for not making changes after consideration of some comments.

Report Section	Change to Report
2.1.2	Inclusion of reference to the section in NZS5259 which states “the altitude factor can be assumed to be 1 where meters are situated at an elevation less than 50 m above sea level” Addition of the total impact on consumption information excluding ICPs at an altitude lower than 50m.
2.3.1	Clarification of dates the temperature information was changed in databases. Clarification that validation occurs against the network pressure field.
5.7	Clarification of the correct gas gates where billed quantities were incorrectly applied to WST03610. Inclusion of reference to incorrect consumption information data resulting from the lack of altitude adjustment for GEND ICPs.

1.6 Transmission Methodology and Audit Trails (Rule 28.4.1)

A complete audit trail was viewed for all data gathering, validation and processing functions. Compliance is confirmed with this rule.

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

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

Compliance with this rule has been examined in relation to the set-up of ICP, metering and billing information. We have also considered the “Gas (Downstream Reconciliation) Rules 2008 Billing factors guideline note, V2.0” (Billing Factors Guideline) published by GIC on 30/11/15 when examining the set up and maintenance of information.

2.1 ICP Set Up Information

2.1.1 New Connections Process

The process was examined for the connection and activation of new ICPs. The new connections process is discussed in the “Switching and Registry Management Report” but it is also relevant to this report because the accuracy of ICP information affects the accuracy of consumption calculations.

New connections are managed via the network portal (POCO or Vector’s Seibel). Progress notifications are automatically generated and the connection details and registry details are loaded into Orion for GEOL and into Gentrack for GENE. The registry is populated manually for GEOL ICPs and an automated update occurs for GENE ICPs.

The billing team notify the new connection team of any sites that have been livened but with no metering recorded. These are investigated.

Consumption information may not be provided to the allocation agent until the registry is updated, which means that for some ICPs where the status has changed to ACTC, consumption information has not been provided to the allocation agent for the initial allocation.

GEOL has only recently started dealing with new connections. There were six ICPs to examine and none had a registry update within the required two business days. The notification from the Distributor to GEOL was later than two business days for three of these ICPs.

We examined the event detail report for the period January 1st to May 31st 2016 to check the timeliness of other status event changes and the tables below shows the results of these plus the new connections.

Status New Connections	Total ICPs	Update greater than 2 days	Update greater than 30 days	Average update days	Percentage compliant
ACTC	2	2	0	11	0.0%
ACTV	1	1	1	95	0.0%
INACT	3	3	0	8.3	0.0%

Status Updates	Total ICPs	Update greater than 2 days	Update greater than 30 days	Average update days
ACTC	1,231	1,064	113	13.4
ACTV	549	524	34	10.5
INACT	71	71	15	33.9
INACP	0	N/A	N/A	N/A

As shown in the tables above, all of the status updates for new connections were conducted later than the two business days allowable in the Rules. Status updates for events other than new connections do not have a time threshold. Rule 61.1 requires that information changes are made “as soon as practicable”. In the auditors’ opinion, updates greater than 30 business days are not made “as soon as practicable” and we recommend the associated processes are examined and improved to achieve shorter registry update timeframes.

GEOL’s Orion system does not automatically update status events on the registry. These are conducted manually on a monthly basis by creating a batch file and uploading it. When ICPs switch in to GEOL the status in Orion is automatically set to ACTC, regardless of the registry status. The discrepancies are identified and corrected through monthly validation. However this validation only deals with a snapshot, not a historic “timeline”, so if any registry fields change more than once in a month, the validation process does not deal with this.

Other fields are updated daily or weekly, and these changes are also made by creating a batch file and uploading it. New ICPs and switched in ICPs have default values of “1” in Orion for altitude and network pressure. The registry notification files are used to populate Orion with the correct information, but it is possible billing and submission to the allocation agent may occur between the population of Orion and the updating of the data.

GENE had 1,209 new connections in the period January 1st to May 31st 2016. We examined the event detail report to check compliance with the requirement to populate the registry within two business days. We also checked the timeliness of other status event changes and the table below shows the results:

Status New Connections	Total ICPs	Update greater than 2 days	Update greater than 30 days	Average update days	Percentage compliant
ACTC	327	327	10	8.8	0.0%
ACTV	2	2	0	6.0	0.0%
INACT	880	759	48	8.2	13.8%

Status Updates	Total ICPs	Update greater than 2 days	Update greater than 30 days	Average update days
ACTC	5,933	3,760	972	47.7
ACTV	5,085	2,061	246	13.7
INACT	1,997	1,163	54	8.8
INACP	74	65	26	65.7

As shown in the tables above, many of the status updates for new connections were conducted later than the two business days allowable in the Rules. Status updates for events other than new

connections do not have a time threshold. Rule 61.1 requires that information changes are made “as soon as practicable”. In the auditors’ opinion updates greater than 30 business days are not made “as soon as practicable” and we recommend the associated processes are examined and improved to achieve shorter registry update timeframes.

