Proposed guideline for application of gas billing factors

Date issued: 19 August 2011
Submissions close:16 September 2011

GAS INDUSTRY COMPANY LIMITED

About Gas Industry Co.

Gas Industry Co was formed to be the co-regulator under the Gas Act.

As such, its role is to:

- recommend arrangements, including rules and regulations where appropriate, which improve:
  - the operation of gas markets;
  - access to infrastructure; and
  - consumer outcomes;
- administer, oversee compliance with, and review such arrangements; and
- report regularly to the Minister of Energy and Resources on the performance and present state of the New Zealand gas industry, and the achievement of Government's policy objectives for the gas sector.

Authorship

This paper was prepared by Gas Industry Co with assistance from Rod Crone.

Submissions close: 16 September 2011

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1 Introduction

The Gas (Downstream Reconciliation) Rules 2008 (‘Reconciliation Rules’) require:

- meter owners to ensure that all metering equipment complies with NZS 5259; and
- retailers to ensure that the conversion of measured volume to energy complies with NZ 5259.

The ongoing programme of performance and event audits of retailers has identified a number of instances where the second of these requirements, the conversion of measured volume to energy, is not occurring on a uniform basis.

The primary purpose of this document is to provide a set of guidelines for consideration by retailers and other allocation participants and to seek feedback on that guideline document. The draft proposed guideline note is contained in Section 3 of this document. It is expected that adoption of the guideline by allocation participants will assist to resolve the discrepancies identified in the audits and generally improve the overall accuracy of consumption submissions under the Reconciliation Rules.

As well as the guideline note, this consultation document seeks feedback on the best way for industry participants to obtain and manage the temperature data required for energy conversion. A discussion on temperature data can be found in Section 4 of this paper.

1.1 Submissions

Submissions are invited from stakeholders on the content of the proposed guideline note and on the questions relating to temperature data. Submissions are sought no later than 16 September 2011. Submissions can be made by registering on Gas Industry Co’s website www.gasindustry.co.nz and uploading your submission.

All submissions will be published on the website after the closing date. For further information, see the Help for New Users document, which can be found using the search function on the Gas Industry Co homepage. Submitters should discuss any intended provision of confidential information with Gas Industry Co prior to submitting the information.

2 Background information

Under the Reconciliation Rules, Gas Industry Co has responsibility for commissioning regular performance audits of the allocation agent and allocation participants. A programme of baseline performance audits of gas retailers is now nearly complete. Gas Industry Co has also commissioned event audits of specific gas gates to investigate instances of high unaccounted-for gas. Although the great majority of customer installations appear to be metered accurately, both of these sets of audits have found inconsistencies between retailers in converting meter readings to energy and discrepancies in metering information records between retailers and meter owners.

In response to these findings, the Energy Retailers Forum (ERF), a group of electricity and gas retailers, produced a draft guideline on industry best practice in applying billing factors. A number of final audit reports have referred to this guideline and recommended that it be developed into an industry guideline note to assist participants with compliance with the rules and to ensure the consistent application of the relevant factors.

Gas Industry Co agrees that a guideline note that spells out expectations in applying billing factors would be a useful reference for industry. We acknowledge the initiative and efforts of the ERF, and particularly Rod Crone of Contact Energy, in providing a draft guideline, which provided the basis for the attached proposed guideline note.

Another source of inconsistency that the performance audits have uncovered is that each retailer uses its own set of temperature data in converting meter readings into energy. Some retailers use ground temperature, while others seem to use an average of ground and air temperatures. In addition, a number of retailers use temperature information that is more than five years old; in such cases, the audit reports have found that the older data can differ by as much as 2^{o} C from more recent data. Gas Industry Co would like to explore with industry participants the possibility of establishing a single common dataset for use by all participants. This issue is discussed further in Section 4.

3 Proposed guideline note

3.1 Introduction

The Reconciliation Rules include obligations on meter owners and retailers with regard to metering accuracy and conversion of measured volume to volume at standard conditions and then to energy. The purpose of this guideline note is to assist retailers and meter owners to meet their obligations under the Reconciliation Rules.

This note is explanatory in nature and is not legally binding. It needs to be read in conjunction with the Reconciliation Rules and the general approaches set out in this note in no way reduce the requirement upon allocation participants to know and comply with their obligations under the Reconciliation Rules.

3.2 Background

The need for billing factors arises because gas meters measure the volume of gas flowing through the meter, while customers are billed according to the amount of energy they have used. There are a number of reasons why the two are not equal. The energy content for a given volume of gas changes according to the conditions present at the time of measurement: temperature, pressure, and altitude all influence the molecular content in a measured volume of a gas. In addition, the energy content of natural gas varies, depending on the gas field it comes from (and therefore its content of hydrocarbon, and other, molecules). Billing factors are the parameters required to convert measured gas volumes into energy quantities.

This conversion occurs in several stages. First, the volume of gas passing through the meter is measured and recorded at the temperature and pressure conditions prevailing at the meter. The recorded or measured volume is then converted to volume at standard conditions, assuming the gas behaves as an ideal gas. This means that the volume of measured gas is converted to the volume it would be if it were under an absolute pressure of 101.325 kPa at a temperature of 15°C.

At high meter pressures, the assumption that the gas behaves as an ideal gas no longer holds, and the volume of the real gas will be greater than of an ideal gas, due to compressibility differences. To compensate for this situation, in installations where pressures are greater than 50 kPa, a correction for compressibility is applied to obtain the volume for the real gas.