GENE’s validation process includes all registry fields, and discrepancies are investigated prior to change to ensure they are not using registry information that may be incorrect.

There were three GEND new connections. The registry was populated within two business days for one of the ICPs but was populated late for the other two. There were four updates to Active that were not new connections and all of the changes were made within 30 business days. We consider these changes were made “as soon as practicable”.

2.1.2 Altitude Information

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

NZS 5259 contains the following points, which affect the way altitude information should be managed:

1. The maximum permissible error is $\pm 1.0\%$ where the meter pressure is below 100kPa and $\pm 0.5\%$ where the meter pressure is greater than 100kPa
2. Altitude should be determined within 10 m where practicable
3. The altitude factor can be assumed to be 1 where meters are situated at an elevation less than 50 m above sea level.

Genesis provided a registry list file and a random sample of ICPs per distributor was checked against “google earth” data. The sample was selected by firstly looking for obvious outliers and then increasing the sample size through random selection. The “google earth” data is based on the “Shuttle Radar Topography Mission” (SRTM) results and a number of recent studies indicate an accuracy of $\pm 10\text{m}$ for altitude. An evaluation against this data is considered an appropriate test for “reasonableness”. Altitude figures that are within approximately 90m of the actual altitude will ensure an accuracy of $\pm 1.0\%$. Point 2 above recommends altitude figures are determined to within 10m where practicable. An evaluation of altitude data on the registry was conducted to check whether this recommendation had been met. As noted above, the margin of error of the “google earth” data appears to be approximately $\pm 10\text{m}$, therefore, to allow for this margin, we have checked that the registry data is within 20m of “google earth” data.

The altitude data on the registry appears to be very accurate. NGCD has two ICPs where the altitude figure differs by more than 90m. ICP 1001274439NG36A shows on the registry as 10m but Google Earth has an altitude of 320m. ICP 1001246022NG97E shows on the registry as 145m but Google Earth has an altitude of 286m. These ICPs are in Rotorua and an altitude higher than 250m would be expected. There were no other differences greater than 20m for any of the ICPs checked.

A further evaluation was conducted of ICPs where the altitude figure was zero on the registry. This data appears to be slightly less accurate than when a figure other than zero is populated. The results

are shown in the table below. There are 14 of 24 ICPs with an altitude difference of more than 20m but no ICPs with an altitude difference of more than 90m.

Distributor	Total ICPs	ICPs with altitude of zero	ICPs checked	Quantity within 20m	Quantity within 90m
UNLG	26,231	3	3	1	3
NGCD	34,564	0	0	N/A	N/A
POCO	51,059	84	21	9	21
GNET	3,615	0	0	N/A	N/A
Total	115,469	87	24	10	24

We have considered whether distributors have potentially breached any rules by populating the registry with inaccurate altitude information. Distributors have responsibility for populating the registry with altitude figures² and for maintaining the accuracy of this information. Distributors must also comply with rule 26.5 of the Gas (Downstream Reconciliation) Rules 2008, which requires them to ensure that any information on the registry is accurate and complete and supports compliance with NZS 5259:2015. There are two ICPs where the incorrect altitude has resulted in consumption information being high, and outside the threshold allowed by NZS 5259:2015, by between 1.1% and 10%. We have alleged a breach of rules 26.5.1 and 26.5.4 by NGCD. Genesis is not in breach of the same rules but is in breach of rule 28.2, which requires retailers to comply with NZS 5259:2015 when converting volume to energy.

Genesis is required to correct the altitude factors in their systems and they must ensure corrections are made for at least those ICPs where the altitude difference is greater than 90m. These corrections are required to flow through to the relevant revision files.

We examined the use of altitude figures for GEND, where the energy consumption calculation occurs in an Access database, not in Gentrack. Altitude adjustment is not occurring in the Access database for GEND ICPs. Altitude adjustment is occurring in Gentrack for billing purposes, but this data is not transferred to the Access database. The Access database conducts a separate calculation. Genesis is in breach of rule 28.2, which requires retailers to comply with NZS 5259:2015 when converting volume to energy.

The altitude factor in GEOL's Orion system is set at 1.0 for 4,202 of 7,704 ICPs. This results in over recording of consumption information by up to 5.14%. 408 ICPs have a variance greater than 1.0%. The overall variance for August 2016 is 110.77 GJ, which is 0.69%. When considering point 3 above, which states *"The altitude factor can be assumed to be 1 where meters are situated at an elevation less than 50 m above sea level"*, the total over recording of consumption information for August 2016 for those ICPs over 50m is 80.83 GJ.

² Gas (Switching Arrangements) Rules 2008, Part A, ICP parameters maintained by Distributors and rules 41 and 58.

2.2 Metering Set-up Information

Meter pressure, meter digits and meter multiplier are now registry fields. Genesis validates against these fields on a regular basis to ensure their data matches the registry. When a difference is found, Genesis asks for the meter docket in order to confirm which information is correct. There were a number of adjustments made as a result of the RAIG working group validation exercise. The matter of corrections is discussed in Section 3.5.

2.3 Billing Factors

2.3.1 Temperature Information

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

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

Genesis has chosen option (c) and they apply the daily weighted average temperature for the billing/read-read period. Option (c) seems to be the most logical choice because it matches the majority of GMS installations. Genesis updated their temperature data in December 2015 for GEOL and in July 2016 for GENG. They are using data from the MetService which contains air temperature at 200cm above ground and not ground temperature at 30cm below ground. We compared this data with data obtained from NIWA's National Climate Database and for two of the areas in the table below for August 2016 the temperature factor will result in conversion errors greater than the 1.1% allowed by NZS 5259:2015. The next table is for February 2016 and it also shows that the temperature factor will result in conversion errors greater than the 1.1% allowed by NZS 5259:2015, this time for three areas. This is a breach of rules 26.2.1, & 28.2.

Month	NIWA area	NIWA average	Genesis area	Genesis average	NIWA factor	Genesis factor	Difference	% difference
Aug-16	Te Puke 30cm	10.22	Tauranga airport	10.18	1.0169	1.0170	(0.0001)	0.01%
Aug-16	Hamilton Aws 10cm	9.61	Hamilton airport	8.83	1.0191	1.0219	(0.0028)	0.27%
Aug-16	Auckland Motat 20cm	11.46	Auckland airport	11.48	1.0124	1.0124	0.0001	0.00%
Aug-16	Whangarei 20cm	12.45	Whangarei airport	11.84	1.0089	1.0111	(0.0022)	0.22%
Aug-16	Rotorua 20cm	8.9	Rotorua airport	7.5	1.0216	1.0267	(0.0051)	0.50%
Aug-16	Gisborne 10cm	10.67	Gisborne airport	7.12	1.0153	1.0281	(0.0129)	1.26%
Aug-16	Wellington 20cm	8.95	Wellington airport	11.42	1.0214	1.0126	0.0089	-0.86%
Aug-16	Upper Hutt 20cm	8.34	Lower Hutt	11.51	1.0237	1.0123	0.0114	-1.11%
Aug-16	Parapapaumu	9.19	Parapapaumu airport	10.51	1.0206	1.0158	0.0047	-0.47%

Month	NIWA area	NIWA average	Genesis area	Genesis average	NIWA factor	Genesis factor	Difference	% difference
Feb-16	Te Puke 30cm	23.04	Tauranga airport	20.73	0.9729	0.9805	0.0076	0.78%
Feb-16	Hamilton Aws 10cm	24.26	Hamilton airport	20.67	0.9689	0.9807	0.0118	1.22%
Feb-16	Auckland Motat 20cm	23.92	Auckland airport	21.8	0.9700	0.9769	0.0069	0.71%
Feb-16	Whangarei 20cm	25.39	Whangarei airport	20.95	0.9652	0.9798	0.0146	1.51%
Feb-16	Rotorua 20cm	20.08	Rotorua airport	18.72	0.9827	0.9873	0.0046	0.47%
Feb-16	Gisborne 10cm	23.16	Gisborne airport	18.98	0.9725	0.9864	0.0139	1.43%
Feb-16	Wellington 20cm	20.28	Wellington airport	21.48	0.9820	0.9780	-0.004	-0.41%
Feb-16	Upper Hutt 20cm	22.68	Lower Hutt	23.47	0.9740	0.9714	-0.0026	-0.27%
Feb-16	Parapapaumu	21.7	Parapapaumu airport	21.03	0.9773	0.9795	0.0022	0.23%

The table below quantifies the errors in GJ for GENG and GEOL. The same temperature data is used for both codes.

Gas Gate	Month	Consumption (GJ)	Correct Consumption (GJ)	Difference (GJ)
GIS07810	Aug-16	5,523	5,454	69
BEL24510	Aug-16	80,382	81,287	-905
GTH11301	Feb-16	21,671	21,409	262
WHG07501	Feb-16	1,307	1,288	19
GIS07810	Feb-16	1,512	1,491	21

GEOL adjusts for the Joule-Thomson effect and the calculation is correct. Validation occurs between Orion and the registry to ensure the network pressure field is correct.