Finally, the volume at standard conditions ("standard volume") calculated in the step above is converted to energy by multiplying by the calorific value of the supplied natural gas.

3.3 Governance arrangements

A number of documents govern the measurement and reporting of volumes of gas sold to customers.

The Gas (Safety and Measurement) Regulations 2010 ('Safety and Measurement Regulations') specify that:

- every person who sells gas must conform with the requirements of Part 1 of NZS5259[1] (unless seller and purchaser have agreed otherwise);
- gas is required to be sold by energy content;
- maximum permissible errors for the gas measurement system itself as well as for corrections of volume to standard conditions and for calorific value measurement must not be exceeded; and
- owners of gas measurement systems must manage those to ensure that accuracy meets the requirements of NZS5259.

The Safety and Measurement Regulations are administered by the Ministry of Economic Development.

The Reconciliation Rules set out meter owner and retailer obligations relevant to metering equipment and billing factors, and they cite NZS5259:2004 Gas Measurement as the reference standard for compliance. The purpose of the Reconciliation Rules is to "*establish a set of uniform processes that will enable the fair, efficient, and reliable downstream allocation and reconciliation of downstream gas quantities*". A key prerequisite for achieving that purpose is that gas be measured as consistently and accurately as reasonably possible by all allocation participants.

The Reconciliation Rules require that:

- retailers ensure metering equipment is installed and interrogated at each customer site;
- certain minimum rates of meter reading be undertaken for various allocation groups (or sites within allocation groups);
- conversion of measured volume to standard conditions and then to energy complies with NZS5259;
- meter owners ensure all metering equipment complies with NZS5259.

[1] NZS5259 is the New Zealand Standard for gas measurement. At the time of writing NZS5259:2004 amendment 1 is in effect (the 2004 standard was amended in 2009).

The Gas (Switching Arrangements) Rules 2008 ('Switching Rules') set out industry participants' obligations with respect to the gas registry. Of relevance to billing factors is each distributor's responsibility for maintaining current and accurate information in the gas registry for Network Pressure (nominal operating pressure of the network at the point of connection), ICP Altitude and Gas Gate for each ICP for which it is the responsible distributor.

Gas Industry Co is responsible for overseeing compliance with the Reconciliation Rules and Switching Rules. Under the former, Gas Industry Co commissions performance audits of allocation participants and the allocation agent on a regular basis; event audits may be commissioned from time to time in response to specific situations.

NZS 5259:2004 Gas Measurement is a revision of the previous gas measurement standard NZS5259:1997. Since its release, NZS5259:2004 has been amended by Amendment No. 1, which was approved by the Associate Minister of Energy and Resources on 18 November 2009 and by the Standards Council on 24 November 2009.

In this paper, 'NZS5259' and 'the Standard' are used interchangeably to mean the most current version of the gas measurement standard.

NZS5259 comprises two main parts. Part 1 – Performance Requirements – deals with the mandatory performance criteria for gas measurement. It sets out the requirements for each of the elements of a gas measurement system together with maximum permissible errors (MPEs). Part 2 – Means of Compliance – provides a range of information with respect to the design, installation, commissioning, operation and maintenance of gas measurement systems. Of particular relevance to this guideline note is section 2.7 dealing with conversion of measured volume to standard value of energy.

In relation to the choice between using fixed factors or a conversion device, NZS5259 states that:

> Under normal circumstances, combined errors for pressure, altitude and compressibility in excess of 2% shall be regarded as unacceptable and errors in excess of 1.5% undesirable when considering the use of factors or conversion devices. If however, the individual quantity is very small, larger errors may be acceptable when the cost of avoiding these would be unacceptably high.

3.4 Conversion formula

The general equation governing the process of converting register readings to energy is:

$$E = V \times M \times F_T \times F_P \times F_A \times F_Z \times H$$

Where:

E is energy to be billed

V is the volume indicated by the meter (typically the difference between two consecutive register readings)

M is the register (or meter) multiplier (or 1 where no multiplier is required)

F_T, F_P, F_A, and F_Z are the correction factors for temperature, pressure, altitude and compressibility, respectively

H is the calorific value of the gas being measured, i.e. the heat content in megajoules of one cubic meter of that gas (measured at standard conditions). The calorific value of gas is readily available on the Open Access Transmission Information System (OATIS). As this factor does not require the management of specific site information, it is not mentioned further in this guideline note.

3.5 Billing factors

Each of the factors in the conversion formula is discussed below with a view to identifying the impact on overall accuracy and providing some guidance on the approach retailers should take to ensure compliance with the relevant governance arrangements.

Register multiplier

The register (or meter) multiplier is a fixed factor used to scale the register reading to cubic metres (uncorrected). For most meters, the register reading shows the volume, in cubic meters, of gas that has passed through the meter, uncorrected for differences in temperature and pressure from standard conditions. For these meters, no register multiplier is required; i.e. the register already shows cubic metres. In those instances, the value of M in the above equation is one.

Some meters, however, measure a proportion of the actual gas volumes that flow through them. For such meters, it is essential that the correct register multiplier be used to obtain actual gas volumes. Some meters, for example, have registers that record one-tenth of gas volumes and require a register multiplier of 10; others record ten times actual gas volumes and require a register multiplier of 0.1. Failure to use the correct register multiplier can have a large impact on volumes charged to customers and reported to the Allocation Agent.

Sources of error include:

- metering information being incorrectly recorded when meters or conversion devices are first installed, or where they are changed;
- conversion devices being incorrectly programmed;
- retailers incorrectly processing data from meter owners regarding meter or conversion device set-up;

- multiplier set-up being miscommunicated or misinterpreted when an ICP switches retailer; and
- inconsistent treatment of a fixed “0” on a meter index, either ignored with only the moving dials recorded by the meter reader and in the retailer’s billing system hence requiring a register multiplier to be applied, or alternatively recorded as a “0” by the meter reader and in the retailer’s billing system. The consequence of getting this wrong is the same as a multiplier error.

[Note: The fixed “0” inconsistency is being addressed by the meter owners and will likely require a refresh of some information held in meter reader and retailer databases.]

Given the potential impact that an incorrect register multiplier can have, the accuracy of this factor should be confirmed with the meter owner. There are also basic checks that retailers and meter owners can make.

Gas Industry Co expectations regarding register multipliers:

- Retailers and meter owners have systems in place to verify on a regular basis that metering set-up information held by the retailer is consistent with the equivalent information in the meter owner’s database (including number of dials to be recorded by the meter reader, and register multiplier). Such verification should take place at least every six months.

[Note: Gas Industry Co is investigating the option of including certain additional metering set-up information in the registry, including number of dials to be recorded by the meter reader and register multiplier, however until this is implemented the above expectation will remain relevant.]

Retailers perform regular checks to ascertain whether the consumption being recorded for a meter is consistent with the volumes for which that meter is intended.

Temperature factor

When gas becomes warmer, it expands; and when gas cools, it contracts. Thus, for a given pressure, the number of gas molecules per cubic metre changes with changes in temperature. Using a temperature factor makes allowance for this effect in converting a measured gas volume to gas volume at a standard temperature of 15°C.

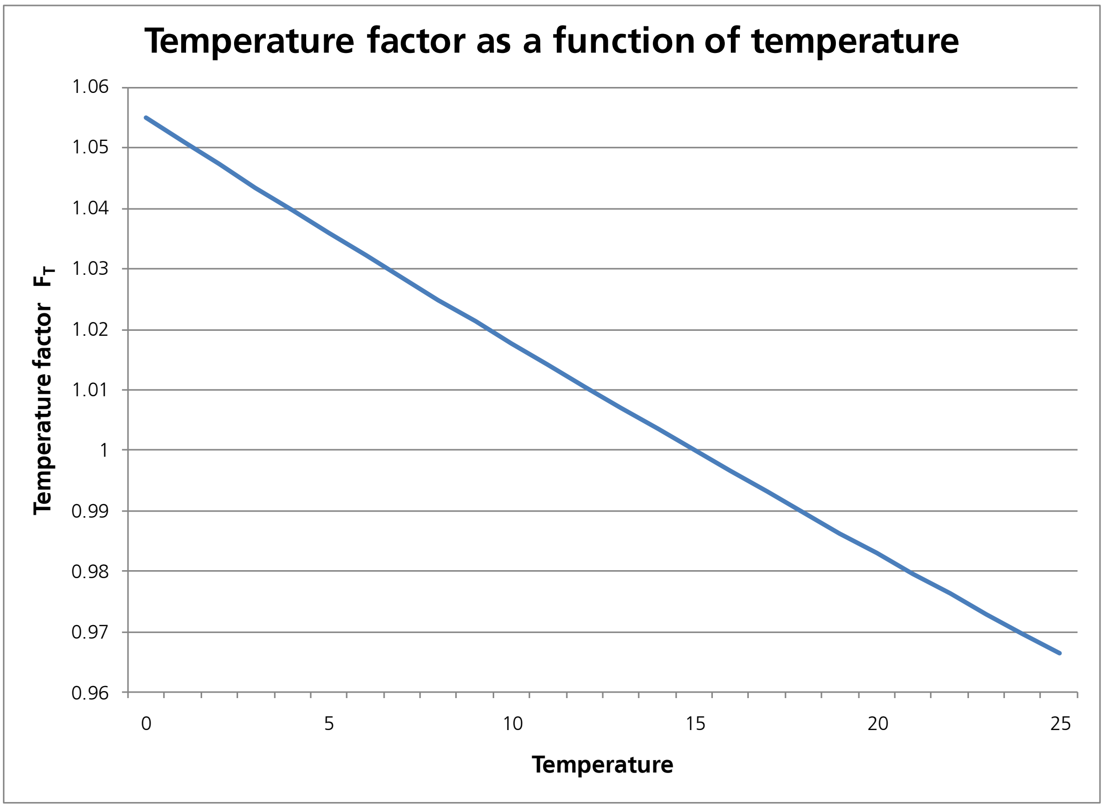
The temperature factor is calculated as[2]:

$$F_T = \frac{288.15}{273.15 + t}$$

[2] The ratio of standard temperature over the gas temperature, both expressed in degrees Kelvin.

Where *t* is the estimated average temperature of the flowing gas in degrees Celsius (taking into account any other temperature influences such as the Joule-Thomson effect).

The following chart shows the sensitivity of the temperature factor to changes in temperature. It illustrates that a variance of five degrees from the standard temperature requires a correction to the recorded volume of around two per cent.



Sites with a conversion device which includes temperature correction will have a live feed from a temperature sensor located in the gas stream just upstream of the meter. The conversion device will correct for temperature in real time, and the temperature correction factor in the conversion formula will be 1.0.

For sites without a conversion device and temperature correction, it is necessary to estimate the temperature of the gas stream. NZS5259 defines four options for doing this.