GENG does not apply the Joule-Thomson effect adjustment. NZS 5259:2015 states “...correction may be made for the temperature drop due to pressure reduction if this reduction is made in the same installation and immediately upstream of the GMS. The temperature drop is about 0.5° per 100kPa of pressure drop. For large pressure drops or high flow rates it is recommended that the actual temperature drop be measured.” This indicates that adjustment for the Joule-Thomson effect is desirable. The Billing Factors Guideline contains the following expectations by GIC:

- Network owners will ensure nominal operating pressures are correctly populated in the registry for all ICPs on their networks.
- Include an assessment of the Joule-Thomson effect if there is a significant pressure reduction before gas enters the meter. The pressure reduction can be assessed as the difference between the network pressure in the registry and the metering pressure.

We recommend GENG applies Joule-Thomson adjustment.

2.3.2 Calorific Values

Gas composition data is sourced from the Open Access Transmission Information System (OATIS) and is loaded into Gentrack, Orion and the GEND submission database. The accuracy of the information was checked by comparing an OATIS file with the contents of these systems for some recent months.

3. Meter Reading and Validation

3.1 Archiving of Register Reading Data (Rule 28.4.2)

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

Some data provided by Genesis's meter reading contractor was checked and it was found that the readings matched the data in Gentrack. This proves the end-to-end process. This data is transmitted via FTP, which ensures its security and integrity.

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

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

Genesis conducts analysis of consumption on a periodic basis to ensure ICPs are in the correct allocation groups. The most recent reporting was reviewed, which showed that all ICPs were in the correct allocation group. If the consumption is just over or just under the thresholds, the allocation group is only changed when the consumption is confirmed as being consistently over. We recommend this analysis is conducted monthly to ensure changes are made at the earliest opportunity.

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

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

Genesis provided a list of ICPs not read in the previous 12 months for GENG and GEOL. The GENG list contained 823 ICPs and the GEOL list contained one ICP. The GAS080 reports for April 2016 show 1,205 ICPs for GENG and one ICP for GEOL. We recommend Genesis investigates the accuracy of both reports to identify why there are differences.

We checked the meter reading processes to assess compliance. For GEOL, the no read code returned by the meter reader determines the next step in the process. For the no access sites, after three no access read codes a letter is sent, followed by another if access is still not gained. This is followed by either a phone call or text to prompt the customer to make contact. For all the other no read codes, contact is made with the customer via a text in the first instance and then followed by two emails or letters after three missed reads. GENG runs the access report on a monthly basis. The outbound communication process includes letters, phone calls and texts to customers to obtain meter readings and resolve on-going access issues. These processes achieve compliance with the rules.

The table below shows the GAS080 results for April 2016.

Target	Reading Percentage (GAS080)	Reading Percentage (GAS080)
	GEOL	GENG
Rolling 4 months (target 90%)	99.49%	97.18%
12 months (target 100%)	99.96%	98.77%

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

3.4 Non TOU Validation

Meter reading validation occurs at multiple levels.

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

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

The second level of validation occurs when the data reaches Genesis. This validation looks for obvious file errors or file corruption and invalid metering information.

Readings are then subject to “billing validation”. Each bill produced is subject to a number of individual validation checks. Bills that fail validation end up on an “exceptions” list and any issues are investigated and resolved prior to sending the bill. These validation checks include:

- Short read period
- Long read period
- High dollar amount
- Zero consumption
- Negative consumption
- Consumption on inactive and vacant premises. The registry status checked in these instances and is updated as required.

Meter readings are not edited during this process. If a reading fails validation and an incorrect meter reading is suspected then a check reading will be performed.

A final level of consumption validation occurs for GENG during “submission validation” in the “consumption validation manager” tool. Each ICP is allocated to a “customer load profile” group and readings are either accepted or rejected based on whether they fit within an expected consumption band. Those readings that fail validation are recalculated to fit the expected profile. Readings that fail

validation at this point have already been “billed” so notification is made back to the billing team when recalculation has occurred.

Genesis checks for consumption at ICPs where their records indicate the ICP is disconnected or vacant. The most recent reporting shows 104 disconnected ICPs with consumption. Consumption information for ICPs with an inactive status is not submitted. The total volume for the 104 ICPs is 17,631 cubic metres so approx. 700 GJ. Compliance is not achieved with rules 26.2.1 and 26.3.

There were four ICPs for GEOL with consumption after the disconnection date. The meter reading results show a total of 23 cubic metres was not converted to GJ and was not submitted to the allocation agent. Whilst this is very minor, compliance has not been achieved with rules 26.2.1 and 26.3.

3.5 Non TOU Error Correction

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

Error correction was examined by a “walk through” of the process and by examining five examples where meters had stopped recording and five examples where the meter pressure was corrected.

The normal process for stopped meter correction is to remove the meter from Gentrack at an estimated reading, higher than that recorded on the register, to cater for the consumption during the period the meter was not recording. Previous incorrect meter reads are invalidated to ensure the consumption is apportioned to the correct months for revision purposes. This process was followed for five GENG examples checked during the audit. Corrected consumption flows through to the appropriate revision files as long as the stopped meter is identified prior to the final allocation. One of the examples was for a period longer than 12 months. The period of the loss was from June 2003 until October 2015, but consumption information was only provided to the allocation agent for the 12 month allocation period. There were no examples to examine for GEOL.