Options for estimating gas temperature

In the absence of actual measurements of gas temperature, NZS5259 lists the following options (in decreasing order of preference).

> (a) Temperature records of the station under flowing conditions. Historical records can be used if similarity is preserved.

Comment: Would only be appropriate where a corrector with a live temperature feed had been installed at the site for some time but had subsequently been removed, or found to be faulty, and the usage remained reasonably similar to the historic usage.

> (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.

Comment: Unlikely to be a practical option for generalised application.

> (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 season should be used.

Comment: Reflective of the configuration at the majority of GMS installations as the riser pipe is generally quite short, and a practical option given NIWA has many stations recording such information in areas where gas is supplied.

> (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.

Comment: Not reflective of the configuration at the majority of GMS installations as the riser pipe is generally quite short and the gas would be unlikely to achieve ambient temperature.

Gas Industry Co expectations regarding temperature factor:

- Retailers select weather stations relevant to the area supplied by each gas gate at which they are trading. Weather stations should have at least five years of historical ground temperature data at 300 mm depth.
- Retailers obtain daily or monthly average temperature data based on the previous five years of weather records for each chosen weather station.
- Retailers use daily or monthly average temperature data to construct average temperatures for billing and reconciliation purposes.
- Retailers refresh temperature data on a regular basis, at least every five years.

[Note: While compliance with NZS 5259 is essential it is also important to achieve an appropriate balance between precision (at a cost) and materially accurate (at a lesser cost). In this context Contact has analysed the accuracy benefits of maintaining and using daily versus monthly temperature data, and selection of a unique weather station for each gas gate versus selection of a single weather station for a group of gas gates. For SAP, we have concluded that a solution that achieves an appropriate balance is monthly temperature data (weighted average temperature reflecting days in each month) with the same temperature data for a group of gas gates. The gas gates have been grouped to ensure the temperature factor will be within an accuracy band of +/- 0.5% (maximum +/- 1.5% is allowed for the temperature factor) which equates to approximately +/- 1.5^{o}C. The monthly data can be derived from daily or monthly data from NIWA.]

Joule-Thomson effect

A related matter is the Joule-Thomson effect, which explains the decrease in temperature of a (non ideal) gas that results from pressure reduction. In situations where the pressure drop immediately upstream of the meter is of sufficient magnitude, there will need to be a correction for the Joule-Thomson effect. Failing to do so will understate gas consumption and contribute to UFG (albeit to a small level).

The magnitude of the Joule-Thomson effect can be estimated as 0.5°C for every 100kPa of pressure reduction. NZS5259 recommends that for larger pressure drops or high flow rates, the actual temperature drop should be measured.

To make it possible to estimate the Joule-Thomson effect, retailers need to know the pressure drop, i.e. the difference between the inlet (i.e. network) pressure for the installation and the pressure at the meter. As noted in "*Event audit to identify sources of UFG in respect of Tawa A gas gate for May 2009 & June 2009*", in a number of instances the network pressure field has not been accurately populated in the gas registry. According to that audit report, only Nova Gas and Auckland Gas Company (both now Nova Energy) were compensating for the Joule-Thomson effect.

Gas Industry Co expectations regarding Joule-Thomson:

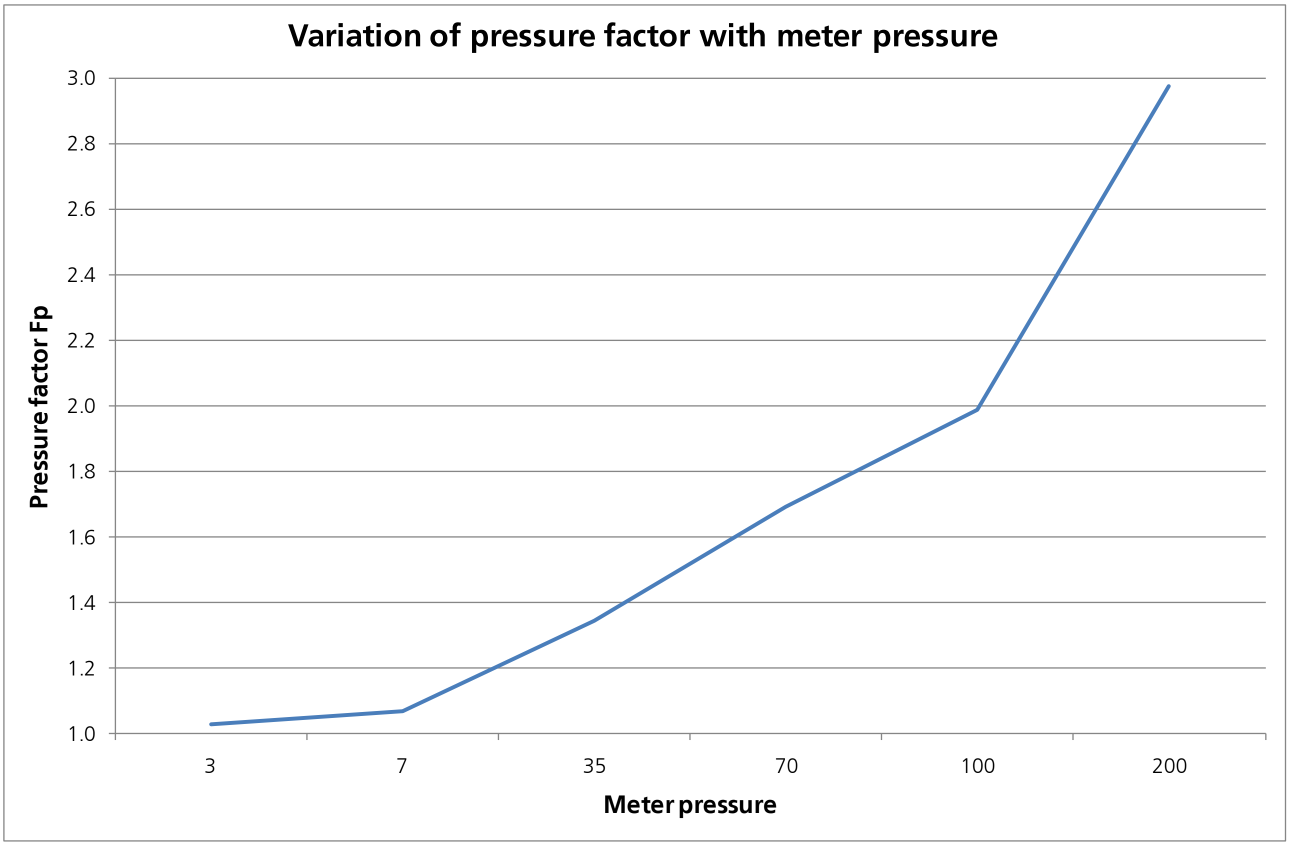
- Network owners ensure nominal operating pressures are correctly populated in the registry for all ICPs on their networks.
- Once network pressures are correctly populated, retailers ensure that they account for the Joule-Thomson effect by using the network pressure in the registry in their conversion of metered volumes to standard volume.