Genesis provided a list of all meter pressure changes since August 2015. GENG had 235 changes; GEOL had 19 changes and in all cases the consumption information was corrected for the appropriate revision files.

As mentioned in Section 3.4, Consumption information for inactive ICPs is not submitted to the allocation agent.

3.6 TOU Validation

Genesis’s TOU data is collected using the Master Link system for 15 ICPs. Manual downloads are conducted if there is an equipment failure or if data is not obtained by Master Link. Clock synchronisation occurs in the field and is checked as part of the periodic accuracy checks.

Once the data has been collected it is then imported into an Access database that is used to create the GAS050 file for submission to the allocation agent. Prior to the preparation of this file, validation occurs visually in a spreadsheet. This validation includes a check against previous data and a check of the consumption profile in a graphical format.

There is an additional check against the billed values, which are derived from meter register readings.

4. Energy Consumption Calculation (Rule 28.2)

To evaluate this calculation a spreadsheet was used which converts volume between meter readings to volume at standard conditions and then to energy consumption. The relevant information for several non TOU and TOU ICPs was entered into the spreadsheet and the resulting energy value was compared to that calculated by GENE and GEOL systems. This comparison identified a number of issues, as follows:

- The altitude factor in GEOL's Orion system is set at 1.0 for 4,202 of 7,704 ICPs. This results in over recording of consumption information by up to 5.14%. 408 ICPs have a variance greater than 1.0%. The overall variance for August 2016 is 110.77 GJ, which is 0.69%.
- As recorded in Section 2.3.1, the updated temperature figures for GEOL and GENG are different to those published by NIWA, and some temperature factors are outside the allowable 1.1% threshold.
- Altitude adjustment is not occurring in the Access database for GEND ICPs. Altitude adjustment is occurring in Gentrack for billing purposes, but this data is not transferred to the Access database. The Access database conducts a separate calculation. There are five ICPs where the conversion error is greater than 1.0% which does not achieve compliance with rule 28.2. For the remaining ICPs where the conversion error is within the threshold, we believe there is a breach of rule 26.2.1, which requires information to be accurate and complete. In aggregate terms, over submission has occurred by 0.18%, or approx. 500GJ per month.

Compressibility adjustment occurs for all GENG ICPs where the meter pressure is above 50 kPa. GEOL ICPs all have a compressibility factor of 1. There are no GEOL ICPs with a pressure above 50 kPa. We checked and confirmed that TOU ICPs had the correct compressibility calculation.

5. Estimation and Submission Information

5.1 TOU Estimation and Correction (Rule 30.3)

This rule requires that retailers must provide the best estimate of consumption information to the Allocation agent in situations where actual data is not available.

In these situations, Genesis uses mechanical readings or the consumption and profile from similar time periods to create estimates, which are appropriately identified.

Ten examples were examined. Genesis's processes achieve compliance with the requirement to provide its "best estimate of consumption information".

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

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

A GAS040 file for a recent month was examined and compared to the data in Genesis's systems at ICP level; the totals matched which confirms compliance. This also proves that Genesis's consumption information provided to the Allocation agent is calculated at ICP level and then aggregated.

As noted in previous sections, there are some issues which have led to the submission of incorrect consumption information to the allocation agent. The specific issues are as follows:

- The altitude factor in GEOL's Orion system is set at 1.0 for 4,202 of 7,704 ICPs. This results in over recording of consumption information by up to 5.14%. 408 ICPs have a variance greater than 1.0%. The overall variance for August 2016 is 110.77 GJ, which is 0.69%.
- The updated temperature figures for GEOL and GENG are different to those published by NIWA, and some temperature factors are outside the allowable 1.1% threshold.
- Altitude adjustment is not occurring in the Access database for GEND ICPs. Altitude adjustment is occurring in Gentrack for billing purposes, but this data is not transferred to the Access database. The Access database conducts a separate calculation.
- Consumption information is not submitted or disconnected ICPs with consumption recorded.

5.3 Initial Submission Accuracy (Rule 37.2)

Rule 37.2 requires that the accuracy of consumption information, for allocation groups 3 to 6, for initial allocation must be within a certain percentage of error published by the industry body. The published percentage for the months analysed is 10%.

GENG did not meet this requirement for a number of gas gates during the 12 month period shown. The results are summarised in the table below:

Month	Total Gas Gates	Number Within 10%	% Compliant	Within +/-10% or < 200 GJ	% Compliant or immaterial
May 2014	81	32	40%	58	72%
June 2014	82	26	32%	58	71%
July 2014	82	48	59%	74	90%
August 2014	81	55	68%	78	96%
September 2014	80	57	70%	80	100%
October 2014	80	36	45%	62	78%
November 2014	79	38	48%	69	87%
December 2014	80	40	50%	76	95%
January 2015	81	39	48%	77	95%
February 2015	81	49	60%	79	97%
March 2015	81	45	56%	77	95%
April 2015	81	26	32%	62	77%

The following table for GENG shows the difference between consumption information for initial and final submissions at an aggregated level for all gas gates:

Month	Initial Submission All Gas Gates (GJ)	Final Submission All Gas Gates (GJ)	Percentage Variation
May 2014	337,625	394,652	14.45%
June 2014	390,000	453,846	14.07%
July 2014	568,353	556,952	-2.05%
August 2014	524,250	515,615	-1.67%
September 2014	383,452	384,245	0.21%
October 2014	343,761	316,389	-8.65%
November 2014	282,552	265,708	-6.34%
December 2014	217,214	209,215	-3.82%
January 2015	159,179	159,522	0.22%
February 2015	160,375	164,179	2.32%
March 2015	182,666	196,313	6.95%
April 2015	230,768	254,693	9.39%

GEOL did not meet this requirement for a number of gas gates during the 12 month period shown. The results are summarised in the table below:

Month	Total Gas Gates	Number Within 10%	% Compliant	Within +/-10% or < 200 GJ	% Compliant or immaterial
May 2014	36	5	14%	34	94%
June 2014	36	16	44%	34	94%
July 2014	36	19	53%	33	92%
August 2014	40	21	53%	40	100%
September 2014	43	14	33%	43	100%
October 2014	45	15	33%	45	100%
November 2014	47	21	45%	46	98%
December 2014	48	6	13%	47	98%
January 2015	47	8	17%	46	98%
February 2015	48	20	42%	48	100%
March 2015	48	27	56%	48	100%
April 2015	51	12	24%	50	98%

The following table for GEOL shows the difference between consumption information for initial and final submissions at an aggregated level for all gas gates:

Month	Initial Submission All Gas Gates (GJ)	Final Submission All Gas Gates (GJ)	Percentage Variation
May 2014	4,002	5,127	21.94%
June 2014	5,433	6,271	13.36%
July 2014	6,786	8,011	15.29%
August 2014	7,806	7,840	0.43%
September 2014	6,411	5,750	-11.50%
October 2014	4,932	4,374	-12.77%
November 2014	5,104	4,329	-17.90%
December 2014	5,076	3,954	-28.39%
January 2015	4,105	3,170	-29.50%
February 2015	3,504	3,305	-6.01%
March 2015	4,362	4,230	-3.12%
April 2015	6528	5806	-12.43%

The variances in the tables above were evaluated and the large differences relate to incorrect consumption information in the initial file for specific ICPs, where the issue was not identified during validation.

5.4 Historic Estimates (Rules 34 & 35)

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

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

GENG's HE processes are compliant for all scenarios.

GEOL HE Scenarios			
Test	Scenario	Test Expectation	Result
a	ICP becomes Active part way through a month	Consumption is only calculated for the Active portion of the month.	Compliant
b	ICP becomes Inactive part way through a month.	Consumption is only calculated for the Active portion of the month.	Not compliant
c	ICP's become Inactive then Active within a month.	Consumption is only calculated for the Active portion of the month.	Not compliant
d	ICP switches in part way through a month	Consumption is calculated to include the 1st day of responsibility.	Compliant
e	ICP switches out part way through a month	Consumption is calculated to include the last day of responsibility.	Not compliant
f	ICP switches out then back in within a month	Consumption is calculated for each day of responsibility.	Not compliant
g	Continuous ICP with a read during the month	Consumption is calculated assuming the readings are valid until the end of the day	Not compliant
h	Continuous ICP without a read during the month	Consumption is calculated assuming the readings are valid until the end of the day	Not compliant
i	Rollover Reads	Consumption is calculated correctly in the instance of meter rollovers.	Compliant

GEOL's HE processes are not compliant for some scenarios. The calculation includes a shape file value for the day of the meter read, but meter readings are deemed to have been obtained at 2400 on any given day so the calculation should use a shape value starting the next day. The exception to this is when an ICP starts with GEOL or has a status change to ACTC, because the ICP is active with GEOL all day. Total consumption is not effected but the apportionment between months will be slightly incorrect, with more consumption in the current month and less in the next month. This does not achieve compliance with rule 35.2.

5.5 Proportion of Historic Estimates (Rule 40.1)

This rule requires retailers to report to the allocation agent the proportion of historic estimates contained within the consumption information for the previous initial, interim and final allocations. The relevant files were examined and compliance is confirmed for GENG, but for GEOL, Orion is incorrectly calculating the proportion of HE field. Orion calculates the proportion of HE differently to the way it calculates the HE for the total submission. The proportion of HE is calculated by taking the number of days where HE was present, divided by the total days in the month then this is multiplied by the total submission. This figure is inaccurate, although it does not affect the total submission.