Pressure factor

Increasing the pressure of a gas causes it to contract; lowering the pressure causes it to expand. Thus, for a given temperature, the number of gas molecules per cubic metre changes with changes in pressure. Using a pressure factor makes allowance for this effect in converting a measured gas volume to gas volume at a standard absolute pressure of 101.325 kPa.

The pressure factor is calculated as[3]: $F_P = \frac{P_g + 101.325}{101.325}$

Where P_g is the meter pressure (gauge) measured in kPa. Meter pressure is set by the regulator immediately upstream of the meter and it is essential that this pressure is accurate in converting measured gas volume to volume at standard conditions. The chart below shows how the pressure factor changes with changes in meter pressure.



The chart illustrates that for sites where the meter pressure is substantially greater than atmospheric pressure, the pressure factor has a dramatic effect on the conversion from volume to energy. Hence it is critical that the correct meter pressure is known and used.

On larger customer sites, a conversion device may be installed with a live pressure feed from the gas stream just upstream of the meter. Such sites will automatically compensate for meter pressure, in which case the pressure factor will be 1.000.

For all other sites, it is necessary for the retailer to calculate and apply a meter pressure factor. The retailer requires an accurate figure for the meter pressure in order to be able to calculate this factor correctly. The meter owner must provide the

3 The ratio of the absolute pressure of the gas (the sum of gauge pressure and atmospheric pressure) to standard atmospheric pressure. The calculation assumes that the gauge pressure is measured at mean sea level. The next factor, altitude, corrects for any deviations to this assumption.

responsible retailer with the correct meter pressure for any new connection and whenever there is any change to an installation that alters the meter pressure. When an ICP is switched, the outgoing retailer is required to provide the incoming retailer with the meter pressure (and, for each register, the register multiplier and the number of dials on the register).[4]

Performance audits have identified varying degrees of inaccuracy with regard to the meter pressure stored in retailers' billing systems.

Given that quite small inaccuracies in the meter pressure can result in material errors in the pressure factor, retailers should have systems in place to compare their metering set-up information with that held in the meter owner's database on a regular basis, and at least every six months.

Gas Industry Co expectations regarding pressure factor:

- Retailers and meter owners have systems in place to verify on a regular basis that metering set-up information held by the retailer is consistent with the equivalent information in the meter owner's database (including meter pressure). Such verification should take place at least every six months.

Note: Gas Industry Co is investigating the option of including certain additional metering set-up information in the registry, including meter pressure, however until this is implemented the above expectation will remain relevant.

Altitude factor

The altitude factor corrects for the change of barometric pressure with change in altitude. To calculate the corrected volume, the pressure at the meter must be an "absolute" pressure value. The pressure correction factor outlined above converts gauge pressure to standard pressure presupposing that the gauge pressure is measured at mean sea level. Accordingly, a further correction must be made to account for sites at altitudes above mean sea level.

For altitudes under 1000 metres, the average barometric pressure can be approximated by:

$$P_m = 101.325 \times \left[1 - \frac{h}{k_2}\right]$$

Where:

h is the altitude in metres

k_2 = 8500 m

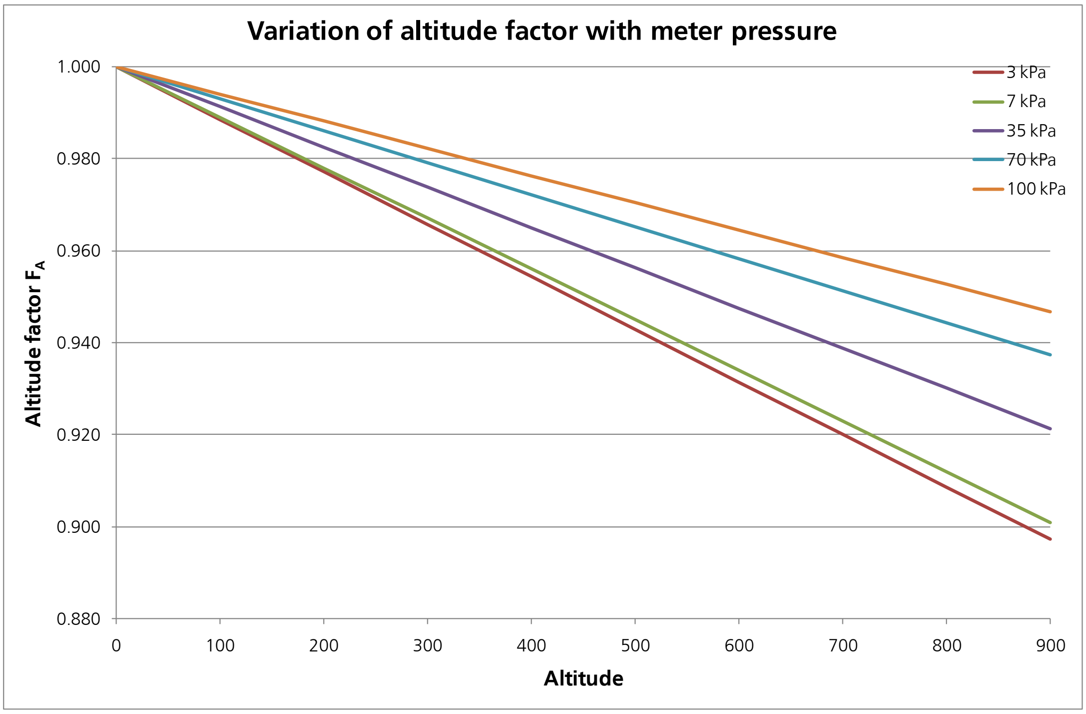
P_m is the calculated absolute pressure at the given altitude, expressed in kPa.

4 See rule 72 of the Gas (Switching Arrangements) Rules 2008.

As a result, the altitude factor (for a fixed factor meter) is defined as:

$$F_A = 1 - \frac{h/k_2}{F_P}$$

The chart below shows how the altitude factor changes in relation to both meter pressure and altitude.



The 2009 amendment to NZS5259 included a note that "*To minimise uncertainty due to altitude factor the aim should be to determine the altitude within 10m where practicable*."

NZS5259 indicates that areas of similar altitude may be defined and the average altitude for that area used for the purpose of calculating the altitude factor. It notes that the difference between the maximum and minimum altitudes in such an area should be such that the maximum permissible errors associated with meter pressure and altitude are not be exceeded.

Table 3 of NZS5259 cites the maximum permissible errors for altitude conversion as ±1% for installations where the metering pressure is less than 100 kPa and ±0.5% otherwise. This could be interpreted as meaning that any installation with an altitude of 90 metres or less (and operating at sub-100 kPa) would not require altitude correction. However, that table also specifies in the notes that when "*factors are used to convert the measured volume to the volume at standard conditions the **combined** MPEs shall not exceed ±1.5%*" (emphasis added). This suggests that compliance with NZS5259 does require a reasonably accurate assessment of, and correction for, altitude, so that the combined MPE of ±1.5% is not exceeded.

The programme of baseline performance audits carried out in 2010/11 identified a range of approaches to using altitude factors. The performance audits also identified that the data used to populate the altitude for ICPs on the gas registry were not of uniform quality. A significant number of ICPs on the registry have been given an altitude of zero (sea level) and sampling has indicated that the error rate among this grouping is high. Rule 58.1 of the Switching Rules requires that:

> Each distributor, retailer, and meter owner must use its reasonable endeavours to maintain current and accurate information in the registry in relation to the ICPs and the ICP parameters for which it has responsibility as set out in the Schedule.

Whilst the Reconciliation Rules place the responsibility for accuracy of metering factors on retailers, it would be efficient for retailers to source their altitude data from the gas registry, but they are unlikely to do this if the data is regarded as unreliable.

Gas Industry Co expectations regarding altitude:

- Distributors populate the registry with altitude information to within 10 m for each ICP on its network.
- Retailers to use ICP-specific altitude in the registry for its conversion of metered volume to standard volume.

Compressibility factor

The compressibility factor F_Z is used to correct for deviations from ideal gas behaviour.[5]

The compressibility factor is defined as:

$$F_Z = {}^{Z_b}\!/_{Z}$$

Where:

Z_b is compressibility at standard conditions for the gas being measured, and

Z is compressibility at operating conditions.

Calculation of compressibility[6] is beyond the scope of this guideline. However, NZS5259 recommends use of any of the following methods:

[5] Compressibility is a function of gas temperature, pressure and gas composition; and it accounts for differences between the behaviour of the measured gas compared to an ideal gas. In an ideal gas, molecules are assumed not to interact, but in a real gas, they do if the density is high enough.. At low density, gas molecules are far apart and do not interact, so the volume is similar to that of an ideal gas. At somewhat higher densities, the molecules are closer together and the interaction forces between the particles are attractive, so the volume of the gas is less than that of an ideal gas in the same conditions. At still higher densities, the molecules are excessively close together, resulting in repulsive interaction forces. This results in the volume being greater than it would for an ideal gas.

a) AGA 8;

b) AGA NX19; or

c) ISO 12213.