5.6 Forward Estimates (Rules 34 & 36)

The rules do not prescribe how forward estimates are to be calculated. GENG uses an “estimated seasonal profile model (ESPM) for forward estimation. In summary this model uses historic seasonal adjustment daily shape values which are then “scaled” depending on temperature relevant to historic temperature. GEOL uses the historic daily consumption as the basis for forward estimates.

5.7 Billed vs Consumption Comparison (Rule 52)

The tables below show a comparison between quantities billed and consumption information submitted to the allocation agent for a five year period. The consumption information is lower than quantities billed for all of the codes. Further analysis was conducted for all large differences per gas gate per month over the entire period. The issues found are discussed after each table.

GEND Billed vs Consumption				
Year ending	Billed GJ	Consumption GJ	Difference GJ	% Difference
Mar-12	1,279,384	1,298,825	19,440	1.52%
Mar-13	1,346,721	1,347,696	975	0.07%
Mar-14	1,781,765	1,763,955	-17,810	-1.00%
Mar-15	3,001,311	2,941,320	-59,990	-2.00%
Mar-16	3,167,797	3,135,467	-32,330	-1.02%
Total	10,576,978	10,487,264	-89,715	-0.85%

The largest discrepancy is in the year ending March 2015 and is mostly attributable to the WST03610 gas gate. A detailed check of this period found the issues shown in the table below:

Over reported billed GJ	ICP	Comments
5,614	0000015871QT8C7	Billed information was incorrectly applied to WST03610 instead of PAP06610 for January 2015.
1,374	0000309141QT9E3	Billed information was incorrectly applied to WST03610 instead of PAP06610 for January 2015.
11,933	1001267123QT294	Billed information was incorrectly applied to WST03610 instead of TUK06502 for March and April 2015.
2,064	0000072511QT407	A register was incorrectly set to “billable” so mechanical volumes were added to the billed volumes.
16,967	0004226838NGB0A	Incorrect billed information was reversed, but the original (incorrect) volume was included in addition to the corrected information. This appears to have caused the issue below as well.

35,599	Multiple	The billed file was not calculating correctly leading to over recording of consumption. This will be rectified.
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The last three issues in the table above have an impact on the total difference between billed GJ and consumption GJ. There is also the issue of inaccurate consumption data due to the lack of adjustment for altitude. The resolution of these matters should align the two sets of data.

GENG Billed vs Consumption				
Year ending	Billed GJ	Consumption GJ	Difference GJ	% Difference
Mar-12	3,968,921	3,853,113	-115,807	-2.92%
Mar-13	3,853,763	3,798,669	-55,094	-1.43%
Mar-14	3,800,938	3,804,845	3,907	0.10%
Mar-15	3,895,257	3,835,902	-59,355	-1.52%
Mar-16	4,054,887	3,997,076	-57,810	-1.43%
Total	19,573,766	19,289,606	-284,159	-1.45%

Detailed analysis was conducted for four gas gates with the largest variances, which included 187 ICPs. All of the issues found related to long day invoices, multiple months billed in the same month, invoice corrections and high using ICPs with estimates. Many of the high using ICPs are now being read monthly. The analysis did not identify any inaccuracies in either the quantities billed data or the GAS040 data. The limitation of the comparison in the tables is that it includes consumption data for the initial and interim allocations, which will change with the next allocation, but the quantities billed data is not revised, any changes appear in the month of the change.

GEOL Billed vs Consumption				
Year ending	Billed GJ	Consumption GJ	Difference GJ	% Difference
Mar-12	15,359	14,528	-830	-5.72%
Mar-13	28,812	27,892	-920	-3.19%
Mar-14	42,095	41,153	-942	-2.24%
Mar-15	61,847	60,157	-1,690	-2.73%
Mar-16	129,489	127,799	-1,690	-1.31%
Total	277,602	271,529	-6,072	-2.19%

Some GEOL quantities billed figures are using default conversion factors, leading to GAS070 totals being incorrectly higher than submission totals. It appears that when a billing period is longer than

exactly one month, the conversion factor rounds to whole numbers for the GAS070 figures but not for actual billed values or for submission values. This issue leads to incorrect data and is contributing to the large percentage error in the files.

We compared quantities billed against consumption information for Greater Tauranga and Mount Maunganui gas gates for all allocation group 4 ICPs for the period October 2008 until July 2016, in order to identify any discrepancies that could lead to UFG. This analysis did not identify any specific problems.