The Standard requires that a compressibility factor be applied whenever the error due to non-application of such a factor would give rise to errors in excess of the limits defined in Table 3 of the Standard (±0.2% for metering pressures below 500 kPa and ±0.25% otherwise). The rule of thumb, as recommended in NZS5259, is to correct for compressibility at pressures above 50 kPa.

In the most recent amendment to NZS5259, the committee recommended that, at the next review of the Standard, consideration should be given to removing AGA NX19 as a recommended method for calculating compressibility. The reason was that the other methods (AGA 8 and ISO 12213) are applicable over a wider range of operating conditions and gas compositions. As a result of that recommendation, retailers undertaking system changes who are currently using AGA NX19 may want to consider changing to one of the other recommended methods.

[Contact Comment: As AGA8 is a much more complex (i.e. more expensive to implement) calculation than AGA NX19 we have been considering what we should do when we transition to SAP, While we are aware of the committee's recommendation we think it may be an inappropriate decision for the retail market and consider the committee should be challenged to produce analysis to support its position. It appears to be overly influenced by what may be appropriate for very large direct supply consumers and transmission meters where the meter pressure is typically high, we also believe Vector as the transmission system owner is the only participant using AGA8.

For by far the majority of consumers (the retail market) the effect of super-compressibility is negligible, and therefore the difference between the AGA8 and AGA NX19 factors will be even less relevant. While compliance with NZS 5259 is essential it is also important like the temperature factor to achieve an appropriate balance between precision (at a cost) and materially accurate (at a lesser cost). We currently plan on implementing AGA NX19 calculations in SAP for retail billing as it is simpler than AGA8 and at the pressures experienced in the retail market we believe there is no material difference between the two calculation methodologies. While we recognise there may be accuracy benefits in high pressure metering situations (larger gas gates, welded points), we question the need to move to a more complex methodology for retail billing and reconciliation.]

Q1: Please provide feedback on the above draft guideline note. The file is available as a Word document and you are invited to provide a marked-up copy with your changes.

6 Calculation of compressibility requires use of formulae that are complex and iterative.

Q2: Do you support the addition to the gas registry of further meter set-up parameters, such as meter pressure, meter multiplier and number of dials, as meter owner maintained fields?

4 Temperature data

The fact that all retailers supplying non-ToU sites need access to accurate, up-to-date temperature data for use in energy conversion calculations suggests that there may be benefits in establishing a single database that is used by all retailers. Such a database would be easier to maintain and update than separate retailer databases, and it would provide consistency across retailers' conversion calculations.

The retailer performance audits identified that retailers use NIWA temperature data for energy conversion, although there are differences in the type of data – some use ground temperature; others use an average of air and ground temperatures – and in the age of the data. A number of retailers were identified as needing to refresh the data they use. Gas Industry Co envisages that it would be possible to procure from NIWA an up-to-date ground temperature dataset that all retailers would be able to use. Such a dataset could be published either on the gas registry website or the allocation agent website, so that it is readily available to industry participants.

There would be a number of factors to consider in establishing a common temperature database, including determining which temperature monitoring stations map to which gas gates, how many years of data should be included in the dataset, and how often the dataset should be refreshed. On the first of these issues, Gas Industry Co is aware that Contact Energy has gone through a similar exercise for its customer base. Their matching of temperature stations and gas gates could either be used as it stands by the wider industry, or it could be used as a starting point for discussion. Other retailers may also have ideas about matching temperature stations to gas gates.

If feedback on the idea of a common temperature dataset is positive, then Gas Industry Co will investigate the feasibility of the idea and revert back to industry with a proposed way forward.

Q3: Do you agree that a common ground temperature dataset should be established for use in energy conversions by retailers?

Q4: If so, do you have any comments or suggestions as to how the database should be configured?

Extract from the Gas (Downstream Reconciliation) Rules 2008

Meter owner obligations

27. Metering equipment accuracy

27.1 For the purposes of gas volume information required to be collected or provided under these rules:

27.1.1 Every meter owner must ensure that all metering equipment used to collect that volume information complies with NZS 5259:2004;

27.1.2 Metering equipment which has a margin of error of less than the relevant margins of error specified in NZS 5259:2004 is considered to be accurate; and

27.1.3 Any verification of accuracy must be in accordance with NZS 5259:2004.

Retailer obligations

28. General obligations of retailers

28.1 Every retailer must ensure that metering equipment is installed and interrogated at each consumer installation to which that retailer is the responsible retailer in accordance with the requirements of the allocation group to which the consumer installation has been assigned.

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 5259:2004 for metering equipment installed at each consumer installation for which the retailer is the responsible retailer.

28.3 Every retailer must supply consumption information in accordance with rules 29 to 40 for all consumer installations for which it was the responsible retailer to the allocation agent.

28.4 Every retailer must ensure that:

28.4.1 The consumption information supplied to the allocation agent in accordance with rules 29 to 40 is transferred and stored in such a manner that it cannot be altered without leaving a detailed audit trail; and

28.4.2 A copy of all register reading data is kept for a minimum period of 30 months and is made available to the allocation agent, industry body or an auditor on request.

28.5 For the purposes of these rules, a retailer continues to be responsible for gas supplied to all consumer installations during all or any part of the consumption period in respect of which it is the responsible retailer.

Extract from the Gas (Safety and Measurement) Regulations 2010

Gas measurement

21 Gas measurement

(1) Every person who sells gas must do so in accordance with the requirements of Part 1 of NZS 5259 unless there is an agreement in writing to the contrary between the seller and the purchaser.

(2) Gas must be sold by energy content measured by a gas measurement system, and the following margins of error must not be exceeded:

(a) for volume, uncorrected for pressure or temperature,—

(i) prior to a meter being placed in service, plus or minus 2%; or

(ii) at any time after a meter has been placed in service, plus or minus 3%:

(b) for corrections of the volume measured to standard conditions, whether by a device used for obtaining corrections or by the setting of factors,—

(i) prior to a device used for obtaining corrections being placed in service, or on the setting of factors, plus or minus 1%; or

(ii) at any time after a device used for obtaining corrections has been placed in service, or on the setting of factors, plus or minus 1.5%:

(c) for calorific value measurements, plus or minus 0.5%.

(3) Every person who owns a gas measurement system used to measure the supply of gas to consumers must manage that gas measurement system to ensure accuracy of measurement and to ensure that adequate records are kept.

(4) Compliance with NZS 5259 is deemed to be compliance with subclauses (2) and (3).

(5) Every person commits a grade A offence who fails to comply with this regulation.

22 Testing and installation of gas measurement systems

(1) This regulation applies to any gas measurement system to which regulation 21 applies before the system is placed in service, and before it is returned to service after being disconnected from service for the purpose of maintenance or recalibration of that system.

(2) Every gas measurement system to which this regulation applies must, before being put into service, be tested by a competent organisation to determine its accuracy,

and must be sealed by the same competent organisation following confirmation that the system complies with regulation 21(2).

(3) Compliance with Part 2 of NZS 5259 is deemed to be compliance with subclause (2).

(4) Any gas measurement system that does not pass the test carried out in accordance with subclause (2) must not be sealed, and any seal that may have been placed on the system must be removed or destroyed.

(5) If a test has been carried out in accordance with subclause (2) and the gas measurement system has been transported before being put into service, the person owning the gas measurement system must ensure that the calibration of the system is unaffected by that transportation before putting that system into service.

(6) Every person commits a grade A offence who installs or uses a gas measurement system contrary to the requirements of this regulation.

(7) Every competent organisation commits a grade A offence that seals a gas measurement system contrary to the requirements in respect of sealing in this regulation.

(8) Every person commits a grade B offence who, not being a competent organisation, breaks the seal of any gas measurement system to which this regulation applies.

23 Records of tests of gas measurement systems must be kept

(1) A record of the results of each test carried out in accordance with regulation 22 must be kept by—

(a) the competent organisation that carried out the test; and

(b) the operator of the gas measurement system tested.

(2) The records kept by the operator of a gas measurement system pursuant to subclause (1)(b) must be retained by that operator for the period of that operator's operation of that gas measurement system.

(3) Every operator of a gas measurement system commits a grade B offence if the operator fails to keep any of the records required by subclause (1).

Submission prepared by: Contact Energy (Rod Crone)

QUESTION	COMMENT

1	Please provide feedback on the above draft guideline note. The file is available as a Word document and you are invited to provide a marked-up copy with your changes.	Marked up changes provided, including notes to provide additional context.
2	Do you support the addition to the gas registry of further meter set-up parameters, such as meter pressure, meter multiplier and number of dials, as meter owner maintained fields?	Yes Contact supports the addition to the gas registry of meter pressure, meter multiplier and number of dials to be read by the meter reader, as meter owner fields. We also support changes to the rules that provide for performance audits of meter owners and distributors with respect to population of the registry and compliance with NZS 5259 of data that affects retailers billing and reconciliation accuracy and compliance with NZS 5259 – namely: • Meter owners - meter pressure, meter multiplier and number of dials to be read by the meter reader • Distributors – altitude, network pressure, gas gate
3	Do you agree that a common ground temperature dataset should be established for use in energy conversions by retailers?	Contact would be supportive of a common ground temperature dataset being established, provided flexibility is maintained for individual retailers to maintain and use daily or monthly temperature data for billing and reconciliation purposes, and unique temperature data for each gas gate or common temperature data for a group of gas gates in a regional area with similar temperature characteristics. Whichever option is chosen the retailer would still have to demonstrate that its methodology complies with NZS 5259.

4	If so, do you have any comments or suggestions as to how the database should be configured?	It would need to be in a standard format, ideally xml. Minimum detail to be included would need to be Gas Gate (gas gate number), Station Name (weather station description), Network Number (weather station unique ID), DDMMYYYY, Temperature. While each station would need to start with a minimum of 5 years daily records, the common dataset would need to grow to 10 years if the retailer's use of the data and compliance with NZS 5259 is to be audited. Comment: • While compliance with NZS 5259 is essential it is also important to achieve an appropriate balance between precision (at a cost) and materially accurate (at a lesser cost). • In this context Contact has analysed the accuracy benefits of maintaining and using daily versus monthly temperature data, and selection of a unique weather station for each gas gate versus selection of a single weather station for a group of gas gates. • For SAP, Contact has concluded that a solution that achieves an appropriate balance is monthly temperature data (weighted average temperature reflecting days in each month) with the same temperature data for a group of gas gates. The gas gates have been grouped to ensure the temperature factor will be within an accuracy band of +/- 0.5% (maximum +/- 1.5% allowed) which equates to approximately +/- 1.5^{o}C. • The monthly data can be derived from daily or monthly data from NIWA. • Contact is happy to share its mapping of gas gates and weather stations which was achieved after a lot of analysis, and if appropriate gas gate grouping analysis which provides for a more pragmatic solution.]