6. Recommendations

As a result of this performance audit the following recommendations are made in relation to Genesis:

- Many registry updates for new connections and status changes are made later than two business days and often later than 30 business days. We recommend the associated processes are examined and improved to achieve shorter registry update timeframes.
- The meter reading reports, which form the basis of the GAS080 reports, do not appear to be accurate. We recommend the accuracy of these reports is investigated to identify why there are differences.
- Allocation group validation occurs periodically. We recommend this is conducted monthly.
- Joule-Thomson adjustment does not occur for GENG. We recommend GENG considers adjusting for the Joule-Thomson effect. Joule-Thomson adjustment does occur for GEOL.

Appendix 1 – Control Rating Definitions

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

Appendix 2 – Response to Contact Energy Comments

Section	Comment	Response
1.3.2	Page 15 – breach relating to altitude factor missing from TOU gas conversion – I believe here is also an impact to annual UFG factors that should be noted.	Consideration of annual UFG factors is outside the scope of the audit, however this may be considered as part of a subsequent investigation.
2.1.2	Missing from NZS 5259 extract is the note regarding where altitudes are below 50 metres then altitude factor of 1 can be applied. This point is also relevant for the final sentence relating to the number of incorrect altitudes occurring in GEOL Orion system.	Report has been changed to include this reference
2.3.1	Report does not state from when (date or consumption period) Genesis changed their temperature values to above ground values also the impact of this issue has not be related back to additional potential 37.2 accuracy breaches as an additional consequence. Report is also silent on the billing impact to customers in addition to the submission inaccuracies which retailers are obligated to achieve under the Gas Act. Finally is there any opportunity to update the volume impact table by gas gate to include the top 3 or 4 gas gates that Genesis trades on in order for the industry can gauge impacts – including potential balancing impacts.	Report has been changed to include the dates the temperature data was updated. The report does not calculate the impact of temperature discrepancies on the difference between initial and final allocations, or the impact by gas gate. This matter may be considered during the investigation phase.
2.3.1	The statement regarding GEOL applying Joule-Thomson Effect – I cannot see any statement regarding confirmation that GEOL's network pressures are accurate. Are you able to confirm this in the report as if the network pressures are inaccurate then JT calculations are wrong	Report has been changed to include reference to the accuracy of network pressure.
3.6	Are there any validations performed on the pressure and temperature interval data? Is this data also visually checked for outliers? Are there any comparisons undertaken between their D+1 and submission values as a final check?	Pressure and temperature data is checked as part of the validation process. There is not a comparison between D+1 and submission values.
5.3	Given the altitude and temperature factor issues identified – should a notation be added to this section that the number of gas gates outside this threshold could change once Genesis made corrections to their submission volumes as an outcome of special allocations to address these issues?	This matter may be considered during the investigation phase.
5.7	GEND comparison – Missing as a noted issue is the missing altitude factor from submission data but present in the billed volumes	Report has been changed to include reference to this point.
5.7	GEND ICP level table – there are a number of comments regarding billed volumes being incorrectly applied to WST03610 gas gate, however no mention of where this billed volumes should be applied to either as a period or as a different gas gate	Report has been changed to clarify this point

Appendix 3 – Contact Energy Comments

Enclosed is Contacts feedback relating to this draft audit.

Page 15 – breach relating to altitude factor missing from TOU gas conversion – I believe here is also an impact to annual UFG factors that should be noted.

Section 2.1.2 - missing from NZS 5259 extract is the note regarding where altitudes are below 50 metres then altitude factor of 1 can be applied. This point is also relevant for the final sentence relating to the number of incorrect altitudes occurring in GEOL Orion system.

Section 2.3.1 – Report does not state from when (date or consumption period) Genesis changed their temperature values to above ground values also the impact of this issue has not be related back to additional potential 37.2 accuracy breaches as an additional consequence. Report is also silent on the billing impact to customers in addition to the submission inaccuracies which retailers are obligated to achieve under the Gas Act. Finally is there any opportunity to update the volume impact table by gas gate to include the top 3 or 4 gas gates that Genesis trades on in order for the industry can gauge impacts – including potential balancing impacts.

The statement regarding GEOL applying Joule-Thomson Effect – I cannot see any statement regarding confirmation that GEOL's network pressures are accurate. Are you able to confirm this in the report as if the network pressures are inaccurate then JT calculations are wrong.

Section 3.6 – Are there any validations performed on the pressure and temperature interval data? Is this data also visually checked for outliers? Are there any comparisons undertaken between their D+1 and submission values as a final check?

Section 5.3 – Given the altitude and temperature factor issues identified – should a notation be added to this section that the number of gas gates outside this threshold could change once Genesis made corrections to their submission volumes as an outcome of special allocations to address these issues?

Section 5.7 GEND comparison – Missing as a noted issue is the missing altitude factor from submission data but present in the billed volumes.

GEND ICP level table – there are a number of comments regarding billed volumes being incorrectly applied to WST03610 gas gate, however no mention of where this billed volumes should be applied to either as a period or as a different gas gate.